Analysis and Estimation of Background Metals Concentrations in Soils and Sediments of the Upper Columbia River Basin

Report by:

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Contents and Outline of Report:

1. Study Objectives

- Provide an estimation of natural background concentrations of metals in soils of NE Washington using existing soil and sediment data.
- Support development of a comprehensive, technically robust dataset for background metals concentrations in NE Washington upland surface soils that can support future project needs.

2. Statistical methodology used – A brief description of the tools used

Our general plan of analysis can be represented in the following steps:

1. We perform detailed exploratory analysis. We do this by graphing (box-plots) the data and doing frequency tables to look at the distribution of the data.
2. We perform distributional analysis using quantile-quantile plots and goodness of fit tests. We identify the distribution and make the decision of parametric analysis or non-parametric analysis. We use the parametric distribution that best fits the data or if none of the distributions fit the data, we decide on rank based non-parametric analysis.
3. We compare the means (or mean ranks) of the data for the different metals to see if the three sources are different, if the WRIA's are different and if there are any source-WRIA interactions (when possible) using Non-parametric rank-based ANOVA. All tests were conducted at

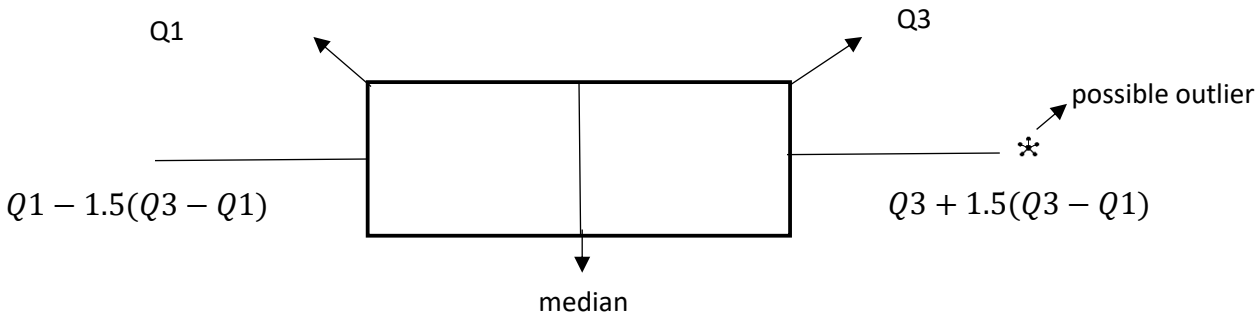
significance levels less than .05. (We were cognizant of the effect of large samples on p-values and made decisions taking both statistical and scientific significance in mind). If the data show no difference, based on source or WRIA or interactions we can advise pooling the data, else, we advise pooling the sources that show minimal difference (or if the data set is so small that we cannot reasonably find differences).

4. Based on the results of 3, we find 90th percentiles for each metal (by source and WRIA when required) parametrically or empirically based on step 2. We provide 95% confidence intervals for the percentiles using parametric or non-parametric methods.

Description of Statistical Methods Used

1. Exploratory Data Analysis

Exploratory Data Analysis (EDA) is done before one starts analyzing data. Box-plots are constructed to see if the data was consistent. We look for issues with data (censoring, outliers). We used box-plots for EDA. Our boxplots were constructed using MINITAB 17 ©software. Here the box of the box-plot was constructed using the 1st quartile (25th percentile) and the 3rd quartile (75th percentile). The "whiskers" or the lines from the boxplot are Q1-1.5(Q3-Q1) and Q3+1.5(Q3-Q1). Any point beyond it is denoted by an Asterix (*) and represents possible outliers. A generic boxplot is given below.



2. Distribution Identification

MINITAB 17 © uses the quantile plots for distribution identification. We can plot the data (broken down by source) over 11 different distributions that are generally used for modelling positive continuous data. These distributions are Normal, Log-normal, Weibull, Logistic, Exponential, smallest extreme value, Log-logistic, 3 parameter Weibull, 3 parameter Log-logistic, 3 parameter Logistic. For each of the distributions, MINITAB provides the Anderson Darling (AD) test statistic. To see if a distribution fits the data well, we can look at how closely the data is to the line and the AD test statistic is smallest. Since we are using multiple variables (from each of the sources) we do not provide a p-value for the AD test.

3. ANOVA

In Analysis of Variance (ANOVA), we model our response variable as a linear model of the categorical explanatory variables. Given that none of the distributions fitted the data well, we used two approaches:

1. $y_1 = \log(y)$
2. $y_2 = rank(y)$

For each, we use the model:

$$y_{ijk} = \mu + \alpha_i + \beta_j + (\alpha\beta)_{ij} + \varepsilon_{ijk}$$

i : Representing the source $i = 1,2,3$

j : Representing the WRIA $j = 1,2, \dots ,11$

k : The sites within the source and WRIA $k = 1,2, \dots$

In our model:

α_i: Represents the effect due to each source

β_j: Represents the effect due to each WRIA

$(\alpha\beta)_{ij}$: Represents the interaction (synergistic or antagonistic) effect for the joint contributions of source and WRIA

Our ANOVA model will provide us with p-values for source, WRIA and interaction. A significant interaction implies that the effect for a source potentially depends upon which WRIA it comes from. A significant interaction implies that data are not appropriate or preferred for pooling.

4. Bootstrapping our percentiles

We use the 90th percentile as our measure of background. The appropriateness of the 90th percentile is based on the fact that we are constructing a one-sided confidence interval for the metal data. Most of the background would be contained within the 90th percentile. Any number beyond the 90th percentile is likely excessive and to come from anomalous or contaminated origins rather than be representative of background.

We provide a 95% confidence for the 90th percentile. As no parametric distribution fitted the data, we used the data based on (non-parametric) bootstrap methods. The bootstrap method (*Efron, B. (1979). "Bootstrap methods: Another look at the jackknife". The Annals of Statistics.* ***7*** *(1): 1–26. doi:10.1214/aos/117634455*) allows us to create empirical distribution using our observed data by sampling *with* replacement from the data and in each case calculating the statistic of interest. This empirical distribution is an appropriate estimate (converges to) our real unknown distribution and we can use percentiles to calculate confidence interval for the bootstrapped data.

3. Data Analysis

3.1 Exploratory Data Analysis:

We explore a total of 25,466 observations over 18 metals [later refined to 25,379 accounting for specific Cd detection limitations]. These are collected over 11 Water Resource Inventory Areas (WRIAs) and three different data sources: Soil, Sediment (NURE), Sediment (Non-Nure). The 18 metals and 11 WRIAs did not have the same number of observations. The following table gives a count of the data total by each metal and by each source. This accentuates the disparity in the data set.

Table 1: Metals by Source

	Metals	group	n	proportion
1	Aluminum	Sedi_nonNURE	195	4.50%
2	Aluminum	Sedi_NURE	4046	93.10%
3	Aluminum	Soil	106	2.40%
4	Antimony	Sedi_nonNURE	14	12.60%
5	Antimony	Soil	97	87.40%
6	Arsenic	Sedi_nonNURE	181	14.10%
7	Arsenic	Sedi_NURE	1004	78.20%
8	Arsenic	Soil	99	7.70%
9	Barium	Sedi_nonNURE	194	69%
10	Barium	Soil	87	31%
11	Beryllium	Sedi_nonNURE	197	13.50%
12	Beryllium	Sedi_NURE	1163	79.70%
13	Beryllium	Soil	99	6.80%
14	Bismuth	Sedi_nonNURE	40	52.63%
15	Bismuth	Soil	36	47.37%
16	Cadmium	Sedi_nonNURE	155	56.80%
17	Cadmium	Soil	118	43.20%
18	Chromium	Sedi_nonNURE	206	13.80%
19	Chromium	Sedi_NURE	1167	78.30%
20	Chromium	Soil	118	7.90%
21	Copper	Sedi_nonNURE	206	14.60%
22	Copper	Sedi_NURE	1087	77.00%
23	Copper	Soil	118	8.40%
24	Indium	Soil	34	100%
25	Iron	Sedi_nonNURE	194	4.50%
26	Iron	Sedi_NURE	3989	93.00%
27	Iron	Soil	106	2.50%
28	Lead	Sedi_nonNURE	205	13.80%
29	Lead	Sedi_NURE	1163	78.30%
30	Lead	Soil	118	7.90%
31	Manganese	Sedi_nonNURE	194	4.50%
32	Manganese	Sedi_NURE	4041	93.10%
33	Manganese	Soil	106	2.40%
34	Mercury	Sedi_nonNURE	111	53.37%
35	Mercury	Soil	97	46.63%
36	Nickel	Sedi_nonNURE	204	13.70%
37	Nickel	Sedi_NURE	1164	78.30%

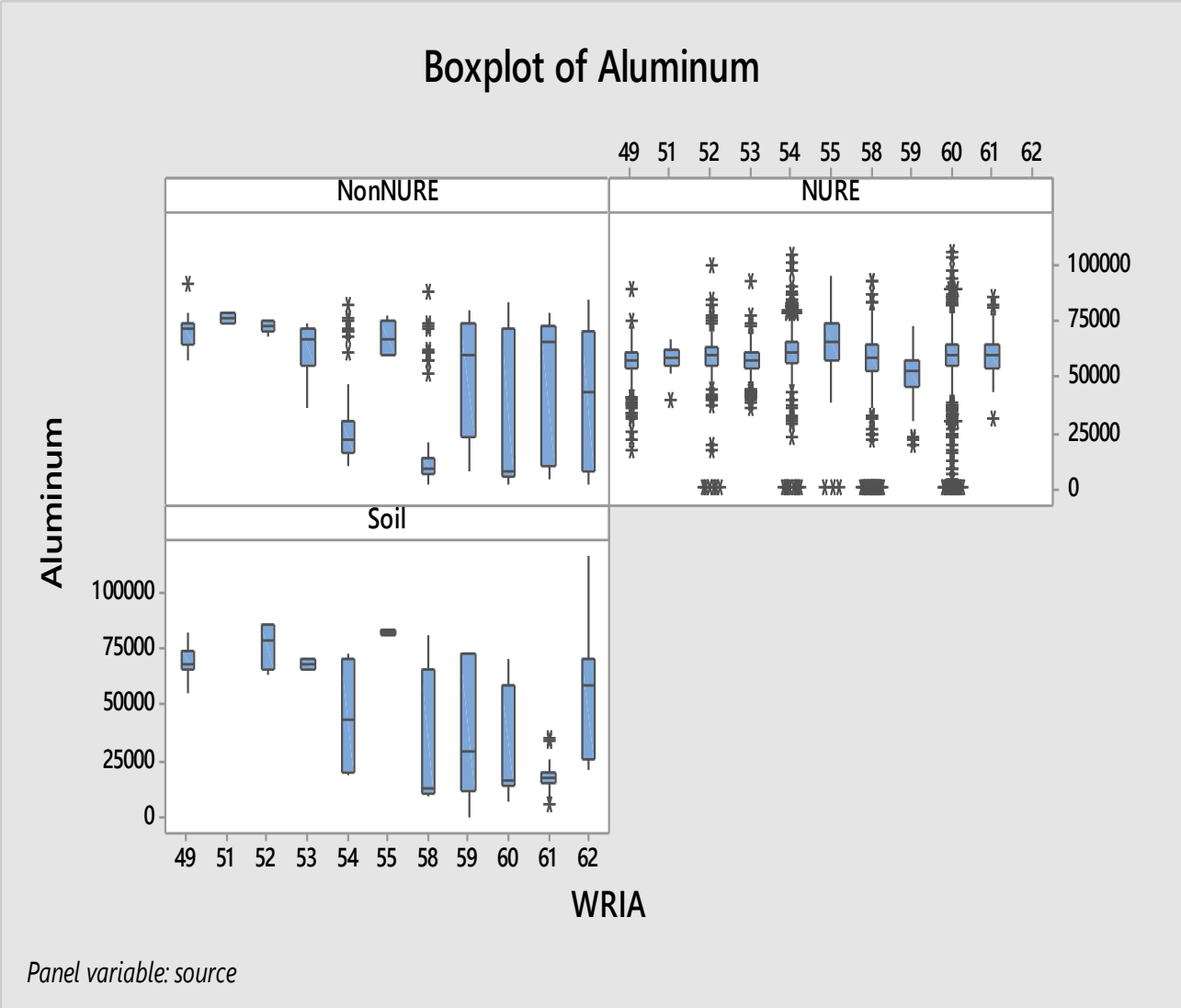
38	Nickel	Soil	118	7.90%
39	Silver	Sedi_nonNURE	22	1.80%
40	Silver	Sedi_NURE	1165	93.20%
41	Silver	Soil	63	5.00%
42	Thallium	Sedi_nonNURE	53	35.10%
43	Thallium	Soil	98	64.90%
44	Zinc	Sedi_nonNURE	206	13.80%
45	Zinc	Sedi_NURE	1165	78.30%
46	Zinc	Soil	117	7.90%

By Source most data for the NURE Sediments (21154 observations) and data from Soil (1735 observations) and Sediment non-NURE (2577 observations) is a fraction of NURE. One of the main questions we want to answer is, **are the data from the different sources similar** so that we can readily pool and combine to find the background values. Most metals were found in all sources. However, Antimony, Barium, Bismuth, Cadmium, Mercury, Thallium and Indium were NOT in NURE and provided Indium data was for Soil only. All other metals were most abundant in the NURE sites.

If we look at it by the number of observations by WRIA, WRIAs 58 and 60 had the most data collected and WRIAs 62 and 51 the least.

To understand the variability of the data and as a first step for distributional analysis, we graphed box plots and histograms for each metal over the different WRIA for the three sources. These are presented as Figures 1 for Aluminum (the others are presented in the Appendix 1). These figures show that the distributions are not the same over the different sources and the different WRIAs. As illustrative example, we will display the graphs for Aluminum in this write up and discuss the results. We see for Aluminum that the NURE data has less distance in between the upper and lower quartiles but are very heavy tailed (many observations outside the expected range of the data).

Figure 1: Box plot for Aluminum with Source and WRIA



*Values beyond (1.5)iqr are denoted by asterix. NURE data contained most asterix but had lower iqr in general.

3.2 Distribution Identification:

To identify the specific parametric distribution, we did quantile-quantile plots and performed goodness of fit analysis.

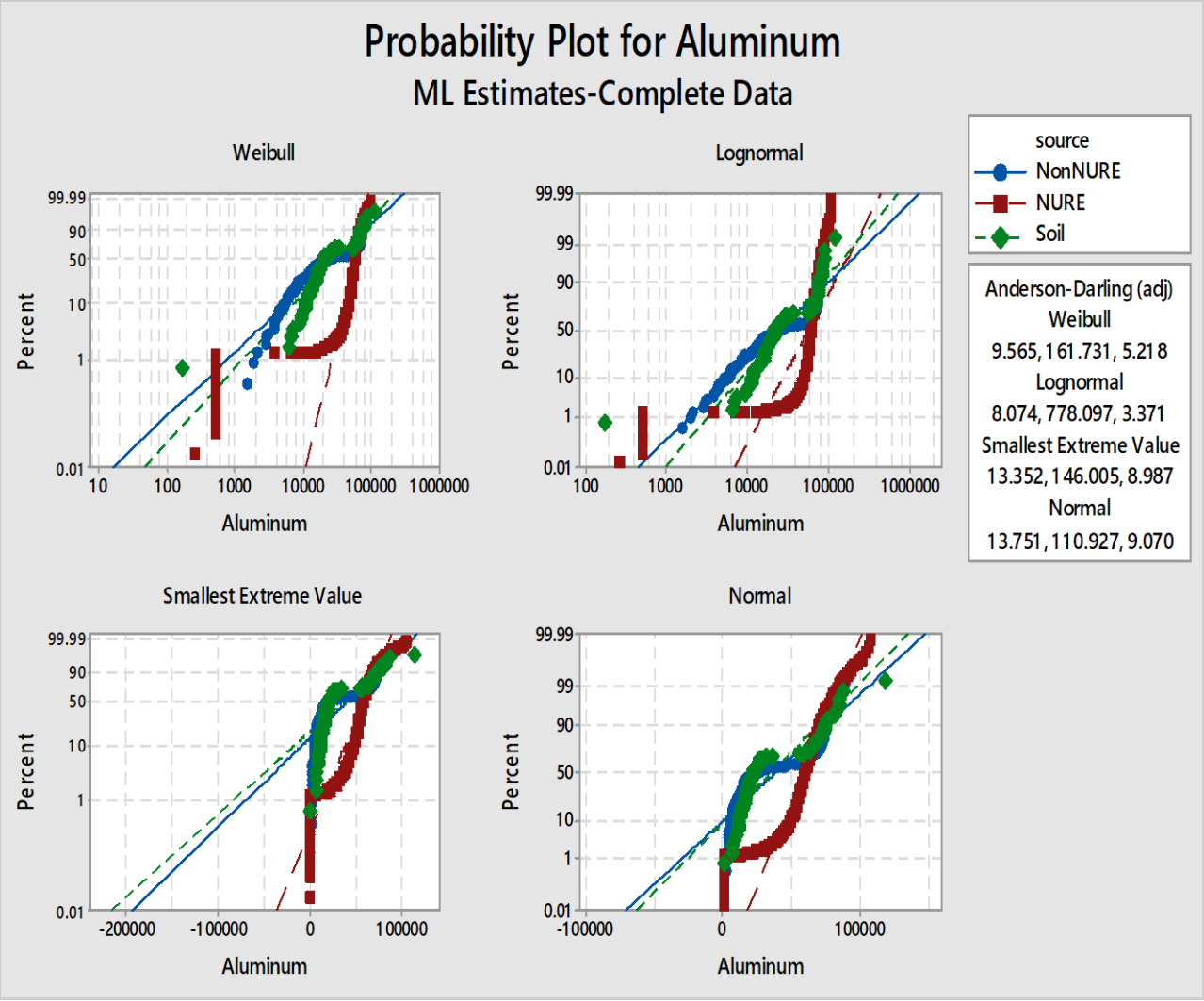
We considered 11 parametric distributions (most of the parametric distributions used for modeling continuous data were used including exponential, log logistic, 3-parameter Weibull). We present all 4 of the most common ones (Normal, Lognormal, Weibull and Standard Extreme Value) in Figure 2 for Aluminum. For the other metals we present the results in the Appendix 1. The graphs show that **none** of the distributions fit the data. However, for Aluminum Lognormal with the lowest Anderson Darling statistic was the best fit among the parametric distributions. In general, the NURE data was difficult to fit, even when we took left censoring into account.

The observed data did not fall in the quantile line for any of the 11 distributions used. The best fit for the aluminum data was the log-normal distribution for soil (Anderson Darling =3.371).

The remaining metals also did not reliably fit any of the distributions we tried. However, lognormal while not a good fit was a better fit for the following metals (Arsenic, Barium, Bismuth, Cadmium, Chromium, Copper, Mercury, Silver, Thallium and Zinc).

These lead us to the conclusion, that we should use non-parametric methods for the analysis and do an ANOVA with a log transformation, for completion. Hence, to look at differences between the WRIA and the Source, we used log transformed ANOVA and non-parametric (rank-based ANOVA).

Figure 2: Distribution ID plot for Aluminum



*These are quantile plots and if the data fits the distribution it would fall on the line specified and have a low Anderson Darling test statistic.

3.2 ANOVA looking for source and WRIA effects

We ran our ANOVA model as described in 2. Our results are given in the following table.

Table 2: Results from parametric and non-parametric two-way ANOVA

Metal	Source Effect		WRIA effect		Interaction	
	Log-Normal	Non-param	Log-Normal	Non-param	Log-Normal	Non-param
Aluminum	***	***	***	***	***	***
Antimony	***		.08	.02	**	***
Arsenic	***	***	***	***	***	***
Barium	***	***	***	***	***	***
Beryllium	***	***	***	***	***	***
Bismuth	*	***				
Cadmium	***	***	***	***	***	***
Chromium	***	***	***		***	***
Copper	***	***	***	***	***	***
Indium			***	***		
Iron	***	***	***	***	***	***
Lead	***		***	***	***	***
Manganese	***	***	***	***	***	***
Mercury	**	***	***	***	***	***
Nickel	***	.03	***		***	***
Silver	***	.02	***	***	***	***
Thallium	***	***	***	***	***	.02
Zinc	***	***	***	***	***	***

P-values are coded as follows: <.05 *, <.01 **, <.001 ***. All Marginal p-values close to .05 are provided; Metal results that differed between the two different methods (Log-Normal and Non-param) *italicized*.

Table 2 suggests that whether we used the log-Normal and followed parametric ANOVA or used ranks and did non-parametric ANOVA, our results didn't change except for Antimony, Bismuth, Chromium and Thallium. In most cases other than Bismuth and Indium (which was only available for the Soil Source) there were significant interactions. This implied that the data should not be pooled, unless there is not enough data to model and provide confidence intervals.

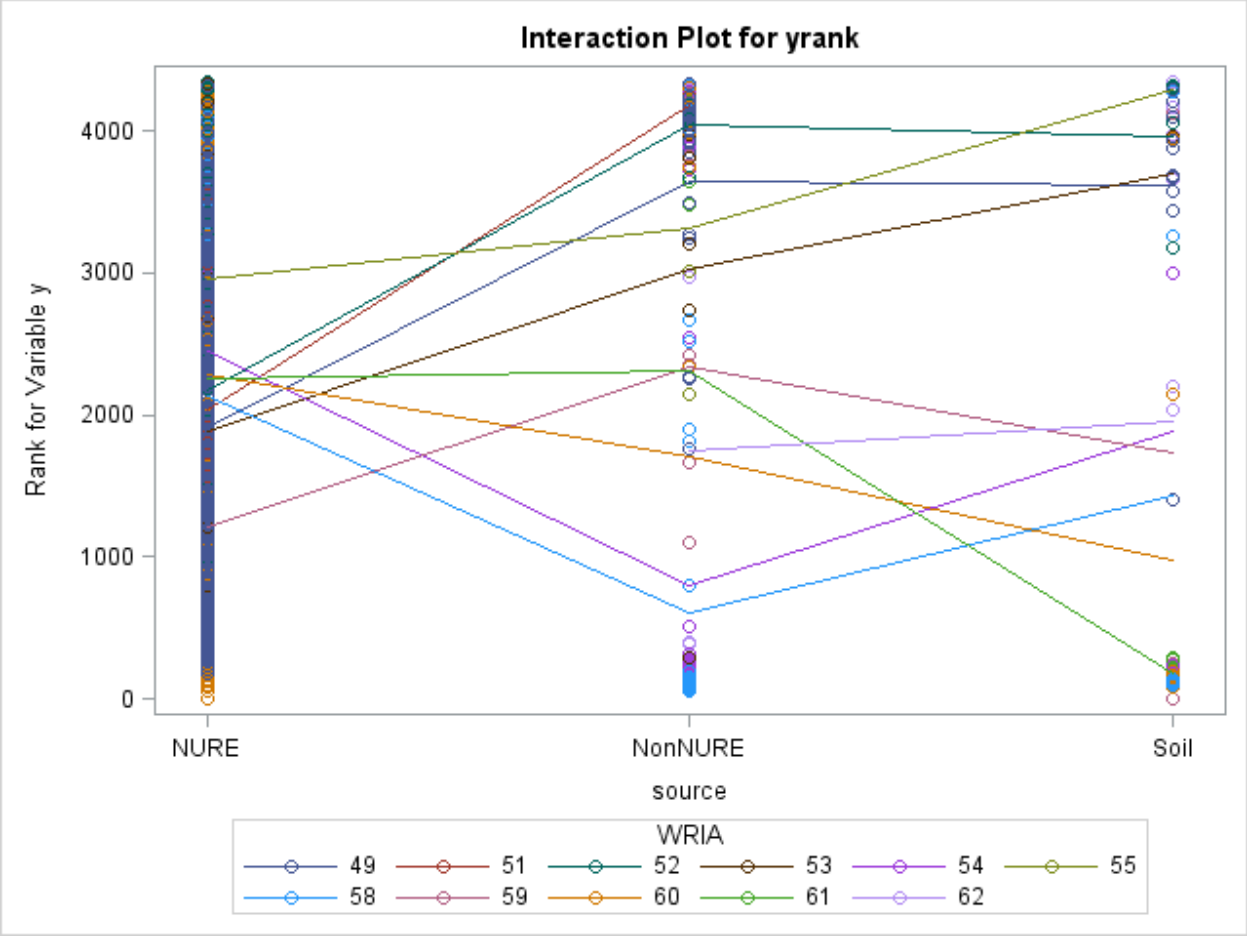
We provide the ANOVA table and interaction plot for Aluminum as an example. All other details of the analysis are in Appendix 1 (Graphs).

Table 3: ANOVA Table for Aluminum showing the effect of Source, WRIA and interactions.

Source	DF	Sum of Square	Mean Square	F Value	p-values
WRIA	10	201975995.8	20197599.6	14.60	<.0001
source	2	17024578.4	8512289.2	6.15	0.0021
source*WRIA	18	479953069.9	26664059.4	19.28	<.0001

Source*WRIA denotes the interaction

Figure 4: Interaction Plot for Aluminum (for the non-parametric rank-based analysis)



- Interaction is suspected as the lines are not parallel to each other. For example, NURE is highest for WRIA 60 followed by Non-NURE and soil, where as in WRIA 55 the exact opposite is observed with NURE being the lowest followed by Non-NURE and Soil.

Given our results and findings in 3.1-3.3, our conclusions were:

1. *No parametric distribution fitted the data well, hence it is best to use non-parametric or empirical methods.*
2. *There was evidence of interaction among Source and WRIA, which indicated that if the sample size permits we should calculate backgrounds by each WRIA and for each source.*

3.3 Calculating Background:

Given that the data didn't follow any distribution well, we focused on our results from the non-parametric rank-based methods. The question of how, background is measured depends upon whether we use parametric methods or not. Based on our findings we decided against normal based (parametric) methods like confidence intervals for background. Instead and most appropriately we use data based empirical methods like percentiles.

We calculate the 90th percentile and its 95% confidence interval for estimating the background distribution for each metal. **The justification for the 90th percentile comes from finding critical regions in hypothesis testing (essentially, we are trying to find the bound that differentiates the background from the contaminated or anomalous results)**. We did not compute 90th percentiles and associated confidence intervals for any group when the sample size was below 10; this threshold is discussed further in Section 5. If we considered mean testing our critical region for background would include any region beyond the one-sided 90th confidence interval. Since we are not using normal distribution, using the same analog we compute the empirical 90th percentile for each metal by Source and WRIA when possible. The utilization of bootstrapped 95% confidence interval method gives us a bound for the percentile (bootstrapping method was discussed in Section 2). Our recommendation would be to use the lower confidence region as a "warning" threshold and the 90th percentile as the "action" threshold in any situation.
These results are provided in the following tables. These data sets are unmodified—they do not include the removal of any data points from the set, as outliers. The determination on outliers is discussed in Section 5. For each metal we provide a table with complete pooling, partial pooling and no pooling (when we have enough data to compute these reliably). These tables further accentuate the differences across Source and WRIA. However, due to lack of data we will suggest pooling only in certain situations. We present our results in Tables 3.1-Table 3.18 for each metal.

4. Results

For our results we present each metal and calculate the 90Th percentile and its bootstrapped upper and lower bounds. In each table we also provide summary information like, n (sample size used for

computation), the IQR (inter-quartile range, a non-parametric measure of variability), the 50th percentile (median, as a measure of center) and the 75Th percentile (upper quartile).

Tables 3.1-3.18 give us the results. Since there were several anomalies, as well as concerns of data within WRIA 61 potentially being non-representative of background, we constructed each table with and without WRIA 61 for the total pooling and pooling by Source; WRIA 61 anomalies are discussed further in Section 5.

Table 4.1 – 4.18: Metal 90th Percentiles

Table 4.1 Aluminum

Pooled	WRIA	source	n	IQR	50th Percentile	75th Percentile	90th Percentile	Lower bound for 90th%ile	Upper Bound For 90th %ile
All			4347	10500	58827	64100	69800	69200	70200
Source	49		366	8280	58130	62315	66607	64813	67700
	51		42	6077	58287	61490	64845	57149	68183
	52		395	7347	59100	62763	67060	65614	68472
	53		249	7082	57400	61282	64800	63675	66460
	54		626	9580	59800	64675	71450	69000	73355
	55		175	15697	65900	73850	81320	78940	84020
	58		753	12613	57800	64100	69260	68340	70440
	59		101	13600	52500	58200	66500	60700	72600
	60		1442	10775	59700	64775	69700	68910	70300
	61		168	40762	54550	61700	67790	66300	69880
	62		30	58980	43250	70580	75435	63040	80249
WRIA		NonNURE	195	59690	23500	69840	74316	72182	75592
		NURE	4046	9800	59060	64000	69367	68983	69882
		Soil	106	49413	20700	65000	72950	65150	75650
None	49	NonNURE	19	8425	71230	73315	76758	62046	80388
	49	NURE	337	7747	57613	61060	64853	63893	65814
	49	Soil	10	5675	68400	72175	77430	72660	85030
	51	NURE	40	5965	57677	61225	62325	58990	63203
	52	NURE	383	7273	58900	62397	65789	64379	66842
	53	NURE	241	6515	57307	60615	63800	62600	64900
	54	NonNURE	49	14000	21800	29500	69774	64908	105622
	54	NURE	573	8700	60400	64900	71653	69220	73806
	55	NURE	169	16000	65893	73300	81107	78433	83993
	58	NonNURE	55	7585	8840	13500	60876	49042	104152
	58	NURE	687	11704	58600	64437	69340	68420	70580
	58	Soil	11	53875	12732	64700	70200	59800	127200
	59	NonNURE	12	27290	59923	70438	77510	75620	87900
	59	NURE	84	11125	51800	56475	60770	56840	62740

Pooled	WRIA	source	n	IQR	50th Percentile	75th Percentile	90th Percentile	Lower bound for 90th%ile	Upper Bound For 90th %ile
	60	NonNURE	16	65685	7660	70965	74170	64850	83025
	60	NURE	1419	10600	59700	64700	69700	69054	70387
	61	NURE	113	10200	59700	64200	68680	64065	70260
	61	Soil	50	5496	17550	20675	24870	22630	29007
	62	NonNURE	19	62420	43150	70570	75990	67280	82006
	62	Soil	11	42257	58300	68950	74600	33200	90200

Aluminum - WRIA 61 excluded

Pooled	WRIA	source	n	IQR	50th Percentile	75th Percentile	90th Percentile	Lower bound for 90th%ile	Upper Bound For 90th %ile
All			4179	10310	58907	64100	69900	69300	70334
WRIA		NonNURE	190	59720	23400	69845	74261	72117	75482
		NURE	3933	9753	59042	63953	69400	68920	69900
		Soil	56	50351	63900	71225	80750	77400	88849

Table 4.2 Antimony

Pooled	WRIA	source	n	IQR	50th Percentile	75th Percentile	90th Percentile	Lower bound for 90th%ile	Upper Bound For 90th %ile
All*			111	0.75	0.42	0.95	1.68 (1.58)	1.37	2.15
WRIA		NonNURE*	14	0.30	0.16	0.37	2.53 (0.49)	0	4.80
		Soil	97	0.80	0.49	1	1.61	1.238	2.02
Source	49		10	0.23	0.64	0.74	2.03	1.686	3.38
	58		11	0.88	0.29	1.12	1.40	0	1.79
	61		69	0.53	0.2	0.73	1.70	1.418	2.18
None	49	Soil	10	0.23	0.64	0.74	2.03	1.686	3.37
	58	Soil	10	0.80	0.28	1.03	1.22	1.04	2.08
	61	NonNURE*	13	0.24	0.15	0.31	0.49 (0.38)	0	0.72
	61	Soil	56	0.85	0.22	1.05	1.74	1.49	2.19

*Certain results are significantly influenced by a single WRIA 61 'NonNURE' sample of 7 mg/Kg. If removed the 90th percentiles are revised as shown in parentheses.

Antimony - WRIA 61 excluded

Pooled	WRIA	source	n	IQR	50th Percentile	75th Percentile	90th Percentile	Lower bound for 90th%ile	Upper Bound For 90th %ile
All			42	0.60	0.64	1.00	1.38	0	1.73
WRIA		Soil	41	0.56	0.64	0.95	1.2	0.03	1.39

Table 4.3 Arsenic

Pooled	WRIA	source	n	IQR	50th Percentile	75th Percentile	90th Percentile	Lower bound for 90th%ile	Upper Bound For 90th %ile
All			1284	4	3	5	8	7	9
WRIA		NonNURE	181	5	5	7	15	11	20
		NURE	1004	3	2	4	7	6	8
		Soil	99	5	6	8	11	9	13
source	49		272	3	2	4	7	5	9
	51		32	1	2	3	3	2	3
	52		165	3	2	4	6	5	7
	53		74	3	3	5	6	3	6
	54		185	3	4	6	10	5	12
	55		80	3	3	5	7	4	8
	58		192	5	3	6	9	8	11
	59		14	4	5	6	9	6	12
	60		170	3	2	4	9	7	13
	61		76	7	5	9	11	9	12
	62		24	4	5	7	9	0	12
None	49	NonNURE	19	2	2	3	10	0	17
	49	NURE	243	3	2	4	6	3	7
	49	Soil	10	2	4	5	18	14	32
	51	NURE	30	2	2	3	3	3	4
	52	NURE	153	3	2	4	6	5	7

Pooled	WRIA	source	n	IQR	50th Percentile	75th Percentile	90th Percentile	Lower bound for 90th%ile	Upper Bound For 90th %ile
	53	NURE	66	3	3	5	6	6	7
	54	NonNURE	48	5	5	9	20	11	29
	54	NURE	133	3	4	6	7	4	7
	55	NURE	74	3	3	5	6	4	7
	58	NonNURE	38	2	5	6	9	5	11
	58	NURE	144	4	2	5	9	7	11
	58	Soil	10	2	6	7	8	8	9
	59	NonNURE	11	3	5	7	10	7	13
	60	NonNURE	12	12	4	15	18	0	22
	60	NURE	156	2	1	3	8	5	10
	61	NonNURE	15	3	2	4	8	5	12
	61	Soil	56	6	6	10	12	9	13
	62	NonNURE	18	3	5	5	9	0	14

Arsenic - WRIA 61 excluded

Pooled	WRIA	source	n	IQR	50th Percentile	75th Percentile	90th Percentile	Lower bound for 90th%ile	Upper Bound For 90th %ile
All			1208	4	3	5	8	7	9
WRIA		NonNURE	166	5	5	7	15	11	21
		NURE	999	3	2	4	7	6	8
		Soil	43	4	5	7	9	1	10

Table 4.4 Barium

Pooled	WRIA	source	n	IQR	50th Percentile	75th Percentile	90th Percentile	Lower bound for 90th%ile	Upper Bound For 90th %ile
All			281	565	264	698	864	801	899
WRIA		NonNURE	194	519	202	636	810	766	869
		Soil	87	654	362	827	982	885	1095
Source	49		29	165	759	863	960	881	1053
	52		12	251	854	1073	1137	1084	1343
	54		52	136	166	262	594	562	839
	58		65	131	146	218	820	624	1085

Pooled	WRIA	source	n	IQR	50th Percentile	75th Percentile	90th Percentile	Lower bound for 90th%ile	Upper Bound For 90th %ile
	59		15	383	594	681	766	739	888
	60		18	855	385	911	999	938	1130
	61		49	245	218	383	524	295	638
	62		25	547	477	649	861	785	1080
None	49	NonNURE	19	157	721	816	864	796	918
	49	Soil	10	182	895	964	1035	990	1139
	54	NonNURE	48	114	159	236	565	509	832
	58	NonNURE	55	127	146	201	729	603	1236
	58	Soil	10	749	151	875	1010	740	1780
	59	NonNURE	12	295	588	640	705	646	804
	60	NonNURE	16	808	135	856	935	810	1182
	61	Soil	44	198	213.5	335	432	160	490
	62	NonNURE	19	447	391	531	600	423	712

Barium - WRIA 61 excluded

Pooled	WRIA	source	n	IQR	50th Percentile	75th Percentile	90th Percentile	Lower bound for 90th%ile	Upper Bound For 90th %ile
All			232	607	375	740	885	813	919
WRIA		NonNURE	189	521	201	637	814	772.4	887
		Soil	43	328	845	964	1076	972	1175

Table 4.5 Beryllium

Pooled	WRIA	source	n	IQR	50th Percentile	75th Percentile	90th Percentile	Lower bound for 90th%ile	Upper Bound For 90th %ile
All			1459	1	1.5	2	2.5		
WRIA		NonNURE	197	1.5	1	2	2	1.2	2
		NURE	1163	1	1.5	2	2.5		
		Soil	99	1.2	0.6	1.7	2.1	1.8	2.3
Source	49		361	0.8	1.5	1.8	2		
	51		42	0.5	2	2	2.5	2.1	3
	52		174	1	2	2.5	3	3	3.5
	53		80	0.5	2	2	2.5	2.5	3

Pooled	WRIA	source	n	IQR	50th Percentile	75th Percentile	90th Percentile	Lower bound for 90th%ile	Upper Bound For 90th %ile
	54		188	0.8	1.5	1.8	2.5	2.5	3
	55		80	1	1.5	2	3.3	2.6	4.1
	58		219	1	1.5	2	2.5	2.5	2.5
	59		28	1	1.8	2	2.5	1.7	3
	60		189	1	1.5	2	2.5	2.5	3
	61		79	0.3	0.5	0.7	1.5	1	2.2
	62		19	1.0	2	2.6	4	3	5.9
None	49	NonNURE	19	0	1	1	1.2	0.4	1.4
	49	NURE	332	1	1.5	2	2	2	2
	49	Soil	10	0.5	1.7	1.8	1.9	1.8	2.1
	51	NURE	40	0.5	2	2	2.5	2	3
	52	NURE	162	1	2	2.5	3	3	3.5
	53	NURE	72	0.5	2	2	2.5	2.5	3
	54	NonNURE	49	0.9	1.1	1.8	2.1	0	2.4
	54	NURE	135	0.5	1.5	1.5	2.5	2.5	3
	55	NURE	74	1	1.5	2	3	2	3.7
	58	NonNURE	53	0.4	0.5	0.7	1	0	1.1
	58	NURE	156	0.5	2	2	2.5	2.5	2.5
	58	Soil	10	1.5	0.5	1.9	2.3	1.7	3.9
	59	NonNURE	12	1.1	2	2	2.9	1.8	3.8
	59	NURE	13	0.5	1.5	2	2	1.5	2.5
	60	NonNURE	14	1.6	0.7	2	2	2	2.3
	60	NURE	173	1	1.5	2	2.5	2.5	3
	61	NonNURE	17	0.41	0.5	0.6	1.8	1.5	2.9
	61	Soil	56	0.2	0.5	0.6	0.7	0.3	0.8
	62	NonNURE	13	2	2	3	4	3	5.2

Beryllium - WRIA 61 excluded

Pooled	WRIA	source	n	IQR	50th Percentile	75th Percentile	90th Percentile	Lower bound for 90th%ile	Upper Bound For 90th %ile
All			1380	1	1.5	2	2.5		
WRIA		NonNURE	180	1.4	1	2	2	1	2
		NURE	1157	1	1.5	2	2.5		
		Soil	43	0.8	1.8	2.1	2.4	1.6	2.6

Table 4.6 Bismuth

Pooled	WRIA	source	n	IQR	50th Percentile	75th Percentile	90th Percentile	Lower bound for 90th%ile	Upper Bound For 90th %ile
All			76	0.38	0.33	0.60	1.21	0.13	1.71
WRIA		NonNURE	40	0.54	0.57	0.90	2.06	0	3.09
		Soil	36	0.15	0.23	0.31	0.43	0.32	0.55
Source	49		10	0.05	0.14	0.17	0.17	0.16	0.19
	54		44	0.505	0.52	0.83	1.871	0	2.742
None	49	Soil	10	0.045	0.14	0.17	0.17	0.16	0.19
	54	NonNURE	40	0.54	0.565	0.90	2.06	0	3.12

Bismuth - WRIA 61 excluded

Pooled	WRIA	source	n	IQR	50th Percentile	75th Percentile	90th Percentile	Lower bound for 90th%ile	Upper Bound For 90th %ile
All			76	0.38	0.33	0.60	1.21	0.06	1.70
WRIA		NonNURE	40	0.54	0.57	0.90	2.06	0	3.08
		Soil	36	0.15	0.23	0.31	0.43	0.32	0.55

Table 4.7 Cadmium

Pooled	WRIA	source	n	IQR	50th Percentile	75th Percentile	90th Percentile	Lower bound for 90th %ile	Upper Bound for 90th %ile
All			186	0.40	0.3	0.60	1.50	0.22	2.15
WRIA		NonNURE	68	0.29	0.26	0.45	0.7	0.39	0.88
		Soil	118	0.60	0.34	0.80	2.42	1.56	3.83
Source	49		10	0.1	0.30	0.3	0.4	0.4	0.5
	54		44	0.14	0.21	0.30	0.48	0	0.63
	58		24	0.38	0.39	0.61	0.83	0.68	1.08
	61		74	0.93	0.49	1.13	2.90	1.54	3.87
	62		12	0.22	0.45	0.52	0.61	0	0.72
None	49	Soil	10	0.1	0.3	0.3	0.4	0.4	0.5

	54	NonNURE	40	0.16	0.23	0.32	0.49	0	0.66
	58	NonNURE	13	0.32	0.56	0.7	0.84	0.74	1
	58	Soil	11	0.15	0.23	0.35	0.5	0	0.7
	61	NonNURE	12	0.21	0.15	0.33	0.39	0.34	0.58
	61	Soil	62	1.31	0.72	1.61	3.62	2.13	4.86
	62	Soil	11	0.20	0.4	0.5	0.59	0.58	0.68

Cadmium - WRIA 61 excluded

Pooled	WRIA	source	n	IQR	50th Percentile	75th Percentile	90th Percentile	Lower bound for 90th %ile	Upper Bound for 90th %ile
All			112	0.24	0.27	0.42	0.63	0.46	0.74
WRIA		NonNURE	56	0.34	0.28	0.51	0.75	0.09	0.95
		Soil	56	0.21	0.25	0.4	0.5	0.37	0.59

Table 4.8 Chromium

Pooled	WRIA	source	n	IQR	50th Percentile	75th Percentile	90th Percentile	Lower bound for 90^{th}%ile	Upper Bound For 90th %ile
All			1491	30	30	50	90	80	95
WRIA		NonNURE	206	17	18	29	43	35	51
		NURE	1167	40	30	60	105	100	120
		Soil	118	13	16	26	46	42	61
Source	49		362	20	25	40	60	50	69.
	51		42	18	28	39	50	0	60
	52		176	45	40	65	103	70	120
	53		80	54	90	110	123	91	121
	54		187	15	25	30	80	73	88
	55		80	11	25	30	35	30	40
	58		222	25	30	45	70	56	85

Pooled	WRIA	source	n	IQR	50th Percentile	75th Percentile	90th Percentile	Lower bound for 90th%ile	Upper Bound For 90th %ile
	59		30	35	33	50	70	60	90
	60		197	50	45	75	151	0	180
	61		85	15	15	25	36	0	43
	62		30	12	19	25	46	42	68
None	49	NonNURE	19	19	27	36	68	39	104
	49	NURE	333	20	25	40	60	50	70
	49	Soil	10	13	35	44	52	45	68
	51	NURE	40	16	28	40	50	0	60
	52	NURE	164	45	40	65	104	72	122
	53	NURE	72	41	95	115	125	95	129
	54	NonNURE	48	7	14	19	26	21	30
	54	NURE	135	30	25	50	85	72	95
	55	NURE	74	10	25	30	35	30	40
	58	NonNURE	55	14	21	27	34	5	39
	58	NURE	156	25	35	50	75	45	90
	58	Soil	11	31	16	46	52	36	85
	59	NonNURE	12	17	24	34	49	46	70
	59	NURE	13	30	50	70	78	76	101
	60	NonNURE	16	15	17	28	51	13	78
	60	NURE	174	60	45	85	164	2	202
	61	NonNURE	17	7	7	12	38	0	65
	61	Soil	62	13	15	24	28	27	31
	62	NonNURE	19	13	16	24	40	21	57
	62	Soil	11	6	21	25	46	42	70

Chromium - WRIA 61 excluded

Pooled	WRIA	source	n	IQR	50th Percentile	75th Percentile	90th Percentile	Lower bound for 90th%ile	Upper Bound For 90th %ile
All			1406	30	30	50	90	80	95
WRIA		NonNURE	189	16	19	29	42	32	50
		NURE	1161	40	30	60	100	90	110
		Soil	56	21	20	36	51	33	56

Table 4.9 Copper

Pooled	WRIA	source	n	IQR	50th Percentile	75th Percentile	90th Percentile	Lower bound for 90th%ile	Upper Bound For 90th %ile
All			1411	10	12	18	25	23	26
WRIA		NonNURE	206	13	15	21	27	21	30
		NURE	1087	9	12	17	24	22	26
		Soil	118	12	14	22	32	29	39
Source	49		364	10	11	18	31	27	36
	51		42	6	10	14	20	15	26
	52		154	10	11	17	21	17	22
	53		80	4	13	14	17	17	19
	54		187	6	13	17	20	17	22
	55		79	7	9	13	17	15	20
	58		165	11	13	19	24	22	26
	59		29	9	13	19	24	18	28
	60		196	15	13	22	32	29	36
	61		85	16	12	22	32	30	41
	62		30	13	16	22	29	18	36
None	49	NonNURE	19	19	10	22	35	25	51
	49	NURE	335	10	11	18	30	26	35
	49	Soil	10	8	22	26	49	45	76
	51	NURE	40	6	10	14	20	14	26
	52	NURE	142	10	11	17	21	17	22
	53	NURE	72	3	13	14	17	16	19
	54	NonNURE	48	7	16	20	29	18	35
	54	NURE	135	5	13	15	18	16	18
	55	NURE	73	7	9	13	17	13	19
	58	NonNURE	55	12	16	22	24	22	25
	58	NURE	99	11	10	17	21	18	23
	58	Soil	11	4	15	17	27	18	37
	59	NonNURE	12	9	19	22	26	19	32
	59	NURE	12	6	12	15	21	15	31
	60	NonNURE	16	22	13	28	41	23	60
	60	NURE	173	14	14	22	32	29	36
	61	NonNURE	17	6	3	8	16	0	25
	61	Soil	62	15	13	22	32	30	41
	62	NonNURE	19	11	16	22	30	5	40
	62	Soil	11	18	18	24	28	16	37

Copper - WRIA 61 excluded

Pooled	WRIA	source	n	IQR	50th Percentile	75th Percentile	90th Percentile	Lower bound for 90th%ile	Upper Bound For 90th %ile
All			1326	10	12	18	25	23	27
WRIA		NonNURE	189	12	16	21	27	21	31
		NURE	1081	9	12	17	24	22	26
		Soil	56	9	15	19	28	8	34

Table 4.10 Indium

Pooled	WRIA	source	n	IQR	50th Percentile	75th Percentile	90th Percentile	Lower bound for 90th%ile	Upper Bound For 90th %ile
All			34	0.02	0.05	0.06	0.06	0.05	0.06
WRIA		Soil	34	0.02	0.05	0.06	0.06	0.05	0.06
Source	49		10	0	0.04	0.04	0.05	0.04	0.06
None	49	Soil	10	0	0.04	0.04	0.05	0.04	0.06

Indium - WRIA 61 excluded

Pooled	WRIA	source	n	IQR	50th Percentile	75th Percentile	90th Percentile	Lower bound for 90th%ile	Upper Bound For 90th %ile
All			34	0.02	0.05	0.06	0.06	0.05	0.06
WRIA		Soil	34	0.02	0.05	0.06	0.06	0.05	0.06

Table 4.11 Iron

Pooled	WRIA	source	n	IQR	50th Percentile	75th Percentile	90th Percentile	Lower bound for 90th%ile	Upper Bound For 90th %ile
All			4289	12393	29840	36900	44629	43851	45558
WRIA		NonNURE	194	13225	20900	28850	36640	32160	39280

Pooled	WRIA	source	n	IQR	50th Percentile	75th Percentile	90th Percentile	Lower bound for 90th%ile	Upper Bound For 90th %ile
		NURE	3989	12200	30400	37400	45100	44221	46100
		Soil	106	9525	21250	25575	30350	26000	33165
source	49		364	15314	28710	38700	50473	46400	55749
	51		42	8340	24754	30049	36618	19711	42090
	52		393	13700	31300	38600	47880	45349	50360
	53		249	11413	39100	45980	54500	46900	56814
	54		619	9950	34400	39650	47860	45520	50473
	55		173	7740	28393	32940	38142	36118	39630
	58		745	10300	28300	34100	41280	39360	43048
	59		99	8743	28000	32300	35900	33800	37260
	60		1413	10500	27600	34000	41880	40777	43577
	61		162	14225	30350	37850	42550	41300	44600
	62		30	15088	24661	30225	34220	31740	37840
none	49	NonNURE	19	11850	29500	35550	46240	33880	60080
	49	NURE	335	16050	28860	39270	50953	47114	56373
	49	Soil	10	6100	26850	30300	32400	26100	36660
	51	NURE	40	7527	24754	29331.5	34895.3	26850.6	39302
	52	NURE	381	13300	31400	38600	48400	46200	51000
	53	NURE	241	11600	39260	46600	54900	47700	57500
	54	NonNURE	48	7900	19750	25475	36220	28330	45060
	54	NURE	567	9250	34800	39900	48384	46409	51281
	55	NURE	167	7760	28400	33087	38172	36310	39703
	58	NonNURE	55	9600	15600	20150	30760	25620	38340
	58	NURE	679	9750	28840	34550	42020	40200	44040
	58	Soil	11	12150	16700	27300	29100	19600	41100
	59	NonNURE	12	11850	26100	32025	37770	8140	47090
	59	NURE	82	8100	28650	32675	35900	34000	37600
	60	NonNURE	16	14693	22700	26800	33800	27700	42100
	60	NURE	1390	10375	27710	34075	41952	40795	43305
	61	NURE	107	10400	34800	40250	43624	36628	46044
	61	Soil	50	8331	19200	23956	26950	25720	28450
	62	NonNURE	19	14600	24200	28500	32560	15820	37700
	62	Soil	11	14032	25122	32900	35300	35300	44500

Iron - WRIA 61 excluded

Pooled	WRIA	source	n	IQR	50th Percentile	75th Percentile	90th Percentile	Lower bound for 90th%ile	Upper Bound For 90th %ile
All			4127	12287	29800	36823	44800	44000	45760
WRIA		NonNURE	189	13000	20800	28700	36960	32280	39900
		NURE	3882	12152	30200	37200	45100	44200	46010
		Soil	56	10400	21650	26850	32900	28800	36700

Table 4.12 Lead

Pooled	WRIA	source	n	IQR	50th Percentile	75th Percentile	90th Percentile	Lower bound for 90th%ile	Upper Bound For 90th %ile
All			1486	10	15	20	25	22	25
WRIA		NonNURE	205	13	18	24.5	33	30	35
		NURE	1163	5	10	15	24	23	28
		Soil	118	26	21	38	86	65	109
Source	49		361	5	10	15	25	25	30
	51		42	10	15	20	25	11	30
	52		174	10	15	20	25	25	29
	53		80	10	10	20	24	20	28
	54		187	5	10	15	22	18	23
	55		80	5	15	15	20	10	25
	58		221	10	15	20	34	31	38
	59		30	10	20	25	33	30	41
	60		196	5	10	15	24	22	27
	61		85	41	24	50	99	73	122
	62		30	17	21	31	35	25	39
None	49	NonNURE	19	3	19	21	30	20	41
	49	NURE	332	5	10	15	20	15	20
	49	Soil	10	2	14	15	28	26	41
	51	NURE	40	10	15	20	25	10	30
	52	NURE	162	10	15	20	25	25	30
	53	NURE	72	10	10	20	20	11	20
	54	NonNURE	48	9	17	22	25	16	28
	54	NURE	135	5	10	15	20	20	25
	55	NURE	74	5	15	15	19	17	22
	58	NonNURE	54	16	15	25	36	32	46
	58	NURE	156	10	15	20	30	25	35
	58	Soil	11	12	12	22	26	14	36

Pooled	WRIA	source	n	IQR	50th Percentile	75th Percentile	90th Percentile	Lower bound for 90th%ile	Upper Bound For 90th %ile
	59	NonNURE	12	11	21	29	33	19	42
	59	NURE	13	10	20	25	25	20	30
	60	NonNURE	16	18	18	24	27	0	30
	60	NURE	173	5	10	15	20	15	25
	61	NonNURE	17	6	6	10	32	25	56
	61	Soil	62	64	30	76	106	82	126
	62	NonNURE	19	19	20	31	33	31	39
	62	Soil	11	10	22	27	43	27	62

Lead - WRIA 61 excluded

Pooled	WRIA	source	n	IQR	50th Percentile	75th Percentile	90th Percentile	Lower bound for 90th%ile	Upper Bound For 90th %ile
All			1401	10	15	20	25	25	25
WRIA		NonNURE	188	13	19	25	33	30	37
		NURE	1157	5	10	15	20	15	20
		Soil	56	12	16	25	32	26	38

Table 4.13 Manganese

Pooled	WRIA	source	n	IQR	50th Percentile	75th Percentile	90th Percentile	Lower bound for 90th%ile	Upper Bound For 90th %ile
All			4341	341	687	880	1130	1100	1150
WRIA		NonNURE	194	361	548	754	919	828	970
		NURE	4041	334	690	880	1130	1110	1160
		Soil	106	722	652	1155	1592	1145	1953
Source	49		364	353	674	876	1093	972	1151
	51		42	232	558	734	972	515	1195
	52		395	350	660	850	1100	1020	1180
	53		246	204	700	800	970	926	1035
	54		625	290	730	900	1164	1089	1249
	55		175	360	660	872	1167	1078	1312
	58		753	391	690	911	1150	1070	1180
	59		101	330	620	800	1120	940	1270

Pooled	WRIA	source	n	IQR	50th Percentile	75th Percentile	90th Percentile	Lower bound for 90th%ile	Upper Bound For 90th %ile
	60		1442	350	670	870	1110	1050	1140
	61		168	353	746	933	1255	981	1371
	62		30	680	831	1193	1884	629	2568
None	49	NonNURE	19	326	611	784	883	781	991
	49	NURE	335	378	681	902	1114	1011	1180
	49	Soil	10	174	646	744	827	574	973
	51	NURE	40	208	558	721	981	496	1221
	52	NURE	383	349	660	850	1100	1020	1180
	53	NURE	238	199	710	809	973	932	1026
	54	NonNURE	48	343	647	869	1200	0	1508
	54	NURE	573	280	740	900	1155	1070	1242
	55	NURE	169	364	660	874	1178	1096	1342
	58	NonNURE	55	349	428	599	879	747	1121
	58	NURE	687	390	710	940	1180	1096	1234
	58	Soil	11	188	387	552	660	527	776
	59	NonNURE	12	346	593	759	880	629	1051
	59	NURE	84	326	615	805	1087	954	1219
	60	NonNURE	16	391	490	572	621	590	688
	60	NURE	1419	350	670	870	1110	1058	1140
	61	NURE	113	250	760	910	1180	1022	1390
	61	Soil	50	787	580	1155	1570	1193	1951
	62	NonNURE	19	449	636	831	923	0	1020
	62	Soil	11	422	1210	1588	2493	1962	3696

Manganese - WRIA 61 excluded

Pooled	WRIA	source	n	IQR	50th Percentile	75th Percentile	90th Percentile	Lower bound for 90th%ile	Upper Bound For 90th %ile
All			4173	335	680	871	1129	1109	1159
WRIA		NonNURE	189	375	548	767	923	836	970
		NURE	3928	340	690	880	1128	1106	1156
		Soil	56	572	664	1100	1588	153	1997

Table 4.14 Mercury

Pooled	WRIA	source	n	IQR	50th Percentile	75th Percentile	90th Percentile	Lower bound for 90th%ile	Upper Bound For 90th %ile
All			208	0.03275	0.03	0.05	0.1	0.08	0.12
WRIA		NonNURE	111	0.03	0.03	0.05	0.12	0.11	0.14
		Soil	97	0.05	0.02	0.06	0.08	0.07	0.10
source	49		29	0.01	0.02	0.02	0.03	0.02	0.04
	52		12	0.01	0.02	0.03	0.03	0	0.03
	54		11	0.01	0.02	0.03	0.04	0.04	0.05
	58		31	0.11	0.03	0.12	0.24	0.19	0.36
	59		13	0.04	0.04	0.07	0.13	0.05	0.21
	61		70	0.05	0.04	0.07	0.09	0.08	0.1
	62		18	0.07	0.05	0.1	0.11	0.09	0.14
none	49	NonNURE	19	0	0.02	0.02	0.03	0.02	0.04
	49	Soil	10	0	0.01	0.01	0.02	0.004	0.03
	58	NonNURE	21	0.09	0.11	0.12	0.27	0	0.42
	58	Soil	10	0.001	0.01	0.01	0.02	0.01	0.03
	59	NonNURE	10	0.04	0.05	0.07	0.15	0.08	0.24
	61	NonNURE	14	0.029	0.01	0.04	0.08	0.06	0.15
	61	Soil	56	0.05	0.05	0.07	0.09	0.07	0.11
	62	NonNURE	12	0.06	0.06	0.1	0.1	0.08	0.11

Mercury - WRIA 61 excluded

Pooled	WRIA	source	n	IQR	50th Percentile	75th Percentile	90th Percentile	Lower bound for 90th%ile	Upper Bound For 90th %ile
All			138	0.02	0.02	0.04	0.11	0.1	0.16
WRIA		NonNURE	97	0.03	0.03	0.05	0.12	0.08	0.14
		Soil	41	0.01	0.01	0.02	0.05	0	0.07

Table 4.15 Nickel

Pooled	WRIA	source	n	IQR	50th Percentile	75th Percentile	90th Percentile	Lower bound for 90th%ile	Upper Bound For 90th %ile
All			1486	11	12	18	27	24	29
WRIA		NonNURE	204	11	15	21	27	22	29
		NURE	1164	10	10	17	27	24	29
		Soil	118	14	16	23	31	24	35
source	49		364	10	10	17	25	21	28
	51		42	10	13	18	23	0	27
	52		175	11	10	16	23	18	26
	53		80	8	11	15	22	19	27
	54		186	5	10	12	17	14	19
	55		79	5	5	10	15	13	20
	58		220	13	14	21	30	25	33
	59		30	13	14	21	25	20	29
	60		195	15	15	25	47	30	57
	61		85	16	15	24	37	16	45
	62		30	9	17	22	26	25	30
None	49	NonNURE	19	6	16	18	24	0	31
	49	NURE	335	12	10	17	25	21	28
	49	Soil	10	5	20	23	30	24	39
	51	NURE	40	10	13	18	24	0	29
	52	NURE	163	10	10	15	23	19	26
	53	NURE	72	8	10	15	22	19	27
	54	NonNURE	47	5	12	15	26	0	35
	54	NURE	135	5	10	12	15	13	18
	55	NURE	73	2	5	7	12	9	14
	58	NonNURE	54	9	18	21	26	14	28
	58	NURE	155	12	13	19	30	25	32
	58	Soil	11	11	13	24	29	11	42
	59	NonNURE	12	10	21	25	28	3	34
	59	NURE	13	9	12	17	21	17	28
	60	NonNURE	16	13	16	22	25	17	28
	60	NURE	172	14	15	26	50	33	62
	61	NonNURE	17	7	7	11	20	0	30.4
	61	Soil	62	14	18	24	33	19	39
	62	NonNURE	19	8	16	22	24	22	28
	62	Soil	11	11	18	24	26	24	34

Nickel - WRIA 61 excluded

Pooled	WRIA	source	n	IQR	50th Percentile	75th Percentile	90th Percentile	Lower bound for 90th%ile	Upper Bound For 90th %ile
All			1401	11	12	17.7	27	25	29
WRIA		NonNURE	187	10	15	21	26	21	29
		NURE	1158	10	10	17	26	21	26
		Soil	56	12	15	22	28	20	33

Table 4.16 Silver

Pooled	WRIA	source	n	IQR	50th Percentile	75th Percentile	90th Percentile	Lower bound for 90th%ile	Upper Bound For 90th %ile
All			1250	0.3	0.4	0.5	0.8	0.8	0.9
WRIA		NonNURE	22	1	0.2	1	1.4	0.9	1.9
		NURE	1165	0.2	0.4	0.5	0.8	0.8	0.9
		Soil	63	0.2	0.2	0.3	0.6	0.2	0.9
source	49		335	0.3	0.3	0.5	0.7	0.6	0.8
	51		40	0.2	0.4	0.5	0.6	0.4	0.7
	52		163	0.2	0.4	0.5	0.6	0.5	0.6
	53		72	0.2	0.2	0.3	0.4	0.3	0.4
	54		135	0.3	0.4	0.6	0.9	0.6	1
	55		73	0.5	0.6	0.8	1	0.5	1.1
	58		165	0.2	0.4	0.5	0.7	0.5	0.8
	59		14	0.4	0.6	0.8	0.9	0	1.1
	60		173	0.3	0.4	0.6	0.8	0.5	0.9
	61		74	0.2	0.2	0.3	0.6	0.5	0.7
None	49	NURE	335	0.3	0.3	0.5	0.7	0.6	0.8
	51	NURE	40	0.2	0.4	0.5	0.6	0.4	0.7
	52	NURE	163	0.2	0.4	0.5	0.6	0.5	0.6
	53	NURE	72	0.2	0.2	0.3	0.4	0.3	0.4
	54	NURE	135	0.3	0.4	0.6	0.9	0.6	1.0
	55	NURE	73	0.5	0.6	0.8	1	0.5	1.1
	58	NURE	155	0.2	0.4	0.5	0.7	0.6	0.8
	59	NURE	13	0.3	0.5	0.7	0.9	0	1.1
	60	NURE	173	0.3	0.4	0.6	0.8	0.5	0.9
	61	NonNURE	12	0.01	0.02	0.03	0.08	0	0.1
	61	Soil	56	0.2	0.2	0.3	0.6	0.01	0.8

Silver - WRIA 61 excluded

Pooled	WRIA	source	n	IQR	50th Percentile	75th Percentile	90th Percentile	Lower bound for 90th%ile	Upper Bound For 90th %ile
All			1176	0.2	0.4	0.5	0.8	0.8	0.9
WRIA		NonNURE	10	0.6	1	1.4	1.8	1.7	2.6
		NURE	1159	0.2	0.4	0.5	0.8	0.8	0.9

Table 4.17 Thallium

Pooled	WRIA	source	n	IQR	50th Percentile	75th Percentile	90th Percentile	Lower bound for 90th%ile	Upper Bound For 90th %ile
All			151	0.1	0.2	0.3	0.5	0.4	0.6
WRIA		NonNURE	53	0.1	0.2	0.3	0.4	0.1	0.5
		Soil	98	0.2	0.2	0.4	0.6	0.6	0.8
source	49		10	0.1	0.4	0.4	0.4	0.4	0.4
	54		44	0.1	0.2	0.3	0.5	0.3	0.6
	58		11	0.4	0.1	0.5	0.7	0	0.9
	61		67	0.04	0.2	0.2	0.2	0.2	0.2
None	49	Soil	10	0.1	0.4	0.4	0.4	0.4	0.4
	54	NonNURE	40	0.1	0.2	0.3	0.4	0.1	0.5
	58	Soil	10	0.4	0.1	0.5	0.5	0.3	0.9
	61	NonNURE	12	0.06	0.2	0.2	0.4	0.2	0.6
	61	Soil	55	0.03	0.2	0.2	0.2	0.2	0.2

Thallium - WRIA 61 excluded

Pooled	WRIA	source	n	IQR	50th Percentile	75th Percentile	90th Percentile	Lower bound for 90th%ile	Upper Bound For 90th %ile
All			84	0.2	0.3	0.4	0.6	0.4	0.7
WRIA		NonNURE	41	0.1	0.2	0.3	0.4	0	0.5
		Soil	43	0.3	0.4	0.6	0.7	0.6	0.8

Table 4.18 Zinc

Pooled	WRIA	source	n	IQR	50th Percentile	75th Percentile	90th Percentile	Lower bound for 90th%ile	Upper Bound For 90th %ile
All			1488	33	40	60	86	81	91
WRIA		NonNURE	206	37	65	84	101	88	106
		NURE	1165	25	35	50	67	64	69
		Soil	117	64	80	121	225	130	309
Source	49		364	25	32	47	67	57	70
	51		42	48	40	74	98	5	114
	52		175	25	37	50	66	51	73
	53		80	15	42	52	71	62	87
	54		187	25	47	62	86	71	96
	55		79	28	37	55	73	66	85
	58		221	38	48	68	92	82	102
	59		29	29	62	68	114	57	157
	60		196	23	32	48	71	63	82
	61		85	86	80	130	252	132	311
	62		30	60	70	114	134	109	152
None	49	NonNURE	19	35	54	77	90	65	112
	49	NURE	335	23	32	45	64	61	71
	49	Soil	10	18	80	89	104	102	125
	51	NURE	40	46	40	71	99	0	122
	52	NURE	163	21	35	46	62	58	70
	53	NURE	72	13	40	48	55	31	58
	54	NonNURE	48	33	70	91	116	59	136
	54	NURE	135	15	40	50	65	57	72
	55	NURE	73	24	35	51	67	55	79
	58	NonNURE	55	39	66	85	100	87	110
	58	NURE	155	35	40	60	80	61	88
	58	Soil	11	19	59	69	91	56	119
	59	NonNURE	12	12	64	69	110	0	154
	59	NURE	13	32	38	65	87	78	122
	60	NonNURE	16	47	59	79	86	81	96
	60	NURE	173	20	32	45	61	50	70
	61	NonNURE	17	57	42	81	99	68	130
	61	Soil	62	130	99	185	347	303	470
	62	NonNURE	19	19	58	70	81	0	96
	62	Soil	11	27	122	132	139	134	150

Zinc - WRIA 61 excluded

Pooled	WRIA	source	n	IQR	50th Percentile	75th Percentile	90th Percentile	Lower bound for 90th%ile	Upper Bound For 90th %ile
All			1403	30	40	57	80	75	83
WRIA		NonNURE	189	36	66	85	101	88	108
		NURE	1159	25	35	50	67	64	69
		Soil	55	47	71	106	126	119	138

In Tables 4.1-4.18, rows with too little data (n<10) and rows that had detection limit issues were not included. For the data that was not pooled, irrespective of certain later refinements to address observable reported detection limitations, entries are included in Appendix 2.

5. Discussion

Our steps for analysis were given in Section 3.

Based on our findings from step 1 and 2, we concluded that **no parametric distribution** fit the data well. The results also indicated that that there were distributional differences across WRIA and Source. Given these results we decided to conduct non-parametric analysis of the data. We further decided not to remove any data points from the set, as outliers. For completion we included the analysis based on log transformations as well. Hence, in step 3 we used rank-based methods to look to see if there are any WRIA and Source differences. The idea was if there are no differences we can safely pool the data. **Unfortunately, our results show that for most of the metals, there were significant interactions, which meant there were differences across Source and WRIA**. This led us to the conclusion that when possible (i.e. we had enough data) we should encourage the incorporation of background outcomes by Source and WRIA. We were cognizant that for some of the metals it was not possible to do so, as we often did not have enough data.

To compute background, we calculate the empirical 90Th percentile and the 95% bootstrapped confidence interval of 90th percentile. The justification for the 90th percentile is based on finding critical regions in hypothesis testing that we mentioned in Section 3. The bootstrapped 95% confidence interval gives us a lower bound for these 90th percentile outcomes. For the purpose of the analysis we suggest using the lower confidence interval where available and the 90th percentile as the lower and upper thresholds for estimation, respectively.

Some Caveats:

We also chose not to remove any outliers. The reason for this is two-fold:

1. Normal distribution was not used, hence, theoretically we cannot say that the outliers were indeed influential outlying observations, assuming the data sets used are representative of objectives.
2. We used robust non-parametric methods which are not affected by outlying observations.

An outcome of not removing outliers was that we re-enforced confidence in the use the 90th percentile, as opposed to some higher percentile that would not be representative of background. We noticed that the data had a fair amount of very large influential values. Since we did not remove outliers, we determined that using the 90th percentile would give us a more stable estimate, as in some cases 5% of the data, for example, could very well yield large suspect observations and using the 95th percentile would be contaminated by these observations.

We did not compute confidence intervals for any group when the sample size was below 10. We observed that when smaller sample sizes were used, the confidence intervals often did not make sense, (very small or negative numbers for the lower threshold and large positive numbers for the upper threshold). While there is no strict theoretical reasons for not computing these, we determined that the confidence intervals for samples less than 10, did not provide any real information and often confused the issue. As a matter of fact, when sample sizes were below 40, our lower confidence limit also could be negative as is evidenced by Bismuth NonNure (n=40) and Zinc NURE-WRIA 51 (n=40) where the lower thresholds were negative and replaced by 0. Also, sample sizes less than 20 often gave us a lower threshold of 0. As negative confidence intervals did not provide any useful information we decided to remove any situation where the sample size was less than 10 from the 90th percentile and confidence interval computation.

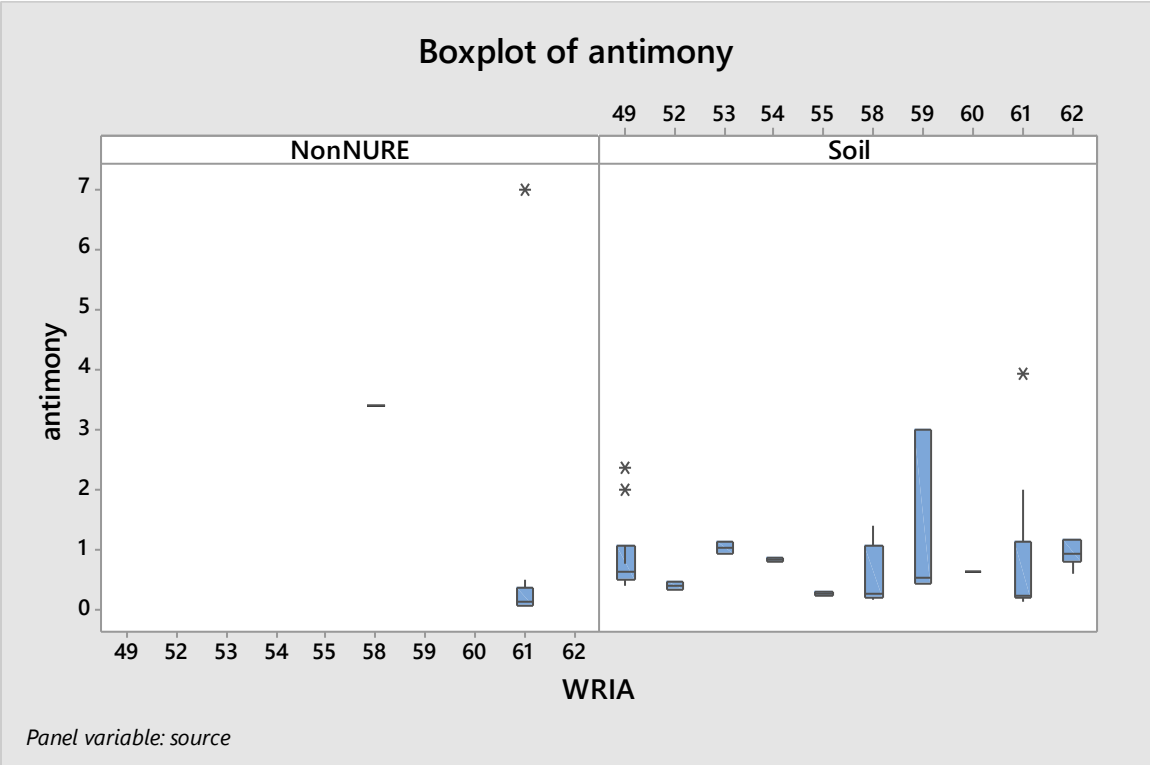
We used the percentile method to construct confidence intervals. Hence constructing 90th percentile meant calculation of the 5th and 95th percentile of the empirical distribution. For small samples like 10, there is no inherent 5th percentile that is a data point. So the percentiles are calculated using weights. If there are very large or small numbers in the data set these dominate the percentile calculation and the calculated percentiles do not give much information. There are several articles on this subject (see for example Fisher and Hall, 1991, Bootstrap algorithms for small samples, Journal of Statistical Inference and Planning, 27, 157-169) that discuss this further. This was a judgement call made by us.

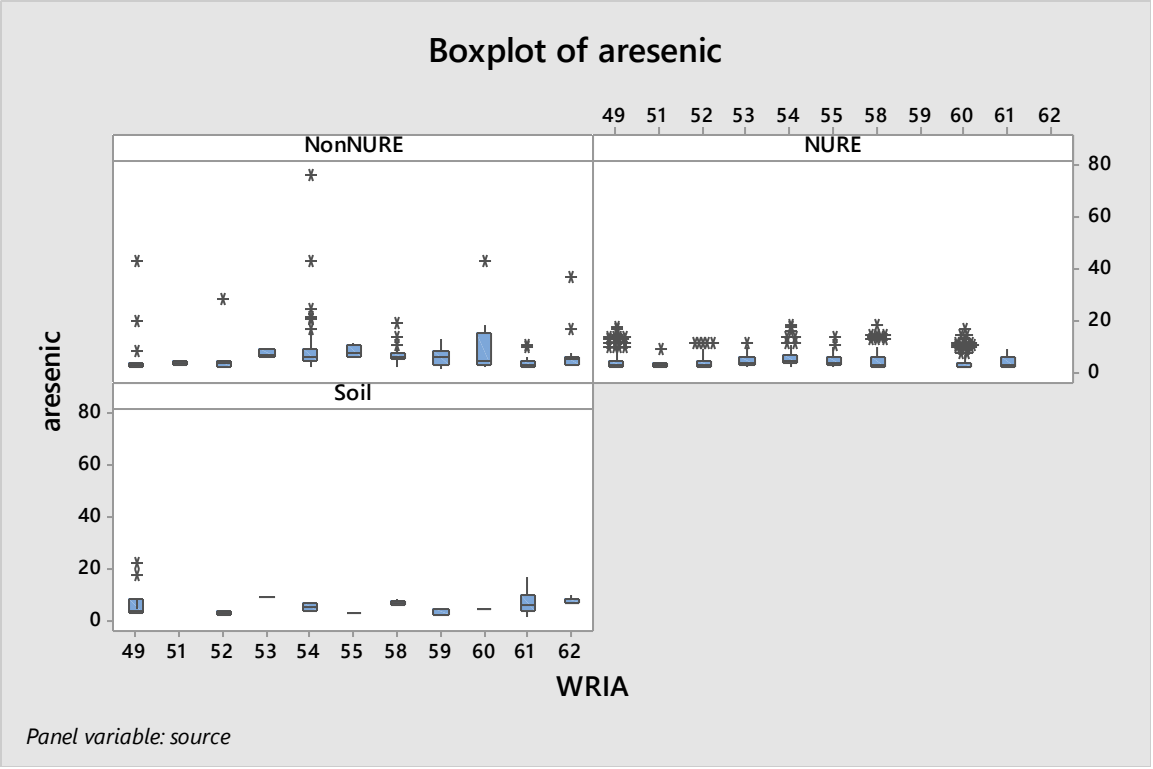
We calculated the 90th percentile with and without WRIA 61: We noticed that WRIA 61 had several anomalies in both upper and lower threshold values. For example the 90th percentile for Aluminum the bounds were between approximately 61,000 to 81,000 except WRIA 61 Soil, which was anomalously low at 24,870. Other examples for which WRIA 61 behaved differently from the others included: Cadmium, Iron, Zinc, and Lead. Further, ECOLOGY also notified us that WRIA 61 included areas of demonstrated, or suspected smelter pollution to soils and tributaries. Hence, we computed our 90th percentiles with and without WRIA 61 and also present those in Table 4.1 – 4.18

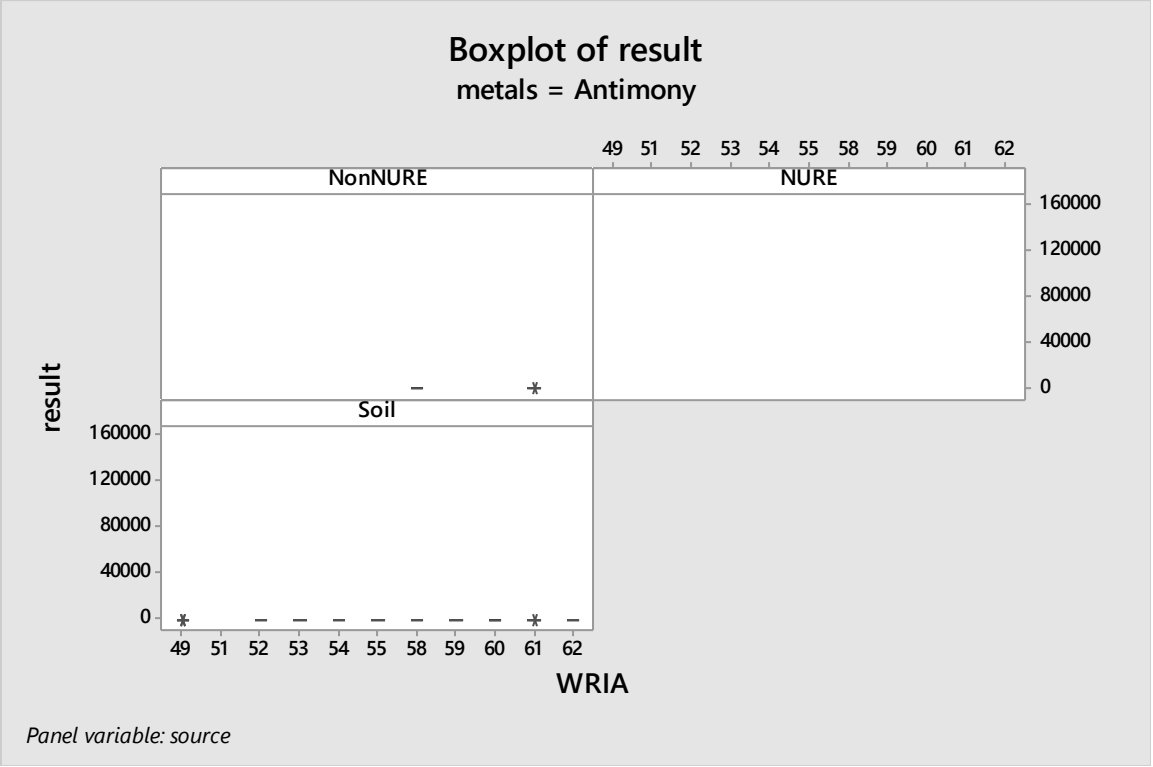
Appendix 1: Graphs and Plots

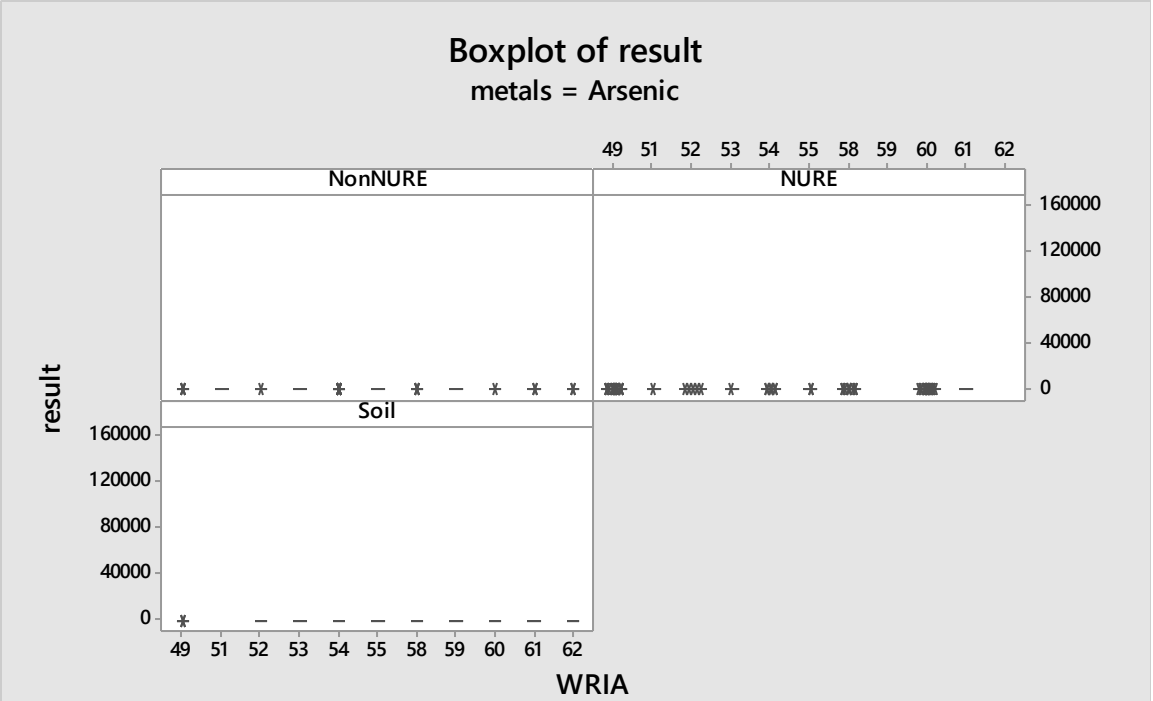
Appendix for the report:

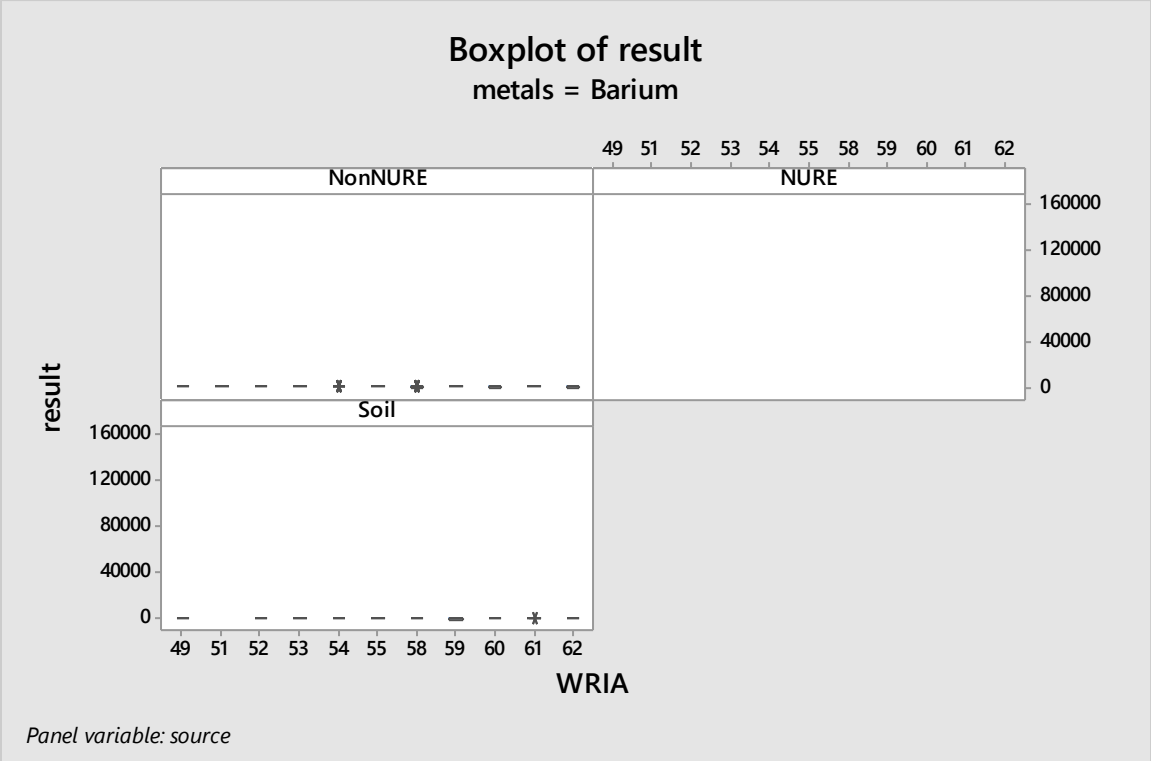
Box plots for the various metals:

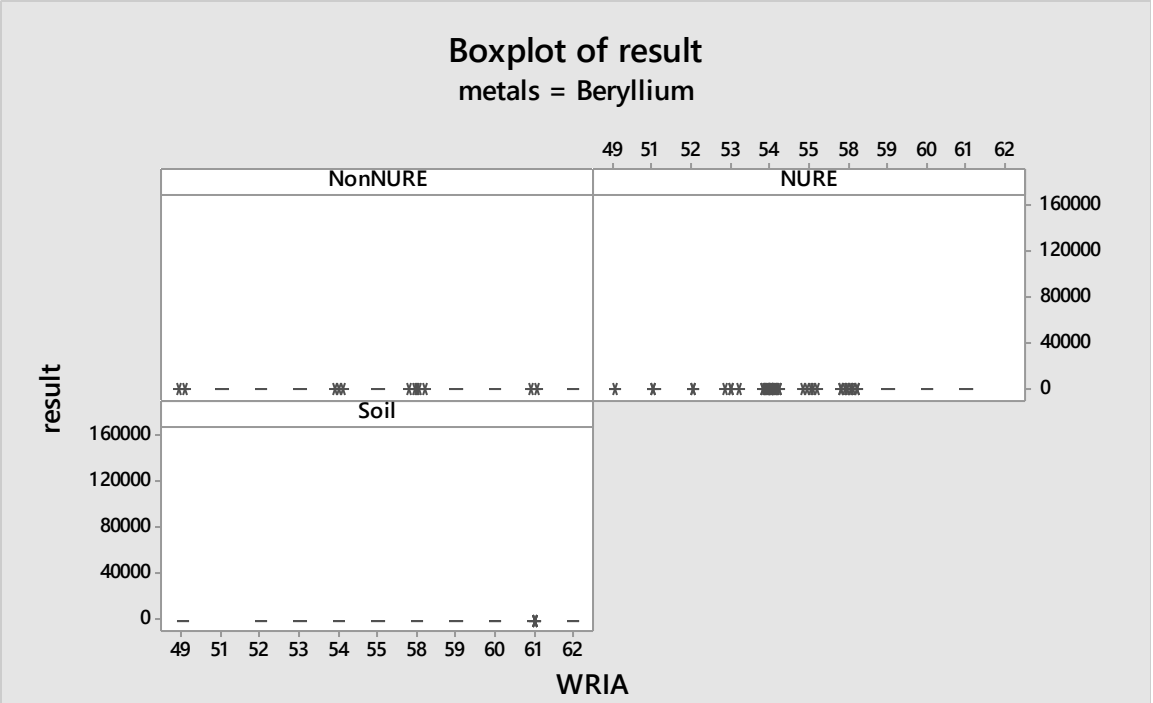


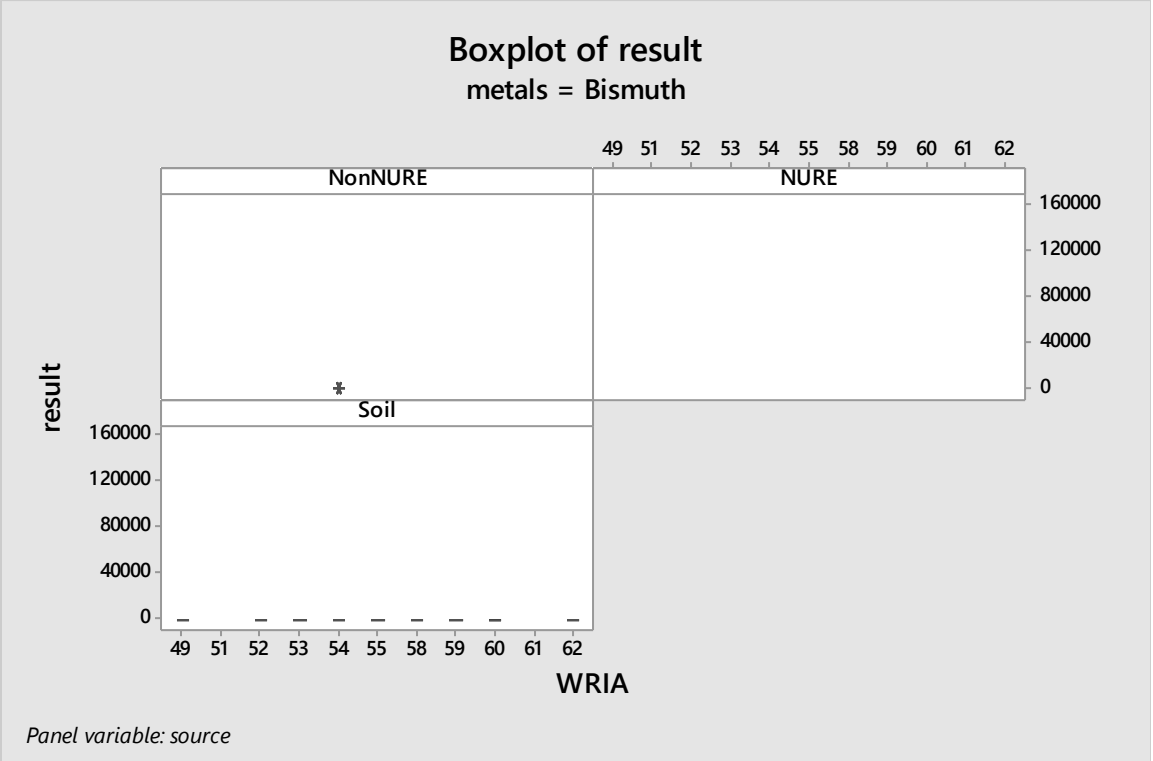

Boxplot of aresenic
NonNURE
NURE
Soil
aresenic
WRIA
49 51 52 53 54 55 58 59 60 61 62
0 20 40 60 80
Panel variable: source

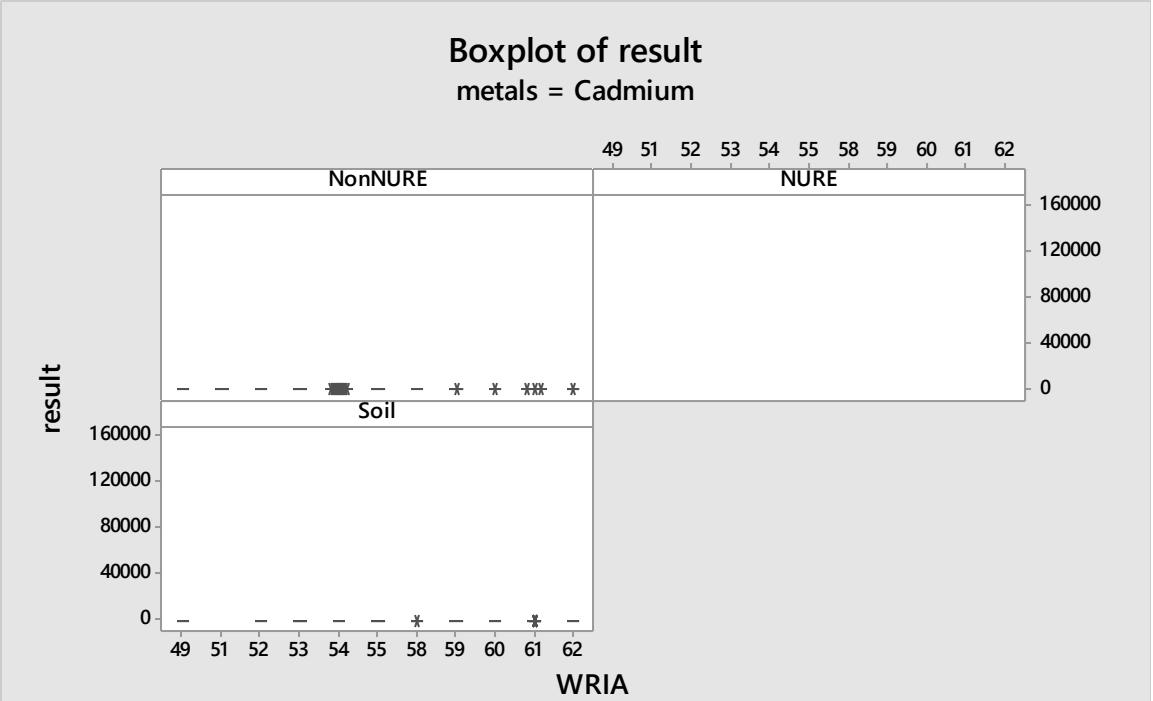

Boxplot of result
metals = Antimony
NonNURE
NURE
Soil
result
WRIA
49 51 52 53 54 55 58 59 60 61 62
0 40000 80000 120000 160000
Panel variable: source

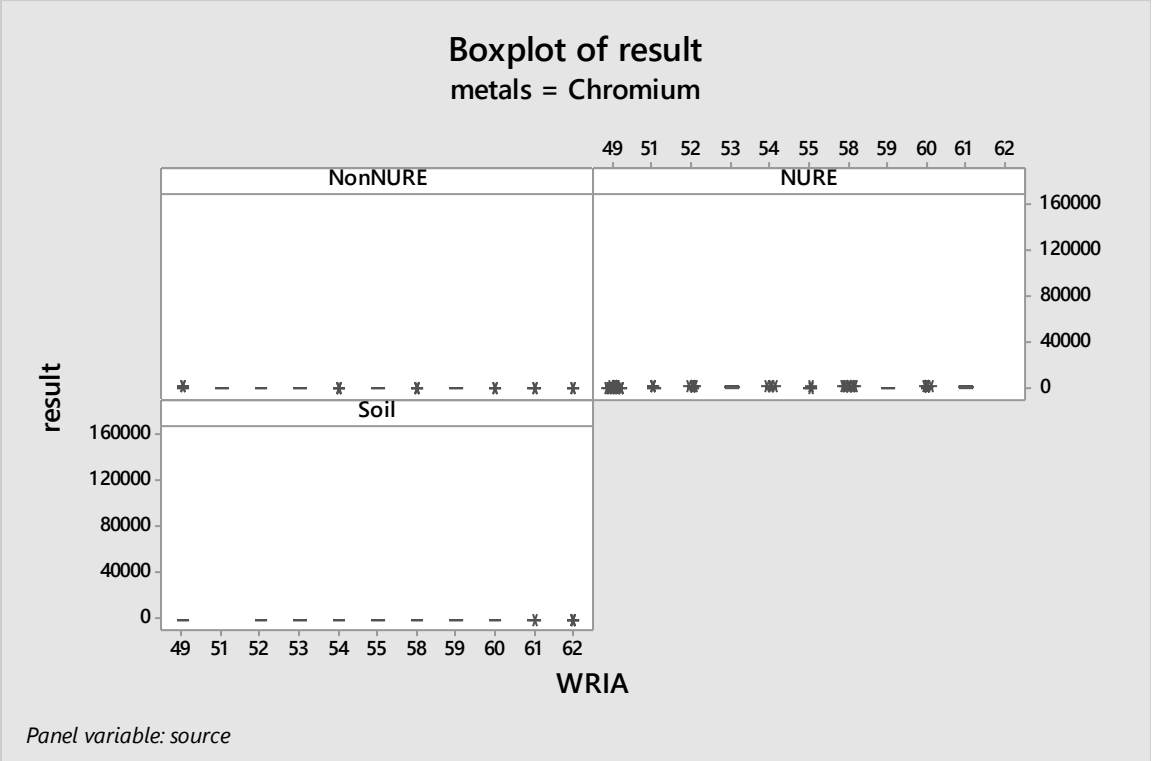

Boxplot of result
metals = Arsenic
NonNURE
NURE
Soil
result
WRIA
49 51 52 53 54 55 58 59 60 61 62
0
40000
80000
120000
160000
Panel variable: source

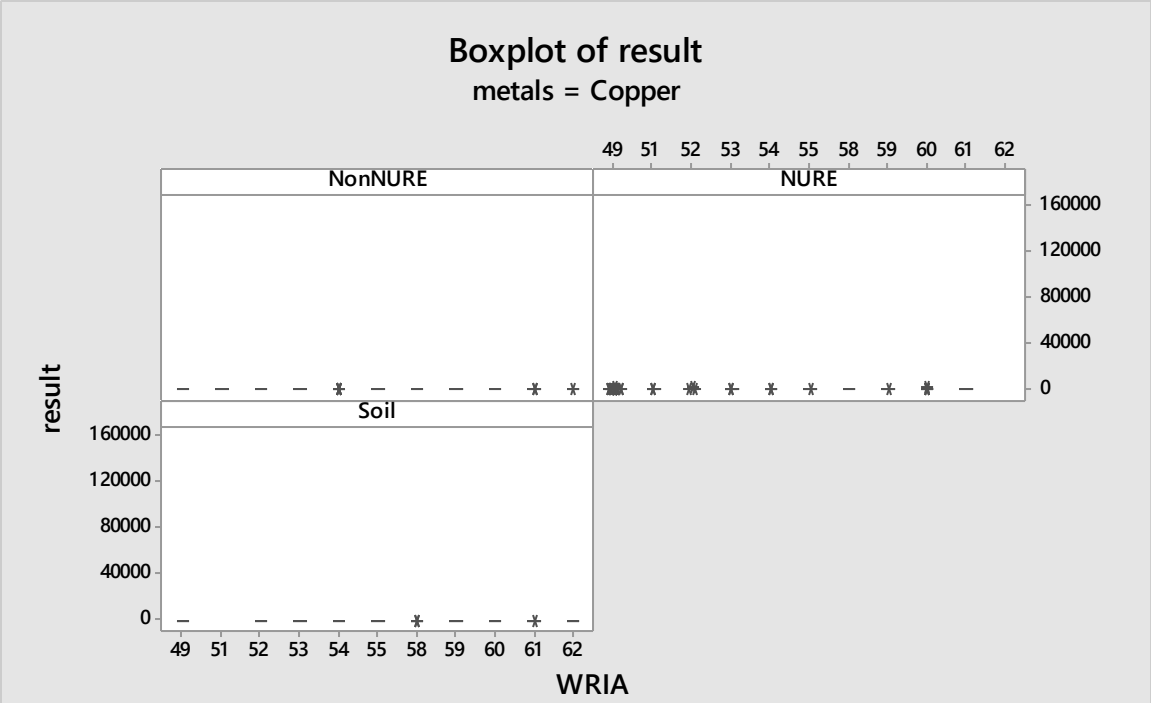

Boxplot of result
metals = Barium
NonNURE
NURE
Soil
result
WRIA
49 51 52 53 54 55 58 59 60 61 62
0
40000
80000
120000
160000
Panel variable: source

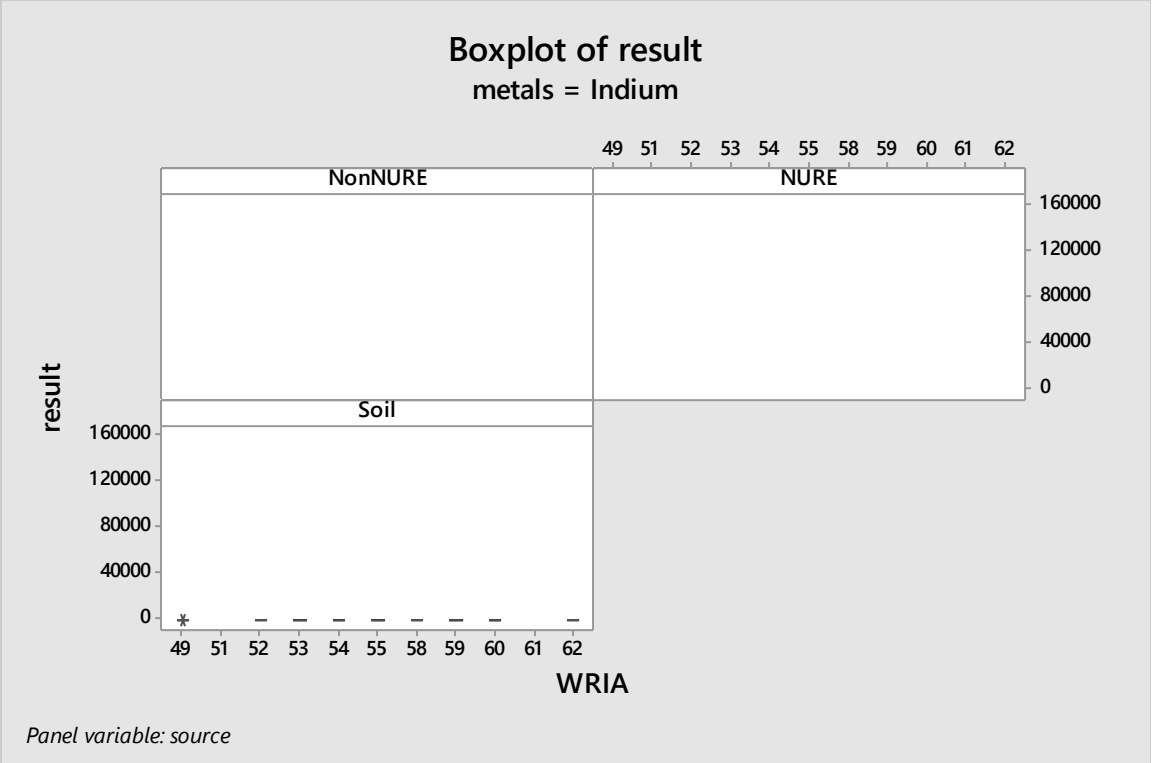

Boxplot of result
metals = Beryllium
NonNURE
NURE
Soil
result
WRIA
49 51 52 53 54 55 58 59 60 61 62
0
40000
80000
120000
160000
Panel variable: source

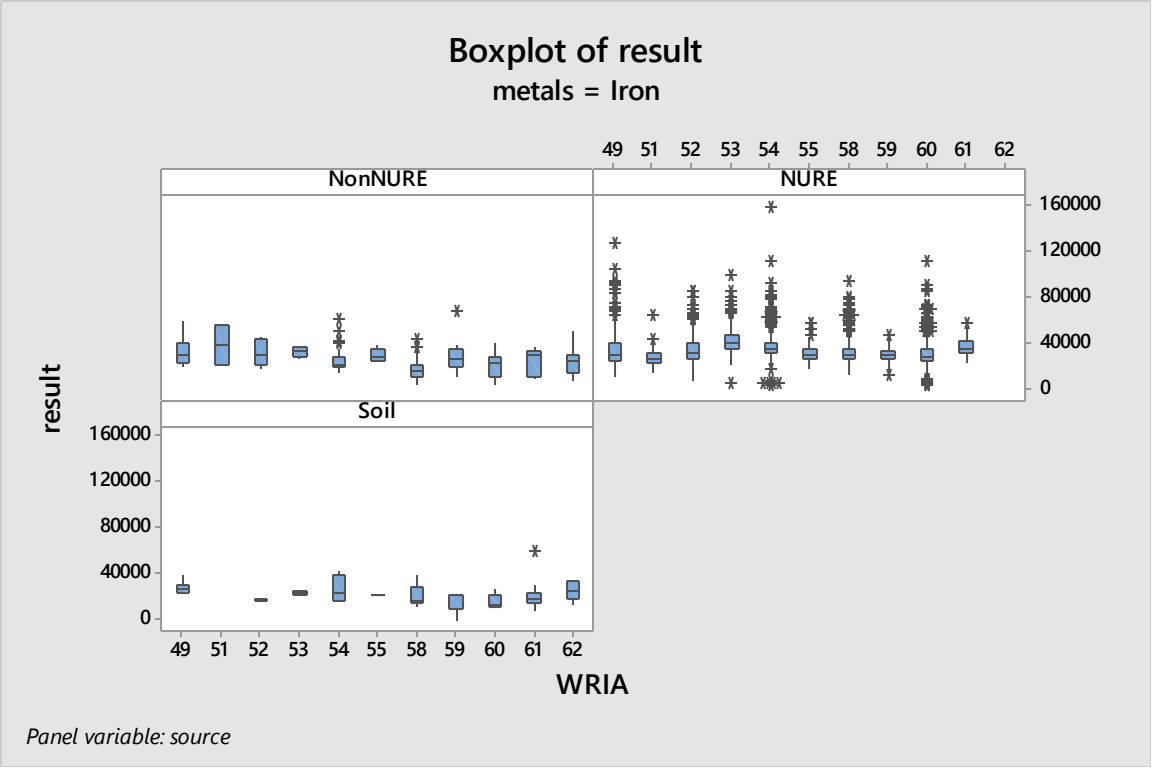

Boxplot of result
metals = Bismuth
NonNURE
NURE
Soil
result
WRIA
49 51 52 53 54 55 58 59 60 61 62
0
40000
80000
120000
160000
Panel variable: source

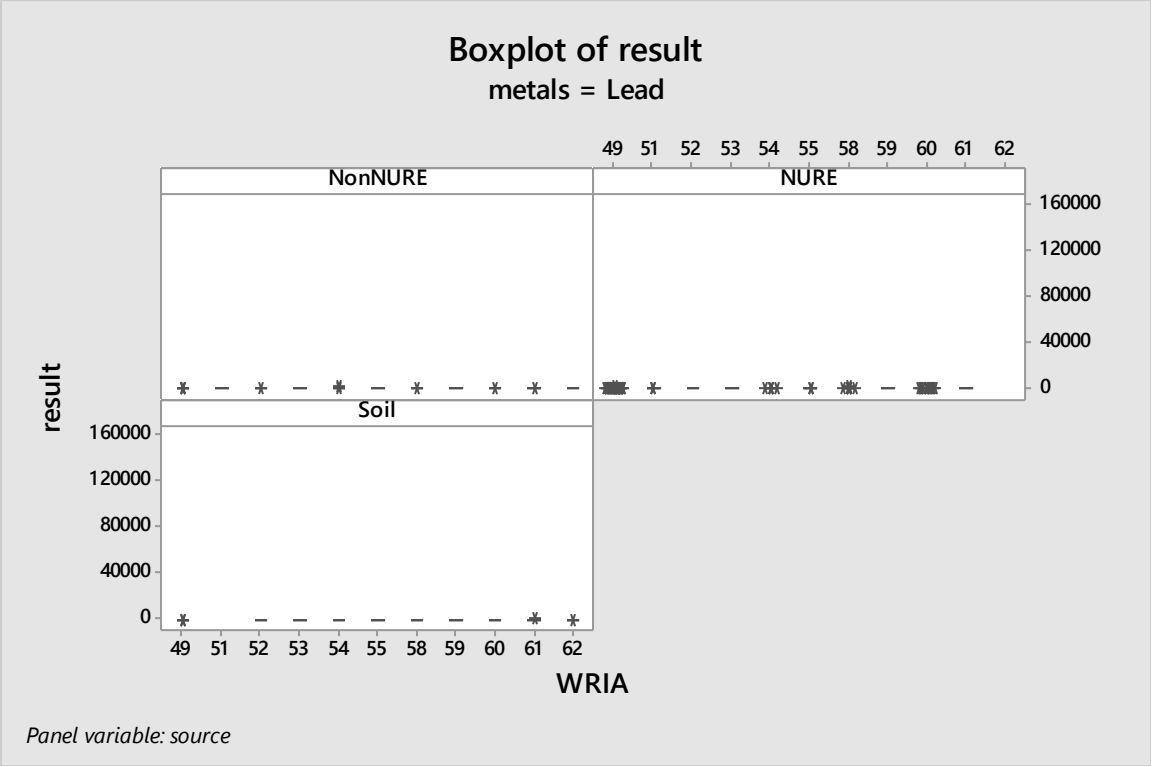

Boxplot of result
metals = Cadmium
NonNURE
NURE
Soil
result
WRIA
49 51 52 53 54 55 58 59 60 61 62
0
40000
80000
120000
160000
Panel variable: source

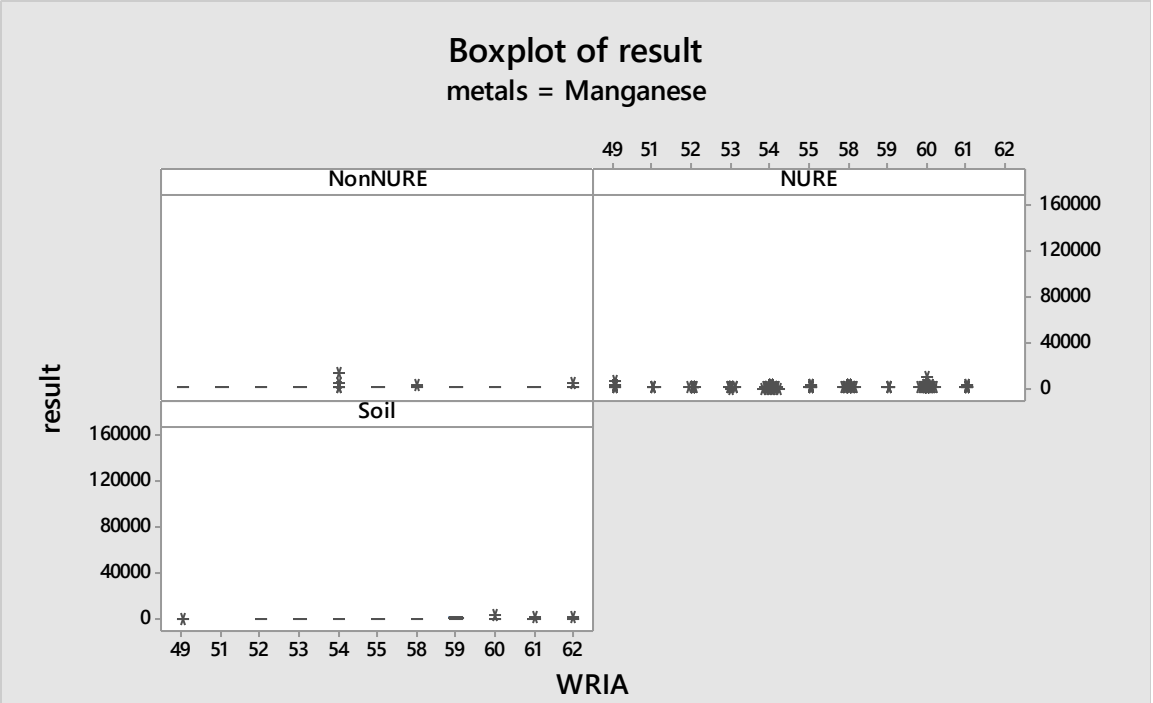

Boxplot of result
metals = Chromium
NonNURE
NURE
Soil
result
WRIA
49 51 52 53 54 55 58 59 60 61 62
0
40000
80000
120000
160000
Panel variable: source

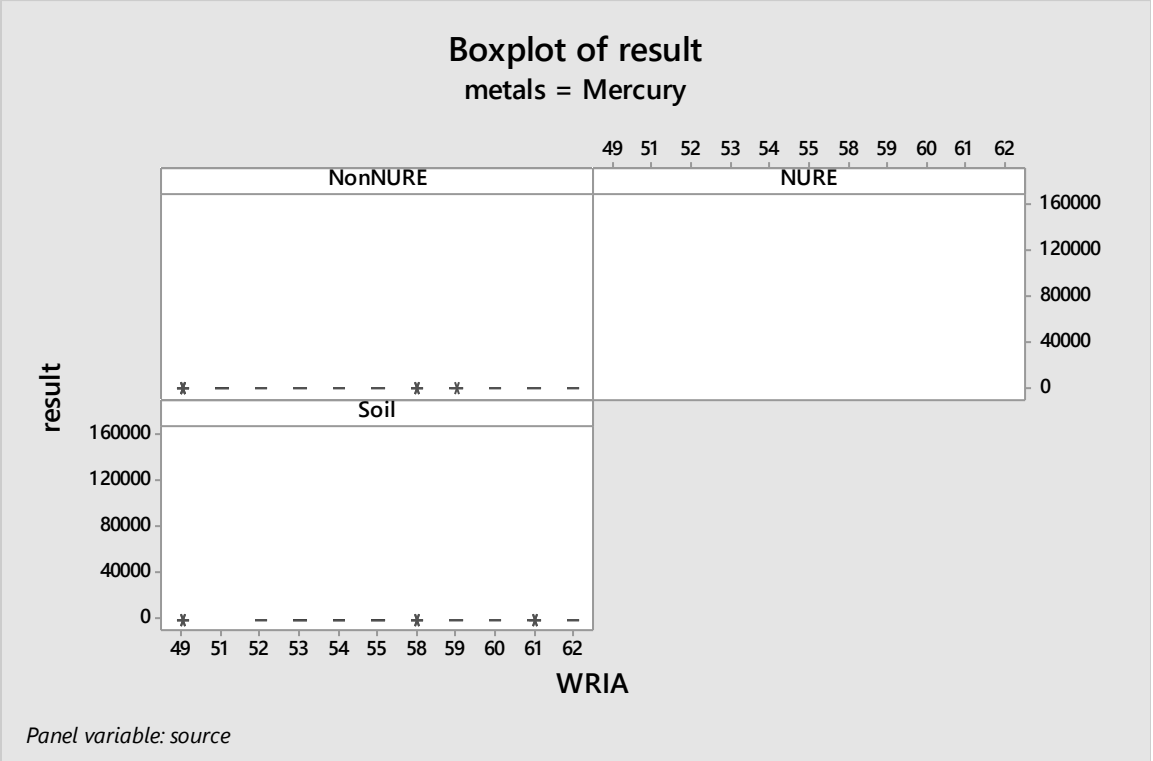

Boxplot of result
metals = Copper
NonNURE
NURE
Soil
result
WRIA
49 51 52 53 54 55 58 59 60 61 62
0
40000
80000
120000
160000
Panel variable: source

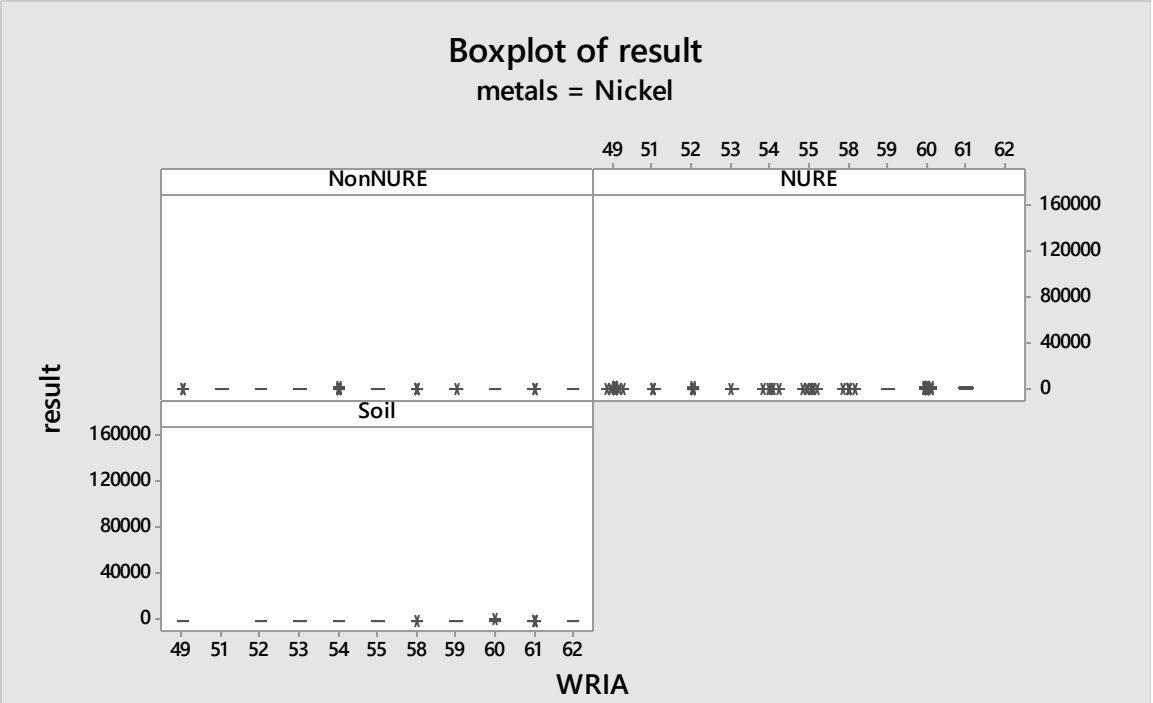

Boxplot of result
metals = Indium
NonNURE
NURE
Soil
result
WRIA
49 51 52 53 54 55 58 59 60 61 62
0
40000
80000
120000
160000
Panel variable: source

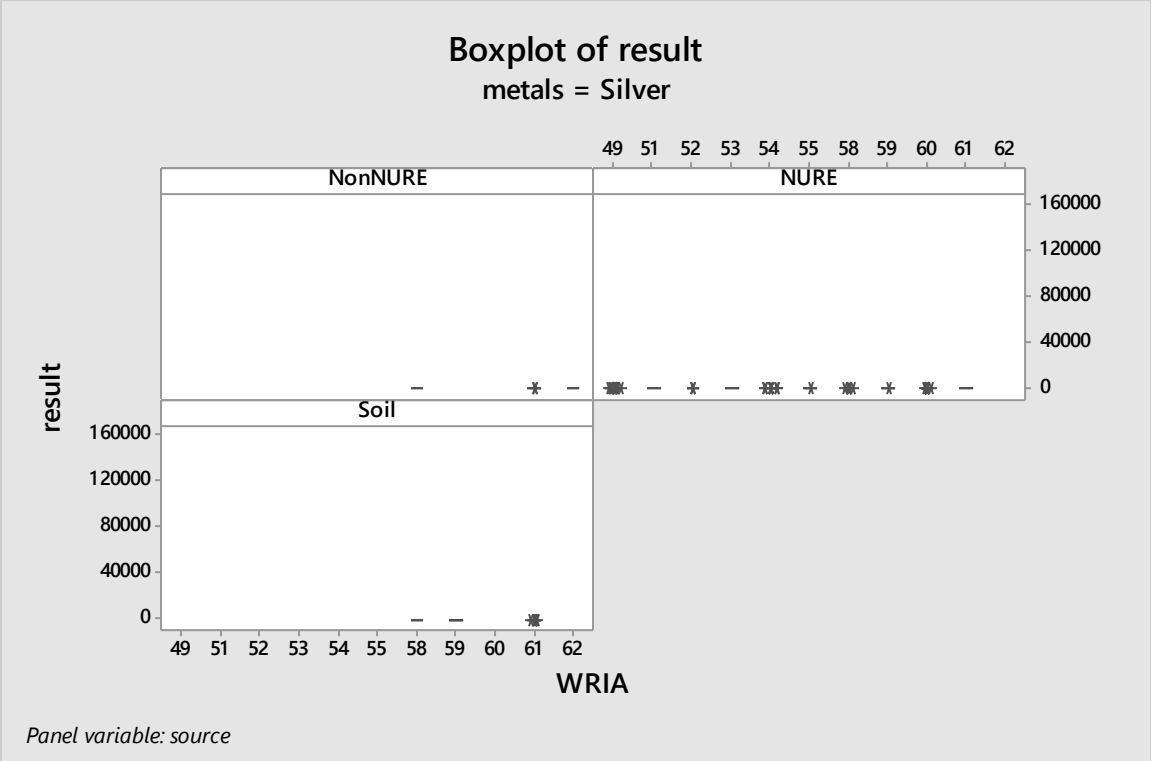

Boxplot of result
metals = Iron
NonNURE
NURE
Soil
result
WRIA
49 51 52 53 54 55 58 59 60 61 62
0 40000 80000 120000 160000
Panel variable: source

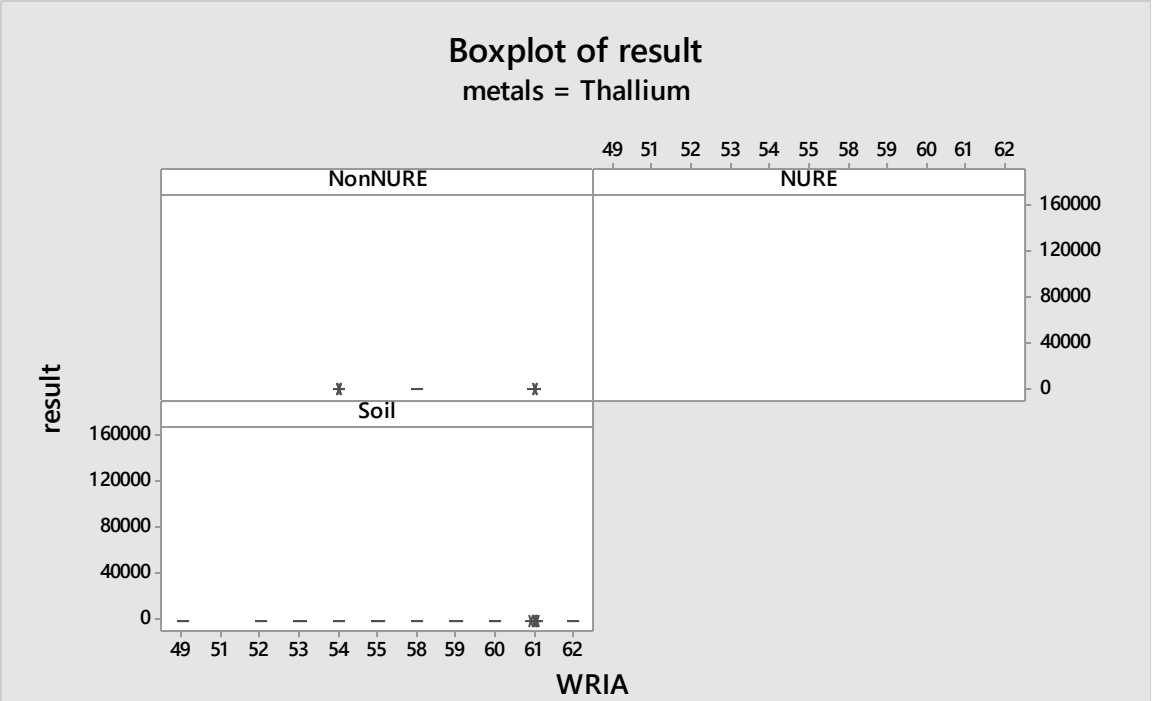

Boxplot of result
metals = Lead
NonNURE
NURE
Soil
result
WRIA
49 51 52 53 54 55 58 59 60 61 62
0 40000 80000 120000 160000
Panel variable: source

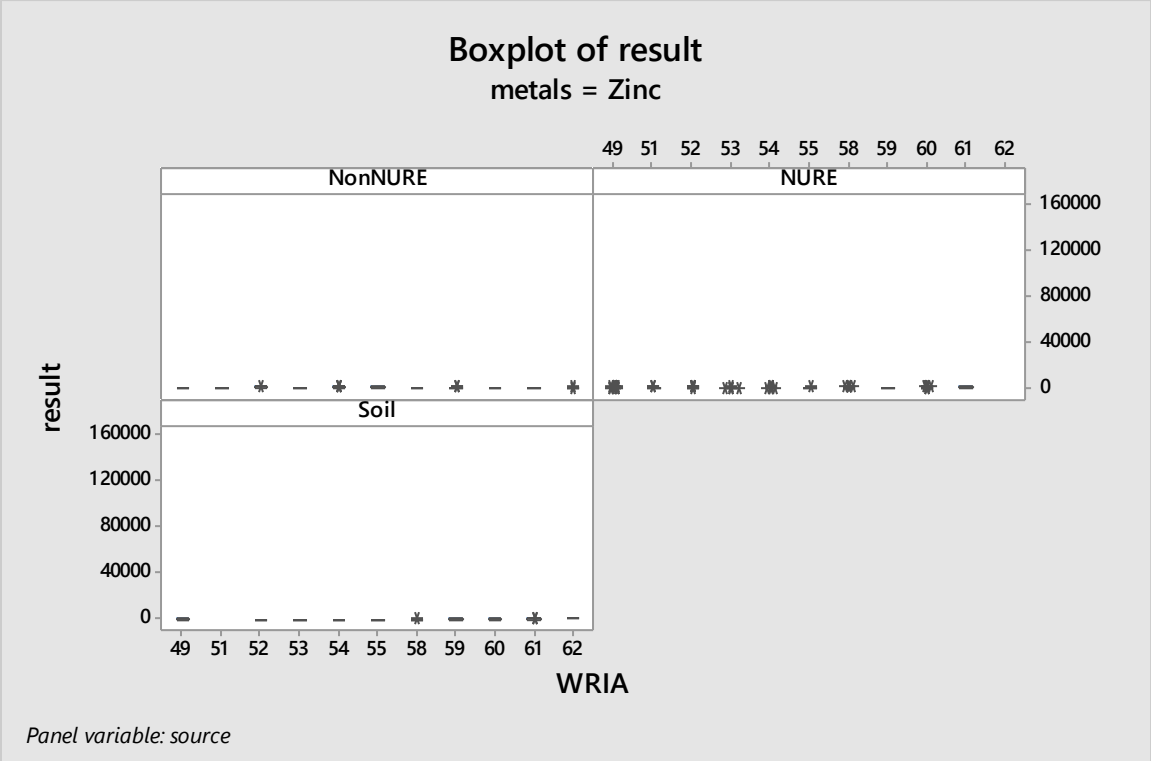

Boxplot of result
metals = Manganese
NonNURE
NURE
Soil
result
WRIA
49 51 52 53 54 55 58 59 60 61 62
0
40000
80000
120000
160000
Panel variable: source

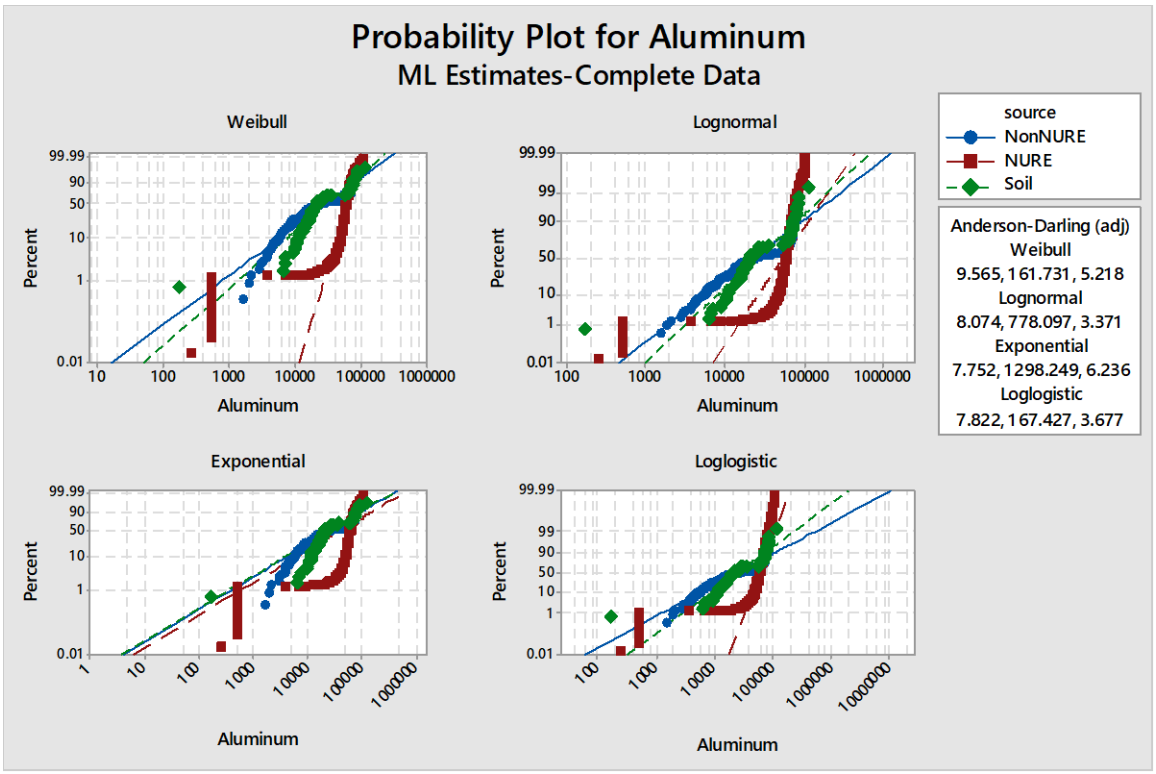

Boxplot of result
metals = Mercury
NonNURE
NURE
Soil
result
WRIA
49 51 52 53 54 55 58 59 60 61 62
0
40000
80000
120000
160000
Panel variable: source

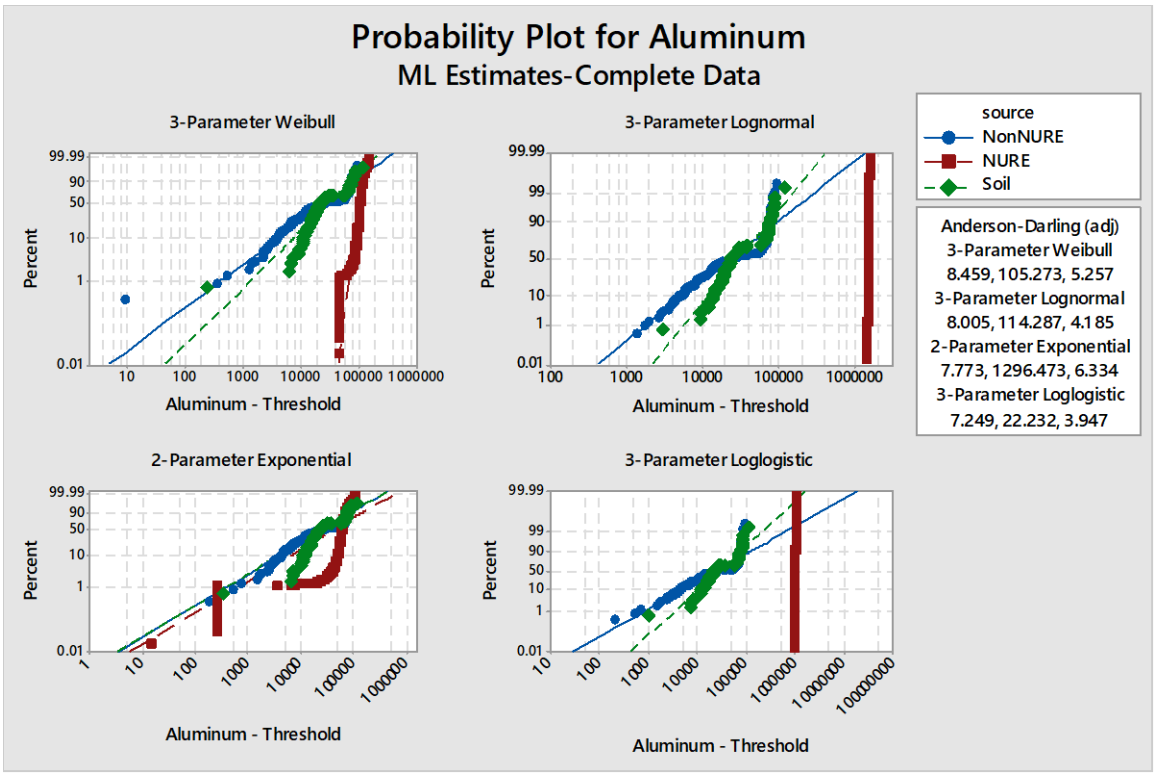

Boxplot of result
metals = Nickel
NonNURE
NURE
Soil
result
WRIA
49 51 52 53 54 55 58 59 60 61 62
0
40000
80000
120000
160000
Panel variable: source

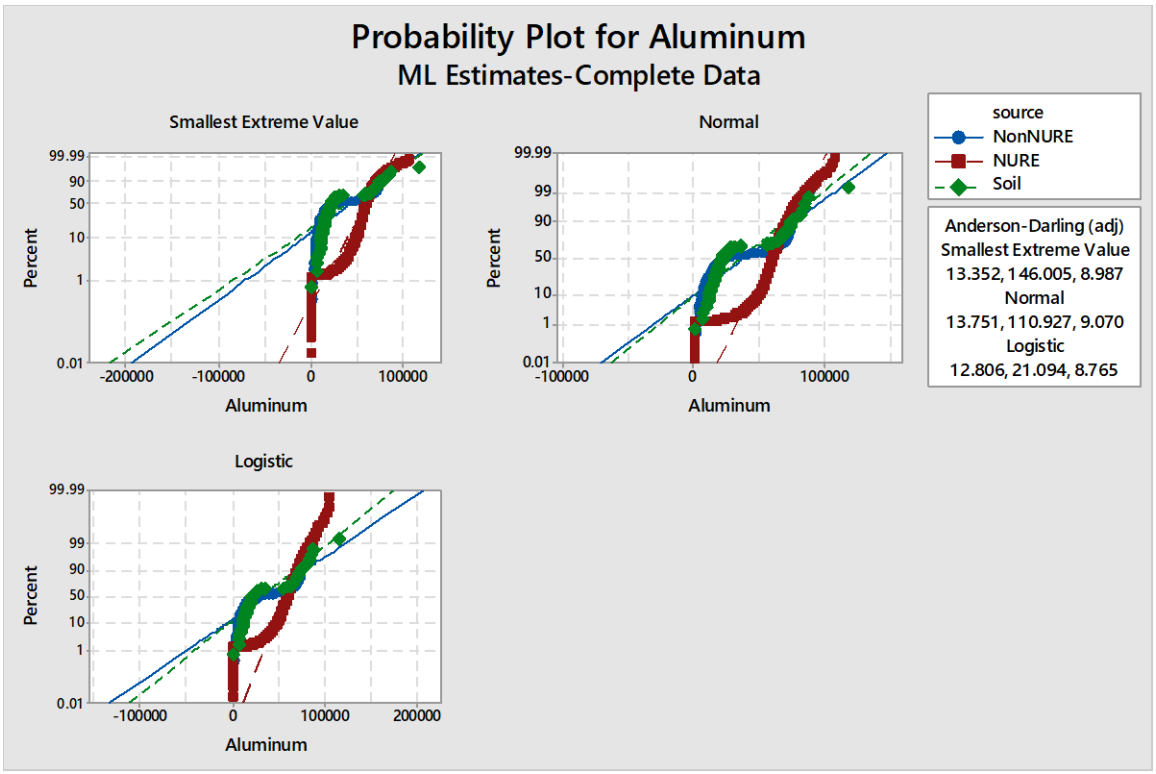

Boxplot of result
metals = Silver
NonNURE
NURE
Soil
result
WRIA
49 51 52 53 54 55 58 59 60 61 62
0
40000
80000
120000
160000
Panel variable: source

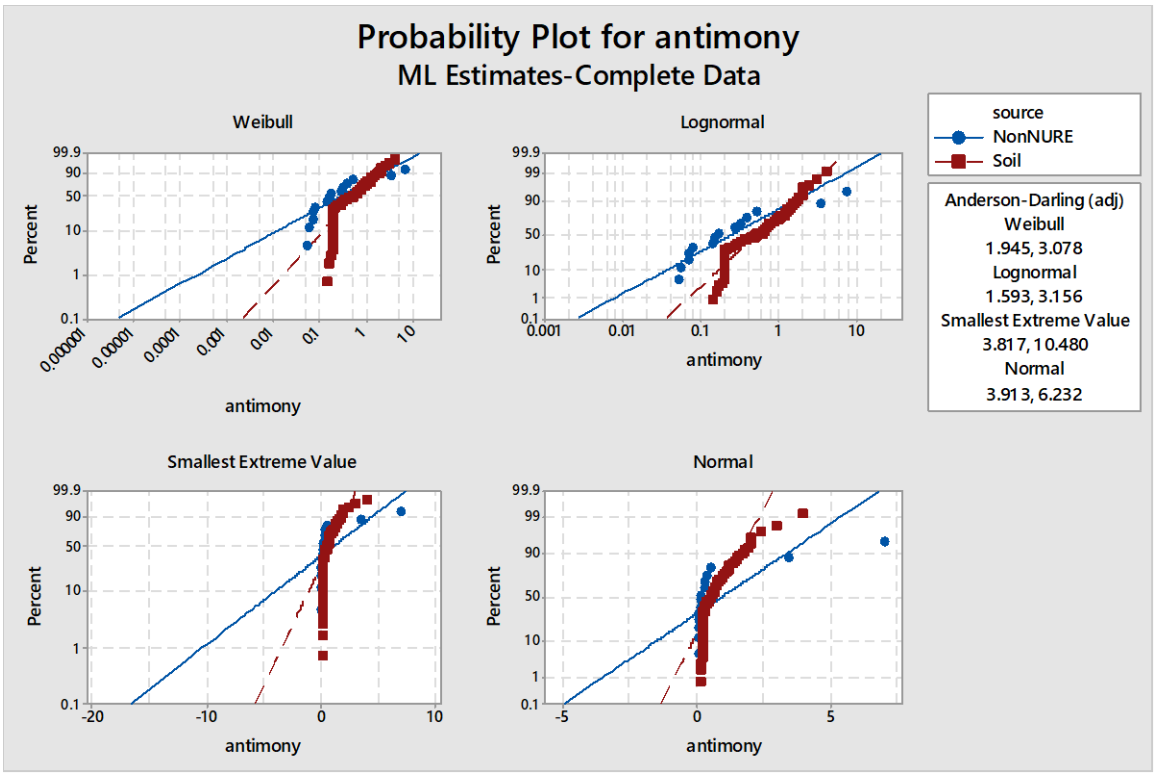

Boxplot of result
metals = Thallium
NonNURE
NURE
Soil
result
WRIA
49 51 52 53 54 55 58 59 60 61 62
0
40000
80000
120000
160000
Panel variable: source

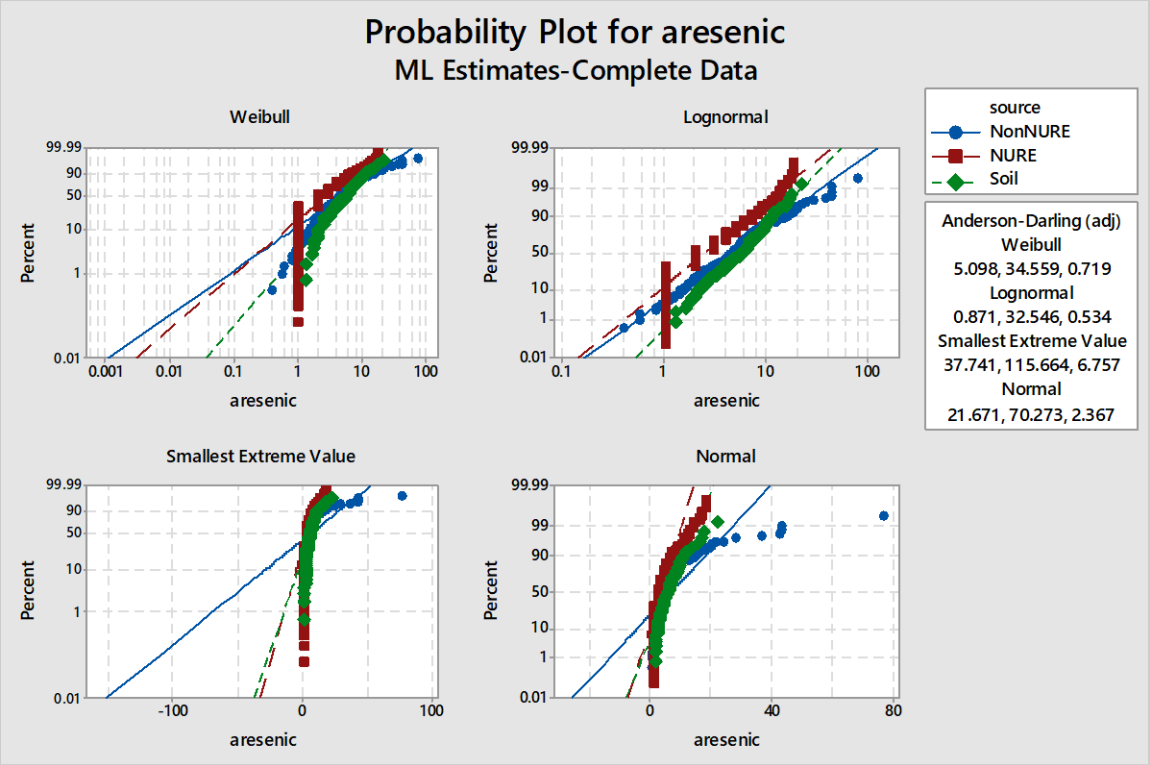

Boxplot of result
metals = Zinc
NonNURE
NURE
Soil
result
WRIA
49 51 52 53 54 55 58 59 60 61 62
0
40000
80000
120000
160000
Panel variable: source

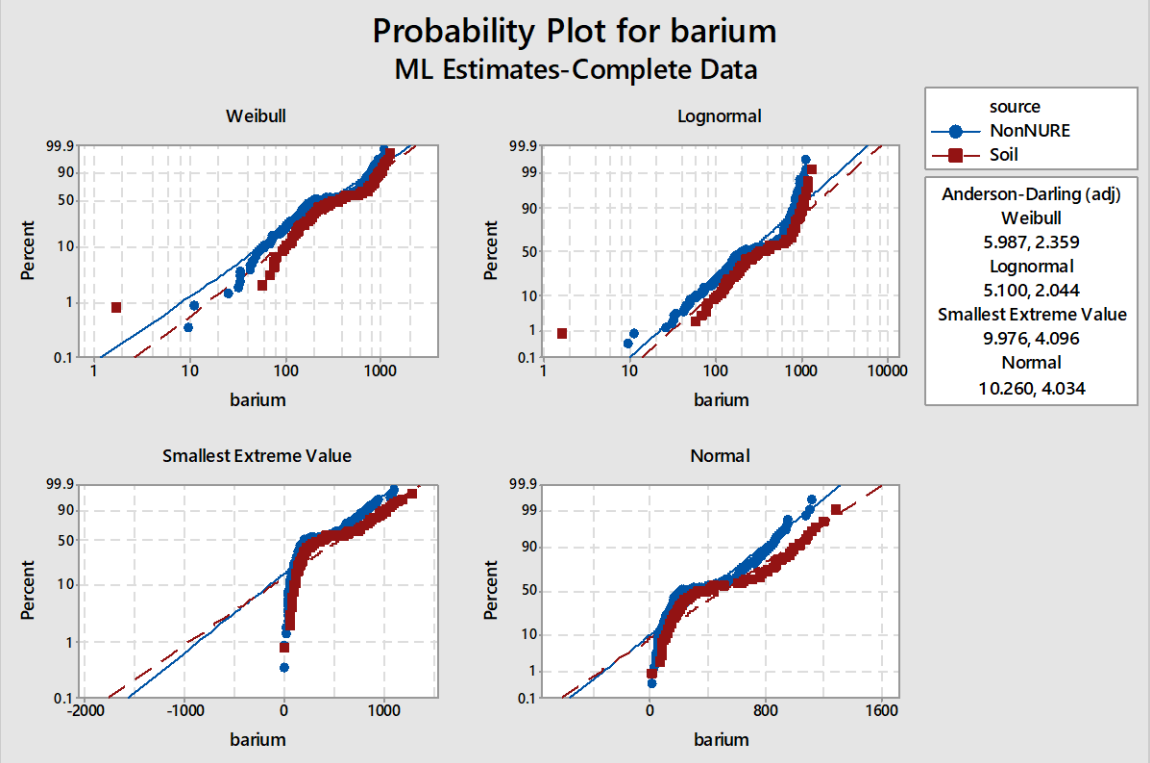

Probability Plot for Aluminum
ML Estimates-Complete Data
Weibull
Lognormal
Exponential
Loglogistic
Percent
Aluminum
source
NonNURE
NURE
Soil
Anderson-Darling (adj)
Weibull
9.565, 161.731, 5.218
Lognormal
8.074, 778.097, 3.371
Exponential
7.752, 1298.249, 6.236
Loglogistic
7.822, 167.427, 3.677

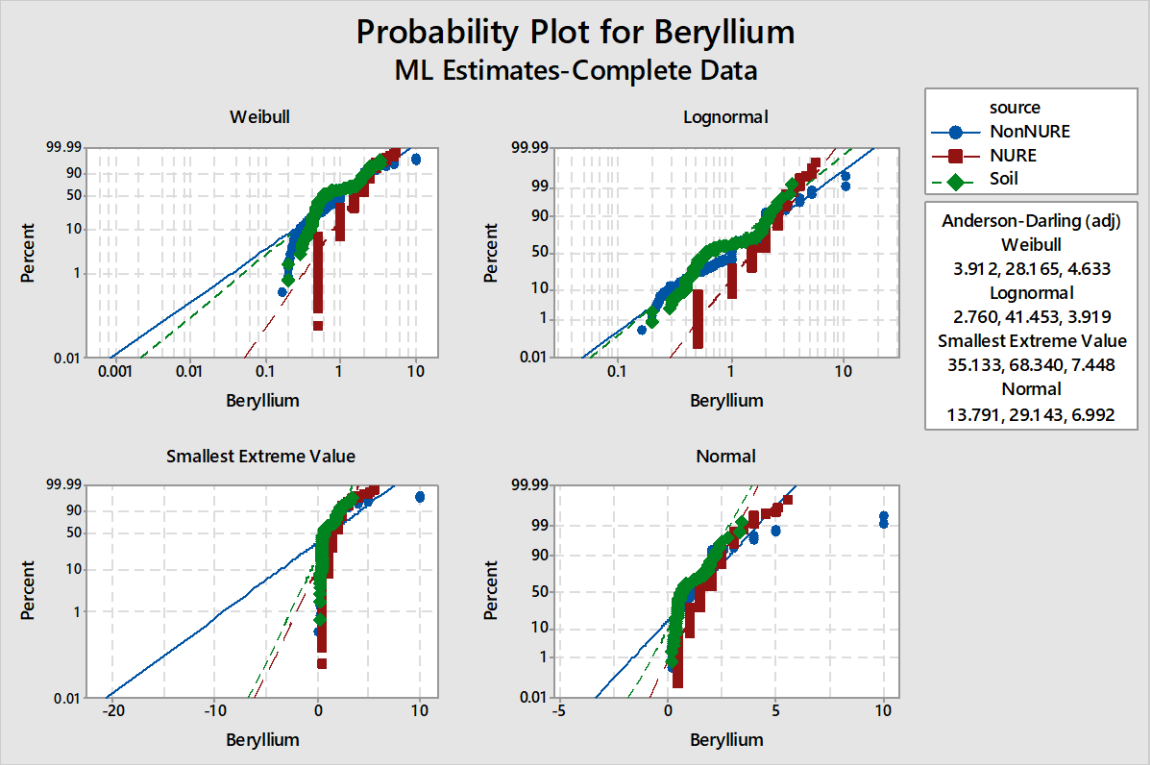

Probability Plot for Aluminum
ML Estimates-Complete Data
3-Parameter Weibull
3-Parameter Lognormal
2-Parameter Exponential
3-Parameter Loglogistic
Percent
Aluminum - Threshold
source
NonNURE
NURE
Soil
Anderson-Darling (adj)
3-Parameter Weibull
8.459, 105.273, 5.257
3-Parameter Lognormal
8.005, 114.287, 4.185
2-Parameter Exponential
7.773, 1296.473, 6.334
3-Parameter Loglogistic
7.249, 22.232, 3.947

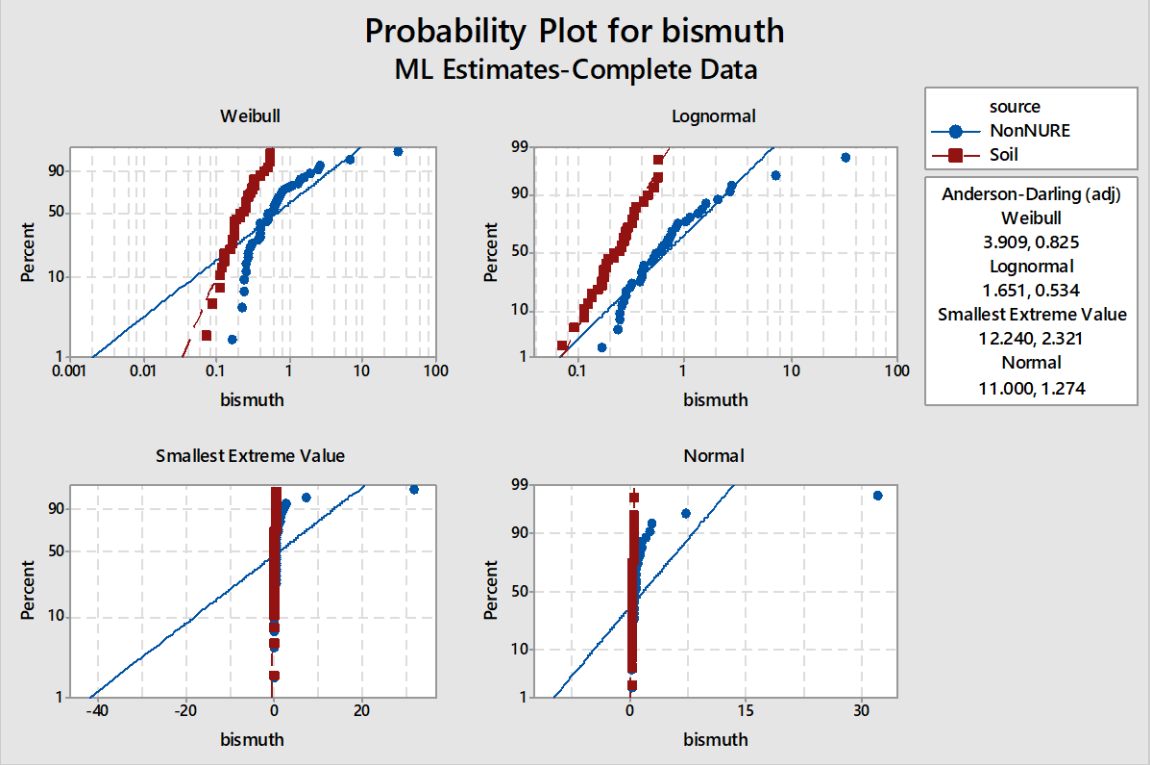

Probability Plot for Aluminum
ML Estimates-Complete Data
Smallest Extreme Value
Normal
Logistic
Percent
Aluminum
source
NonNURE
NURE
Soil
Anderson-Darling (adj)
Smallest Extreme Value
13.352, 146.005, 8.987
Normal
13.751, 110.927, 9.070
Logistic
12.806, 21.094, 8.765

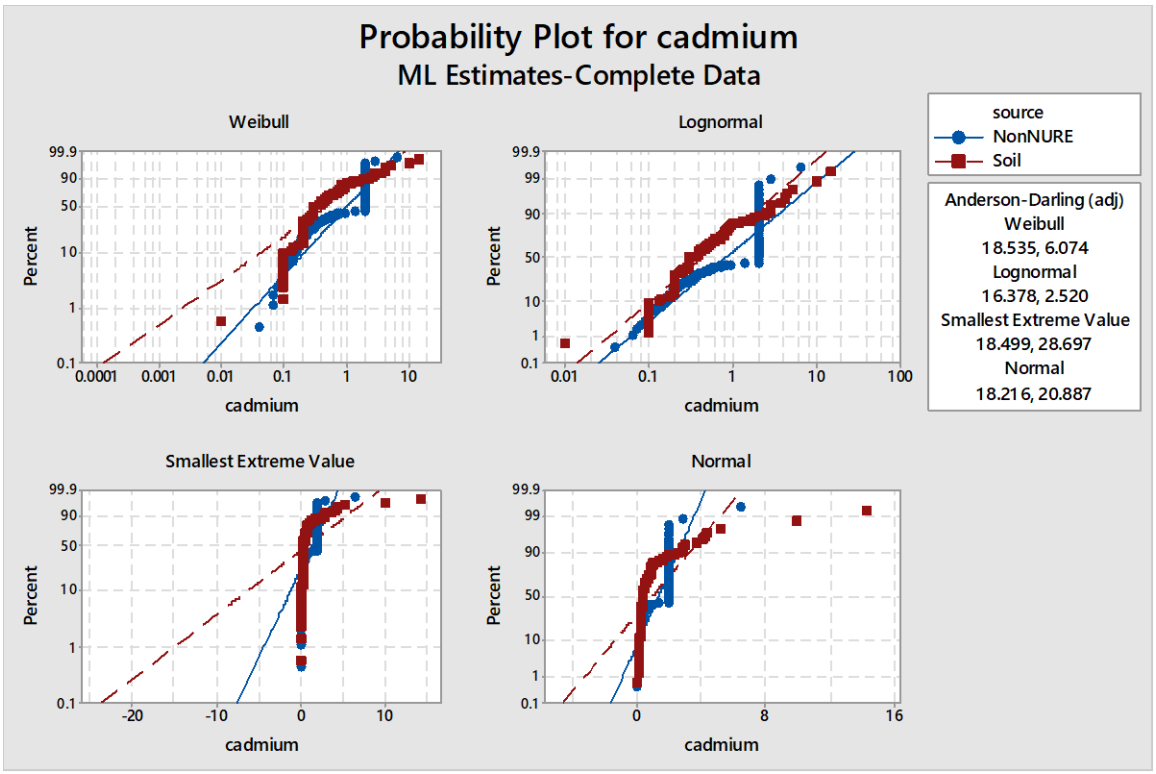

Probability Plot for antimony
ML Estimates-Complete Data
Weibull
Lognormal
Smallest Extreme Value
Normal
Percent
antimony
source
NonNURE
Soil
Anderson-Darling (adj)
Weibull
1.945, 3.078
Lognormal
1.593, 3.156
Smallest Extreme Value
3.817, 10.480
Normal
3.913, 6.232

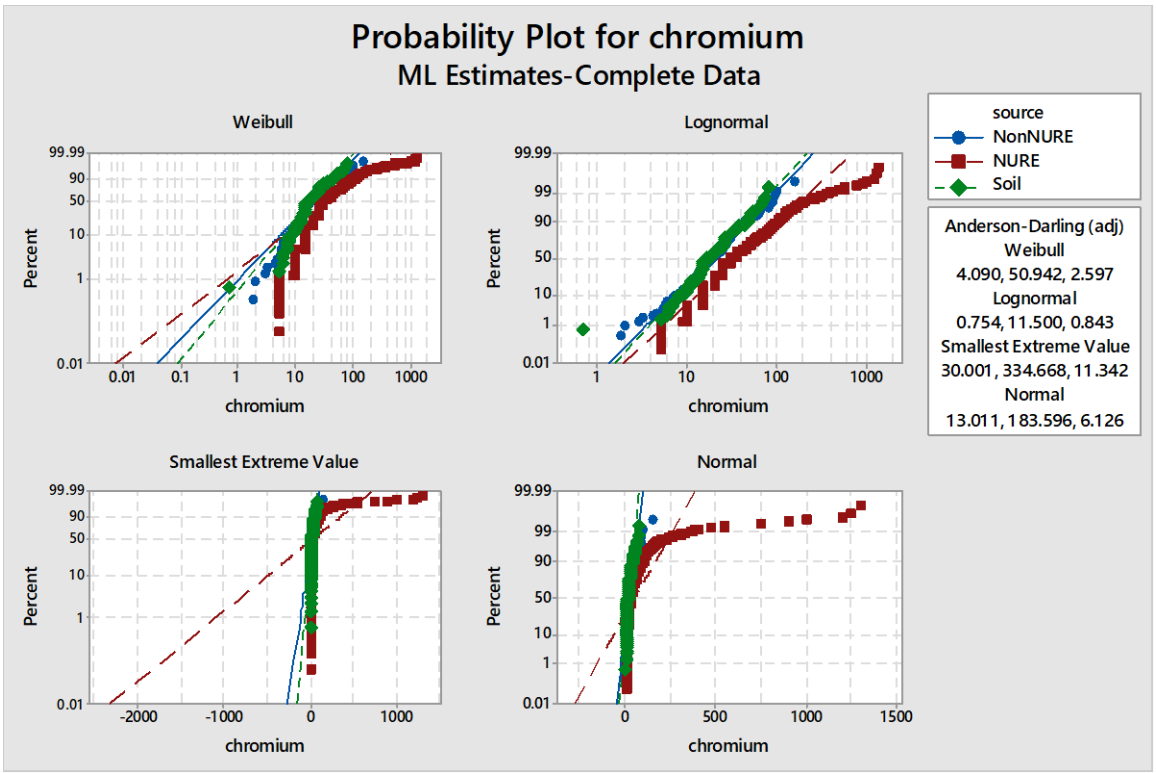

Probability Plot for aresenic
ML Estimates-Complete Data
Weibull
Lognormal
Smallest Extreme Value
Normal
Percent
aresenic
source
NonNURE
NURE
Soil
Anderson-Darling (adj)
Weibull
5.098, 34.559, 0.719
Lognormal
0.871, 32.546, 0.534
Smallest Extreme Value
37.741, 115.664, 6.757
Normal
21.671, 70.273, 2.367

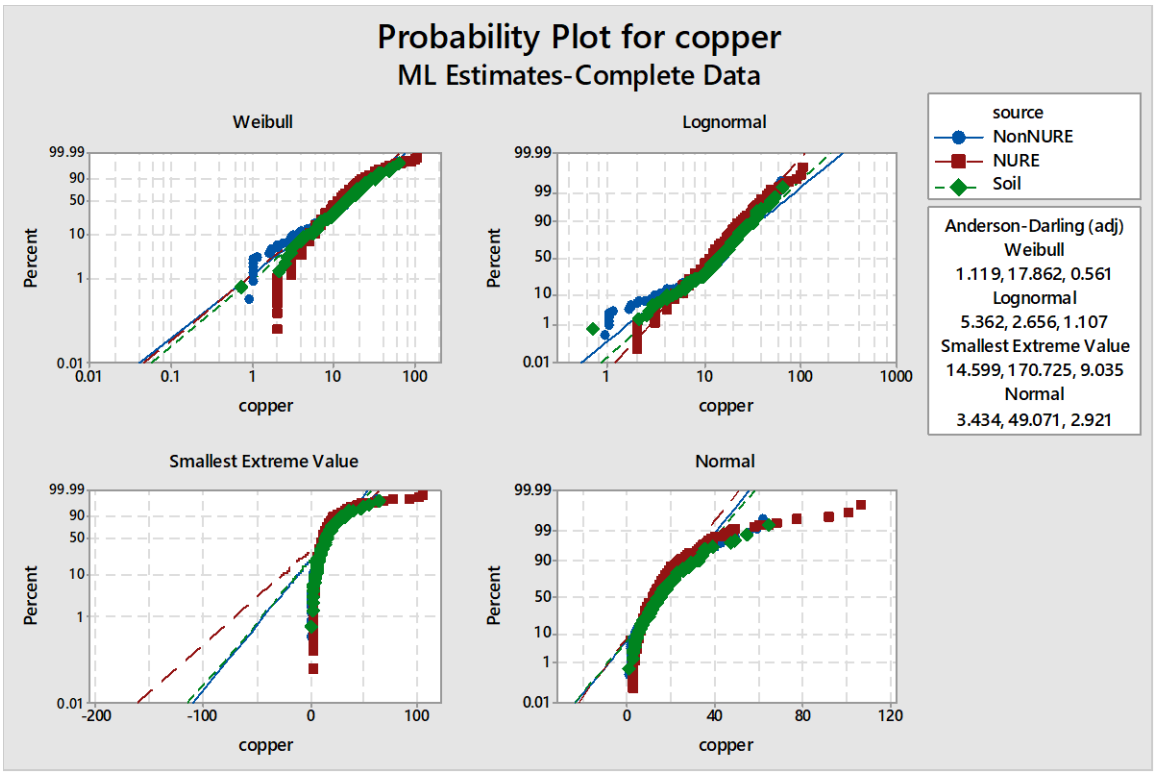

Probability Plot for barium
ML Estimates-Complete Data
Weibull
Lognormal
Smallest Extreme Value
Normal
Percent
barium
source
NonNURE
Soil
Anderson-Darling (adj)
Weibull
5.987, 2.359
Lognormal
5.100, 2.044
Smallest Extreme Value
9.976, 4.096
Normal
10.260, 4.034

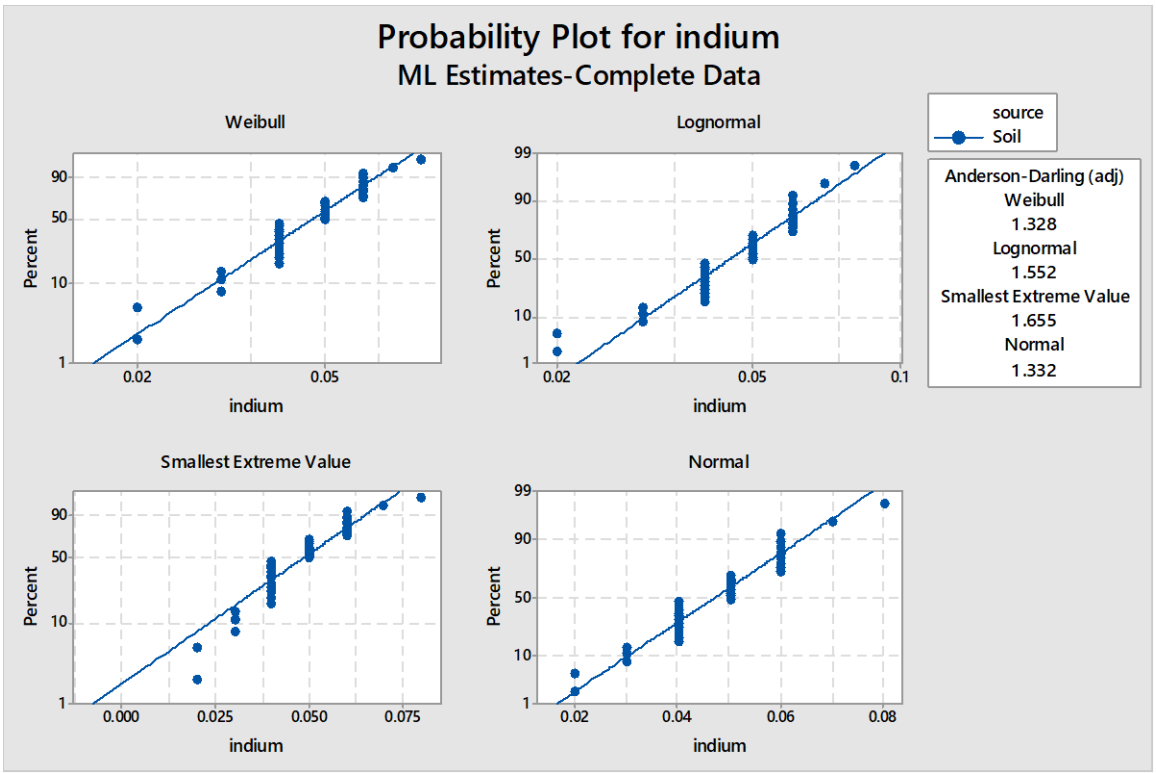

Probability Plot for Beryllium
ML Estimates-Complete Data
Weibull
Lognormal
Smallest Extreme Value
Normal
Percent
Beryllium
source
NonNURE
NURE
Soil
Anderson-Darling (adj)
Weibull
3.912, 28.165, 4.633
Lognormal
2.760, 41.453, 3.919
Smallest Extreme Value
35.133, 68.340, 7.448
Normal
13.791, 29.143, 6.992

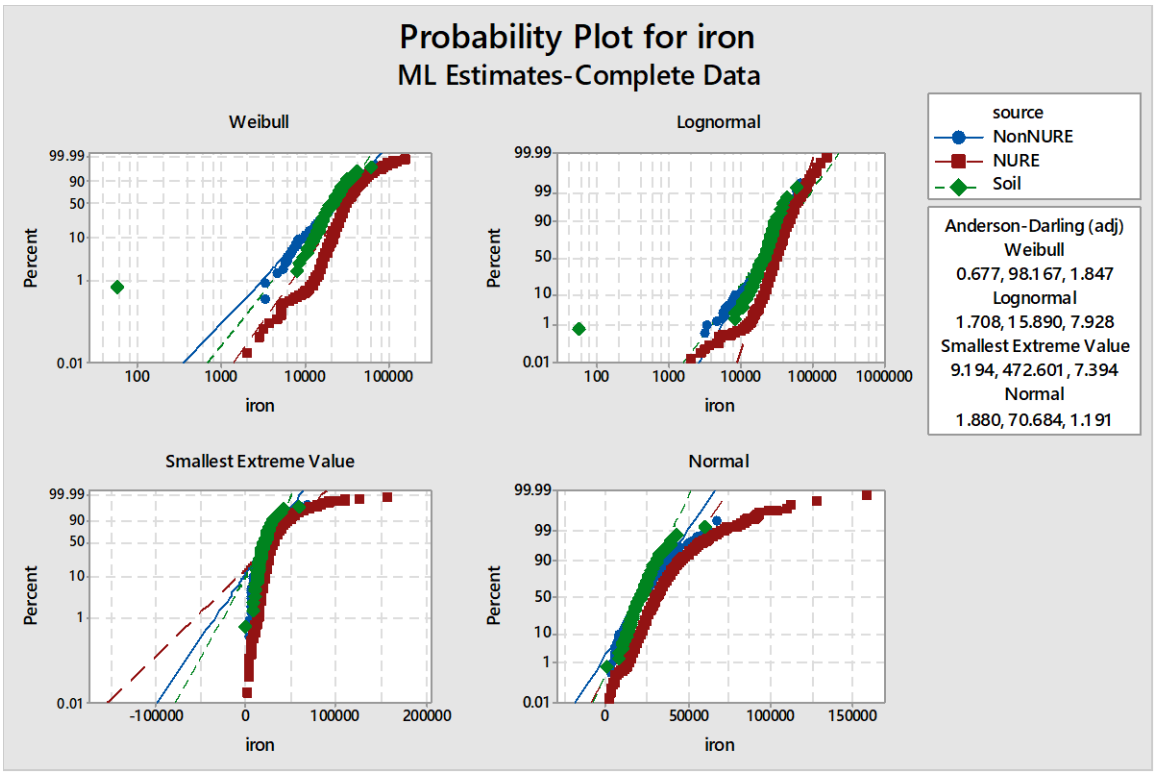

Probability Plot for bismuth
ML Estimates-Complete Data
Weibull
Lognormal
Smallest Extreme Value
Normal
Percent
bismuth
source
NonNURE
Soil
Anderson-Darling (adj)
Weibull
3.909, 0.825
Lognormal
1.651, 0.534
Smallest Extreme Value
12.240, 2.321
Normal
11.000, 1.274

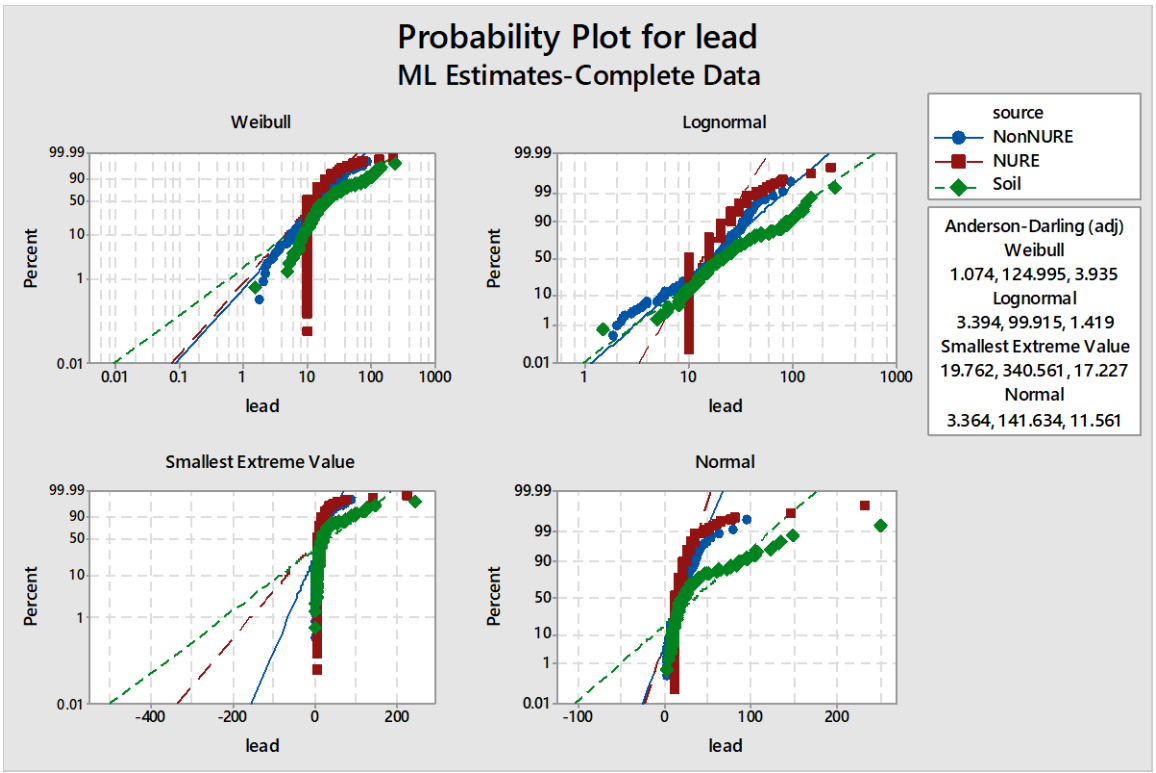

Probability Plot for cadmium
ML Estimates-Complete Data
Weibull
Lognormal
Smallest Extreme Value
Normal
Percent
cadmium
source
NonNURE
Soil
Anderson-Darling (adj)
Weibull
18.535, 6.074
Lognormal
16.378, 2.520
Smallest Extreme Value
18.499, 28.697
Normal
18.216, 20.887

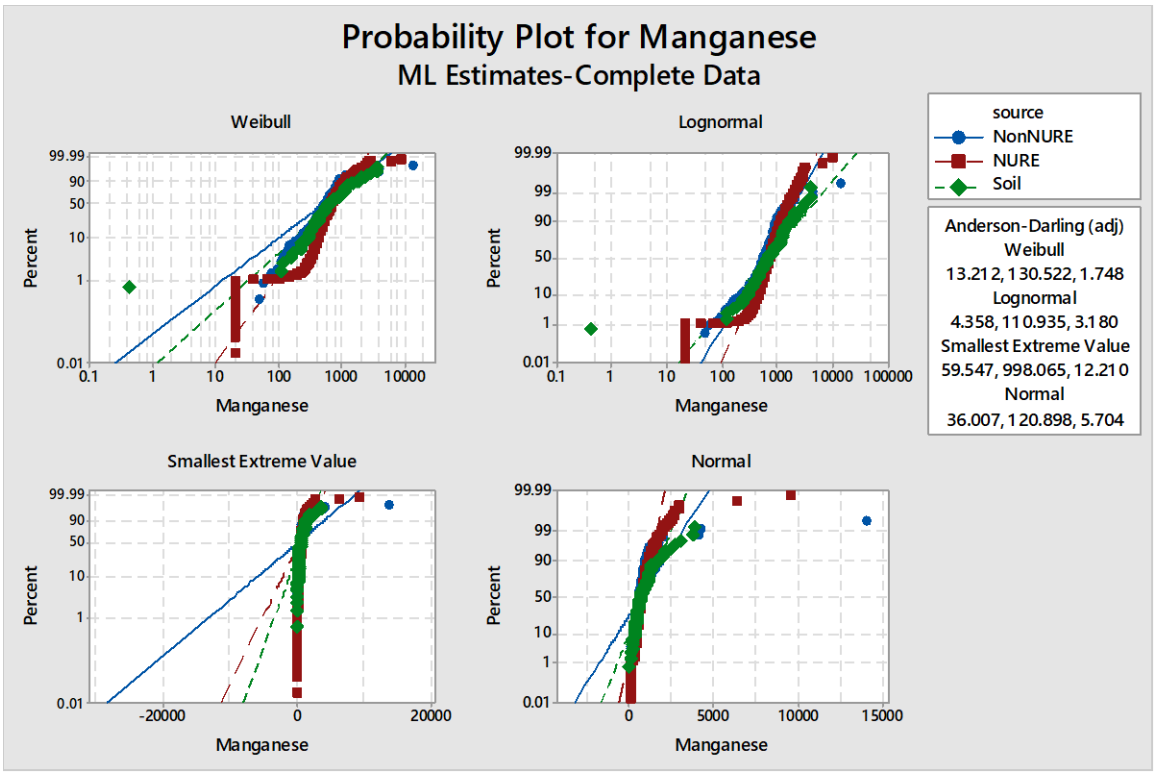

Probability Plot for chromium
ML Estimates-Complete Data
Weibull
Lognormal
Smallest Extreme Value
Normal
Percent
chromium
source
NonNURE
NURE
Soil
Anderson-Darling (adj)
Weibull
4.090, 50.942, 2.597
Lognormal
0.754, 11.500, 0.843
Smallest Extreme Value
30.001, 334.668, 11.342
Normal
13.011, 183.596, 6.126

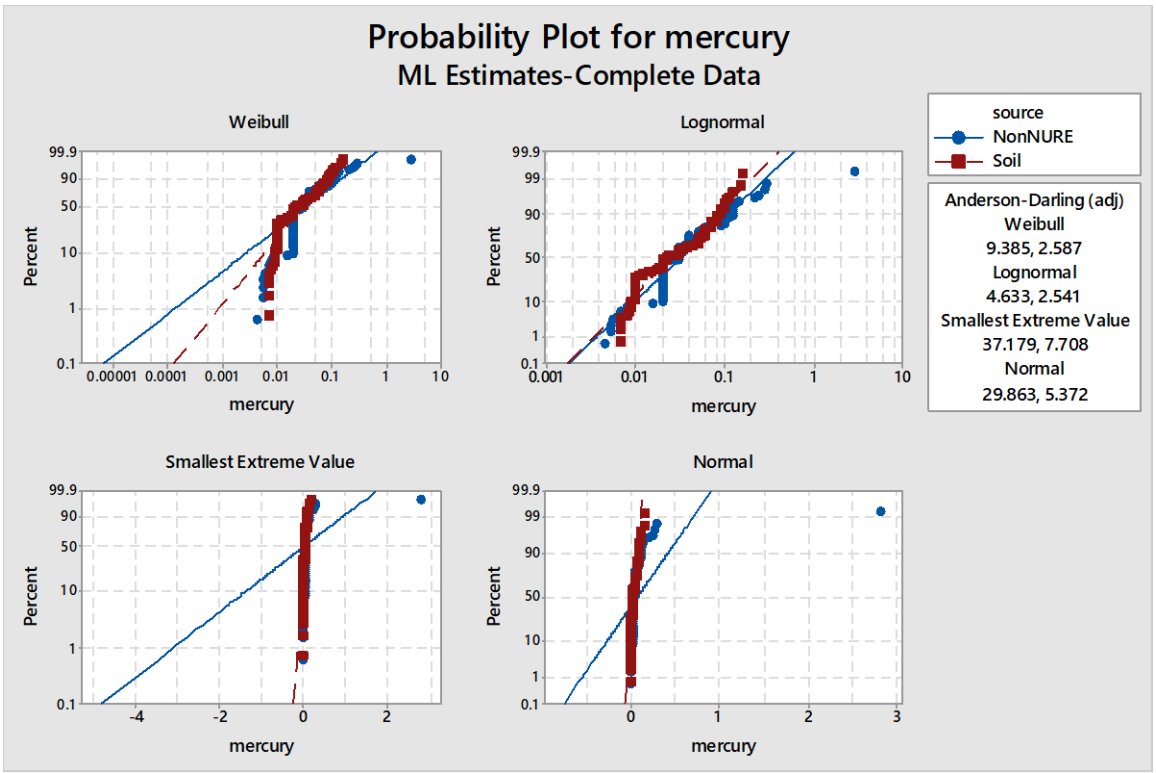

Probability Plot for copper
ML Estimates-Complete Data
Weibull
Lognormal
Smallest Extreme Value
Normal
Percent
copper
source
NonNURE
NURE
Soil
Anderson-Darling (adj)
Weibull
1.119, 17.862, 0.561
Lognormal
5.362, 2.656, 1.107
Smallest Extreme Value
14.599, 170.725, 9.035
Normal
3.434, 49.071, 2.921

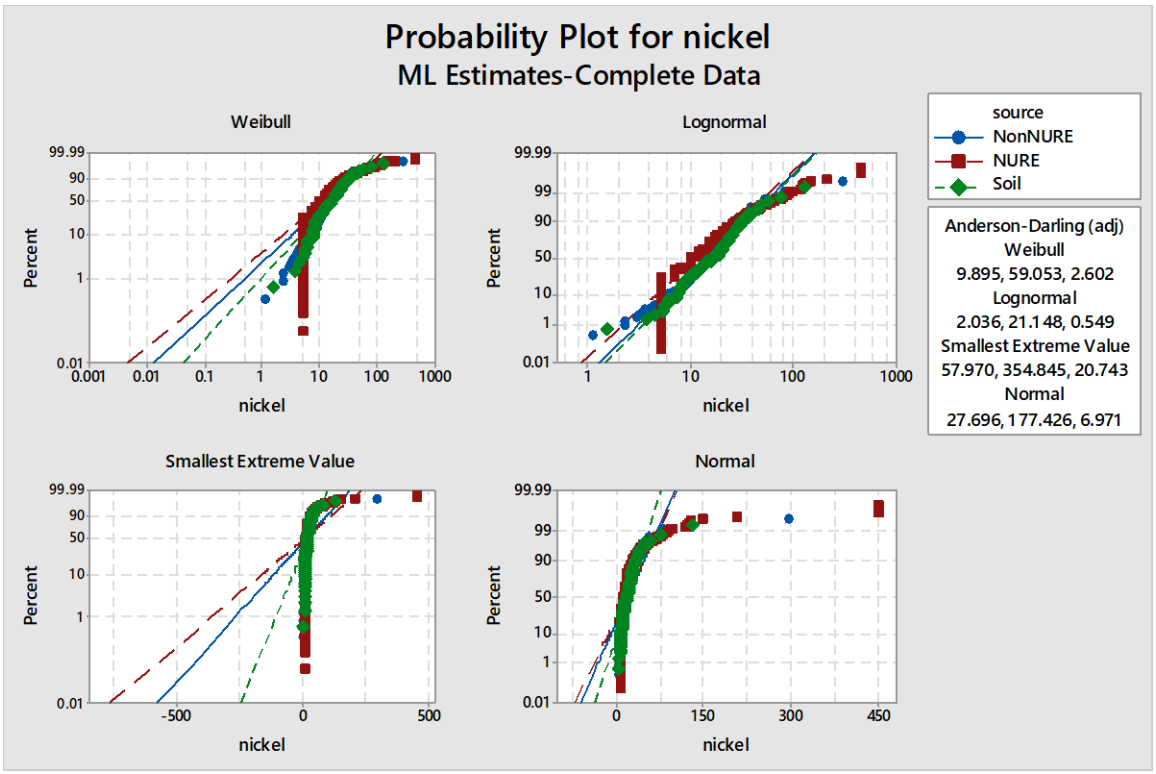

Probability Plot for indium
ML Estimates-Complete Data
Weibull
Lognormal
Smallest Extreme Value
Normal
Percent
indium
source
Soil
Anderson-Darling (adj)
Weibull
1.328
Lognormal
1.552
Smallest Extreme Value
1.655
Normal
1.332

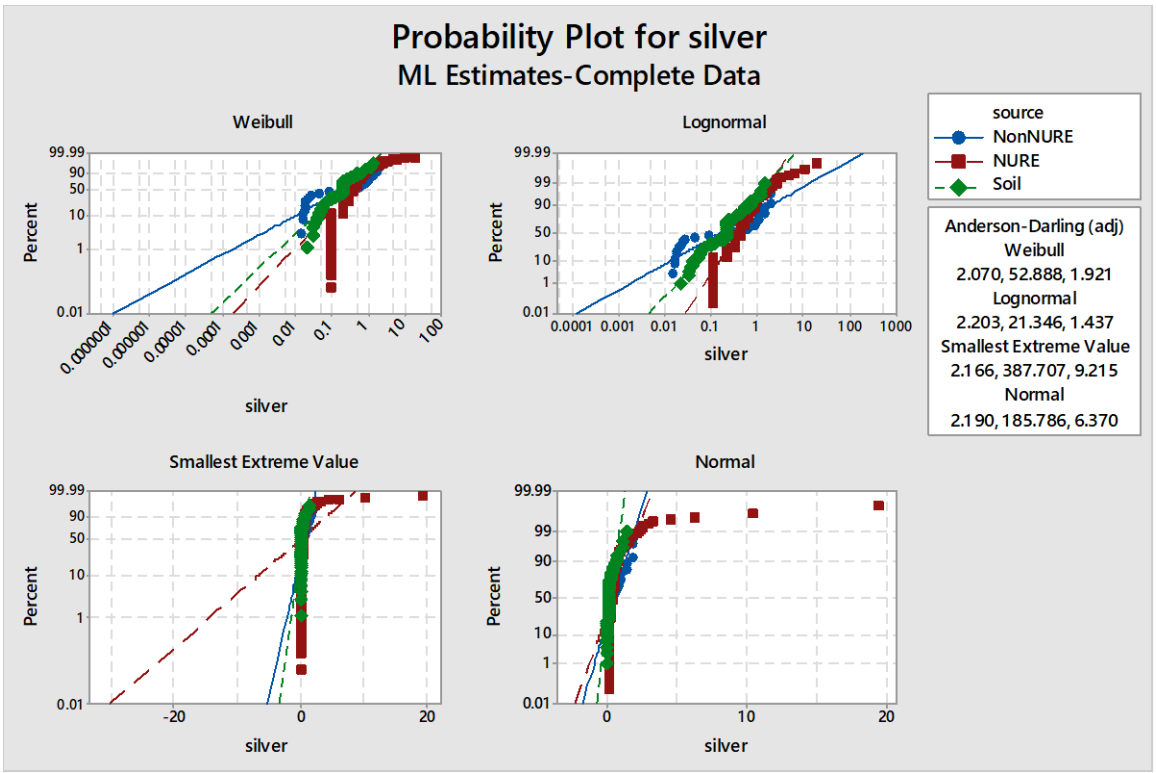

Probability Plot for iron
ML Estimates-Complete Data
Weibull
Lognormal
Smallest Extreme Value
Normal
Percent
iron
source
NonNURE
NURE
Soil
Anderson-Darling (adj)
Weibull
0.677, 98.167, 1.847
Lognormal
1.708, 15.890, 7.928
Smallest Extreme Value
9.194, 472.601, 7.394
Normal
1.880, 70.684, 1.191

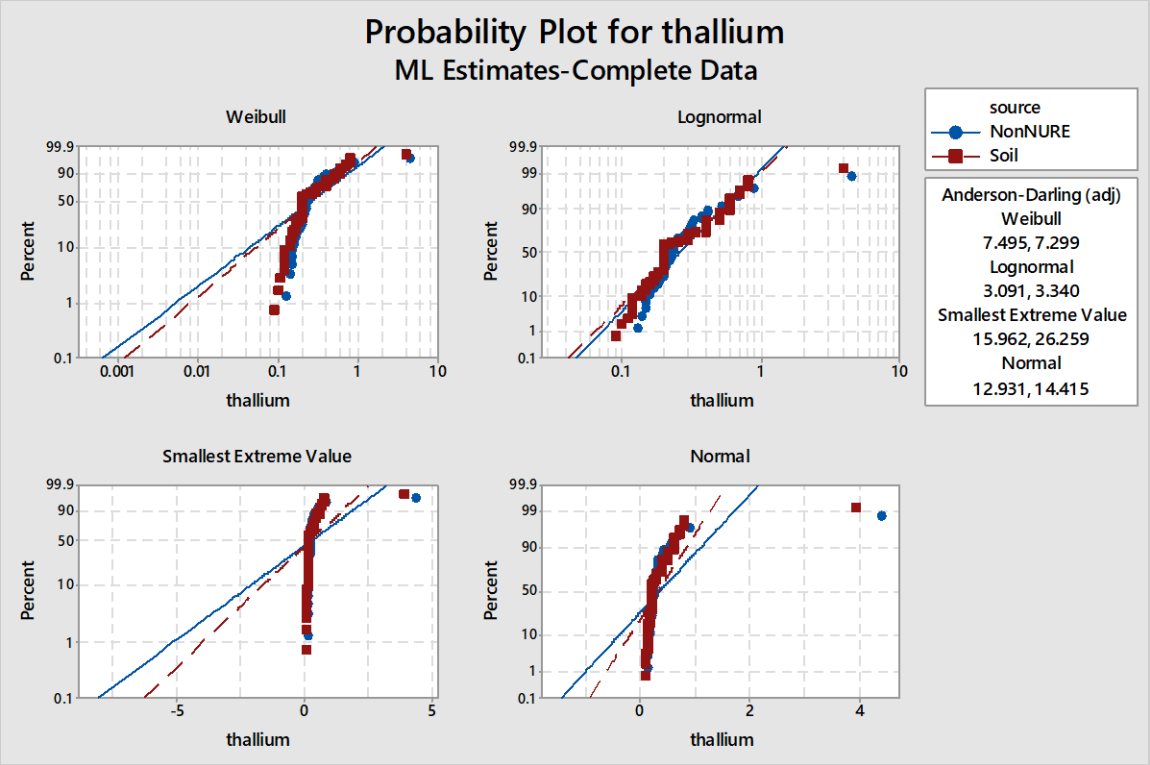

Probability Plot for lead
ML Estimates-Complete Data
Weibull
Lognormal
Smallest Extreme Value
Normal
Percent
lead
source
NonNURE
NURE
Soil
Anderson-Darling (adj)
Weibull
1.074, 124.995, 3.935
Lognormal
3.394, 99.915, 1.419
Smallest Extreme Value
19.762, 340.561, 17.227
Normal
3.364, 141.634, 11.561

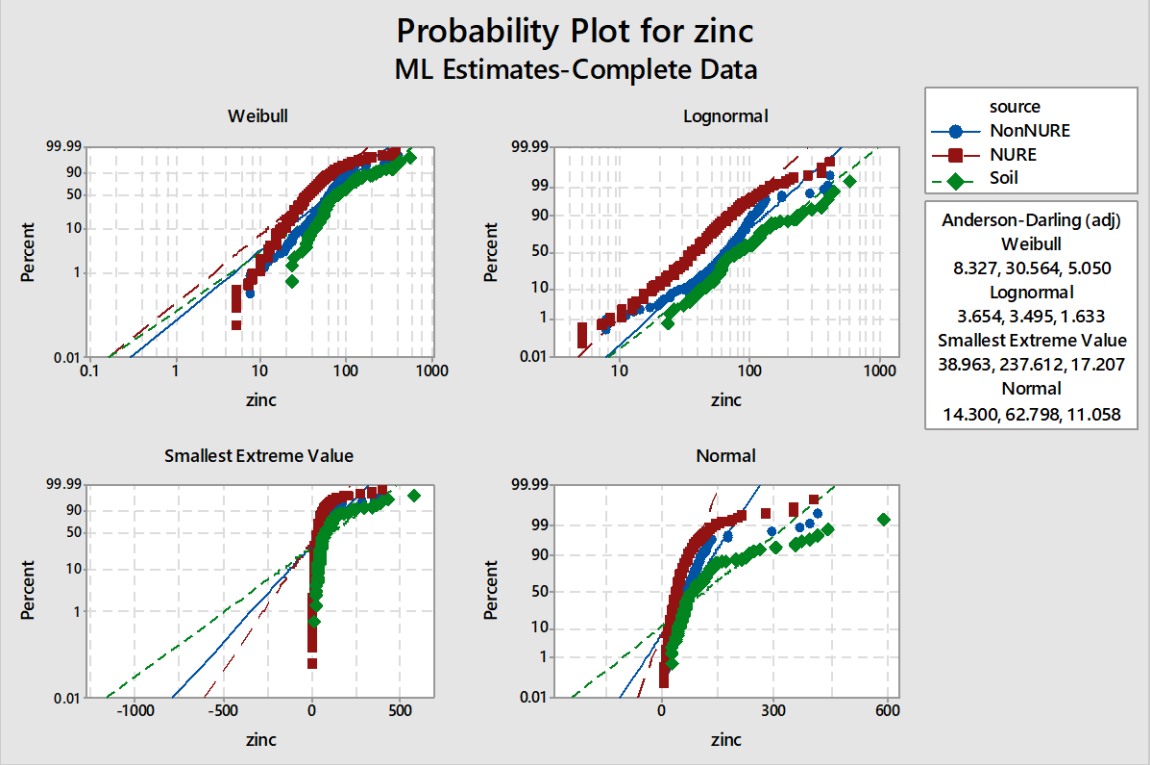

Probability Plot for Manganese
ML Estimates-Complete Data
Weibull
Lognormal
Smallest Extreme Value
Normal
Percent
Manganese
source
NonNURE
NURE
Soil
Anderson-Darling (adj)
Weibull
13.212, 130.522, 1.748
Lognormal
4.358, 110.935, 3.180
Smallest Extreme Value
59.547, 998.065, 12.210
Normal
36.007, 120.898, 5.704


Probability Plot for mercury
ML Estimates-Complete Data
Weibull
Lognormal
Smallest Extreme Value
Normal
Percent
mercury
source
NonNURE
Soil
Anderson-Darling (adj)
Weibull
9.385, 2.587
Lognormal
4.633, 2.541
Smallest Extreme Value
37.179, 7.708
Normal
29.863, 5.372


Probability Plot for nickel
ML Estimates-Complete Data
Weibull
Lognormal
Smallest Extreme Value
Normal
Percent
nickel
source
NonNURE
NURE
Soil
Anderson-Darling (adj)
Weibull
9.895, 59.053, 2.602
Lognormal
2.036, 21.148, 0.549
Smallest Extreme Value
57.970, 354.845, 20.743
Normal
27.696, 177.426, 6.971


Probability Plot for silver
ML Estimates-Complete Data
Weibull
Lognormal
Smallest Extreme Value
Normal
Percent
silver
source
NonNURE
NURE
Soil
Anderson-Darling (adj)
Weibull
2.070, 52.888, 1.921
Lognormal
2.203, 21.346, 1.437
Smallest Extreme Value
2.166, 387.707, 9.215
Normal
2.190, 185.786, 6.370


Probability Plot for thallium
ML Estimates-Complete Data
Weibull
Lognormal
Smallest Extreme Value
Normal
Percent
thallium
source
NonNURE
Soil
Anderson-Darling (adj)
Weibull
7.495, 7.299
Lognormal
3.091, 3.340
Smallest Extreme Value
15.962, 26.259
Normal
12.931, 14.415


Probability Plot for zinc
ML Estimates-Complete Data
Weibull
Lognormal
Smallest Extreme Value
Normal
Percent
zinc
source
NonNURE
NURE
Soil
Anderson-Darling (adj)
Weibull
8.327, 30.564, 5.050
Lognormal
3.654, 3.495, 1.633
Smallest Extreme Value
38.963, 237.612, 17.207
Normal
14.300, 62.798, 11.058

Results from Rank based analysis for WRIA and Source effect:

The SAS System

The GLM Procedure
metal=Aluminum

Class Level Information

Class	Levels	Values
source	3	NURE NonNURE Soil
WRIA	11	49 51 52 53 54 55 58 59 60 61 62

Number of Observations Read	4347
Number of Observations Used	4347

The GLM Procedure

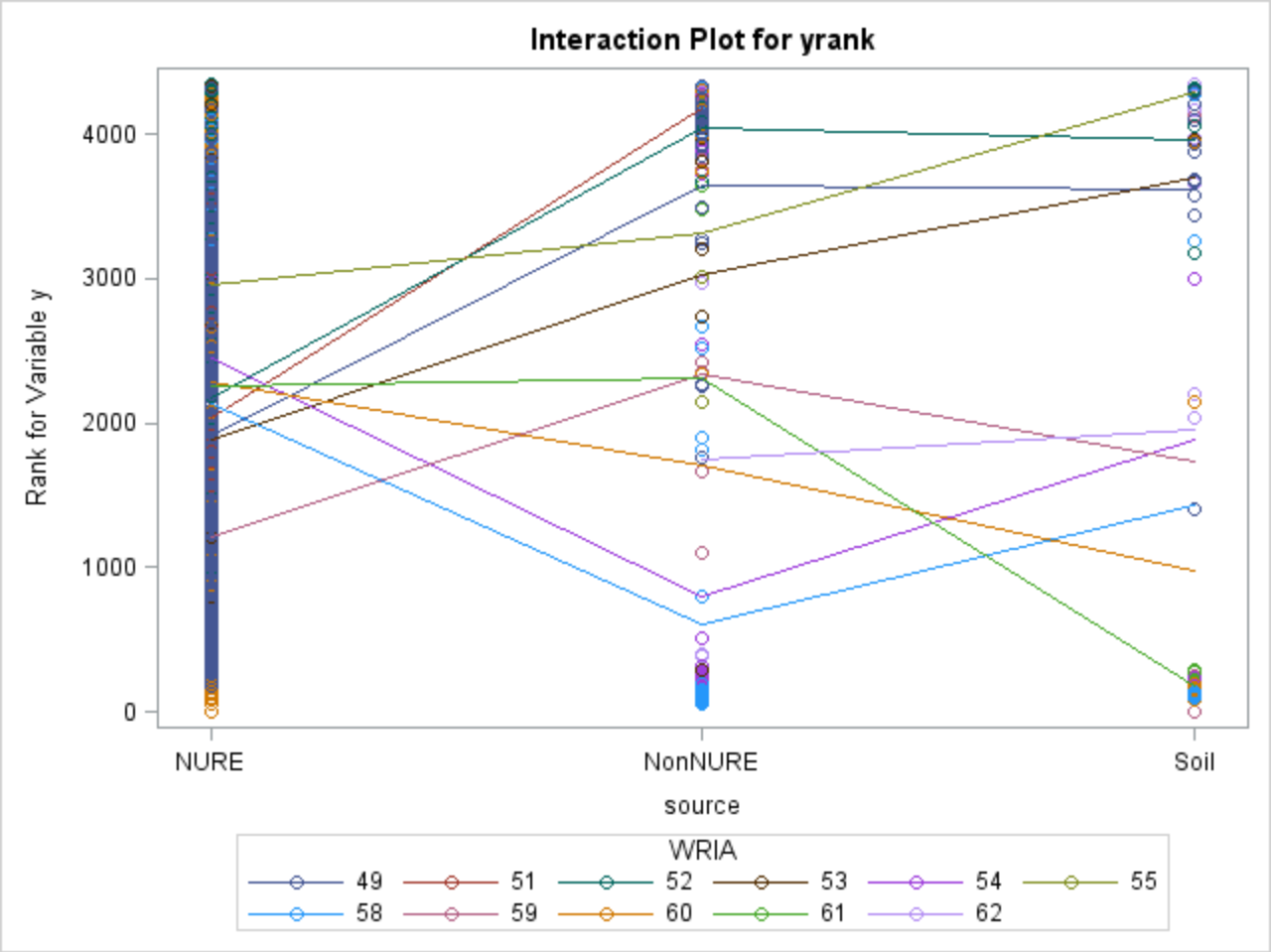
Dependent Variable: yrank Rank for Variable y
metal=Aluminum

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	30	874145094	29138170	21.07	<.0001
Error	4316	5969410783	1383089		
Corrected Total	4346	6843555878			

R-Square	Coeff Var	Root MSE	yrank Mean
0.127733	54.19770	1176.048	2169.922

Source	DF	Type I SS	Mean Square	F Value	Pr > F
WRIA	10	298821908.9	29882190.9	21.61	<.0001
source	2	95370115.5	47685057.7	34.48	<.0001
source*WRIA	18	479953069.9	26664059.4	19.28	<.0001

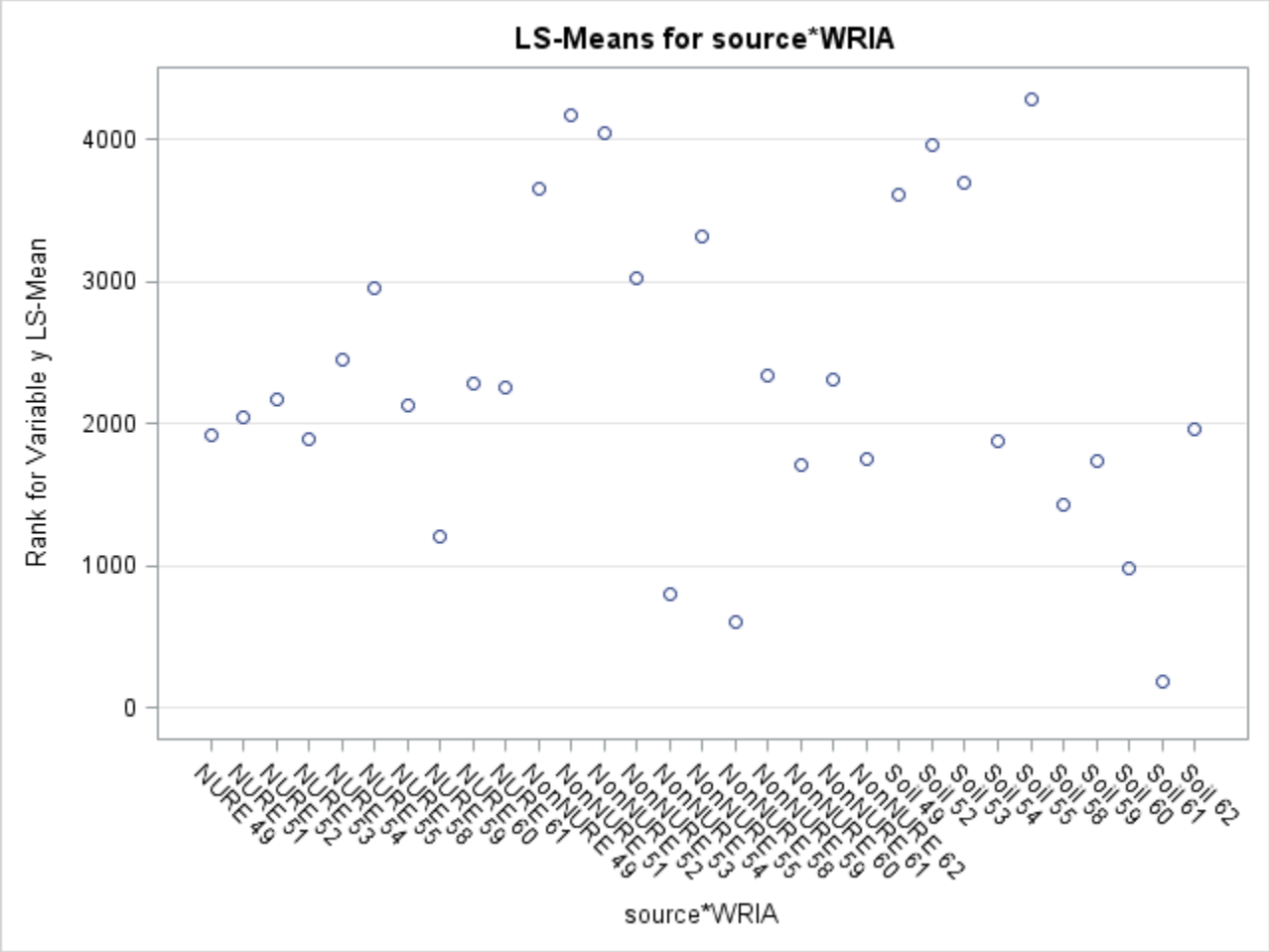
Source	DF	Type III SS	Mean Square	F Value	Pr > F
WRIA	10	201975995.8	20197599.6	14.60	<.0001
source	2	17024578.4	8512289.2	6.15	0.0021
source*WRIA	18	479953069.9	26664059.4	19.28	<.0001


Interaction Plot for yrank
Rank for Variable y
4000
3000
2000
1000
0
NURE
NonNURE
Soil
source
WRIA
49
51
52
53
54
55
58
59
60
61
62

The GLM Procedure
Least Squares Means
metal=Aluminum

source	WRIA	yrank	LSMEAN
NURE	**49**		1920.14837
NURE	**51**		2042.00000
NURE	**52**		2176.14621
NURE	**53**		1886.57676
NURE	**54**		2451.29494
NURE	**55**		2957.88166
NURE	**58**		2130.27365
NURE	**59**		1207.22619
NURE	**60**		2282.83721
NURE	**61**		2260.54867
NonNURE	**49**		3651.73684
NonNURE	**51**		4178.00000
NonNURE	**52**		4040.00000
NonNURE	**53**		3028.66667
NonNURE	**54**		795.75510
NonNURE	**55**		3320.75000
NonNURE	**58**		607.98182
NonNURE	**59**		2342.75000
NonNURE	**60**		1706.50000
NonNURE	**61**		2316.60000
NonNURE	**62**		1753.63158
Soil	**49**		3618.60000
Soil	**52**		3965.75000
Soil	**53**		3700.00000
Soil	**54**		1879.25000

source	WRIA	yrank LSMEAN
Soil	**55**	4284.50000
Soil	**58**	1431.18182
Soil	**59**	1737.20000
Soil	**60**	982.14286
Soil	**61**	178.32000
Soil	**62**	1960.63636



T Comparison Lines for Least Squares Means of source*WRIA

LS-means with the same letter are not significantly different.

	yrank LSMEAN	source	WRIA	LSMEAN Number
A	4284.50	**Soil**	**55**	26

T Comparison Lines for Least Squares Means of source*WRIA

LS-means with the same letter are not significantly different.

					yrank	LSMEAN	source	WRIA	LSMEAN Number
			A						
	B		A			4178.00	**NonNURE**	**51**	12
	B		A						
	B		A			4040.00	**NonNURE**	**52**	13
	B		A						
	B		A			3965.75	**Soil**	**52**	23
	B		A						
	B		A	C		3700.00	**Soil**	**53**	24
	B		A	C					
	B		A	C		3651.74	**NonNURE**	**49**	11
	B		A	C					
	B		A	C		3618.60	**Soil**	**49**	22
	B		A	C					
	B		A	C		3320.75	**NonNURE**	**55**	16
	B		A	C					
	B	D	A	C		3028.67	**NonNURE**	**53**	14
	B	D	A	C					
	B	D	A	C		2957.88	**NURE**	**55**	6
	B	D		C					
	B	D		C		2451.29	**NURE**	**54**	5
	B	D		C					
	B	D	E	C		2342.75	**NonNURE**	**59**	18
	B	D	E	C					
F	B	D	E	C		2316.60	**NonNURE**	**61**	20
F		D	E	C					
F		D	E	C		2282.84	**NURE**	**60**	9

T Comparison Lines for Least Squares Means of source*WRIA

LS-means with the same letter are not significantly different.

					yrank	LSMEAN	source	WRIA	LSMEAN Number
F		D	E	C					
F		D	E	C		2260.55	**NURE**	**61**	10
F		D	E	C					
F		D	E	C		2176.15	**NURE**	**52**	3
F		D	E	C					
F		D	E	C		2130.27	**NURE**	**58**	7
F		D	E	C					
F		D	E	C		2042.00	**NURE**	**51**	2
F		D	E	C					
F		D	E	C		1960.64	**Soil**	**62**	31
F		D	E	C					
F		D	E	C		1920.15	**NURE**	**49**	1
F		D	E	C					
F		D	E	C		1886.58	**NURE**	**53**	4
F		D	E	C					
F	G	D	E	C		1879.25	**Soil**	**54**	25
F	G	D	E						
F	G	D	E			1753.63	**NonNURE**	**62**	21
F	G	D	E						
F	G	D	E			1737.20	**Soil**	**59**	28
F	G		E						
F	G		E			1706.50	**NonNURE**	**60**	19
F	G		E						
F	G		E			1431.18	**Soil**	**58**	27
F	G								
F	G					1207.23	**NURE**	**59**	8

T Comparison Lines for Least Squares Means of source*WRIA

LS-means with the same letter are not significantly different.

			yrank LSMEAN	source	WRIA	LSMEAN Number
F	G					
F	G	H	982.14	**Soil**	**60**	29
	G	H				
	G	H	795.76	**NonNURE**	**54**	15
		H				
		H	607.98	**NonNURE**	**58**	17
		H				
		H	178.32	**Soil**	**61**	30

The LINES display does not reflect all significant comparisons. The following additional pairs are significantly different: (12,5) (12,18) (13,6) (13,5) (13,18) (13,20) (23,5) (23,18) (23,20) (24,1) (24,4) (11,6) (11,5) (11,18) (11,20) (11,9) (11,10) (11,3) (11,7) (11,2) (11,31) (11,1) (11,4) (11,25) (22,5) (22,18) (22,20) (22,9) (22,10) (22,3) (22,7) (22,2) (22,31) (22,1) (22,4) (22,25) (16,7) (16,2) (16,31) (16,1) (16,4) (14,1) (14,4) (14,21) (6,5) (6,9) (6,10) (6,3) (6,7) (6,2) (6,31) (6,1) (6,4) (6,21) (6,28) (5,9) (5,3) (5,7) (5,2) (5,1) (5,4) (5,21) (20,8) (9,7) (9,1) (9,4) (9,27) (9,8) (9,29) (10,1) (10,4) (10,27) (10,8) (10,29) (3,1) (3,4) (3,27) (3,8) (3,29) (7,1) (7,4) (7,8) (7,29) (2,8) (2,29) (31,8) (1,8) (1,29) (4,8) (4,29) (21,15) (19,15) (15,30)

The GLM Procedure
metal=Antimony

Class Level Information

Class	Levels	Values
source	2	NonNURE Soil
WRIA	10	49 52 53 54 55 58 59 60 61 62

Number of Observations Read	111
Number of Observations Used	111

The GLM Procedure

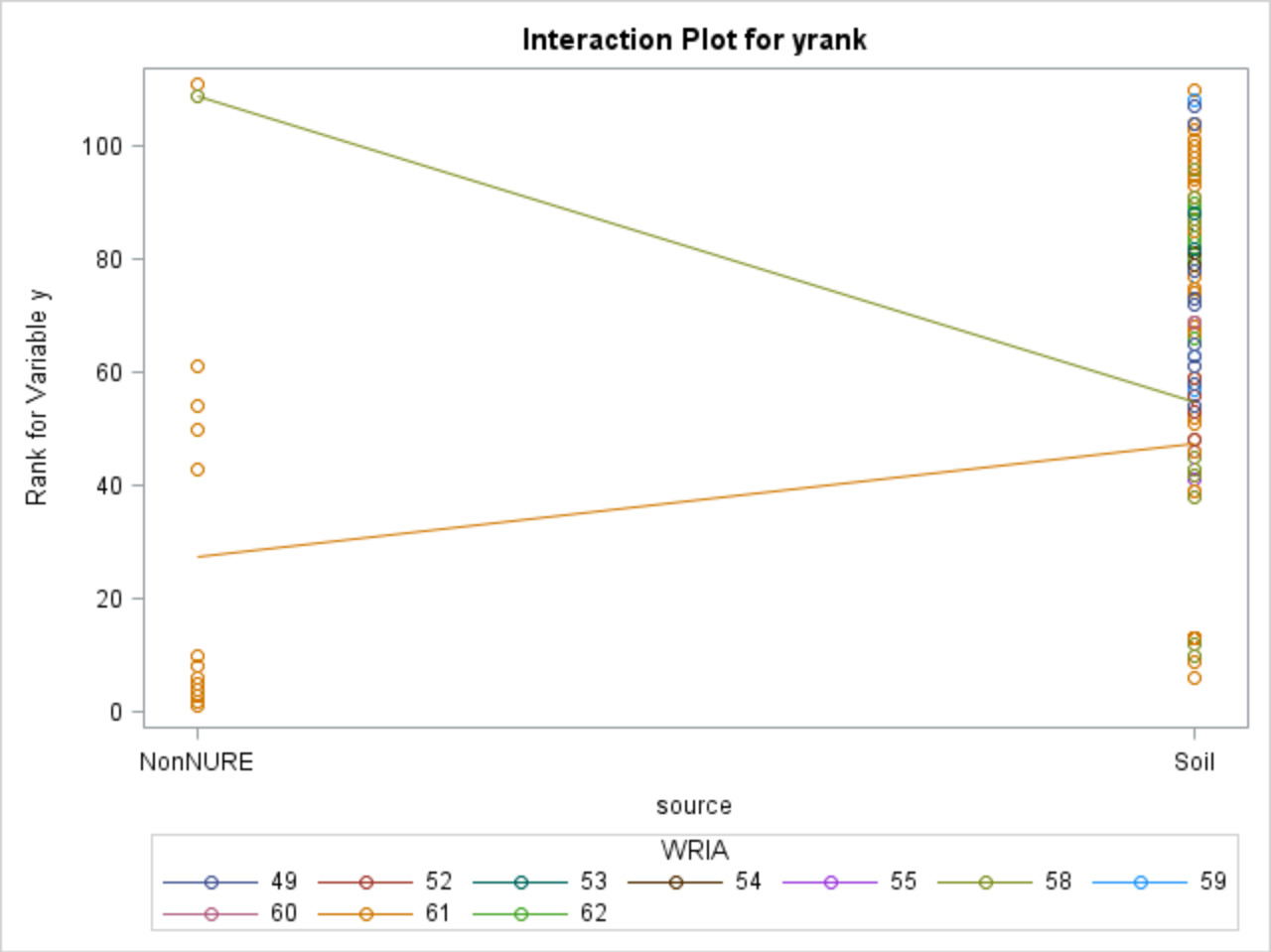
Dependent Variable: yrank Rank for Variable y
metal=Antimony

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	11	28400.6463	2581.8769	2.43	0.0101
Error	99	105217.5879	1062.8039		
Corrected Total	110	133618.2342			

R-Square	Coeff Var	Root MSE	yrank Mean
0.212551	61.36467	32.60067	53.12613

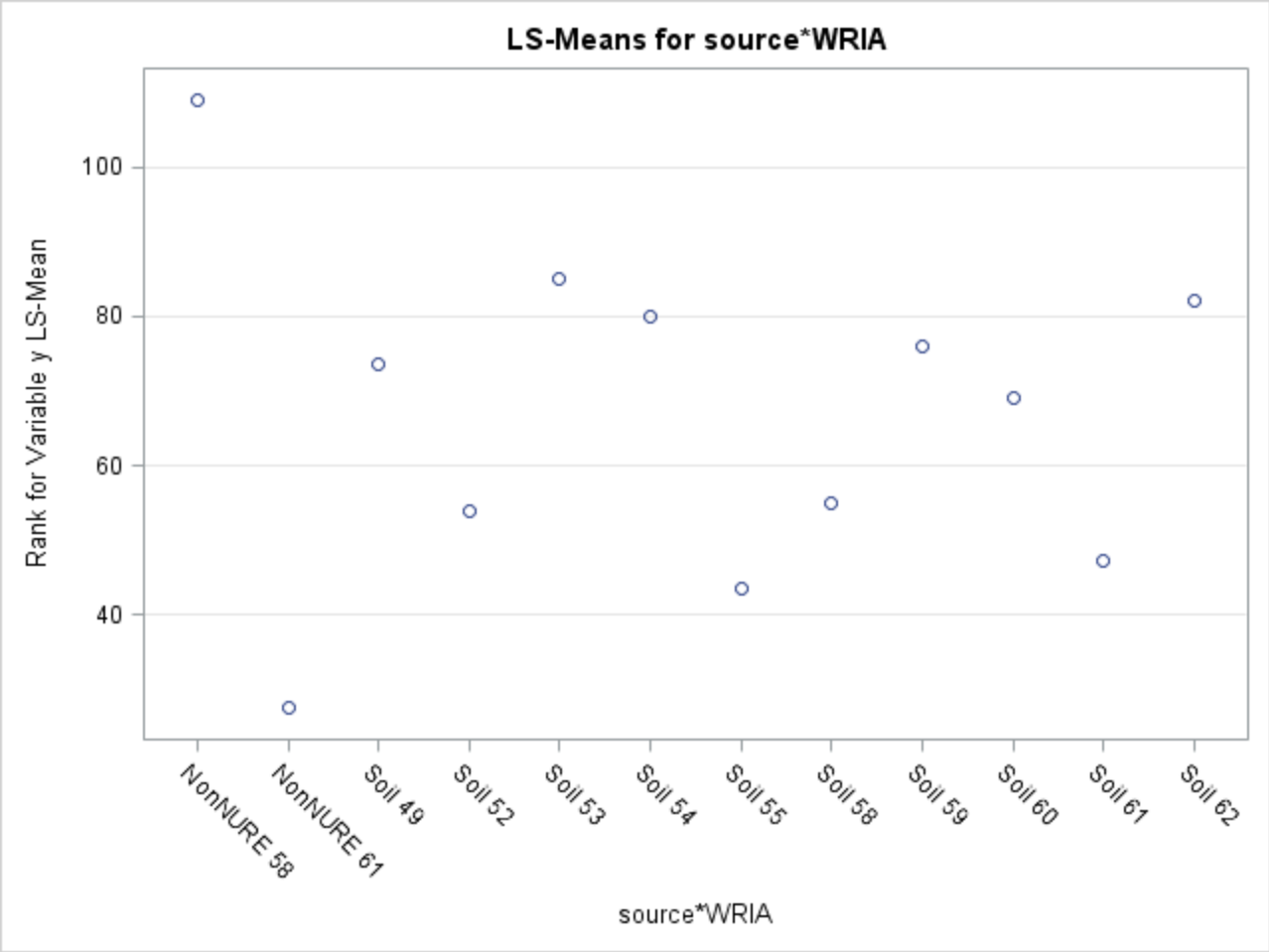
Source	DF	Type I SS	Mean Square	F Value	Pr > F
WRIA	9	21590.67297	2398.96366	2.26	0.0242
source	1	2244.72222	2244.72222	2.11	0.1493
source*WRIA	1	4565.25113	4565.25113	4.30	0.0408

Source	DF	Type III SS	Mean Square	F Value	Pr > F
WRIA	9	20004.91913	2222.76879	2.09	0.0372
source	1	975.84667	975.84667	0.92	0.3403
source*WRIA	1	4565.25113	4565.25113	4.30	0.0408


Interaction Plot for yrank
Rank for Variable y
100
80
60
40
20
0
NonNURE
Soil
source
WRIA
49
52
53
54
55
58
59
60
61
62

The GLM Procedure
Least Squares Means
metal=Antimony

source	WRIA	yrank	LSMEAN
NonNURE	**58**		109.000000
NonNURE	**61**		27.538462
Soil	**49**		73.500000
Soil	**52**		54.000000
Soil	**53**		85.000000
Soil	**54**		80.000000
Soil	**55**		43.500000
Soil	**58**		55.000000
Soil	**59**		76.000000
Soil	**60**		69.000000
Soil	**61**		47.392857
Soil	**62**		82.000000



T Comparison Lines for Least Squares Means of source*WRIA

LS-means with the same letter are not significantly different.

	yrank LSMEAN	source	WRIA	LSMEAN Number
A	109.0000	**NonNURE**	**58**	1
A				
A	85.0000	**Soil**	**53**	5
A				
A	82.0000	**Soil**	**62**	12
A				
A	80.0000	**Soil**	**54**	6
A				
A	76.0000	**Soil**	**59**	9

T Comparison Lines for Least Squares Means of source*WRIA

LS-means with the same letter are not significantly different.

		yrank LSMEAN	source	WRIA	LSMEAN Number
	A				
	A	73.5000	**Soil**	**49**	3
	A				
B	A	69.0000	**Soil**	**60**	10
B	A				
B	A	55.0000	**Soil**	**58**	8
B	A				
B	A	54.0000	**Soil**	**52**	4
B	A				
B	A	47.3929	**Soil**	**61**	11
B	A				
B	A	43.5000	**Soil**	**55**	7
B					
B		27.5385	**NonNURE**	**61**	2

The LINES display does not reflect all significant comparisons. The following additional pairs are significantly different: (12,11) (3,11) (8,2)

The GLM Procedure
metal=Arsenic

Class Level Information

Class	Levels	Values
source	3	NURE NonNURE Soil
WRIA	11	49 51 52 53 54 55 58 59 60 61 62

Number of Observations Read	1284
Number of Observations Used	1284

The GLM Procedure

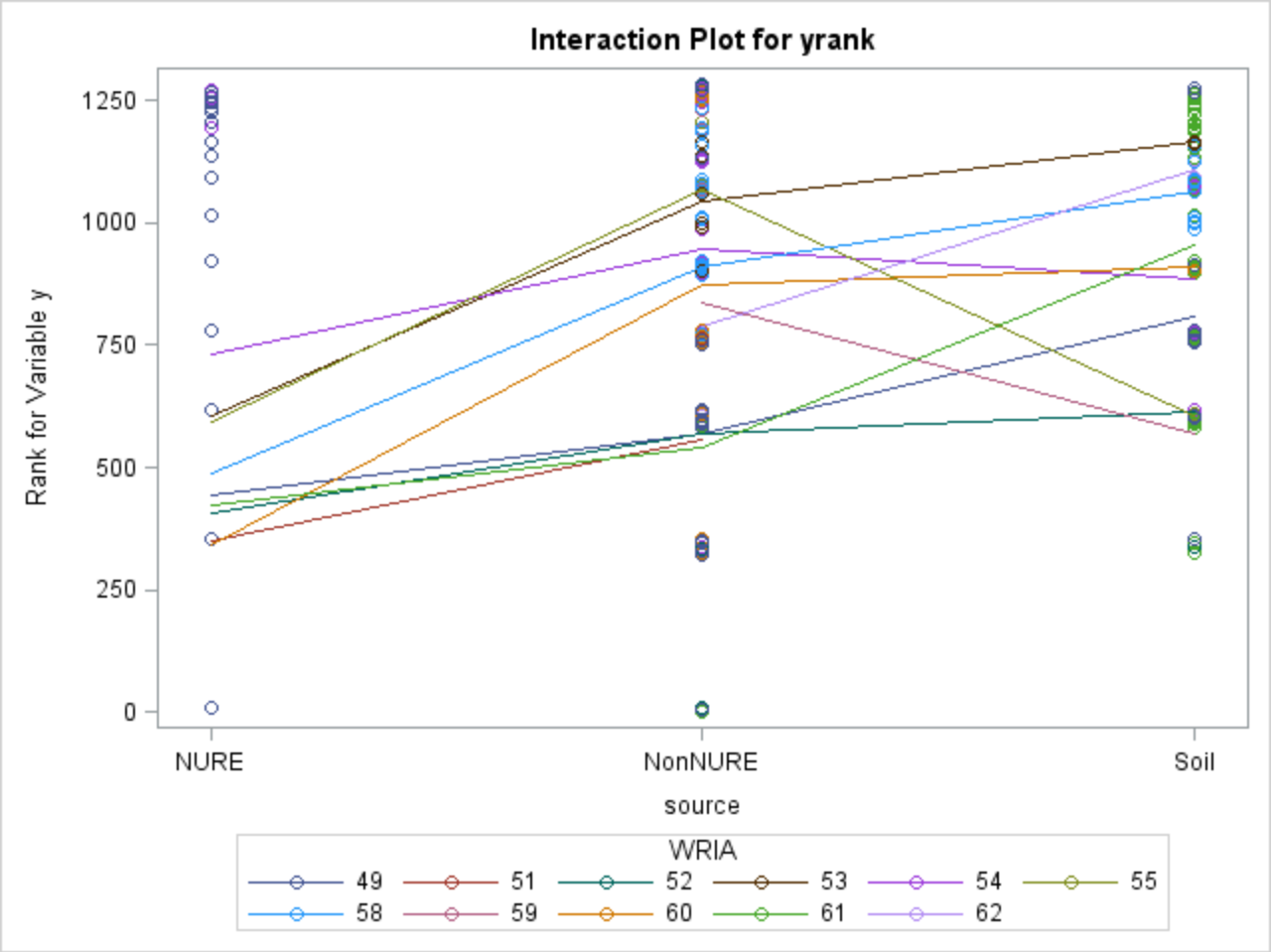
Dependent Variable: yrank Rank for Variable y
metal=Arsenic

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	29	52806340.6	1820908.3	13.11	<.0001
Error	1254	174145008.6	138871.6		
Corrected Total	1283	226951349.2			

R-Square	Coeff Var	Root MSE	yrank Mean
0.232677	65.57929	372.6548	568.2508

Source	DF	Type I SS	Mean Square	F Value	Pr > F
WRIA	10	31920482.41	3192048.24	22.99	<.0001
source	2	16226699.67	8113349.84	58.42	<.0001
source*WRIA	17	4659158.53	274068.15	1.97	0.0103

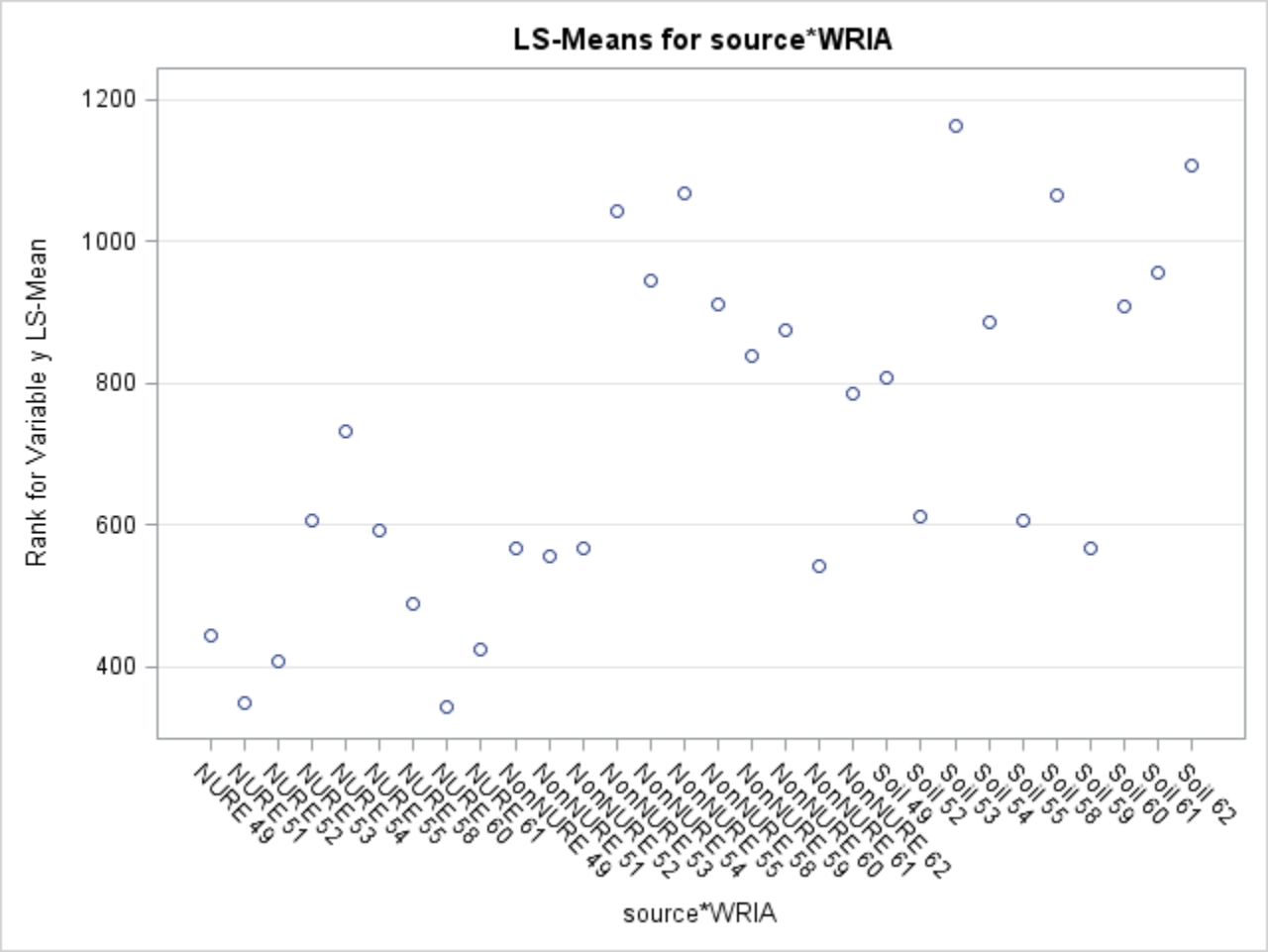
Source	DF	Type III SS	Mean Square	F Value	Pr > F
WRIA	10	4466270.639	446627.064	3.22	0.0004
source	2	6441780.422	3220890.211	23.19	<.0001
source*WRIA	17	4659158.533	274068.149	1.97	0.0103


Interaction Plot for yrank
Rank for Variable y
1250
1000
750
500
250
0
NURE
NonNURE
Soil
source
WRIA
49
51
52
53
54
55
58
59
60
61
62

The GLM Procedure
Least Squares Means
metal=Arsenic

source	WRIA	yrank	LSMEAN
NURE	**49**		444.25514
NURE	**51**		349.20000
NURE	**52**		408.61438
NURE	**53**		606.80303
NURE	**54**		732.64662
NURE	**55**		593.91892
NURE	**58**		489.97222
NURE	**60**		342.90385
NURE	**61**		424.80000
NonNURE	**49**		568.78947
NonNURE	**51**		557.50000
NonNURE	**52**		568.00000
NonNURE	**53**		1042.50000
NonNURE	**54**		945.72917
NonNURE	**55**		1067.75000
NonNURE	**58**		911.68421
NonNURE	**59**		838.63636
NonNURE	**60**		874.83333
NonNURE	**61**		541.73333
NonNURE	**62**		786.55556
Soil	**49**		809.20000
Soil	**52**		612.50000
Soil	**53**		1164.00000
Soil	**54**		885.50000
Soil	**55**		607.00000

source	WRIA	yrank LSMEAN
Soil	**58**	1066.10000
Soil	**59**	568.66667
Soil	**60**	909.00000
Soil	**61**	956.62500
Soil	**62**	1108.66667



T Comparison Lines for Least Squares Means of source*WRIA

LS-means with the same letter are not significantly different.

	yrank LSMEAN	source	WRIA	LSMEAN Number
A	1164.00	**Soil**	**53**	23
A				

T Comparison Lines for Least Squares Means of source*WRIA

LS-means with the same letter are not significantly different.

		yrank LSMEAN	source	WRIA	LSMEAN Number
	A	1108.67	**Soil**	**62**	30
	A				
	A	1067.75	**NonNURE**	**55**	15
	A				
	A	1066.10	**Soil**	**58**	26
	A				
	A	1042.50	**NonNURE**	**53**	13
	A				
	A	956.63	**Soil**	**61**	29
	A				
	A	945.73	**NonNURE**	**54**	14
	A				
	A	911.68	**NonNURE**	**58**	16
	A				
B	A	909.00	**Soil**	**60**	28
B	A				
B	A	885.50	**Soil**	**54**	24
B	A				
B	A	874.83	**NonNURE**	**60**	18
B	A				
B	A	838.64	**NonNURE**	**59**	17
B	A				
B	A	809.20	**Soil**	**49**	21
B	A				
B	A	786.56	**NonNURE**	**62**	20
B	A				

T Comparison Lines for Least Squares Means of source*WRIA

LS-means with the same letter are not significantly different.

			yrank LSMEAN	source	WRIA	LSMEAN Number
B	A		732.65	**NURE**	**54**	5
B	A					
B	A	C	612.50	**Soil**	**52**	22
B	A	C				
B	A	C	607.00	**Soil**	**55**	25
B	A	C				
B	A	C	606.80	**NURE**	**53**	4
B	A	C				
B	A	C	593.92	**NURE**	**55**	6
B	A	C				
B	A	C	568.79	**NonNURE**	**49**	10
B	A	C				
B	A	C	568.67	**Soil**	**59**	27
B	A	C				
B	A	C	568.00	**NonNURE**	**52**	12
B	A	C				
B	A	C	557.50	**NonNURE**	**51**	11
B		C				
B		C	541.73	**NonNURE**	**61**	19
B		C				
B		C	489.97	**NURE**	**58**	7
B		C				
B		C	444.26	**NURE**	**49**	1
B		C				
B		C	424.80	**NURE**	**61**	9
B		C				

T Comparison Lines for Least Squares Means of source*WRIA

LS-means with the same letter are not significantly different.

		yrank LSMEAN	source	WRIA	LSMEAN Number
B	C	408.61	**NURE**	**52**	3
	C				
	C	349.20	**NURE**	**51**	2
	C				
	C	342.90	**NURE**	**60**	8

The LINES display does not reflect all significant comparisons. The following additional pairs are significantly different: (23,4) (23,6) (23,10) (23,12) (30,5) (30,22) (30,4) (30,6) (30,10) (30,27) (30,12) (15,4) (15,6) (15,10) (15,12) (26,5) (26,22) (26,4) (26,6) (26,10) (26,27) (26,12) (13,5) (13,4) (13,6) (13,10) (13,12) (29,5) (29,4) (29,6) (29,10) (29,12) (14,5) (14,4) (14,6) (14,10) (14,12) (16,5) (16,4) (16,6) (16,10) (16,12) (24,7) (24,1) (24,3) (18,4) (18,6) (18,10) (18,19) (18,7) (18,1) (18,9) (18,3) (17,6) (17,19) (17,7) (17,1) (17,9) (17,3) (21,7) (21,1) (21,3) (20,6) (20,7) (20,1) (20,3) (5,4) (5,6) (5,7) (5,1) (5,3) (4,7) (4,1) (4,3) (4,2) (4,8) (6,1) (6,3) (6,2) (6,8) (10,2) (10,8) (19,8) (7,8) (1,8)

The GLM Procedure
metal=Barium

Class Level Information

Class	Levels	Values
source	2	NonNURE Soil
WRIA	11	49 51 52 53 54 55 58 59 60 61 62

Number of Observations Read	281
Number of Observations Used	281

The GLM Procedure

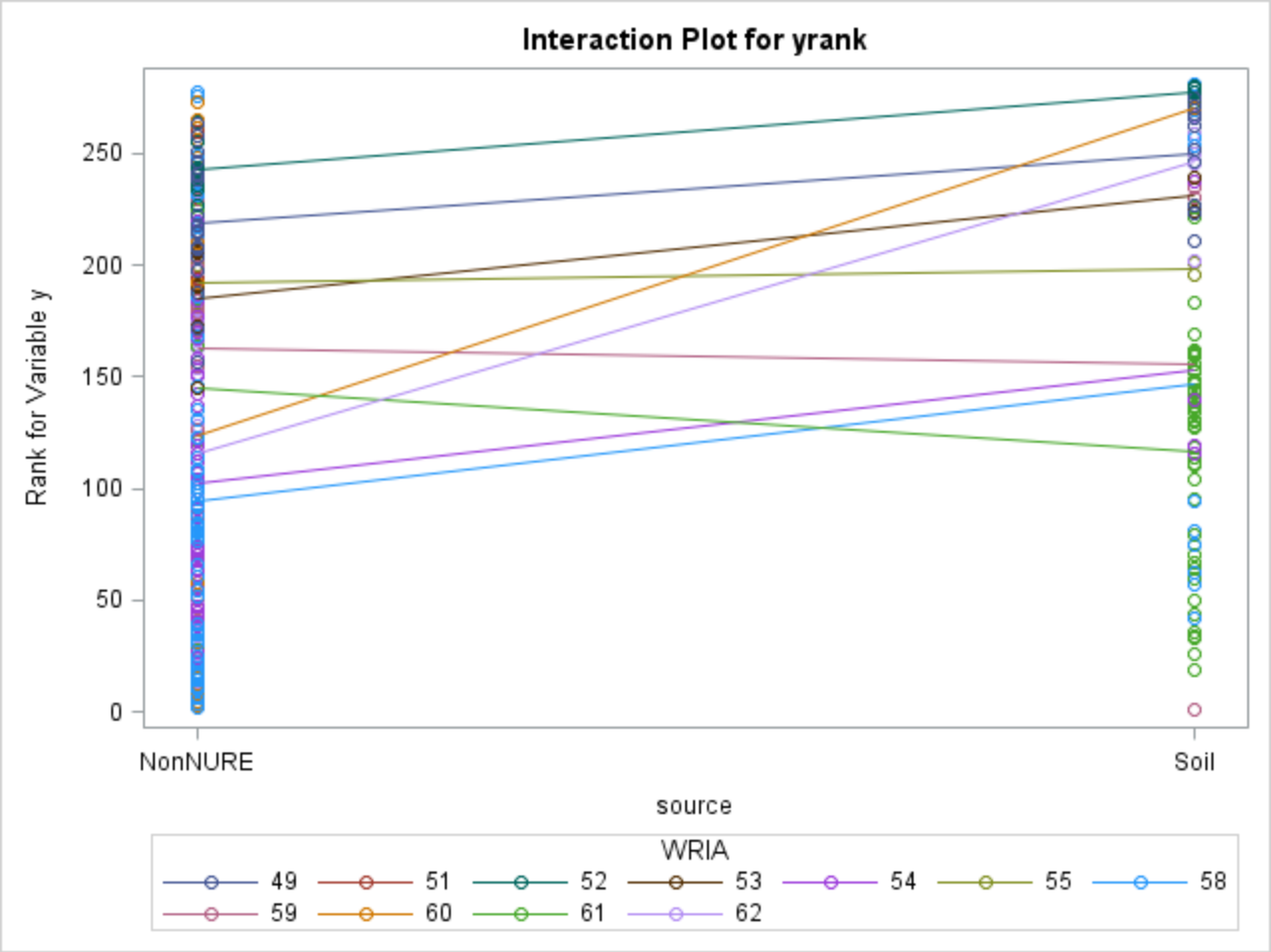
Dependent Variable: yrank Rank for Variable y
metal=Barium

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	20	792034.209	39601.710	9.73	<.0001
Error	260	1058460.261	4071.001		
Corrected Total	280	1850494.470			

R-Square	Coeff Var	Root MSE	yrank Mean
0.428012	45.30394	63.80440	140.8363

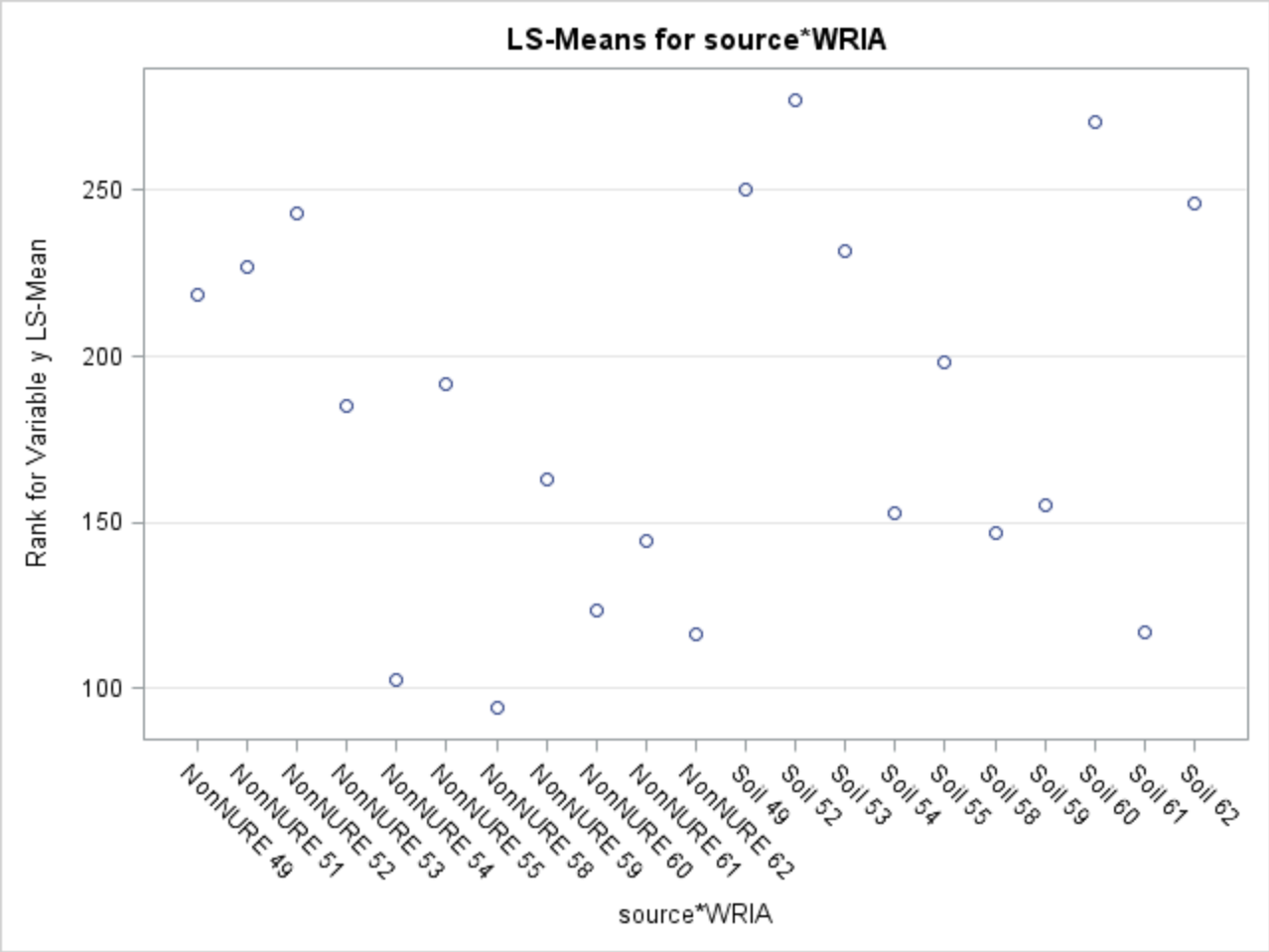
Source	DF	Type I SS	Mean Square	F Value	Pr > F
WRIA	10	626989.8034	62698.9803	15.40	<.0001
source	1	79103.4486	79103.4486	19.43	<.0001
source*WRIA	9	85940.9568	9548.9952	2.35	0.0147

Source	DF	Type III SS	Mean Square	F Value	Pr > F
WRIA	10	362363.7938	36236.3794	8.90	<.0001
source	1	57225.2509	57225.2509	14.06	0.0002
source*WRIA	9	85940.9568	9548.9952	2.35	0.0147


Interaction Plot for yrank
Rank for Variable y
250
200
150
100
50
0
NonNURE
Soil
source
WRIA
49
51
52
53
54
55
58
59
60
61
62

The GLM Procedure
Least Squares Means
metal=Barium

source	WRIA	yrank	LSMEAN
NonNURE	49		218.631579
NonNURE	51		227.000000
NonNURE	52		243.125000
NonNURE	53		185.000000
NonNURE	54		102.625000
NonNURE	55		192.000000
NonNURE	58		94.127273
NonNURE	59		163.166667
NonNURE	60		123.312500
NonNURE	61		144.600000
NonNURE	62		116.105263
Soil	49		250.100000
Soil	52		277.250000
Soil	53		231.500000
Soil	54		153.000000
Soil	55		198.500000
Soil	58		147.100000
Soil	59		155.333333
Soil	60		270.500000
Soil	61		116.931818
Soil	62		246.000000



T Comparison Lines for Least Squares Means of source*WRIA

LS-means with the same letter are not significantly different.

		yrank LSMEAN	source	WRIA	LSMEAN Number
	A	277.2500	**Soil**	**52**	13
	A				
B	A	270.5000	**Soil**	**60**	19
B	A				
B	A	250.1000	**Soil**	**49**	12
B	A				
B	A	246.0000	**Soil**	**62**	21
B	A				
B	A	243.1250	**NonNURE**	**52**	3

T Comparison Lines for Least Squares Means of source*WRIA

LS-means with the same letter are not significantly different.

				yrank LSMEAN	source	WRIA	LSMEAN Number
B		A					
B		A	C	231.5000	**Soil**	**53**	14
B		A	C				
B		A	C	227.0000	**NonNURE**	**51**	2
B		A	C				
B		A	C	218.6316	**NonNURE**	**49**	1
B		A	C				
B	D	A	C	198.5000	**Soil**	**55**	16
B	D	A	C				
B	D	A	C	192.0000	**NonNURE**	**55**	6
B	D		C				
B	D		C	185.0000	**NonNURE**	**53**	4
	D		C				
	D		C	163.1667	**NonNURE**	**59**	8
	D		C				
	D	E	C	155.3333	**Soil**	**59**	18
	D	E	C				
	D	E	C	153.0000	**Soil**	**54**	15
	D	E	C				
	D	E	C	147.1000	**Soil**	**58**	17
	D	E	C				
	D	E	C	144.6000	**NonNURE**	**61**	10
	D	E					
	D	E		123.3125	**NonNURE**	**60**	9
	D	E					
	D	E		116.9318	**Soil**	**61**	20

T Comparison Lines for Least Squares Means of source*WRIA

LS-means with the same letter are not significantly different.

		yrank LSMEAN	source	WRIA	LSMEAN Number
D	E				
D	E	116.1053	**NonNURE**	**62**	11
	E				
	E	102.6250	**NonNURE**	**54**	5
	E				
	E	94.1273	**NonNURE**	**58**	7

The LINES display does not reflect all significant comparisons. The following additional pairs are significantly different: (12,4) (1,8) (1,17) (1,10) (6,20) (6,11) (4,9) (4,20) (4,11) (8,20) (8,11) (17,5) (17,7)

The GLM Procedure
metal=Beryllium

Class Level Information

Class	Levels	Values
source	3	NURE NonNURE Soil
WRIA	11	49 51 52 53 54 55 58 59 60 61 62

Number of Observations Read	1459
Number of Observations Used	1459

The GLM Procedure

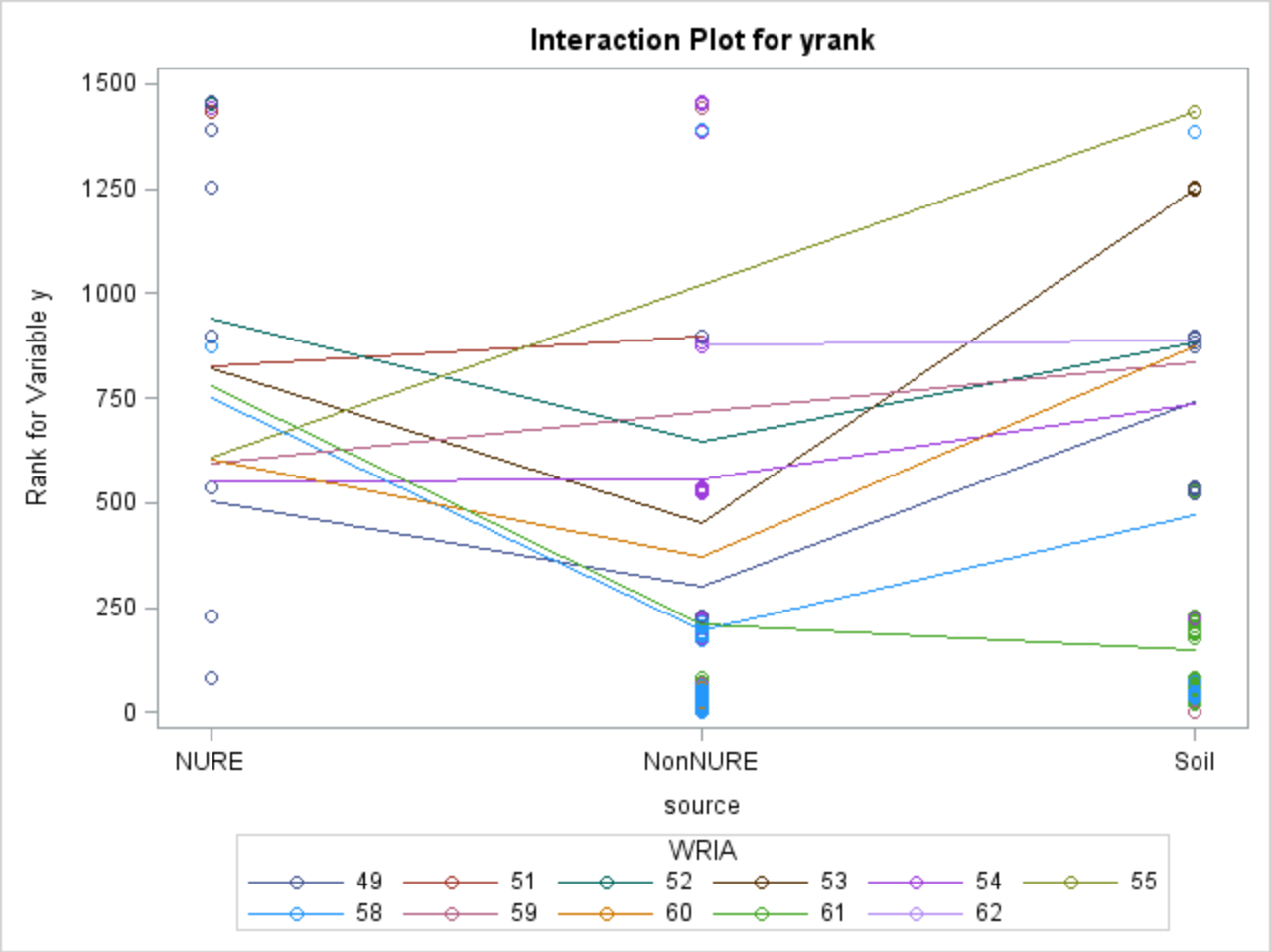
Dependent Variable: yrank Rank for Variable y
metal=Beryllium

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	30	62681810.4	2089393.7	16.72	<.0001
Error	1428	178455258.6	124968.7		
Corrected Total	1458	241137069.0			

R-Square	Coeff Var	Root MSE	yrank Mean
0.259943	57.83281	353.5091	611.2605

Source	DF	Type I SS	Mean Square	F Value	Pr > F
WRIA	10	41887757.81	4188775.78	33.52	<.0001
source	2	6386583.90	3193291.95	25.55	<.0001
source*WRIA	18	14407468.71	800414.93	6.40	<.0001

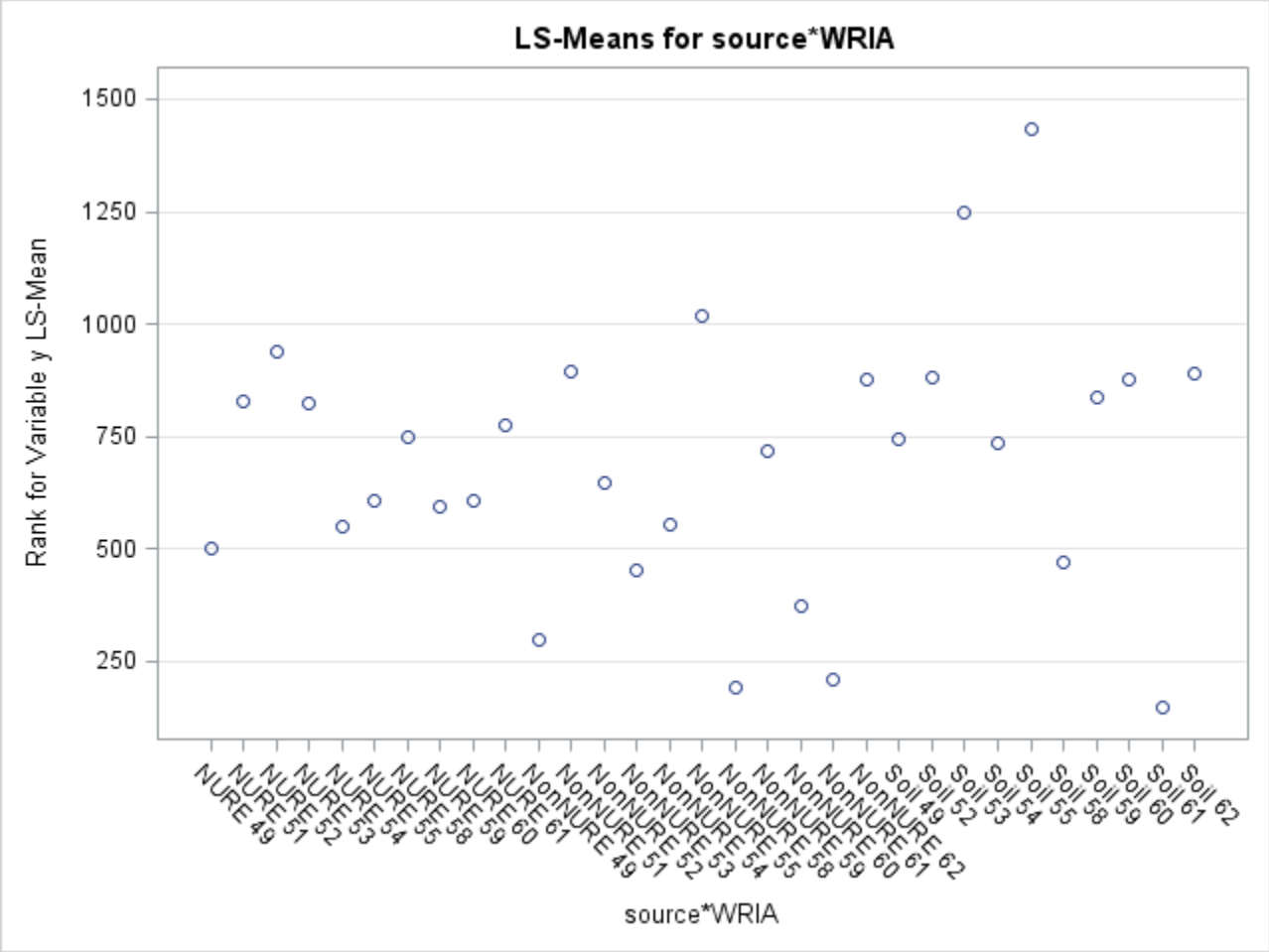
Source	DF	Type III SS	Mean Square	F Value	Pr > F
WRIA	10	10233205.67	1023320.57	8.19	<.0001
source	2	2552209.97	1276104.98	10.21	<.0001
source*WRIA	18	14407468.71	800414.93	6.40	<.0001


Interaction Plot for yrank
Rank for Variable y
1500
1250
1000
750
500
250
0
NURE
NonNURE
Soil
source
WRIA
49
51
52
53
54
55
58
59
60
61
62

The GLM Procedure
Least Squares Means
metal=Beryllium

source	WRIA	yrank	LSMEAN
NURE	**49**		502.28614
NURE	**51**		827.35000
NURE	**52**		940.20988
NURE	**53**		821.68056
NURE	**54**		550.02963
NURE	**55**		606.98649
NURE	**58**		748.14744
NURE	**59**		593.53846
NURE	**60**		605.57803
NURE	**61**		777.16667
NonNURE	**49**		300.10526
NonNURE	**51**		896.00000
NonNURE	**52**		646.25000
NonNURE	**53**		452.00000
NonNURE	**54**		555.08163
NonNURE	**55**		1019.25000
NonNURE	**58**		193.26415
NonNURE	**59**		716.00000
NonNURE	**60**		372.50000
NonNURE	**61**		210.52941
NonNURE	**62**		876.92308
Soil	**49**		742.70000
Soil	**52**		882.00000
Soil	**53**		1250.00000
Soil	**54**		737.00000

source	WRIA	yrank LSMEAN
Soil	**55**	1432.50000
Soil	**58**	471.10000
Soil	**59**	836.00000
Soil	**60**	876.00000
Soil	**61**	146.78571
Soil	**62**	889.16667



T Comparison Lines for Least Squares Means of source*WRIA

LS-means with the same letter are not significantly different.

	yrank LSMEAN	source	WRIA	LSMEAN Number
A	1432.50	**Soil**	**55**	26

T Comparison Lines for Least Squares Means of source*WRIA

LS-means with the same letter are not significantly different.

				yrank	LSMEAN	source	WRIA	LSMEAN Number
		A						
B		A			1250.00	**Soil**	**53**	24
B		A						
B		A	C		1019.25	**NonNURE**	**55**	16
B		A	C					
B		A	C		940.21	**NURE**	**52**	3
B		A	C					
B	D	A	C		896.00	**NonNURE**	**51**	12
B	D	A	C					
B	D	A	C		889.17	**Soil**	**62**	31
B	D	A	C					
B	D	A	C		882.00	**Soil**	**52**	23
B	D	A	C					
B	D	A	C		876.92	**NonNURE**	**62**	21
B	D	A	C					
B	D	A	C		876.00	**Soil**	**60**	29
B	D	A	C					
B	D	A	C		836.00	**Soil**	**59**	28
B	D		C					
B	D		C		827.35	**NURE**	**51**	2
B	D		C					
B	D		C		821.68	**NURE**	**53**	4
B	D		C					
B	D		C		777.17	**NURE**	**61**	10
B	D		C					
B	D		C		748.15	**NURE**	**58**	7

T Comparison Lines for Least Squares Means of source*WRIA

LS-means with the same letter are not significantly different.

			yrank LSMEAN	source	WRIA	LSMEAN Number
B	D	C				
B	D	C	742.70	**Soil**	**49**	22
B	D	C				
B	D	C	737.00	**Soil**	**54**	25
	D	C				
	D	C	716.00	**NonNURE**	**59**	18
	D	C				
	D	C	646.25	**NonNURE**	**52**	13
	D					
	D		606.99	**NURE**	**55**	6
	D					
	D		605.58	**NURE**	**60**	9
	D					
	D		593.54	**NURE**	**59**	8
	D					
	D		555.08	**NonNURE**	**54**	15
	D					
	D		550.03	**NURE**	**54**	5
	D					
	D		502.29	**NURE**	**49**	1
	D					
	D	E	471.10	**Soil**	**58**	27
	D	E				
F	D	E	452.00	**NonNURE**	**53**	14
F	D	E				
F	D	E	372.50	**NonNURE**	**60**	19

T Comparison Lines for Least Squares Means of source*WRIA

LS-means with the same letter are not significantly different.

			yrank LSMEAN	source	WRIA	LSMEAN Number
F	E					
F	E	G	300.11	**NonNURE**	**49**	11
F	E	G				
F	E	G	210.53	**NonNURE**	**61**	20
F		G				
F		G	193.26	**NonNURE**	**58**	17
		G				
		G	146.79	**Soil**	**61**	30

The LINES display does not reflect all significant comparisons. The following additional pairs are significantly different: (26,21) (24,7) (3,4) (3,7) (3,18) (3,13) (31,15) (31,5) (31,1) (31,27) (31,14) (31,19) (23,1) (23,27) (23,19) (21,6) (21,9) (21,8) (21,15) (21,5) (21,1) (21,27) (21,14) (21,19) (28,19) (2,6) (2,9) (2,8) (2,15) (2,5) (2,1) (2,27) (2,14) (2,19) (4,6) (4,9) (4,8) (4,15) (4,5) (4,1) (4,27) (4,14) (4,19) (10,19) (7,6) (7,9) (7,15) (7,5) (7,1) (7,27) (7,14) (7,19) (22,1) (22,19) (18,1) (18,19) (6,1) (6,19) (9,1) (9,19)

The GLM Procedure
metal=Bismuth

Class Level Information

Class	Levels	Values
source	2	NonNURE Soil
WRIA	9	49 52 53 54 55 58 59 60 62

Number of Observations Read	76
Number of Observations Used	76

The GLM Procedure

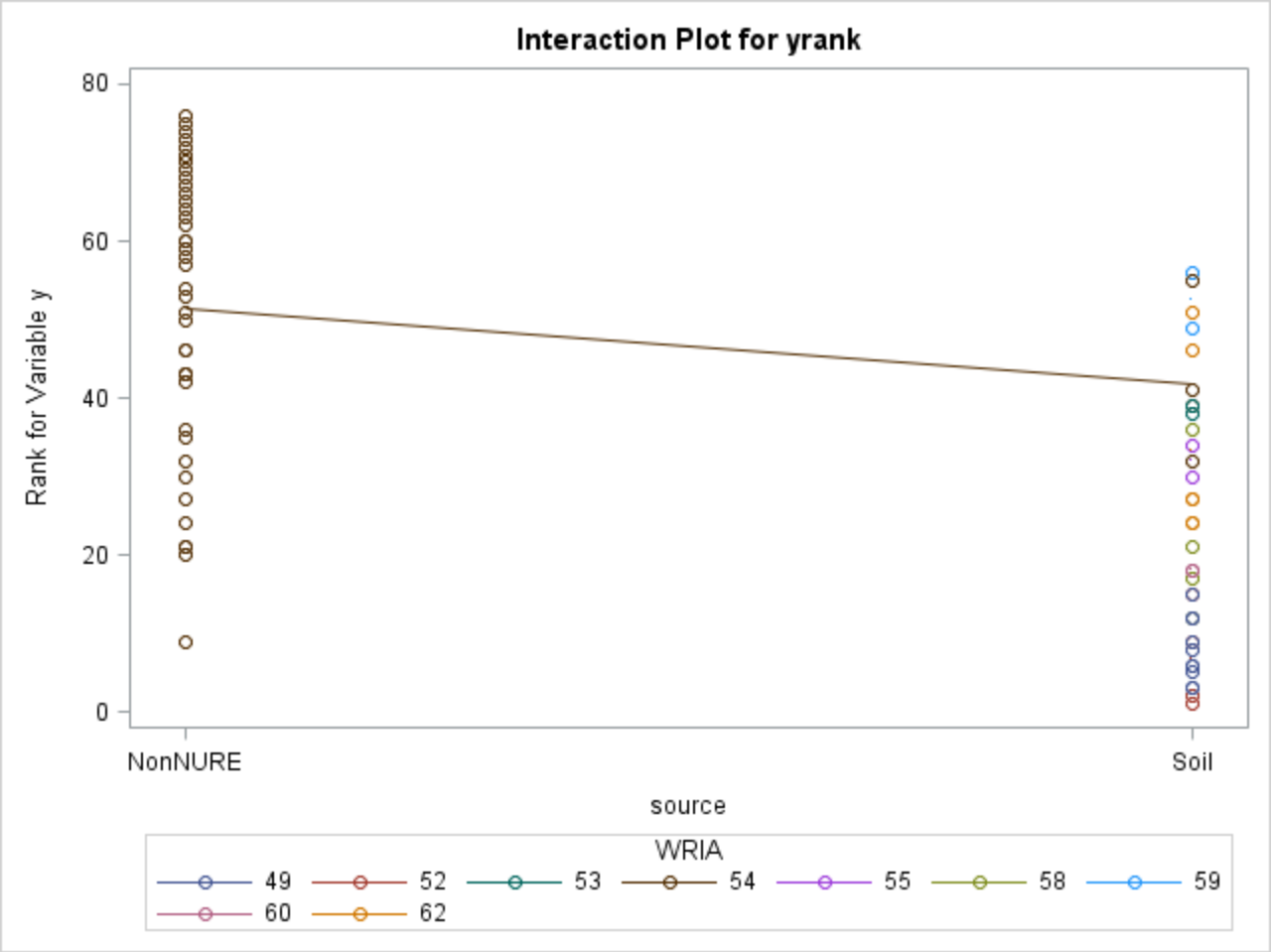
Dependent Variable: yrank Rank for Variable y
metal=Bismuth

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	9	22699.74693	2522.19410	11.45	<.0001
Error	66	14532.60833	220.19104		
Corrected Total	75	37232.35526			

R-Square	Coeff Var	Root MSE	yrank Mean
0.609678	38.95515	14.83884	38.09211

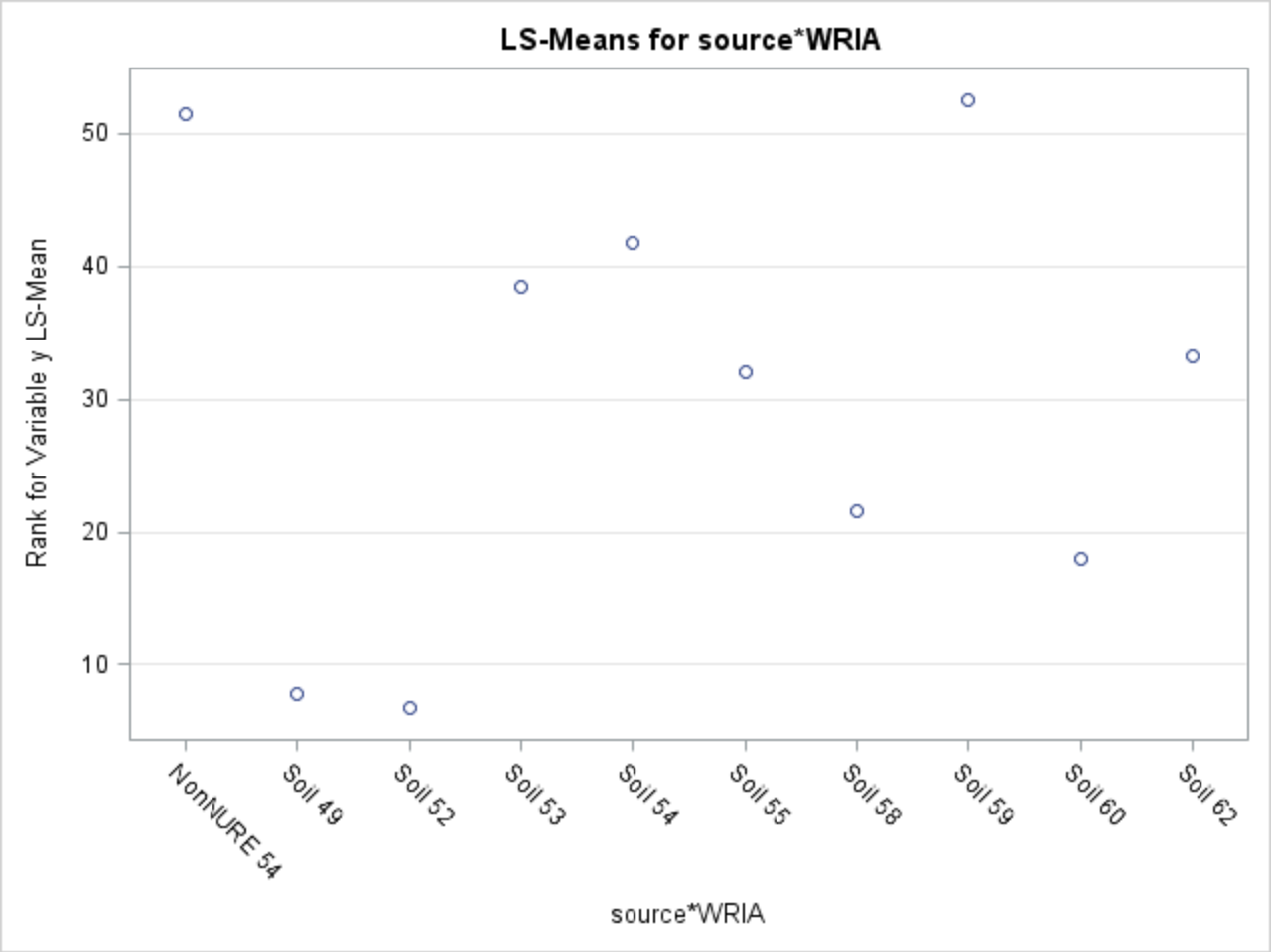
Source	DF	Type I SS	Mean Square	F Value	Pr > F
WRIA	8	22362.87193	2795.35899	12.70	<.0001
source	1	336.87500	336.87500	1.53	0.2205
source*WRIA	0	0.00000	.	.	.

Source	DF	Type III SS	Mean Square	F Value	Pr > F
WRIA	8	7800.766667	975.095833	4.43	0.0003
source	1	336.875000	336.875000	1.53	0.2205
source*WRIA	0	0.000000	.	.	.


Interaction Plot for yrank
Rank for Variable y
80
60
40
20
0
NonNURE
Soil
source
WRIA
49
52
53
54
55
58
59
60
62

The GLM Procedure
Least Squares Means
metal=Bismuth

source	WRIA	yrank LSMEAN
NonNURE	**54**	51.3750000
Soil	**49**	7.9000000
Soil	**52**	6.7500000
Soil	**53**	38.5000000
Soil	**54**	41.7500000
Soil	**55**	32.0000000
Soil	**58**	21.5000000
Soil	**59**	52.5000000
Soil	**60**	18.0000000
Soil	**62**	33.1666667



T Comparison Lines for Least Squares Means of source*WRIA

LS-means with the same letter are not significantly different.

		yrank LSMEAN	source	WRIA	LSMEAN Number
	A	52.50000	**Soil**	**59**	8
	A				
	A	51.37500	**NonNURE**	**54**	1
	A				
B	A	41.75000	**Soil**	**54**	5
B	A				
B	A	38.50000	**Soil**	**53**	4
B	A				
B	A	33.16667	**Soil**	**62**	10

T Comparison Lines for Least Squares Means of source*WRIA

LS-means with the same letter are not significantly different.

			yrank LSMEAN	source	WRIA	LSMEAN Number
B	A					
B	A	C	32.00000	**Soil**	**55**	6
B		C				
B		C	21.50000	**Soil**	**58**	7
B		C				
B		C	18.00000	**Soil**	**60**	9
		C				
		C	7.90000	**Soil**	**49**	2
		C				
		C	6.75000	**Soil**	**52**	3

The LINES display does not reflect all significant comparisons. The following additional pairs are significantly different: (1,10) (6,2)

The GLM Procedure
metal=Cadmium

Class Level Information

Class	Levels	Values
source	2	NonNURE Soil
WRIA	11	49 51 52 53 54 55 58 59 60 61 62

Number of Observations Read	273
Number of Observations Used	273

The GLM Procedure

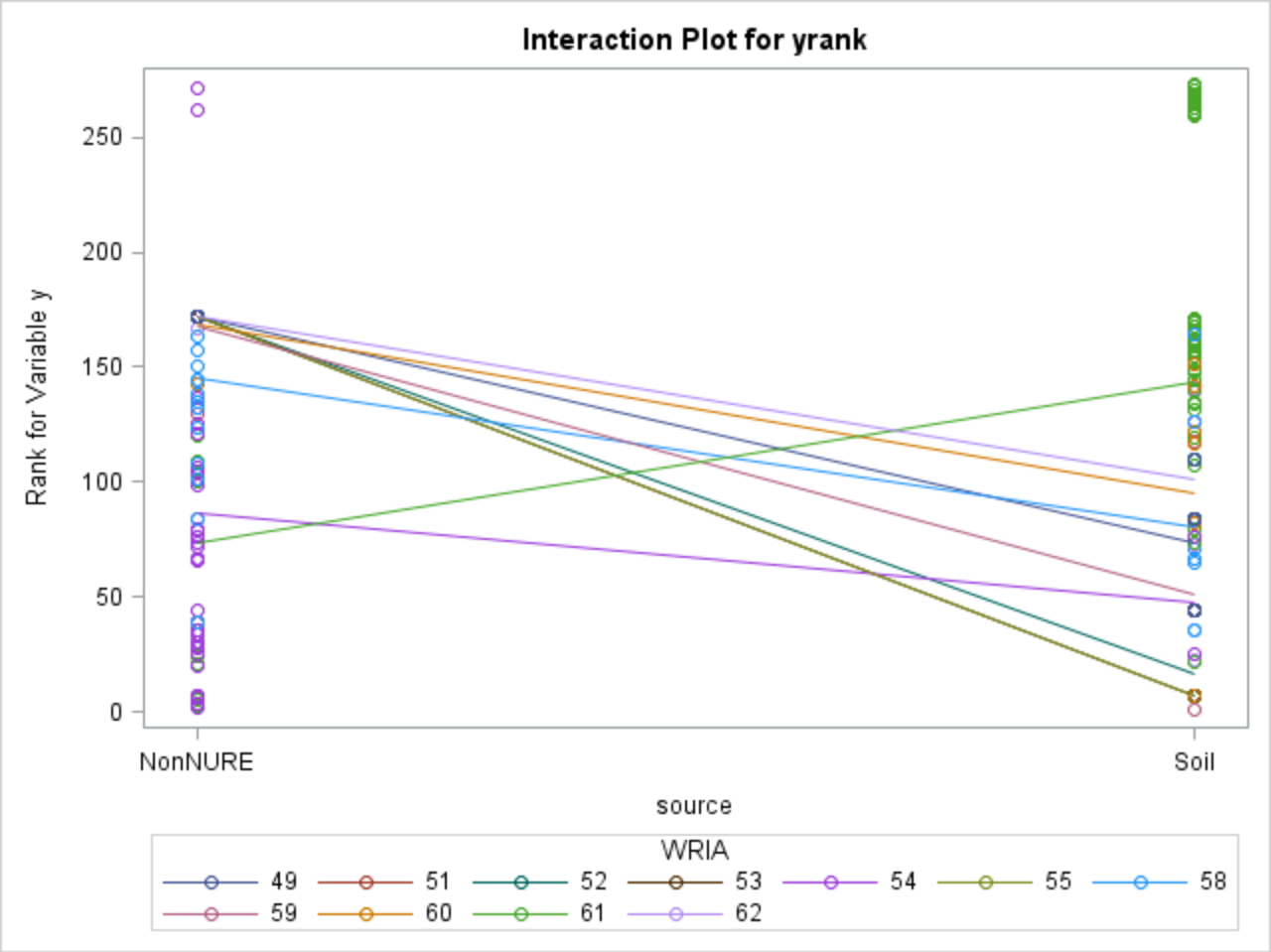
Dependent Variable: yrank Rank for Variable y
metal=Cadmium

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	20	498546.569	24927.328	8.63	<.0001
Error	252	727622.141	2887.389		
Corrected Total	272	1226168.711			

R-Square	Coeff Var	Root MSE	yrank Mean
0.406589	44.19856	53.73443	121.5751

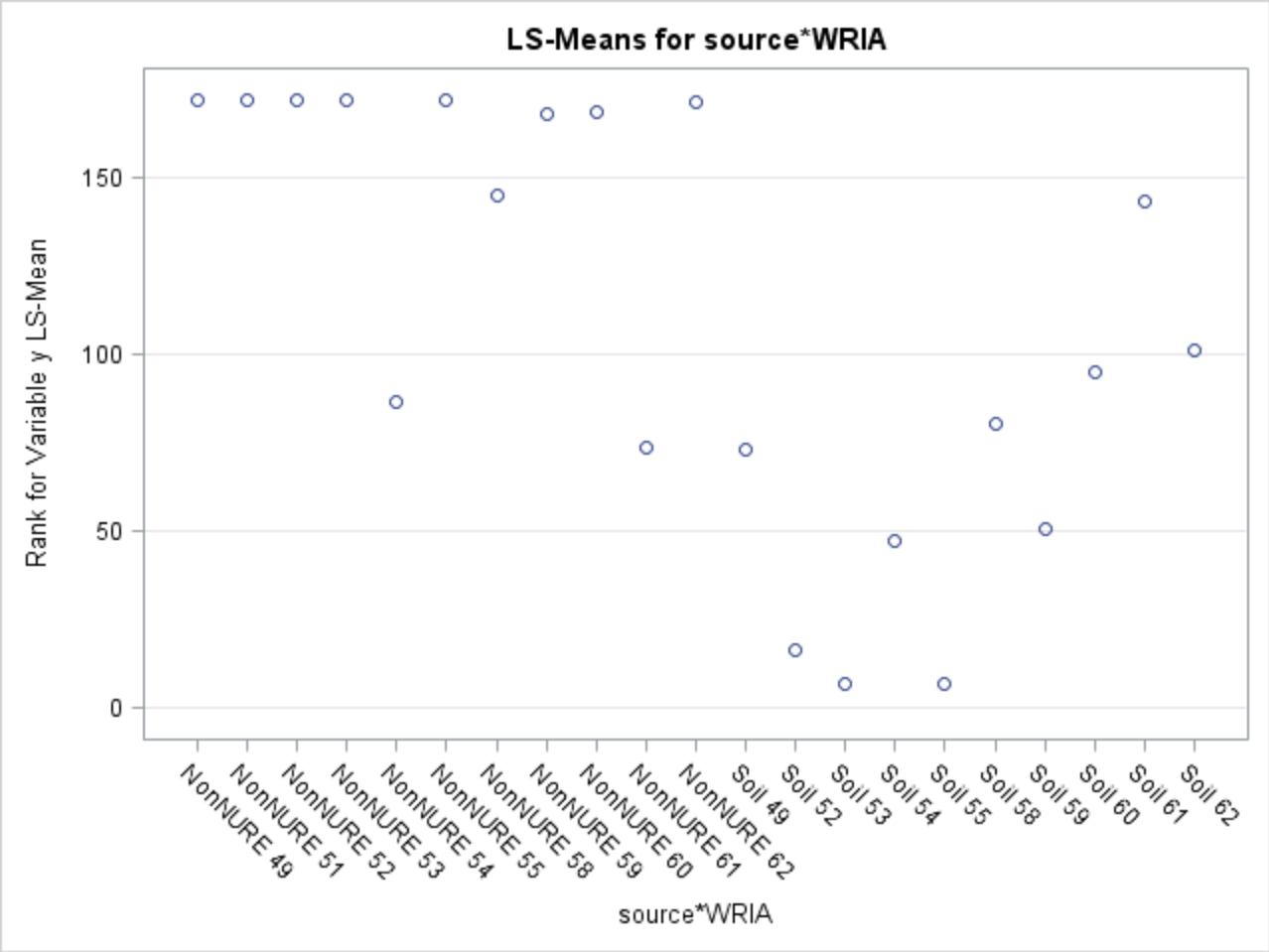
Source	DF	Type I SS	Mean Square	F Value	Pr > F
WRIA	10	103671.0959	10367.1096	3.59	0.0002
source	1	118073.5509	118073.5509	40.89	<.0001
source*WRIA	9	276801.9225	30755.7692	10.65	<.0001

Source	DF	Type III SS	Mean Square	F Value	Pr > F
WRIA	10	63325.9063	6332.5906	2.19	0.0187
source	1	243607.0221	243607.0221	84.37	<.0001
source*WRIA	9	276801.9225	30755.7692	10.65	<.0001


Interaction Plot for yrank
Rank for Variable y
250
200
150
100
50
0
NonNURE
Soil
source
WRIA
49
51
52
53
54
55
58
59
60
61
62

The GLM Procedure
Least Squares Means
metal=Cadmium

source	WRIA	yrank	LSMEAN
NonNURE	**49**		172.000000
NonNURE	**51**		172.000000
NonNURE	**52**		172.000000
NonNURE	**53**		172.000000
NonNURE	**54**		86.479167
NonNURE	**55**		172.000000
NonNURE	**58**		145.173913
NonNURE	**59**		167.800000
NonNURE	**60**		168.375000
NonNURE	**61**		73.533333
NonNURE	**62**		171.583333
Soil	**49**		73.200000
Soil	**52**		16.250000
Soil	**53**		7.000000
Soil	**54**		47.250000
Soil	**55**		7.000000
Soil	**58**		80.636364
Soil	**59**		50.800000
Soil	**60**		95.000000
Soil	**61**		143.064516
Soil	**62**		101.363636



T Comparison Lines for Least Squares Means of source*WRIA

LS-means with the same letter are not significantly different.

		yrank LSMEAN	source	WRIA	LSMEAN Number
	A	172.0000	**NonNURE**	**49**	1
	A				
B	A	172.0000	**NonNURE**	**51**	2
B	A				
B	A	172.0000	**NonNURE**	**53**	4
B	A				
B	A	172.0000	**NonNURE**	**55**	6
B	A				
B	A	172.0000	**NonNURE**	**52**	3

T Comparison Lines for Least Squares Means of source*WRIA

LS-means with the same letter are not significantly different.

		yrank LSMEAN	source	WRIA	LSMEAN Number
B	A				
B	A	171.5833	**NonNURE**	**62**	11
B	A				
B	A	168.3750	**NonNURE**	**60**	9
B	A				
B	A	167.8000	**NonNURE**	**59**	8
B	A				
B	A	145.1739	**NonNURE**	**58**	7
B					
B		143.0645	**Soil**	**61**	20
B					
B	C	101.3636	**Soil**	**62**	21
B	C				
B	C	95.0000	**Soil**	**60**	19
	C				
	C	86.4792	**NonNURE**	**54**	5
	C				
D	C	80.6364	**Soil**	**58**	17
D	C				
D	C	73.5333	**NonNURE**	**61**	10
D	C				
D	C	73.2000	**Soil**	**49**	12
D	C				
D	C	50.8000	**Soil**	**59**	18
D	C				
D	C	47.2500	**Soil**	**54**	15

T Comparison Lines for Least Squares Means of source*WRIA

LS-means with the same letter are not significantly different.

	yrank LSMEAN	source	WRIA	LSMEAN Number
D				
D	16.2500	**Soil**	**52**	13
D				
D	7.0000	**Soil**	**55**	16
D				
D	7.0000	**Soil**	**53**	14

The LINES display does not reflect all significant comparisons. The following additional pairs are significantly different: (4,21) (4,19) (6,21) (6,19) (3,21) (3,19) (11,21) (11,19) (9,21) (9,19) (8,21) (8,19) (7,21) (7,19) (20,21) (20,19) (17,13)

The GLM Procedure
metal=Chromium

Class Level Information

Class	Levels	Values
source	3	NURE NonNURE Soil
WRIA	11	49 51 52 53 54 55 58 59 60 61 62

Number of Observations Read	1491
Number of Observations Used	1491

The GLM Procedure

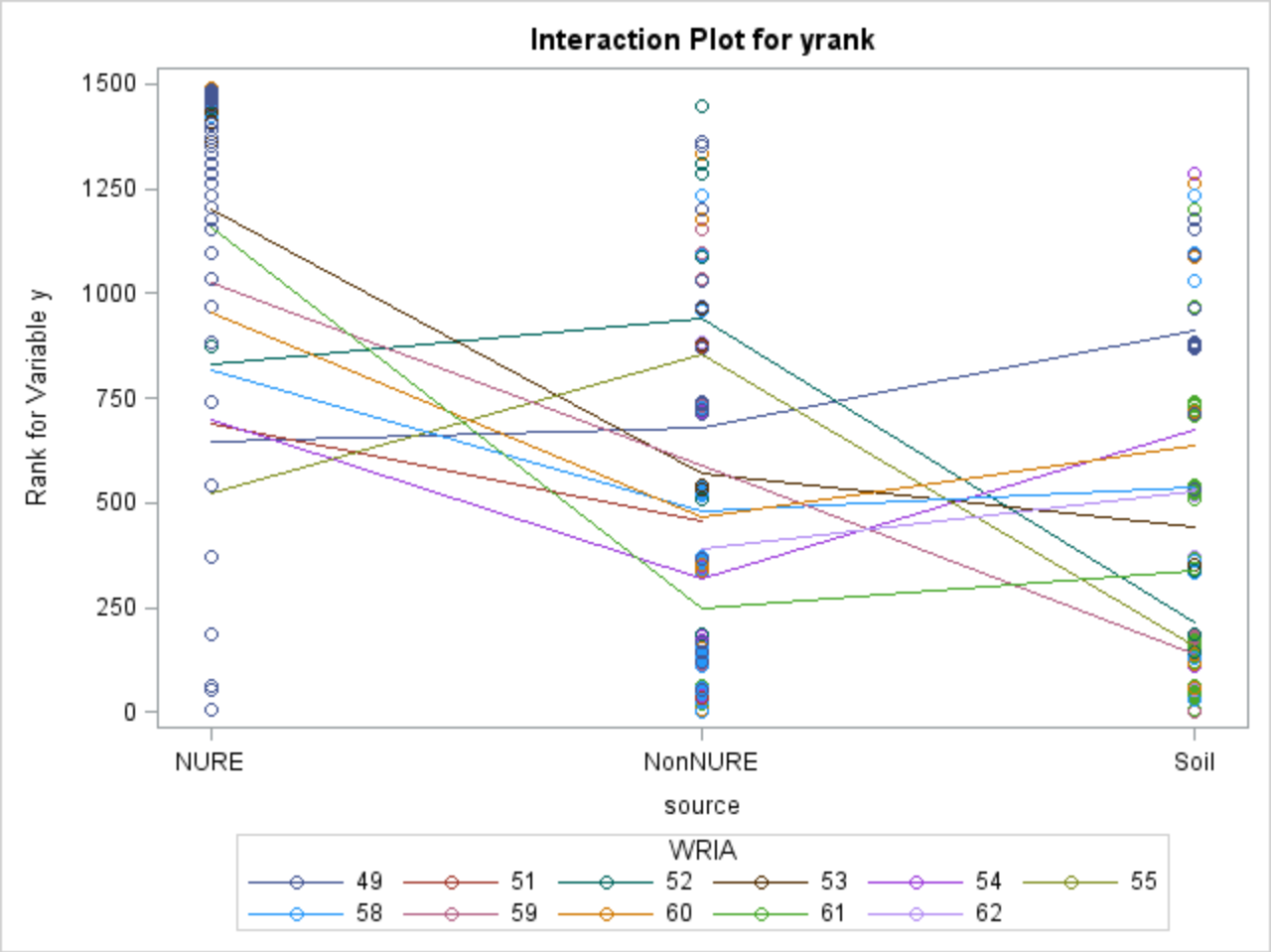
Dependent Variable: yrank Rank for Variable y
metal=Chromium

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	30	69650533.9	2321684.5	15.43	<.0001
Error	1460	219700835.4	150480.0		
Corrected Total	1490	289351369.3			

R-Square	Coeff Var	Root MSE	yrank Mean
0.240713	54.56375	387.9175	710.9437

Source	DF	Type I SS	Mean Square	F Value	Pr > F
WRIA	10	41798606.41	4179860.64	27.78	<.0001
source	2	14427192.55	7213596.27	47.94	<.0001
source*WRIA	18	13424734.94	745818.61	4.96	<.0001

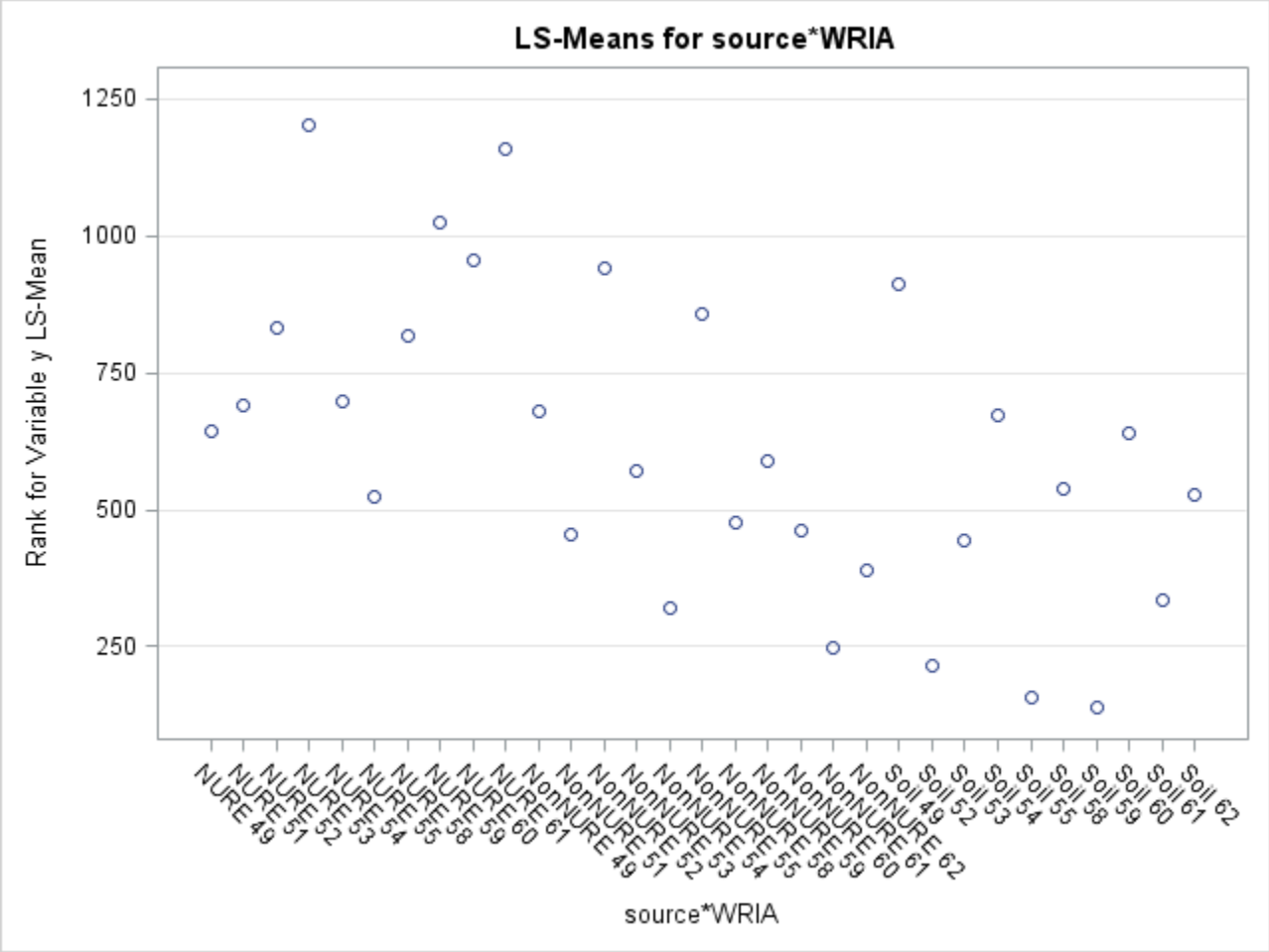
Source	DF	Type III SS	Mean Square	F Value	Pr > F
WRIA	10	1794381.92	179438.19	1.19	0.2912
source	2	8962409.70	4481204.85	29.78	<.0001
source*WRIA	18	13424734.94	745818.61	4.96	<.0001


Interaction Plot for yrank
Rank for Variable y
1500
1250
1000
750
500
250
0
NURE
NonNURE
Soil
source
WRIA
49
51
52
53
54
55
58
59
60
61
62

The GLM Procedure
Least Squares Means
metal=Chromium

source	WRIA	yrank	LSMEAN
NURE	**49**		644.49850
NURE	**51**		689.50000
NURE	**52**		832.11585
NURE	**53**		1202.84722
NURE	**54**		698.60741
NURE	**55**		524.04054
NURE	**58**		818.44872
NURE	**59**		1023.53846
NURE	**60**		954.93103
NURE	**61**		1157.50000
NonNURE	**49**		678.94737
NonNURE	**51**		455.50000
NonNURE	**52**		942.37500
NonNURE	**53**		570.83333
NonNURE	**54**		319.27083
NonNURE	**55**		856.50000
NonNURE	**58**		477.87273
NonNURE	**59**		588.41667
NonNURE	**60**		463.62500
NonNURE	**61**		249.29412
NonNURE	**62**		391.26316
Soil	**49**		913.40000
Soil	**52**		214.00000
Soil	**53**		443.50000
Soil	**54**		673.25000

source	WRIA	yrank LSMEAN
Soil	**55**	157.00000
Soil	**58**	537.90909
Soil	**59**	138.20000
Soil	**60**	638.71429
Soil	**61**	336.22581
Soil	**62**	527.27273



T Comparison Lines for Least Squares Means of source*WRIA

LS-means with the same letter are not significantly different.

	yrank LSMEAN	source	WRIA	LSMEAN Number
A	1202.85	**NURE**	**53**	4

T Comparison Lines for Least Squares Means of source*WRIA

LS-means with the same letter are not significantly different.

				yrank LSMEAN	source	WRIA	LSMEAN Number
		A					
B		A		1157.50	**NURE**	**61**	10
B		A					
B		A	C	1023.54	**NURE**	**59**	8
B		A	C				
B	D	A	C	954.93	**NURE**	**60**	9
B	D	A	C				
B	D	A	C	942.38	**NonNURE**	**52**	13
B	D	A	C				
B	D	A	C	913.40	**Soil**	**49**	22
B	D	A	C				
B	D	A	C	856.50	**NonNURE**	**55**	16
B	D		C				
B	D		C	832.12	**NURE**	**52**	3
B	D		C				
B	D		C	818.45	**NURE**	**58**	7
B	D		C				
B	D	E	C	698.61	**NURE**	**54**	5
B	D	E	C				
B	D	E	C	689.50	**NURE**	**51**	2
B	D	E	C				
B	D	E	C	678.95	**NonNURE**	**49**	11
B	D	E	C				
B	D	E	C	673.25	**Soil**	**54**	25
	D	E	C				
	D	E	C	644.50	**NURE**	**49**	1

T Comparison Lines for Least Squares Means of source*WRIA

LS-means with the same letter are not significantly different.

				yrank LSMEAN	source	WRIA	LSMEAN Number
	D	E	C				
	D	E	C	638.71	**Soil**	**60**	29
	D	E	C				
	D	E	C	588.42	**NonNURE**	**59**	18
	D	E	C				
F	D	E	C	570.83	**NonNURE**	**53**	14
F	D	E	C				
F	D	E	C	537.91	**Soil**	**58**	27
F	D	E	C				
F	D	E	C	527.27	**Soil**	**62**	31
F	D	E	C				
F	D	E	C	524.04	**NURE**	**55**	6
F	D	E	C				
F	D	E	C	477.87	**NonNURE**	**58**	17
F	D	E	C				
F	D	E	C	463.63	**NonNURE**	**60**	19
F	D	E	C				
F	D	E	C	455.50	**NonNURE**	**51**	12
F	D	E					
F	D	E		443.50	**Soil**	**53**	24
F		E					
F		E		391.26	**NonNURE**	**62**	21
F		E					
F		E		336.23	**Soil**	**61**	30
F		E					
F		E		319.27	**NonNURE**	**54**	15

T Comparison Lines for Least Squares Means of source*WRIA

LS-means with the same letter are not significantly different.

		yrank LSMEAN	source	WRIA	LSMEAN Number
F	E				
F	E	249.29	**NonNURE**	**61**	20
F	E				
F	E	214.00	**Soil**	**52**	23
F	E				
F	E	157.00	**Soil**	**55**	26
F					
F		138.20	**Soil**	**59**	28

The LINES display does not reflect all significant comparisons. The following additional pairs are significantly different: (4,9) (4,22) (10,3) (10,7) (10,5) (10,2) (10,11) (8,5) (8,2) (8,11) (8,1) (8,29) (8,18) (8,14) (8,27) (8,31) (8,6) (8,17) (8,19) (9,3) (9,7) (9,5) (9,2) (9,11) (9,1) (9,29) (9,18) (9,14) (9,27) (9,31) (9,6) (9,17) (9,19) (13,1) (13,18) (13,27) (13,31) (13,6) (13,17) (13,19) (22,1) (22,27) (22,31) (22,6) (22,17) (22,19) (3,5) (3,2) (3,1) (3,18) (3,27) (3,31) (3,6) (3,17) (3,19) (7,5) (7,1) (7,18) (7,27) (7,31) (7,6) (7,17) (7,19) (5,6) (5,17) (5,19) (5,21) (5,30) (5,15) (5,20) (5,23) (2,6) (2,17) (2,19) (2,21) (2,30) (2,15) (2,20) (2,23) (11,21) (11,30) (11,15) (11,20) (11,23) (25,20) (1,6) (1,17) (1,21) (1,30) (1,15) (1,20) (1,23) (29,15) (29,20) (18,30) (18,15) (18,20) (6,30) (6,15) (6,20) (6,28) (17,30) (17,15) (17,20)

The GLM Procedure
metal=Copper

Class Level Information

Class	Levels	Values
source	3	NURE NonNURE Soil
WRIA	11	49 51 52 53 54 55 58 59 60 61 62

Number of Observations Read	1411
Number of Observations Used	1411

The GLM Procedure

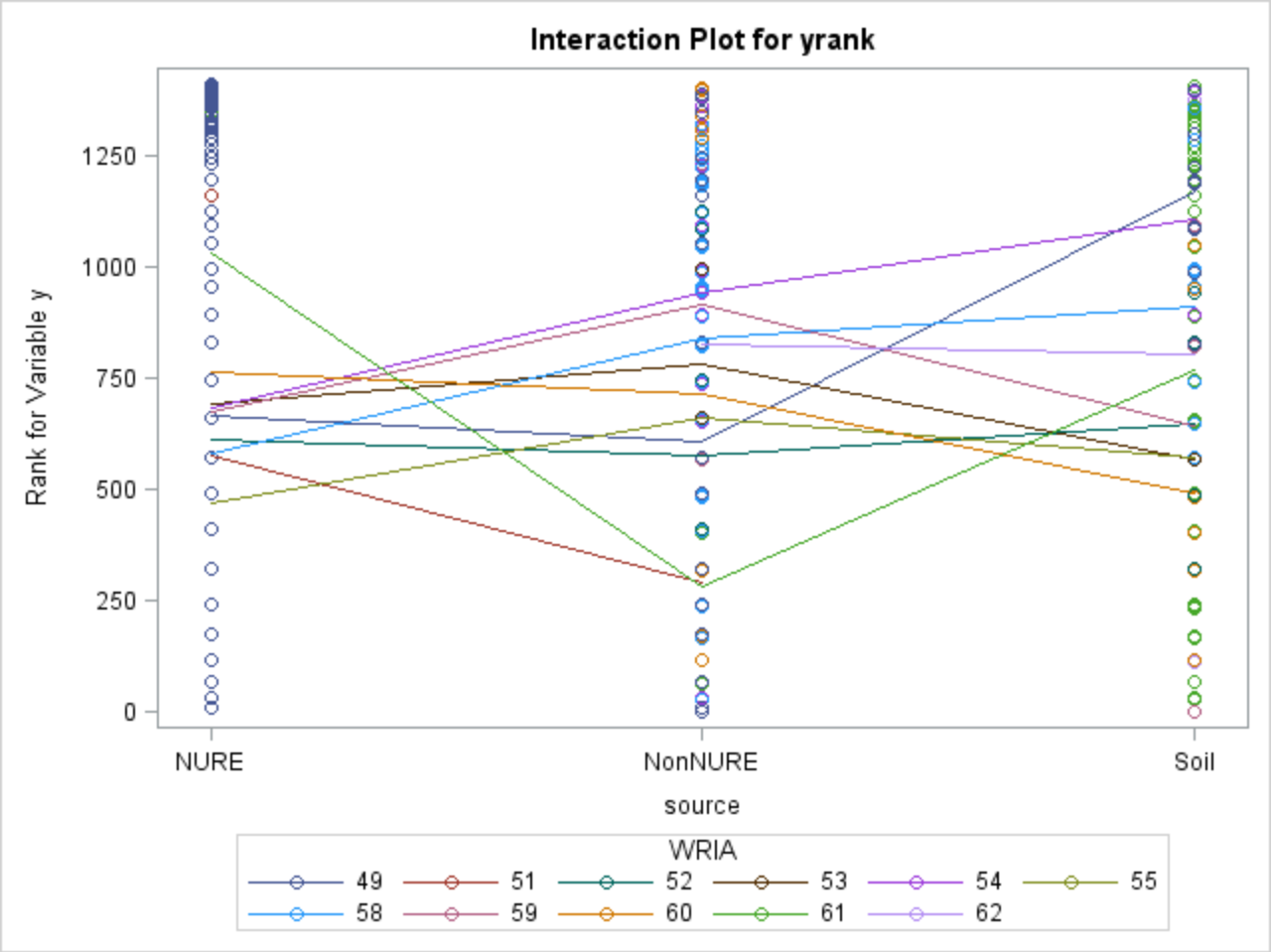
Dependent Variable: yrank Rank for Variable y
metal=Copper

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	30	21046451.4	701548.4	4.39	<.0001
Error	1380	220649230.3	159890.7		
Corrected Total	1410	241695681.7			

R-Square	Coeff Var	Root MSE	yrank Mean
0.087078	58.42082	399.8634	684.4536

Source	DF	Type I SS	Mean Square	F Value	Pr > F
WRIA	10	7350183.36	735018.34	4.60	<.0001
source	2	3520346.39	1760173.20	11.01	<.0001
source*WRIA	18	10175921.69	565328.98	3.54	<.0001

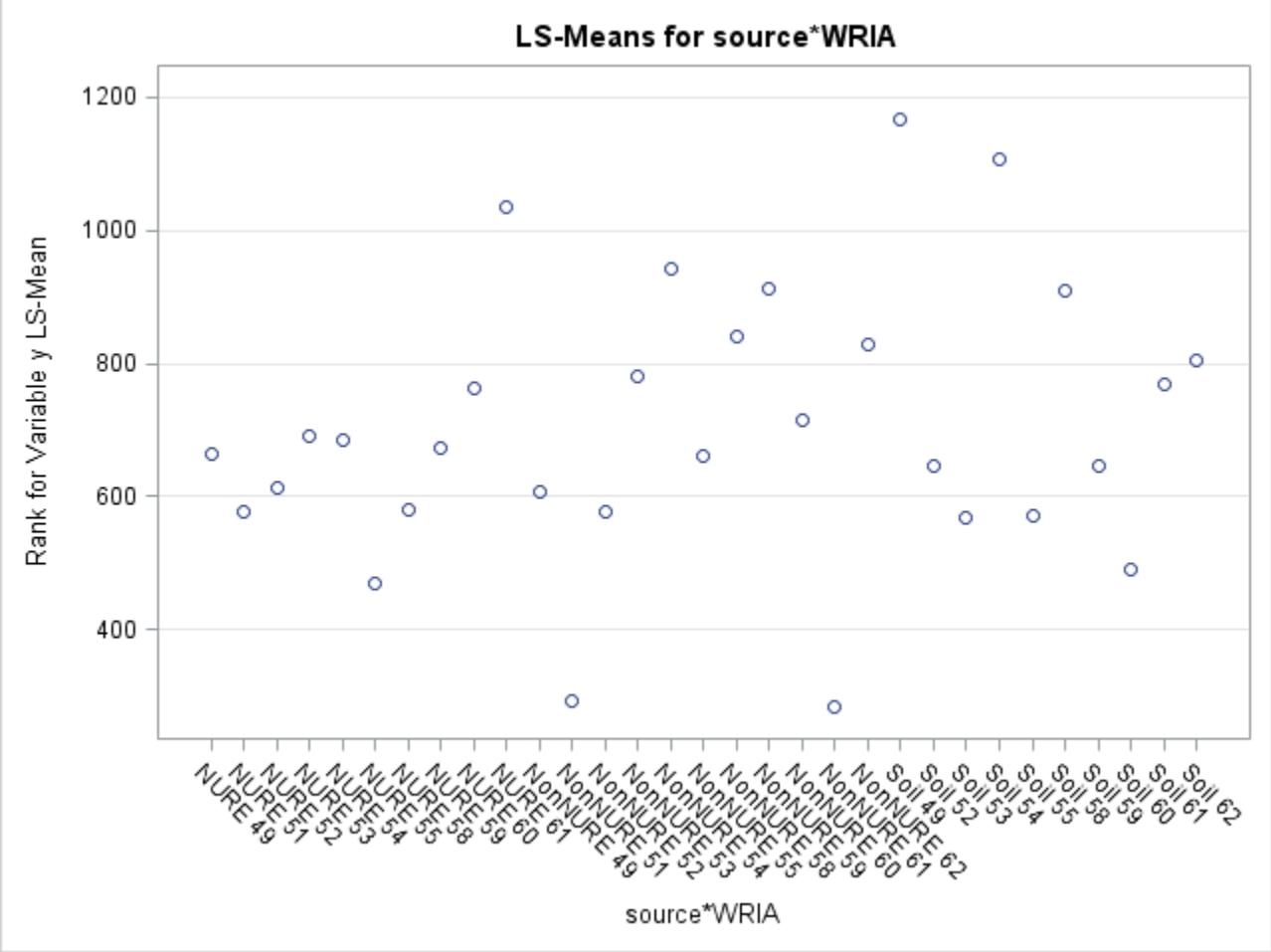
Source	DF	Type III SS	Mean Square	F Value	Pr > F
WRIA	10	3185346.15	318534.61	1.99	0.0308
source	2	155013.70	77506.85	0.48	0.6160
source*WRIA	18	10175921.69	565328.98	3.54	<.0001


Interaction Plot for yrank
Rank for Variable y
1250
1000
750
500
250
0
NURE
NonNURE
Soil
source
WRIA
49
51
52
53
54
55
58
59
60
61
62

The GLM Procedure
Least Squares Means
metal=Copper

source	WRIA	yrank	LSMEAN
NURE	**49**		664.39701
NURE	**51**		577.32500
NURE	**52**		614.29577
NURE	**53**		691.20833
NURE	**54**		684.73333
NURE	**55**		469.00000
NURE	**58**		579.94949
NURE	**59**		672.58333
NURE	**60**		763.45087
NURE	**61**		1033.66667
NonNURE	**49**		605.52632
NonNURE	**51**		292.00000
NonNURE	**52**		577.00000
NonNURE	**53**		780.16667
NonNURE	**54**		943.14583
NonNURE	**55**		661.25000
NonNURE	**58**		841.76364
NonNURE	**59**		913.75000
NonNURE	**60**		714.12500
NonNURE	**61**		282.82353
NonNURE	**62**		827.63158
Soil	**49**		1168.20000
Soil	**52**		645.75000
Soil	**53**		567.00000
Soil	**54**		1107.25000

source	WRIA	yrank LSMEAN
Soil	**55**	571.50000
Soil	**58**	909.63636
Soil	**59**	644.60000
Soil	**60**	490.42857
Soil	**61**	768.53226
Soil	**62**	805.00000



T Comparison Lines for Least Squares Means of source*WRIA

LS-means with the same letter are not significantly different.

	yrank LSMEAN	source	WRIA	LSMEAN Number
A	1168.20	**Soil**	**49**	22

T Comparison Lines for Least Squares Means of source*WRIA

LS-means with the same letter are not significantly different.

		yrank LSMEAN	source	WRIA	LSMEAN Number
	A				
	A	1107.25	**Soil**	**54**	25
	A				
	A	1033.67	**NURE**	**61**	10
	A				
	A	943.15	**NonNURE**	**54**	15
	A				
	A	913.75	**NonNURE**	**59**	18
	A				
	A	909.64	**Soil**	**58**	27
	A				
B	A	841.76	**NonNURE**	**58**	17
B	A				
B	A	827.63	**NonNURE**	**62**	21
B	A				
B	A	805.00	**Soil**	**62**	31
B	A				
B	A	780.17	**NonNURE**	**53**	14
B	A				
B	A	768.53	**Soil**	**61**	30
B	A				
B	A	763.45	**NURE**	**60**	9
B	A				
B	A	714.13	**NonNURE**	**60**	19
B	A				
B	A	691.21	**NURE**	**53**	4

T Comparison Lines for Least Squares Means of source*WRIA

LS-means with the same letter are not significantly different.

			yrank LSMEAN	source	WRIA	LSMEAN Number
B	A					
B	A		684.73	**NURE**	**54**	5
B	A					
B	A		672.58	**NURE**	**59**	8
B	A					
B	A		664.40	**NURE**	**49**	1
B	A					
B	A	C	661.25	**NonNURE**	**55**	16
B	A	C				
B	A	C	645.75	**Soil**	**52**	23
B	A	C				
B	A	C	644.60	**Soil**	**59**	28
B	A	C				
B	A	C	614.30	**NURE**	**52**	3
B	A	C				
B	A	C	605.53	**NonNURE**	**49**	11
B	A	C				
B	A	C	579.95	**NURE**	**58**	7
B	A	C				
B	A	C	577.33	**NURE**	**51**	2
B	A	C				
B	A	C	577.00	**NonNURE**	**52**	13
B	A	C				
B	A	C	571.50	**Soil**	**55**	26
B	A	C				
B	A	C	567.00	**Soil**	**53**	24

T Comparison Lines for Least Squares Means of source*WRIA

LS-means with the same letter are not significantly different.

		yrank LSMEAN	source	WRIA	LSMEAN Number
B	C				
B	C	490.43	**Soil**	**60**	29
B	C				
B	C	469.00	**NURE**	**55**	6
B	C				
B	C	292.00	**NonNURE**	**51**	12
	C				
	C	282.82	**NonNURE**	**61**	20

The LINES display does not reflect all significant comparisons. The following additional pairs are significantly different: (22,17) (22,21) (22,31) (22,30) (22,9) (22,19) (22,4) (22,5) (22,8) (22,1) (22,16) (22,23) (22,28) (22,3) (22,11) (22,7) (22,2) (22,13) (25,4) (25,5) (25,1) (25,3) (25,11) (25,7) (25,2) (25,13) (10,4) (10,5) (10,1) (10,3) (10,11) (10,7) (10,2) (10,13) (15,30) (15,9) (15,19) (15,4) (15,5) (15,8) (15,1) (15,3) (15,11) (15,7) (15,2) (15,13) (18,1) (18,3) (18,11) (18,7) (18,2) (27,1) (27,3) (27,11) (27,7) (27,2) (17,4) (17,5) (17,1) (17,3) (17,11) (17,7) (17,2) (17,29) (17,6) (21,3) (21,7) (21,2) (21,6) (31,6) (30,3) (30,7) (30,2) (30,6) (9,1) (9,3) (9,7) (9,2) (9,6) (19,6) (4,6) (5,7) (5,6) (1,6) (3,6) (3,20) (11,20) (7,20) (2,20)

The GLM Procedure
metal=Indium

Class Level Information

Class	Levels	Values
source	1	Soil
WRIA	9	49 52 53 54 55 58 59 60 62

Number of Observations Read	34
Number of Observations Used	34

The GLM Procedure

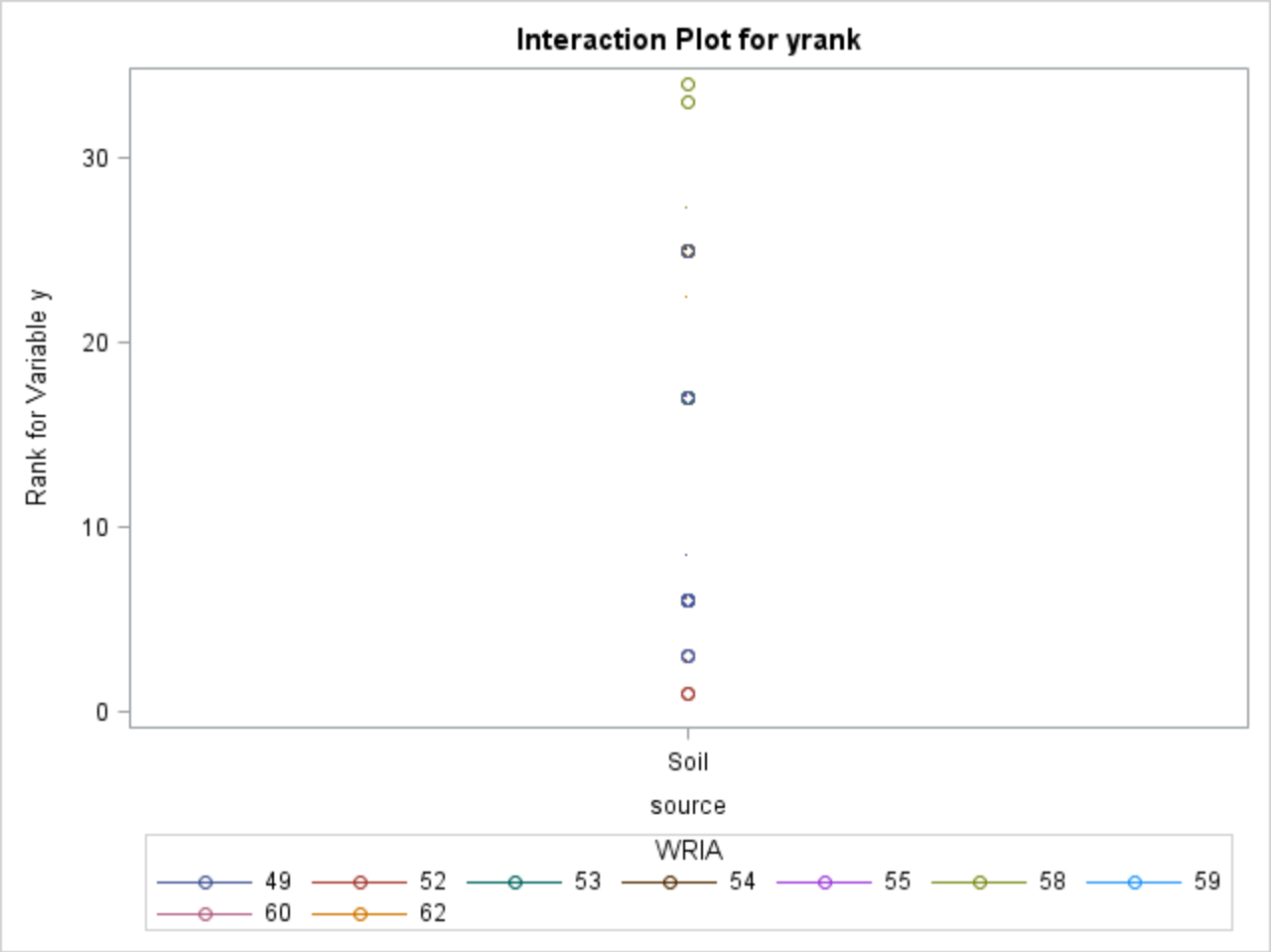
Dependent Variable: yrank Rank for Variable y
metal=Indium

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	8	2472.296078	309.037010	10.54	<.0001
Error	25	733.233333	29.329333		
Corrected Total	33	3205.529412			

R-Square	Coeff Var	Root MSE	yrank Mean
0.771260	38.36090	5.415656	14.11765

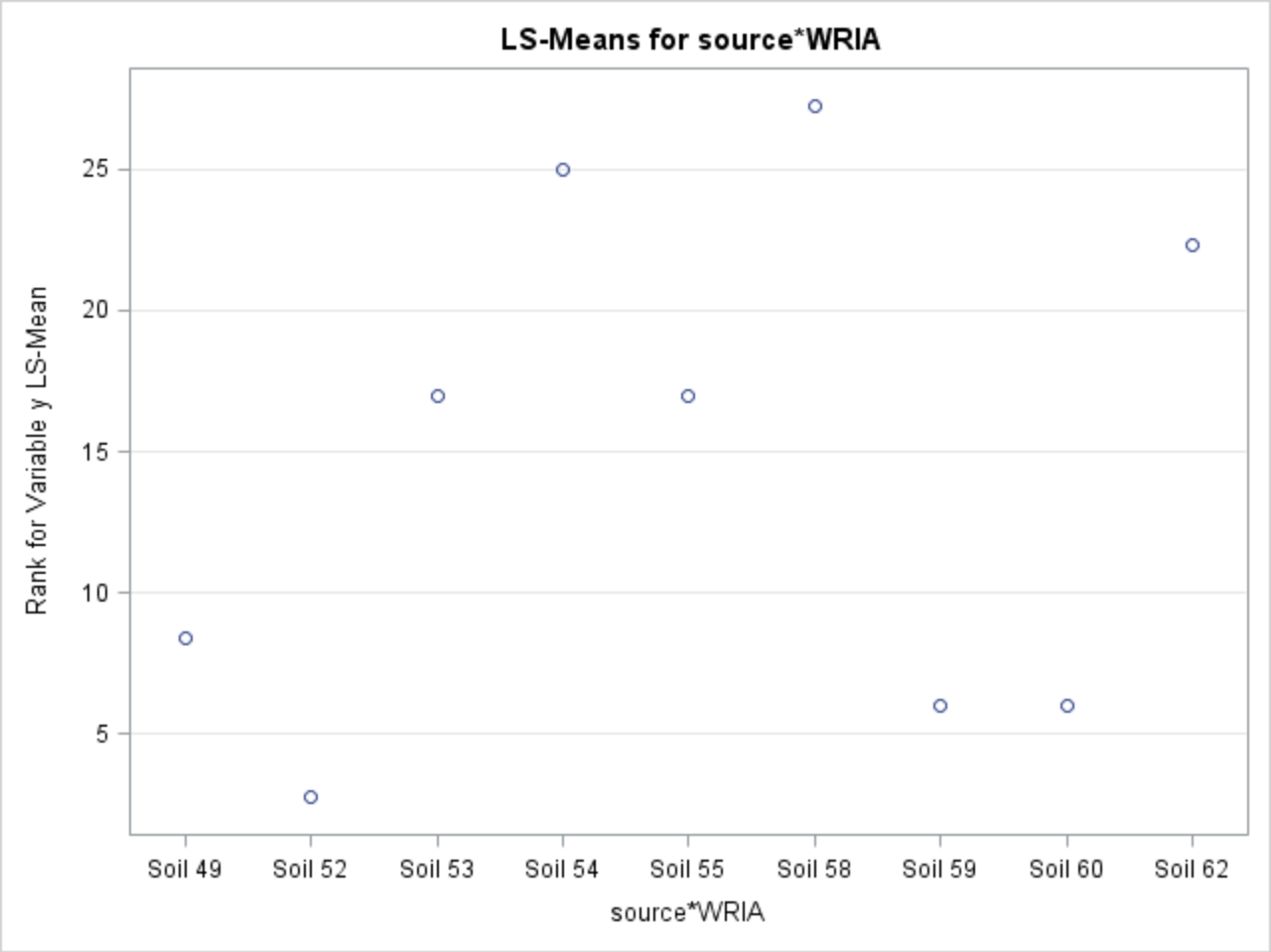
Source	DF	Type I SS	Mean Square	F Value	Pr > F
WRIA	8	2472.296078	309.037010	10.54	<.0001
source	0	0.000000	.	.	.
source*WRIA	0	0.000000	.	.	.

Source	DF	Type III SS	Mean Square	F Value	Pr > F
WRIA	8	2472.296078	309.037010	10.54	<.0001
source	0	0.000000	.	.	.
source*WRIA	0	0.000000	.	.	.


Interaction Plot for yrank
Rank for Variable y
30
20
10
0
Soil
source
WRIA
49
52
53
54
55
58
59
60
62

The GLM Procedure
Least Squares Means
metal=Indium

source	WRIA	yrank LSMEAN
Soil	**49**	8.4000000
Soil	**52**	2.7500000
Soil	**53**	17.0000000
Soil	**54**	25.0000000
Soil	**55**	17.0000000
Soil	**58**	27.2500000
Soil	**59**	6.0000000
Soil	**60**	6.0000000
Soil	**62**	22.3333333



T Comparison Lines for Least Squares Means of source*WRIA

LS-means with the same letter are not significantly different.

		yrank LSMEAN	source	WRIA	LSMEAN Number
	A	27.25000	**Soil**	**58**	6
	A				
B	A	25.00000	**Soil**	**54**	4
B	A				
B	A	22.33333	**Soil**	**62**	9
B					
B	C	17.00000	**Soil**	**53**	3
B	C				
B	C	17.00000	**Soil**	**55**	5

T Comparison Lines for Least Squares Means of source*WRIA

LS-means with the same letter are not significantly different.

		yrank LSMEAN	source	WRIA	LSMEAN Number
	C				
D	C	8.40000	**Soil**	**49**	1
D	C				
D	C	6.00000	**Soil**	**60**	8
D	C				
D	C	6.00000	**Soil**	**59**	7
D					
D		2.75000	**Soil**	**52**	2

The GLM Procedure
metal=Iron

Class Level Information

Class	Levels	Values
source	3	NURE NonNURE Soil
WRIA	11	49 51 52 53 54 55 58 59 60 61 62

Number of Observations Read	4289
Number of Observations Used	4289

The GLM Procedure

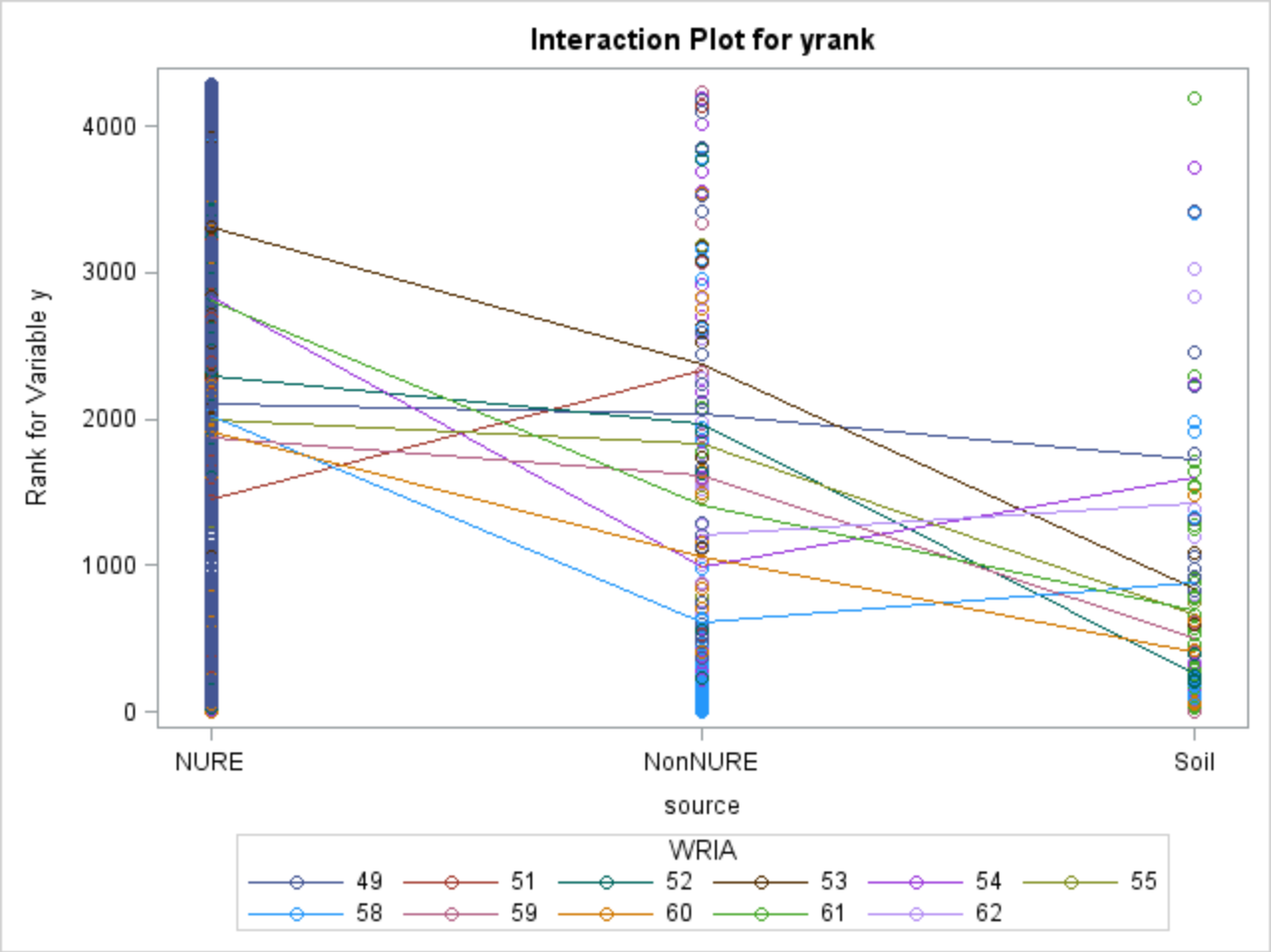
Dependent Variable: yrank Rank for Variable y
metal=Iron

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	30	1195971689	39865723	31.53	<.0001
Error	4258	5384147068	1264478		
Corrected Total	4288	6580118757			

R-Square	Coeff Var	Root MSE	yrank Mean
0.181755	52.51632	1124.490	2141.220

Source	DF	Type I SS	Mean Square	F Value	Pr > F
WRIA	10	696028811.7	69602881.2	55.04	<.0001
source	2	396423655.8	198211827.9	156.75	<.0001
source*WRIA	18	103519221.6	5751067.9	4.55	<.0001

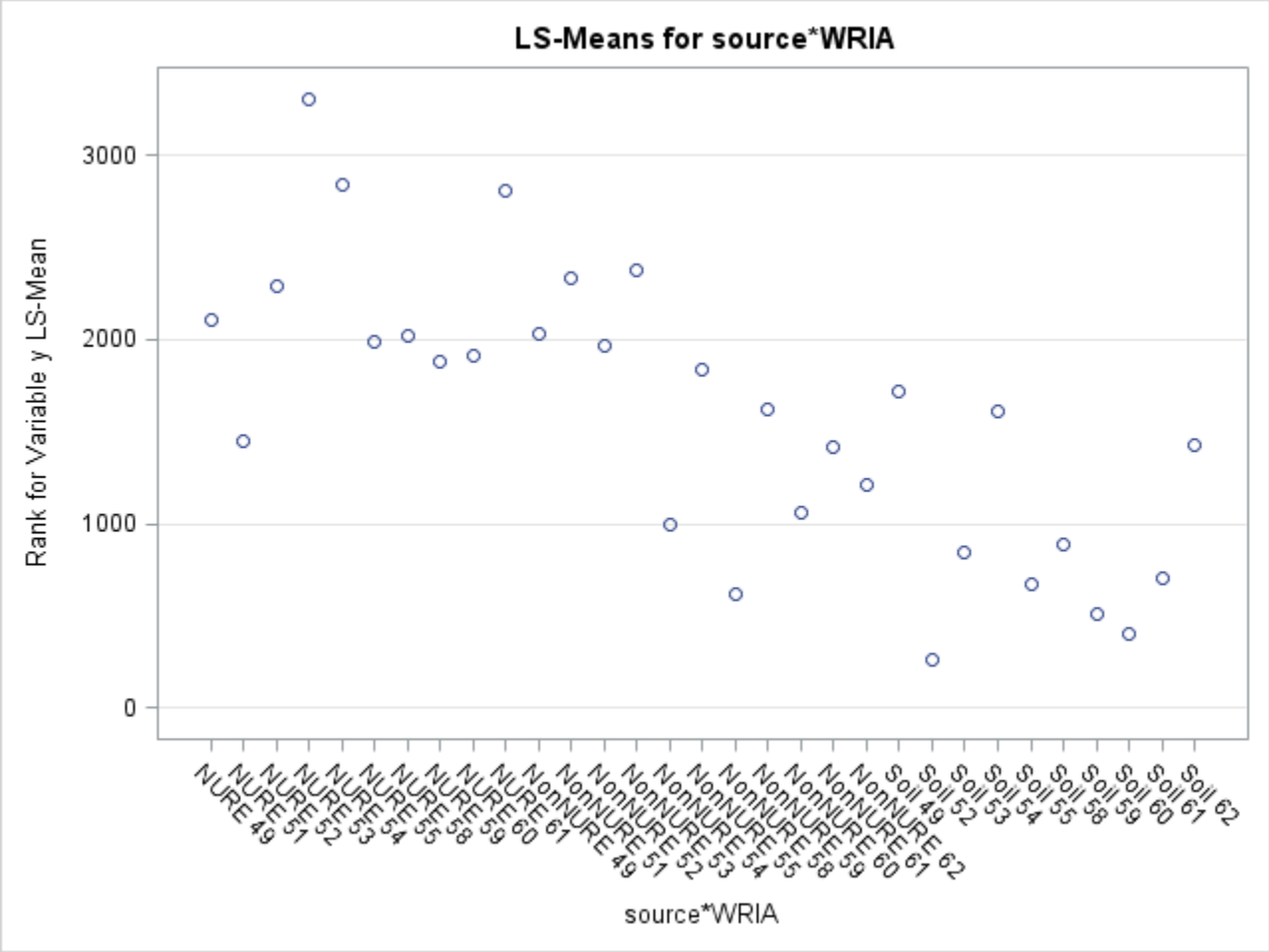
Source	DF	Type III SS	Mean Square	F Value	Pr > F
WRIA	10	38339610.0	3833961.0	3.03	0.0008
source	2	90343259.3	45171629.7	35.72	<.0001
source*WRIA	18	103519221.6	5751067.9	4.55	<.0001


Interaction Plot for yrank
Rank for Variable y
4000
3000
2000
1000
0
NURE
NonNURE
Soil
source
WRIA
49
51
52
53
54
55
58
59
60
61
62

The GLM Procedure
Least Squares Means
metal=Iron

source	WRIA	yrank LSMEAN
NURE	**49**	2109.52239
NURE	**51**	1448.00000
NURE	**52**	2291.44094
NURE	**53**	3306.86722
NURE	**54**	2842.19753
NURE	**55**	1993.40719
NURE	**58**	2024.14433
NURE	**59**	1877.80488
NURE	**60**	1908.52518
NURE	**61**	2814.70093
NonNURE	**49**	2030.57895
NonNURE	**51**	2336.50000
NonNURE	**52**	1968.75000
NonNURE	**53**	2378.33333
NonNURE	**54**	995.18750
NonNURE	**55**	1838.00000
NonNURE	**58**	613.34545
NonNURE	**59**	1620.75000
NonNURE	**60**	1061.18750
NonNURE	**61**	1415.40000
NonNURE	**62**	1209.00000
Soil	**49**	1721.20000
Soil	**52**	267.00000
Soil	**53**	840.00000
Soil	**54**	1609.75000

source	WRIA	yrank LSMEAN
Soil	**55**	673.50000
Soil	**58**	889.81818
Soil	**59**	510.40000
Soil	**60**	406.57143
Soil	**61**	701.10000
Soil	**62**	1425.09091



T Comparison Lines for Least Squares Means of source*WRIA

LS-means with the same letter are not significantly different.

	yrank LSMEAN	source	WRIA	LSMEAN Number
A	3306.87	**NURE**	**53**	4

T Comparison Lines for Least Squares Means of source*WRIA

LS-means with the same letter are not significantly different.

				yrank	LSMEAN	source	WRIA	LSMEAN Number
		A						
B		A			2842.20	**NURE**	**54**	5
B		A						
B		A			2814.70	**NURE**	**61**	10
B		A						
B		A	C		2378.33	**NonNURE**	**53**	14
B		A	C					
B	D	A	C		2336.50	**NonNURE**	**51**	12
B	D		C					
B	D		C		2291.44	**NURE**	**52**	3
B	D		C					
B	D		C		2109.52	**NURE**	**49**	1
B	D		C					
B	D		C		2030.58	**NonNURE**	**49**	11
B	D		C					
B	D		C		2024.14	**NURE**	**58**	7
B	D		C					
B	D		C		1993.41	**NURE**	**55**	6
B	D		C					
B	D		C		1968.75	**NonNURE**	**52**	13
B	D		C					
B	D		C		1908.53	**NURE**	**60**	9
B	D		C					
B	D		C		1877.80	**NURE**	**59**	8
B	D		C					
B	D		C		1838.00	**NonNURE**	**55**	16

T Comparison Lines for Least Squares Means of source*WRIA

LS-means with the same letter are not significantly different.

			yrank LSMEAN	source	WRIA	LSMEAN Number
D		C				
D		C	1721.20	**Soil**	**49**	22
D		C				
D		C	1620.75	**NonNURE**	**59**	18
D		C				
D	E	C	1609.75	**Soil**	**54**	25
D	E	C				
D	E	C	1448.00	**NURE**	**51**	2
D	E	C				
D	E	C	1425.09	**Soil**	**62**	31
D	E	C				
D	E	C	1415.40	**NonNURE**	**61**	20
D	E	C				
D	E	C	1209.00	**NonNURE**	**62**	21
D	E	C				
D	E	C	1061.19	**NonNURE**	**60**	19
D	E	C				
D	E	C	995.19	**NonNURE**	**54**	15
D	E	C				
D	E	C	889.82	**Soil**	**58**	27
D	E	C				
D	E	C	840.00	**Soil**	**53**	24
D	E	C				
D	E	C	701.10	**Soil**	**61**	30
D	E	C				
D	E	C	673.50	**Soil**	**55**	26

T Comparison Lines for Least Squares Means of source*WRIA

LS-means with the same letter are not significantly different.

		yrank LSMEAN	source	WRIA	LSMEAN Number
D	E				
D	E	613.35	**NonNURE**	**58**	17
D	E				
D	E	510.40	**Soil**	**59**	28
	E				
	E	406.57	**Soil**	**60**	29
	E				
	E	267.00	**Soil**	**52**	23

The LINES display does not reflect all significant comparisons. The following additional pairs are significantly different: (4,5) (4,10) (4,14) (5,3) (5,1) (5,11) (5,7) (5,6) (5,13) (5,9) (5,8) (10,3) (10,1) (10,11) (10,7) (10,6) (10,13) (10,9) (10,8) (14,21) (14,19) (14,15) (14,27) (14,30) (12,30) (12,17) (3,1) (3,7) (3,6) (3,9) (3,8) (3,18) (3,2) (3,31) (3,21) (3,19) (3,15) (3,27) (3,30) (3,26) (3,17) (3,28) (1,9) (1,2) (1,31) (1,21) (1,19) (1,15) (1,27) (1,30) (1,17) (1,28) (11,21) (11,19) (11,15) (11,27) (11,30) (11,17) (11,28) (7,9) (7,2) (7,21) (7,19) (7,15) (7,27) (7,30) (7,17) (7,28) (6,2) (6,21) (6,19) (6,15) (6,27) (6,30) (6,17) (6,28) (13,15) (13,27) (13,30) (13,17) (13,28) (9,2) (9,21) (9,19) (9,15) (9,27) (9,30) (9,17) (9,28) (8,2) (8,21) (8,19) (8,15) (8,27) (8,30) (8,17) (8,28) (16,17) (22,30) (22,17) (22,28) (18,30) (18,17) (2,30) (2,17) (2,29) (2,23) (31,17) (21,17)

The GLM Procedure
metal=Lead

Class Level Information

Class	Levels	Values
source	3	NURE NonNURE Soil
WRIA	11	49 51 52 53 54 55 58 59 60 61 62

Number of Observations Read	1486
Number of Observations Used	1486

The GLM Procedure

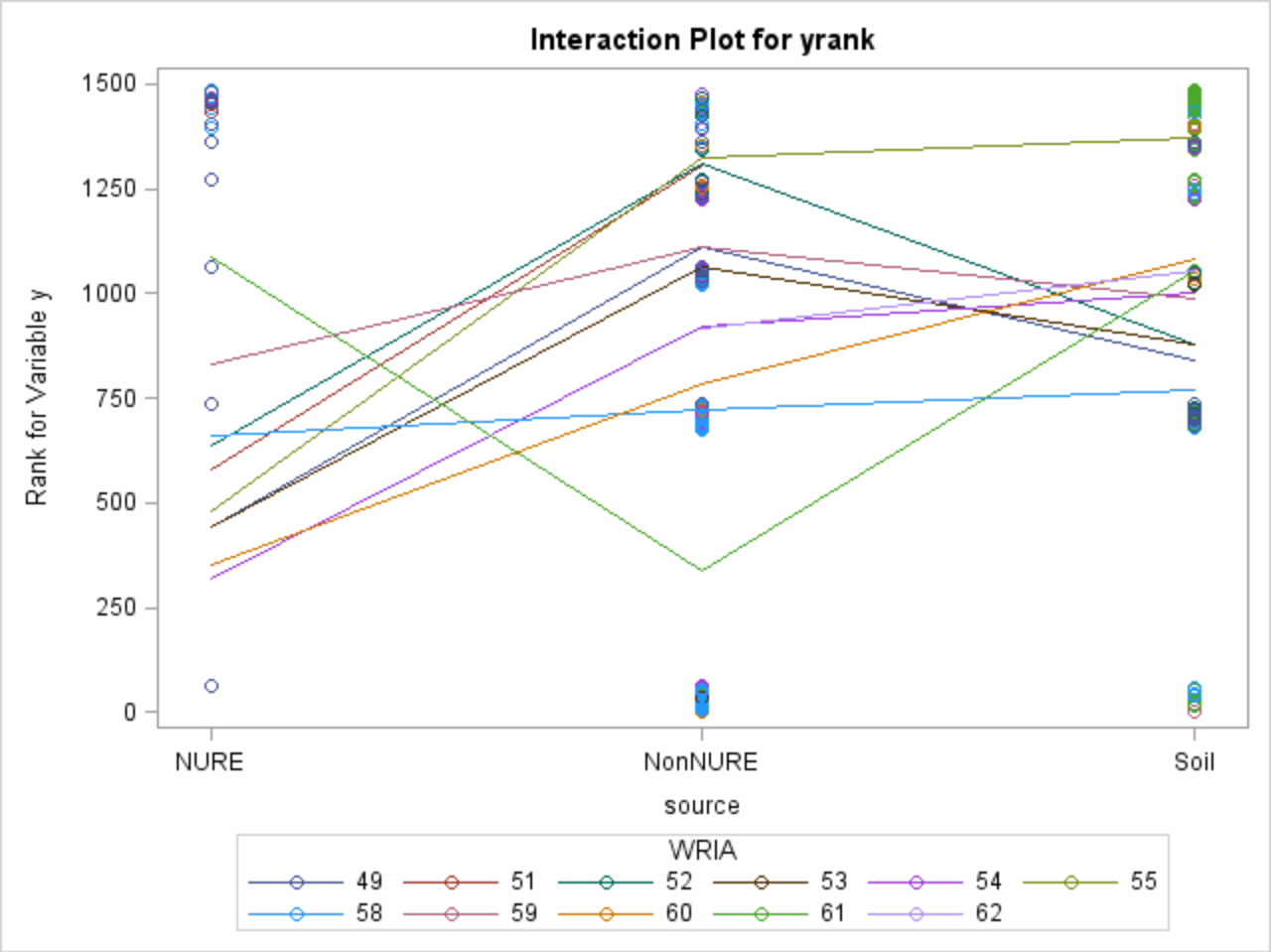
Dependent Variable: yrank Rank for Variable y
metal=Lead

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	30	81089001.2	2702966.7	12.65	<.0001
Error	1455	311017327.5	213757.6		
Corrected Total	1485	392106328.7			

R-Square	Coeff Var	Root MSE	yrank Mean
0.206804	79.75198	462.3393	579.7214

Source	DF	Type I SS	Mean Square	F Value	Pr > F
WRIA	10	32900623.12	3290062.31	15.39	<.0001
source	2	29220020.96	14610010.48	68.35	<.0001
source*WRIA	18	18968357.12	1053797.62	4.93	<.0001

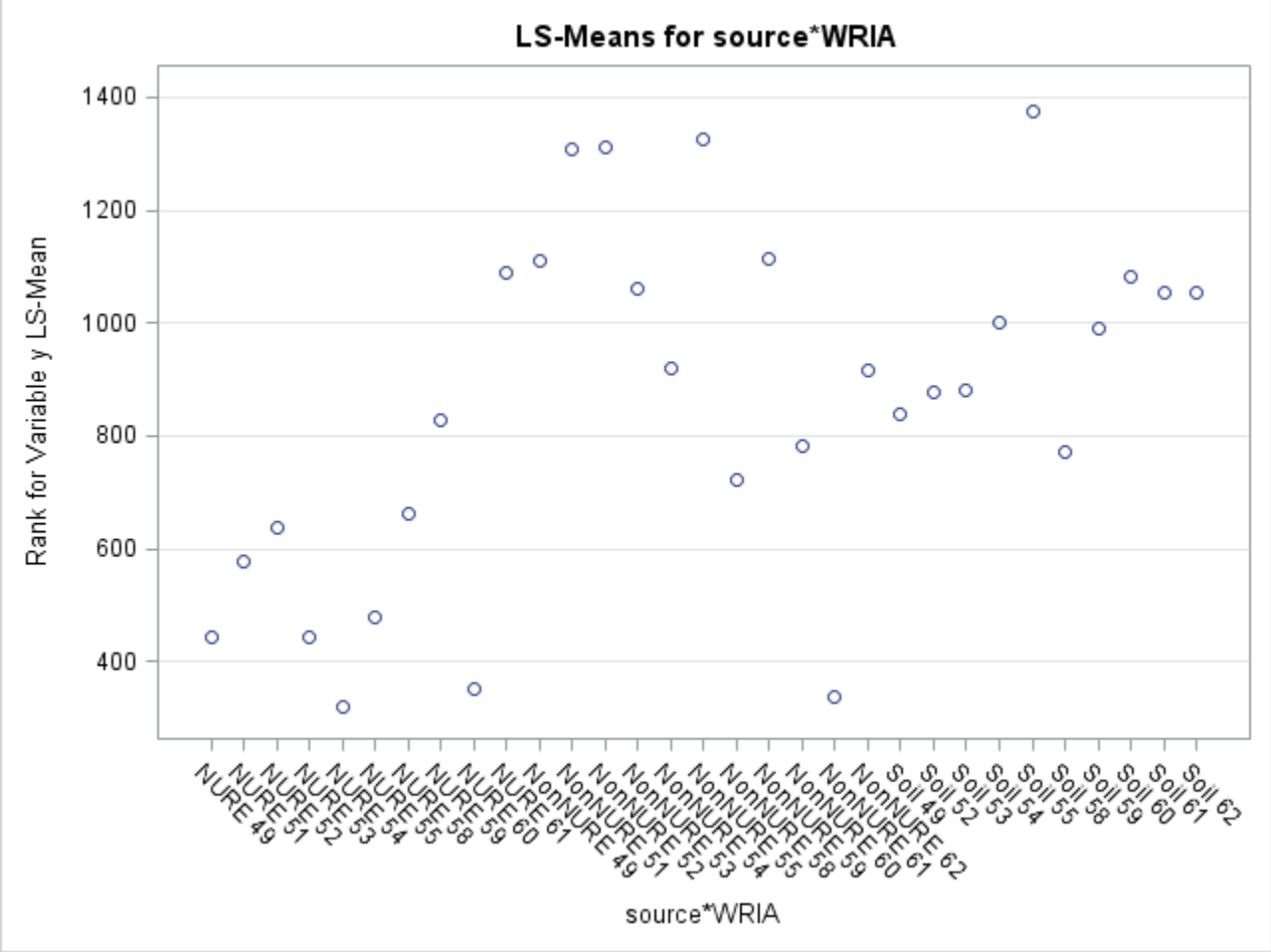
Source	DF	Type III SS	Mean Square	F Value	Pr > F
WRIA	10	3233478.26	323347.83	1.51	0.1288
source	2	13158598.64	6579299.32	30.78	<.0001
source*WRIA	18	18968357.12	1053797.62	4.93	<.0001


Interaction Plot for yrank
Rank for Variable y
1500
1250
1000
750
500
250
0
NURE
NonNURE
Soil
source
WRIA
49
51
52
53
54
55
58
59
60
61
62

The GLM Procedure
Least Squares Means
metal=Lead

source	WRIA	yrank	LSMEAN
NURE	**49**		443.19277
NURE	**51**		578.62500
NURE	**52**		635.74074
NURE	**53**		443.75000
NURE	**54**		318.97778
NURE	**55**		479.60811
NURE	**58**		660.64103
NURE	**59**		828.76923
NURE	**60**		351.57803
NURE	**61**		1089.33333
NonNURE	**49**		1109.63158
NonNURE	**51**		1306.50000
NonNURE	**52**		1311.00000
NonNURE	**53**		1062.00000
NonNURE	**54**		919.89583
NonNURE	**55**		1326.25000
NonNURE	**58**		723.90741
NonNURE	**59**		1112.66667
NonNURE	**60**		783.75000
NonNURE	**61**		339.23529
NonNURE	**62**		916.36842
Soil	**49**		839.00000
Soil	**52**		878.50000
Soil	**53**		879.50000
Soil	**54**		1002.00000

source	WRIA	yrank LSMEAN
Soil	**55**	1374.00000
Soil	**58**	771.36364
Soil	**59**	989.20000
Soil	**60**	1082.28571
Soil	**61**	1052.95161
Soil	**62**	1055.36364



T Comparison Lines for Least Squares Means of source*WRIA

LS-means with the same letter are not significantly different.

	yrank LSMEAN	source	WRIA	LSMEAN Number
A	1374.00	**Soil**	**55**	26

T Comparison Lines for Least Squares Means of source*WRIA

LS-means with the same letter are not significantly different.

		yrank LSMEAN	source	WRIA	LSMEAN Number
	A				
	A	1326.25	**NonNURE**	**55**	16
	A				
	A	1311.00	**NonNURE**	**52**	13
	A				
	A	1306.50	**NonNURE**	**51**	12
	A				
	A	1112.67	**NonNURE**	**59**	18
	A				
	A	1109.63	**NonNURE**	**49**	11
	A				
	A	1089.33	**NURE**	**61**	10
	A				
	A	1082.29	**Soil**	**60**	29
	A				
	A	1062.00	**NonNURE**	**53**	14
	A				
	A	1055.36	**Soil**	**62**	31
	A				
	A	1052.95	**Soil**	**61**	30
	A				
B	A	1002.00	**Soil**	**54**	25
B	A				
B	A	989.20	**Soil**	**59**	28
B	A				
B	A	919.90	**NonNURE**	**54**	15

T Comparison Lines for Least Squares Means of source*WRIA

LS-means with the same letter are not significantly different.

			yrank	LSMEAN	source	WRIA	LSMEAN Number
B	A						
B	A			916.37	**NonNURE**	**62**	21
B	A						
B	A	C		879.50	**Soil**	**53**	24
B	A	C					
B	A	C		878.50	**Soil**	**52**	23
B	A	C					
B	A	C		839.00	**Soil**	**49**	22
B	A	C					
B	A	C		828.77	**NURE**	**59**	8
B	A	C					
B	A	C		783.75	**NonNURE**	**60**	19
B	A	C					
B	A	C		771.36	**Soil**	**58**	27
B	A	C					
B	A	C		723.91	**NonNURE**	**58**	17
B		C					
B		C		660.64	**NURE**	**58**	7
B		C					
B		C		635.74	**NURE**	**52**	3
B		C					
B		C		578.63	**NURE**	**51**	2
		C					
		C		479.61	**NURE**	**55**	6
		C					
		C		443.75	**NURE**	**53**	4

T Comparison Lines for Least Squares Means of source*WRIA

LS-means with the same letter are not significantly different.

	yrank LSMEAN	source	WRIA	LSMEAN Number
C				
C	443.19	**NURE**	**49**	1
C				
C	351.58	**NURE**	**60**	9
C				
C	339.24	**NonNURE**	**61**	20
C				
C	318.98	**NURE**	**54**	5

The LINES display does not reflect all significant comparisons. The following additional pairs are significantly different: (16,19) (16,27) (16,17) (13,15) (13,21) (13,22) (13,8) (13,19) (13,27) (13,17) (18,17) (11,19) (11,17) (31,17) (30,19) (30,17) (15,17) (15,7) (15,3) (15,2) (21,7) (21,3) (21,2) (23,9) (23,20) (23,5) (22,6) (22,4) (22,1) (22,9) (22,20) (22,5) (8,6) (8,4) (8,1) (8,9) (8,20) (8,5) (19,6) (19,4) (19,1) (19,9) (19,20) (19,5) (27,4) (27,1) (27,9) (27,20) (27,5) (17,6) (17,4) (17,1) (17,9) (17,20) (17,5) (7,6) (7,4) (7,1) (7,9) (7,20) (7,5) (3,6) (3,4) (3,1) (3,9) (3,20) (3,5) (2,9) (2,5) (6,9) (6,5) (1,9) (1,5)

The GLM Procedure
metal=Manganese

Class Level Information

Class	Levels	Values
source	3	NURE NonNURE Soil
WRIA	11	49 51 52 53 54 55 58 59 60 61 62

Number of Observations Read	4341
Number of Observations Used	4341

The GLM Procedure

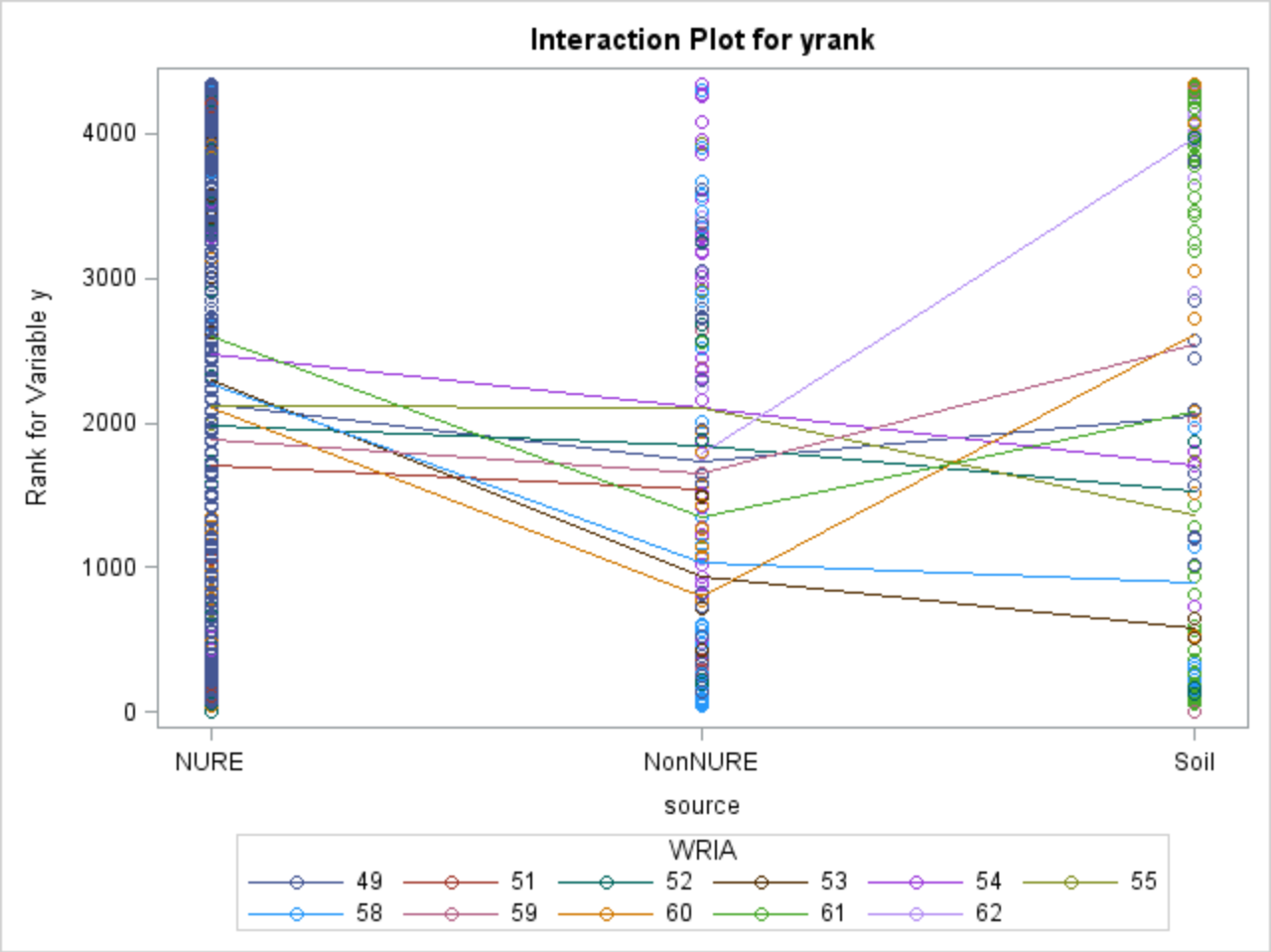
Dependent Variable: yrank Rank for Variable y
metal=Manganese

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	30	311819782	10393993	6.87	<.0001
Error	4310	6516752083	1512007		
Corrected Total	4340	6828571865			

R-Square	Coeff Var	Root MSE	yrank Mean
0.045664	56.94893	1229.637	2159.193

Source	DF	Type I SS	Mean Square	F Value	Pr > F
WRIA	10	106362989.7	10636299.0	7.03	<.0001
source	2	120927184.8	60463592.4	39.99	<.0001
source*WRIA	18	84529607.7	4696089.3	3.11	<.0001

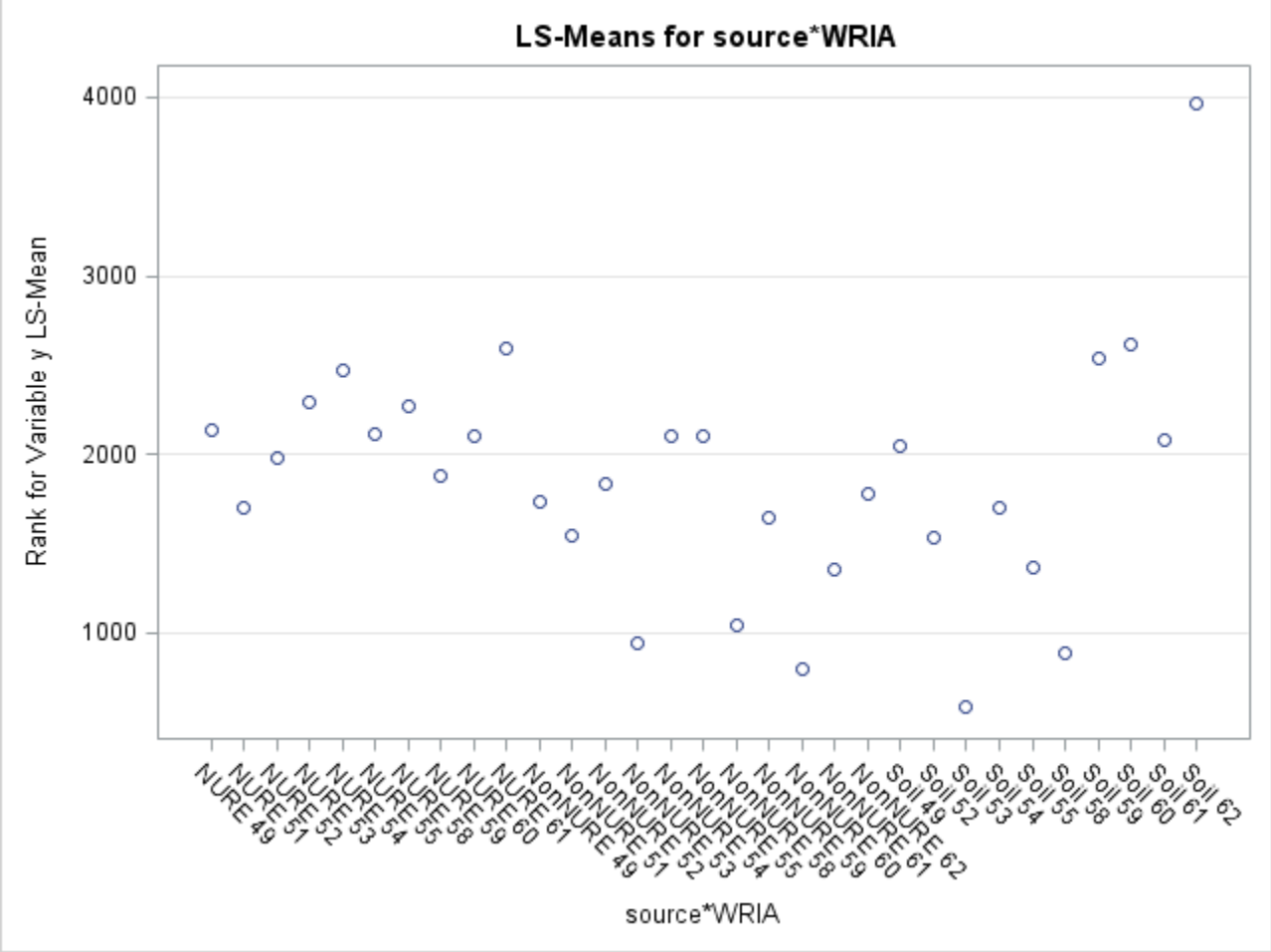
Source	DF	Type III SS	Mean Square	F Value	Pr > F
WRIA	10	62588861.76	6258886.18	4.14	<.0001
source	2	38203234.91	19101617.45	12.63	<.0001
source*WRIA	18	84529607.69	4696089.32	3.11	<.0001


Interaction Plot for yrank
Rank for Variable y
4000
3000
2000
1000
0
NURE
NonNURE
Soil
source
WRIA
49
51
52
53
54
55
58
59
60
61
62

The GLM Procedure
Least Squares Means
metal=Manganese

source	WRIA	yrank LSMEAN
NURE	**49**	2130.60896
NURE	**51**	1698.25000
NURE	**52**	1979.32115
NURE	**53**	2293.45378
NURE	**54**	2473.02792
NURE	**55**	2110.79882
NURE	**58**	2274.56332
NURE	**59**	1881.00000
NURE	**60**	2098.69979
NURE	**61**	2597.84071
NonNURE	**49**	1738.78947
NonNURE	**51**	1541.50000
NonNURE	**52**	1838.75000
NonNURE	**53**	938.00000
NonNURE	**54**	2097.45833
NonNURE	**55**	2099.75000
NonNURE	**58**	1037.90909
NonNURE	**59**	1644.33333
NonNURE	**60**	800.18750
NonNURE	**61**	1351.80000
NonNURE	**62**	1782.78947
Soil	**49**	2041.90000
Soil	**52**	1531.25000
Soil	**53**	581.50000
Soil	**54**	1703.00000

source	WRIA	yrank LSMEAN
Soil	**55**	1364.50000
Soil	**58**	890.45455
Soil	**59**	2535.60000
Soil	**60**	2612.00000
Soil	**61**	2079.50000
Soil	**62**	3970.18182



T Comparison Lines for Least Squares Means of source*WRIA

LS-means with the same letter are not significantly different.

	yrank LSMEAN	source	WRIA	LSMEAN Number
A	3970.18	**Soil**	**62**	31

T Comparison Lines for Least Squares Means of source*WRIA

LS-means with the same letter are not significantly different.

		yrank LSMEAN	source	WRIA	LSMEAN Number
	B	2612.00	**Soil**	**60**	29
	B				
	B	2597.84	**NURE**	**61**	10
	B				
C	B	2535.60	**Soil**	**59**	28
C	B				
C	B	2473.03	**NURE**	**54**	5
C	B				
C	B	2293.45	**NURE**	**53**	4
C	B				
C	B	2274.56	**NURE**	**58**	7
C	B				
C	B	2130.61	**NURE**	**49**	1
C	B				
C	B	2110.80	**NURE**	**55**	6
C	B				
C	B	2099.75	**NonNURE**	**55**	16
C	B				
C	B	2098.70	**NURE**	**60**	9
C	B				
C	B	2097.46	**NonNURE**	**54**	15
C	B				
C	B	2079.50	**Soil**	**61**	30
C	B				
C	B	2041.90	**Soil**	**49**	22

T Comparison Lines for Least Squares Means of source*WRIA

LS-means with the same letter are not significantly different.

		yrank LSMEAN	source	WRIA	LSMEAN Number
C	B				
C	B	1979.32	**NURE**	**52**	3
C	B				
C	B	1881.00	**NURE**	**59**	8
C	B				
C	B	1838.75	**NonNURE**	**52**	13
C	B				
C	B	1782.79	**NonNURE**	**62**	21
C	B				
C	B	1738.79	**NonNURE**	**49**	11
C	B				
C	B	1703.00	**Soil**	**54**	25
C	B				
C	B	1698.25	**NURE**	**51**	2
C	B				
C	B	1644.33	**NonNURE**	**59**	18
C	B				
C	B	1541.50	**NonNURE**	**51**	12
C	B				
C	B	1531.25	**Soil**	**52**	23
C	B				
C	B	1364.50	**Soil**	**55**	26
C	B				
C	B	1351.80	**NonNURE**	**61**	20
C					
C		1037.91	**NonNURE**	**58**	17

T Comparison Lines for Least Squares Means of source*WRIA

LS-means with the same letter are not significantly different.

	yrank LSMEAN	source	WRIA	LSMEAN Number
C				
C	938.00	**NonNURE**	**53**	14
C				
C	890.45	**Soil**	**58**	27
C				
C	800.19	**NonNURE**	**60**	19
C				
C	581.50	**Soil**	**53**	24

The LINES display does not reflect all significant comparisons. The following additional pairs are significantly different: (10,4) (10,7) (10,1) (10,6) (10,9) (10,15) (10,30) (10,3) (10,8) (10,21) (10,11) (10,2) (10,18) (10,20) (28,17) (28,14) (28,27) (28,19) (5,7) (5,1) (5,6) (5,9) (5,15) (5,30) (5,3) (5,8) (5,21) (5,11) (5,2) (5,18) (5,20) (5,17) (5,14) (5,27) (5,19) (5,24) (4,9) (4,3) (4,8) (4,2) (4,17) (4,14) (4,27) (4,19) (4,24) (7,9) (7,3) (7,8) (7,2) (7,17) (7,14) (7,27) (7,19) (1,2) (1,17) (1,14) (1,27) (1,19) (6,17) (6,14) (6,27) (6,19) (9,2) (9,17) (9,14) (9,27) (9,19) (15,17) (15,14) (15,27) (15,19) (30,17) (30,14) (30,27) (30,19) (22,17) (22,27) (22,19) (3,17) (3,14) (3,27) (3,19) (8,17) (8,27) (8,19) (21,17) (21,19) (11,17) (11,19) (2,17) (2,19)

The GLM Procedure
metal=Mercury

Class Level Information

Class	Levels	Values
source	2	NonNURE Soil
WRIA	11	49 51 52 53 54 55 58 59 60 61 62

Number of Observations Read	208
Number of Observations Used	208

The GLM Procedure

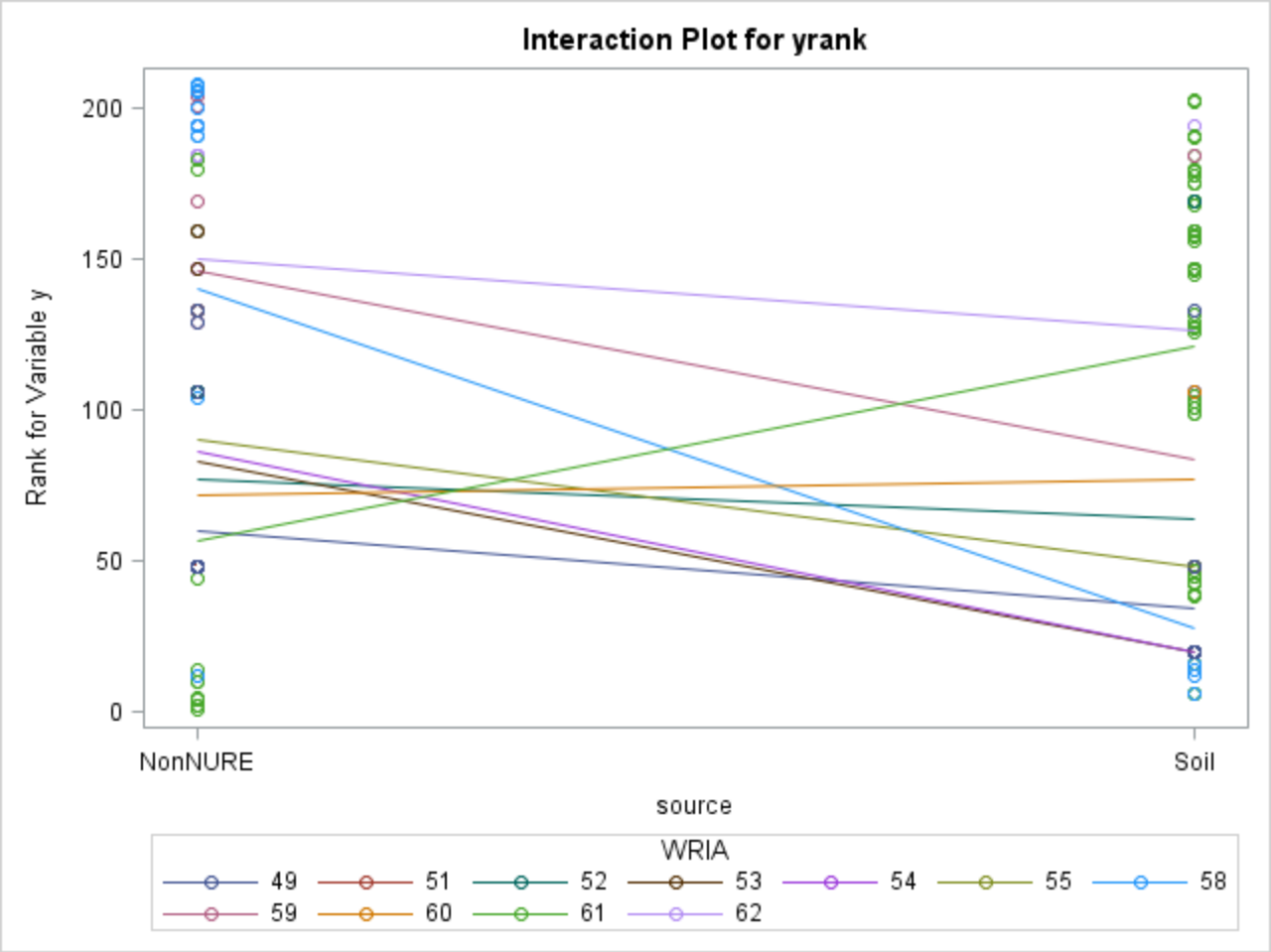
Dependent Variable: yrank Rank for Variable y
metal=Mercury

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	20	318573.5560	15928.6778	5.72	<.0001
Error	187	520413.8623	2782.9618		
Corrected Total	207	838987.4183			

R-Square	Coeff Var	Root MSE	yrank Mean
0.379712	55.13686	52.75378	95.67788

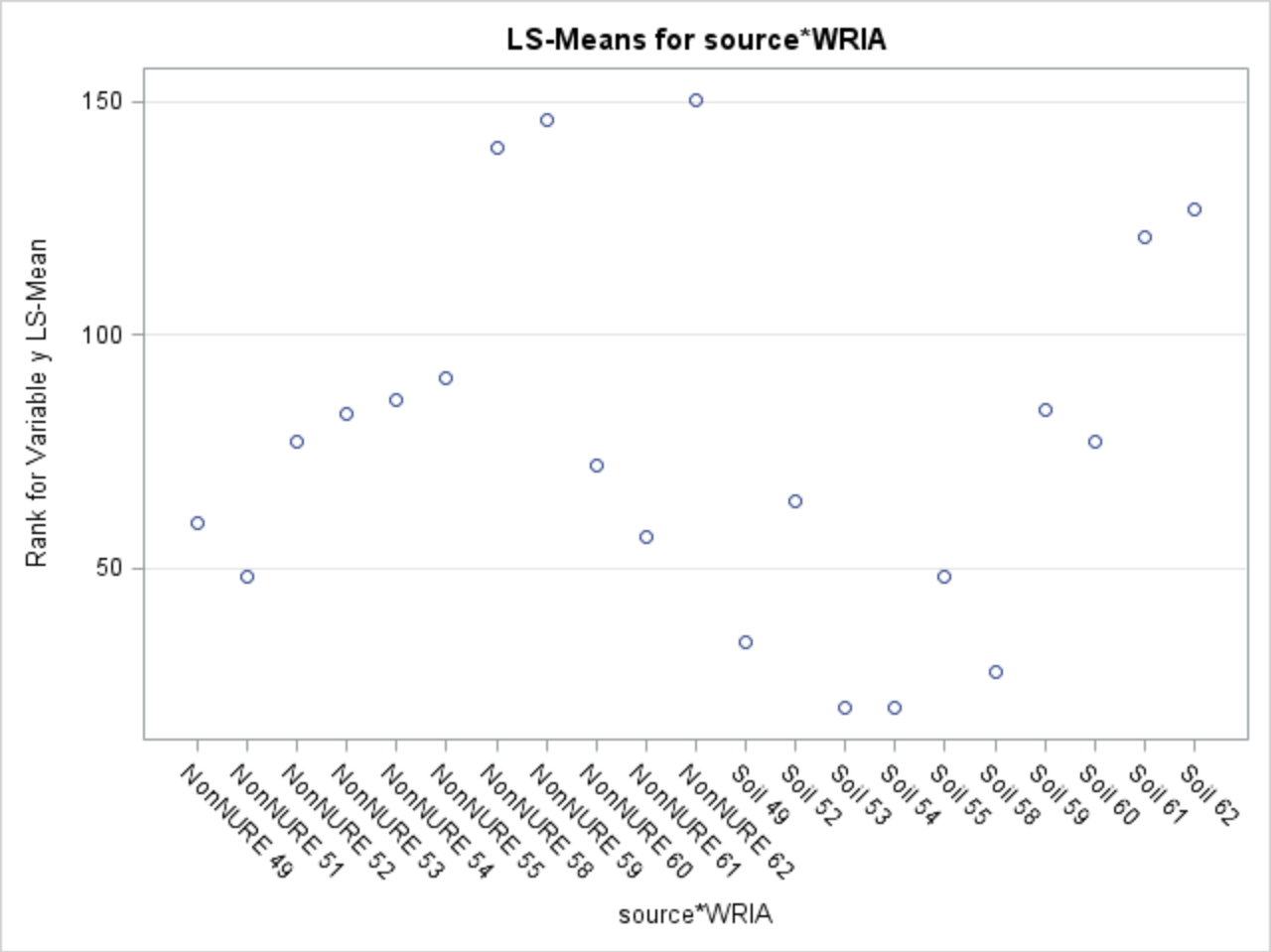
Source	DF	Type I SS	Mean Square	F Value	Pr > F
WRIA	10	155694.2620	15569.4262	5.59	<.0001
source	1	13691.9465	13691.9465	4.92	0.0278
source*WRIA	9	149187.3476	16576.3720	5.96	<.0001

Source	DF	Type III SS	Mean Square	F Value	Pr > F
WRIA	10	113729.8171	11372.9817	4.09	<.0001
source	1	27721.5295	27721.5295	9.96	0.0019
source*WRIA	9	149187.3476	16576.3720	5.96	<.0001


Interaction Plot for yrank
Rank for Variable y
200
150
100
50
0
NonNURE
Soil
source
WRIA
49
51
52
53
54
55
58
59
60
61
62

The GLM Procedure
Least Squares Means
metal=Mercury

source	WRIA	yrank	LSMEAN
NonNURE	**49**		59.789474
NonNURE	**51**		48.000000
NonNURE	**52**		77.000000
NonNURE	**53**		83.000000
NonNURE	**54**		86.222222
NonNURE	**55**		90.500000
NonNURE	**58**		140.142857
NonNURE	**59**		146.000000
NonNURE	**60**		71.833333
NonNURE	**61**		56.785714
NonNURE	**62**		150.250000
Soil	**49**		34.100000
Soil	**52**		64.250000
Soil	**53**		20.000000
Soil	**54**		20.000000
Soil	**55**		48.000000
Soil	**58**		27.800000
Soil	**59**		84.000000
Soil	**60**		77.000000
Soil	**61**		120.839286
Soil	**62**		126.666667



T Comparison Lines for Least Squares Means of source*WRIA

LS-means with the same letter are not significantly different.

		yrank LSMEAN	source	WRIA	LSMEAN Number
	A	150.2500	**NonNURE**	**62**	11
	A				
	A	146.0000	**NonNURE**	**59**	8
	A				
	A	140.1429	**NonNURE**	**58**	7
	A				
B	A	126.6667	**Soil**	**62**	21
B	A				
B	A	120.8393	**Soil**	**61**	20

T Comparison Lines for Least Squares Means of source*WRIA

LS-means with the same letter are not significantly different.

			yrank	LSMEAN	source	WRIA	LSMEAN Number
B	A						
B	A	C		90.5000	**NonNURE**	**55**	6
B	A	C					
B	A	C		86.2222	**NonNURE**	**54**	5
B	A	C					
B	A	C		84.0000	**Soil**	**59**	18
B	A	C					
B	A	C		83.0000	**NonNURE**	**53**	4
B	A	C					
B	A	C		77.0000	**Soil**	**60**	19
B		C					
B		C		77.0000	**NonNURE**	**52**	3
B		C					
B		C		71.8333	**NonNURE**	**60**	9
B		C					
B		C		64.2500	**Soil**	**52**	13
B		C					
B		C		59.7895	**NonNURE**	**49**	1
B		C					
B		C		56.7857	**NonNURE**	**61**	10
B		C					
B		C		48.0000	**NonNURE**	**51**	2
B		C					
B		C		48.0000	**Soil**	**55**	16
		C					
		C		34.1000	**Soil**	**49**	12

T Comparison Lines for Least Squares Means of source*WRIA

LS-means with the same letter are not significantly different.

	yrank LSMEAN	source	WRIA	LSMEAN Number
C				
C	27.8000	**Soil**	**58**	17
C				
C	20.0000	**Soil**	**53**	14
C				
C	20.0000	**Soil**	**54**	15

The LINES display does not reflect all significant comparisons. The following additional pairs are significantly different: (11,5) (11,4) (8,5) (8,4) (7,5) (7,4) (21,1) (21,10) (20,3) (20,9) (20,13) (20,1) (20,10) (6,17) (5,12) (5,17) (4,17)

The GLM Procedure
metal=Nickel

Class Level Information

Class	Levels	Values
source	3	NURE NonNURE Soil
WRIA	11	49 51 52 53 54 55 58 59 60 61 62

Number of Observations Read	1486
Number of Observations Used	1486

The GLM Procedure

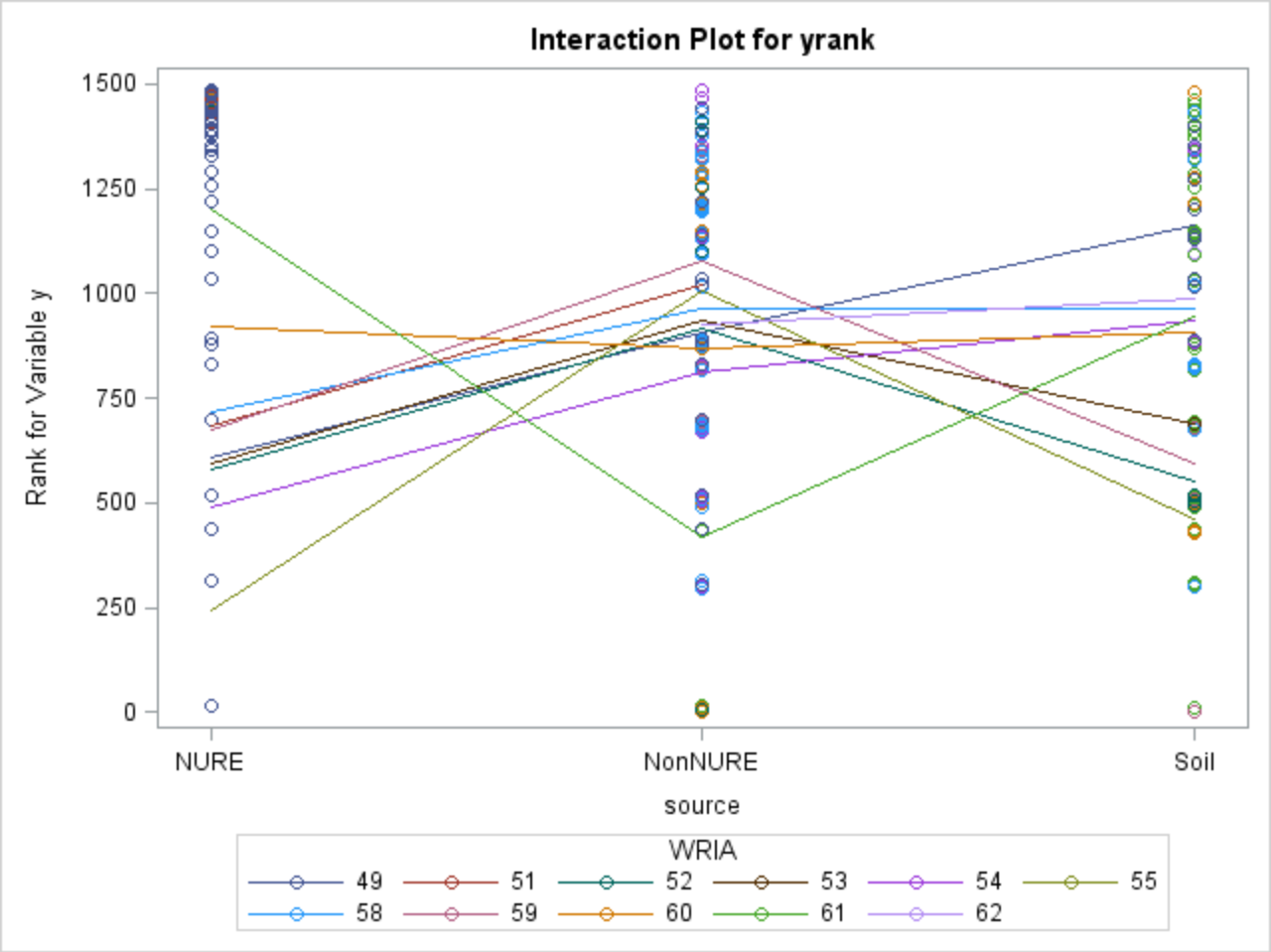
Dependent Variable: yrank Rank for Variable y
metal=Nickel

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	30	56442581.8	1881419.4	10.28	<.0001
Error	1455	266213781.4	182964.8		
Corrected Total	1485	322656363.3			

R-Square	Coeff Var	Root MSE	yrank Mean
0.174931	61.99694	427.7438	689.9435

Source	DF	Type I SS	Mean Square	F Value	Pr > F
WRIA	10	35210259.07	3521025.91	19.24	<.0001
source	2	10311710.16	5155855.08	28.18	<.0001
source*WRIA	18	10920612.61	606700.70	3.32	<.0001

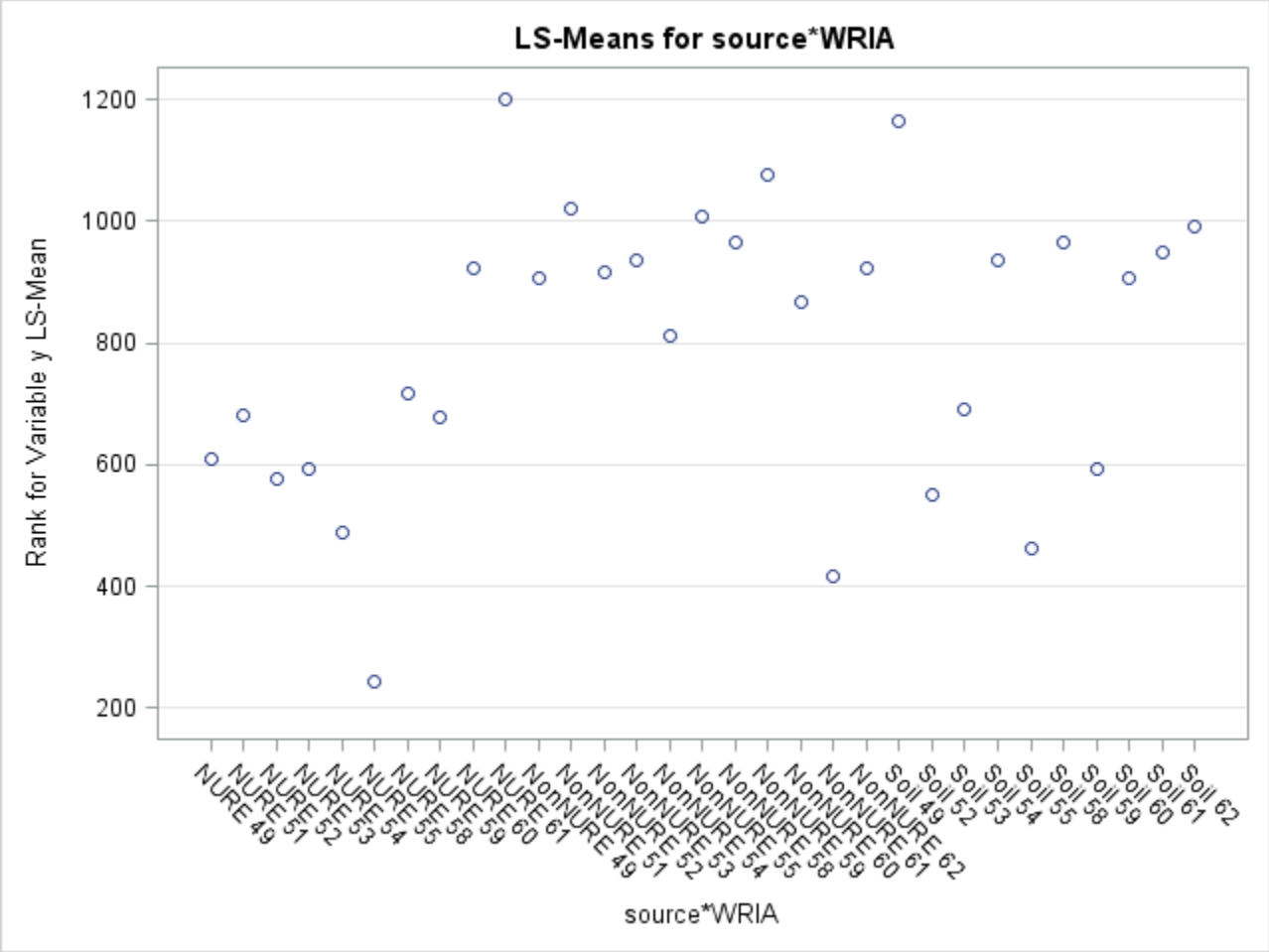
Source	DF	Type III SS	Mean Square	F Value	Pr > F
WRIA	10	2454312.09	245431.21	1.34	0.2027
source	2	3009756.72	1504878.36	8.22	0.0003
source*WRIA	18	10920612.61	606700.70	3.32	<.0001


Interaction Plot for yrank
Rank for Variable y
1500
1250
1000
750
500
250
0
NURE
NonNURE
Soil
source
WRIA
49
51
52
53
54
55
58
59
60
61
62

The GLM Procedure
Least Squares Means
metal=Nickel

source	WRIA	yrank	LSMEAN
NURE	**49**		610.07463
NURE	**51**		681.72500
NURE	**52**		577.60123
NURE	**53**		593.55556
NURE	**54**		488.54815
NURE	**55**		243.09589
NURE	**58**		717.44516
NURE	**59**		676.76923
NURE	**60**		921.87791
NURE	**61**		1200.50000
NonNURE	**49**		905.36842
NonNURE	**51**		1022.00000
NonNURE	**52**		916.12500
NonNURE	**53**		937.16667
NonNURE	**54**		810.36170
NonNURE	**55**		1007.00000
NonNURE	**58**		964.38889
NonNURE	**59**		1075.83333
NonNURE	**60**		866.75000
NonNURE	**61**		417.88235
NonNURE	**62**		923.73684
Soil	**49**		1164.30000
Soil	**52**		551.50000
Soil	**53**		689.50000
Soil	**54**		937.00000

source	WRIA	yrank LSMEAN
Soil	**55**	462.50000
Soil	**58**	964.81818
Soil	**59**	591.60000
Soil	**60**	907.57143
Soil	**61**	947.16129
Soil	**62**	989.72727



T Comparison Lines for Least Squares Means of source*WRIA

LS-means with the same letter are not significantly different.

	yrank LSMEAN	source	WRIA	LSMEAN Number
A	1200.50	**NURE**	**61**	10

T Comparison Lines for Least Squares Means of source*WRIA

LS-means with the same letter are not significantly different.

			yrank LSMEAN	source	WRIA	LSMEAN Number
	A					
	A		1164.30	**Soil**	**49**	22
	A					
B	A		1075.83	**NonNURE**	**59**	18
B	A					
B	A	C	1022.00	**NonNURE**	**51**	12
B	A	C				
B	A	C	1007.00	**NonNURE**	**55**	16
B	A	C				
B	A	C	989.73	**Soil**	**62**	31
B	A	C				
B	A	C	964.82	**Soil**	**58**	27
B	A	C				
B	A	C	964.39	**NonNURE**	**58**	17
B	A	C				
B	A	C	947.16	**Soil**	**61**	30
B	A	C				
B	A	C	937.17	**NonNURE**	**53**	14
B	A	C				
B	A	C	937.00	**Soil**	**54**	25
B	A	C				
B	A	C	923.74	**NonNURE**	**62**	21
B	A	C				
B	A	C	921.88	**NURE**	**60**	9
B	A	C				
B	A	C	916.13	**NonNURE**	**52**	13

T Comparison Lines for Least Squares Means of source*WRIA

LS-means with the same letter are not significantly different.

				yrank	LSMEAN	source	WRIA	LSMEAN Number
B		A	C					
B		A	C		907.57	**Soil**	**60**	29
B		A	C					
B		A	C		905.37	**NonNURE**	**49**	11
B		A	C					
B		A	C		866.75	**NonNURE**	**60**	19
B		A	C					
B		A	C		810.36	**NonNURE**	**54**	15
B		A	C					
B		A	C		717.45	**NURE**	**58**	7
B		A	C					
B	D	A	C		689.50	**Soil**	**53**	24
B	D		C					
B	D		C		681.72	**NURE**	**51**	2
B	D		C					
B	D		C		676.77	**NURE**	**59**	8
B	D		C					
B	D		C		610.07	**NURE**	**49**	1
B	D		C					
B	D		C		593.56	**NURE**	**53**	4
B	D		C					
B	D		C		591.60	**Soil**	**59**	28
B	D		C					
B	D		C		577.60	**NURE**	**52**	3
B	D		C					
B	D		C		551.50	**Soil**	**52**	23

T Comparison Lines for Least Squares Means of source*WRIA

LS-means with the same letter are not significantly different.

			yrank LSMEAN	source	WRIA	LSMEAN Number
B	D	C				
B	D	C	488.55	**NURE**	**54**	5
B	D	C				
B	D	C	462.50	**Soil**	**55**	26
	D	C				
	D	C	417.88	**NonNURE**	**61**	20
	D					
	D		243.10	**NURE**	**55**	6

The LINES display does not reflect all significant comparisons. The following additional pairs are significantly different: (10,15) (10,7) (22,15) (22,7) (18,7) (18,2) (18,8) (18,1) (18,4) (18,28) (18,3) (18,23) (18,5) (16,3) (16,5) (16,20) (31,7) (31,2) (31,1) (31,4) (31,3) (31,5) (31,20) (27,1) (27,4) (27,3) (27,5) (27,20) (17,7) (17,2) (17,8) (17,1) (17,4) (17,3) (17,5) (17,20) (30,7) (30,2) (30,8) (30,1) (30,4) (30,3) (30,5) (30,20) (14,3) (14,5) (14,20) (25,5) (25,20) (21,7) (21,2) (21,1) (21,4) (21,3) (21,5) (21,20) (9,7) (9,2) (9,8) (9,1) (9,4) (9,3) (9,5) (9,20) (13,1) (13,4) (13,3) (13,5) (13,20) (29,3) (29,5) (29,20) (11,1) (11,4) (11,3) (11,5) (11,20) (19,1) (19,4) (19,3) (19,5) (19,20) (15,1) (15,4) (15,3) (15,5) (15,20) (7,1) (7,4) (7,3) (7,5) (7,20) (2,5) (2,20) (2,6) (8,6) (1,5) (1,6) (4,6) (3,6) (5,6)

The GLM Procedure
metal=Silver

Class Level Information

Class	Levels	Values
source	3	NURE NonNURE Soil
WRIA	11	49 51 52 53 54 55 58 59 60 61 62

Number of Observations Read	1250
Number of Observations Used	1250

The GLM Procedure

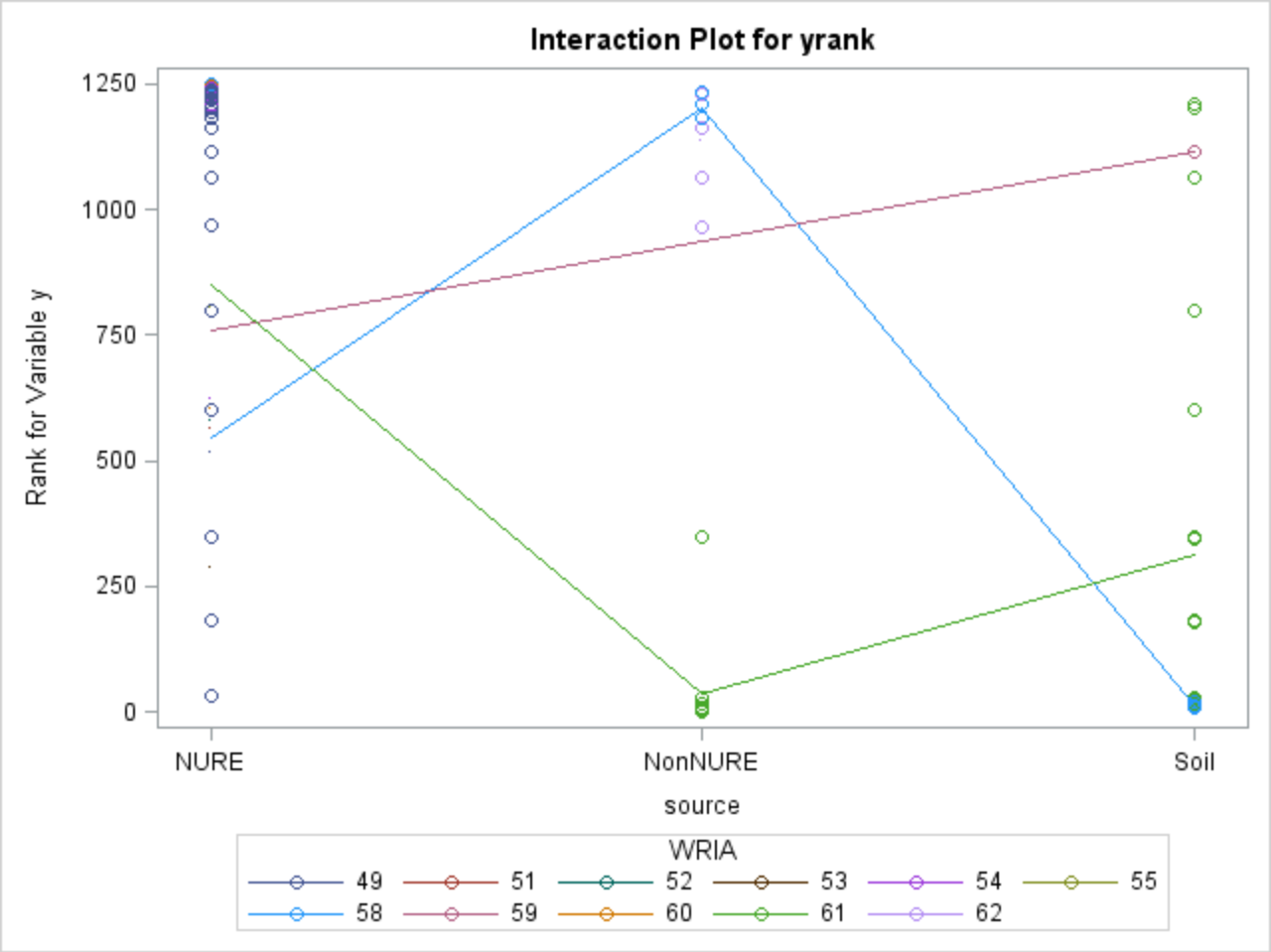
Dependent Variable: yrank Rank for Variable y
metal=Silver

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	15	24694443.7	1646296.2	13.47	<.0001
Error	1234	150836857.5	122234.1		
Corrected Total	1249	175531301.2			

R-Square	Coeff Var	Root MSE	yrank Mean
0.140684	63.66514	349.6199	549.1544

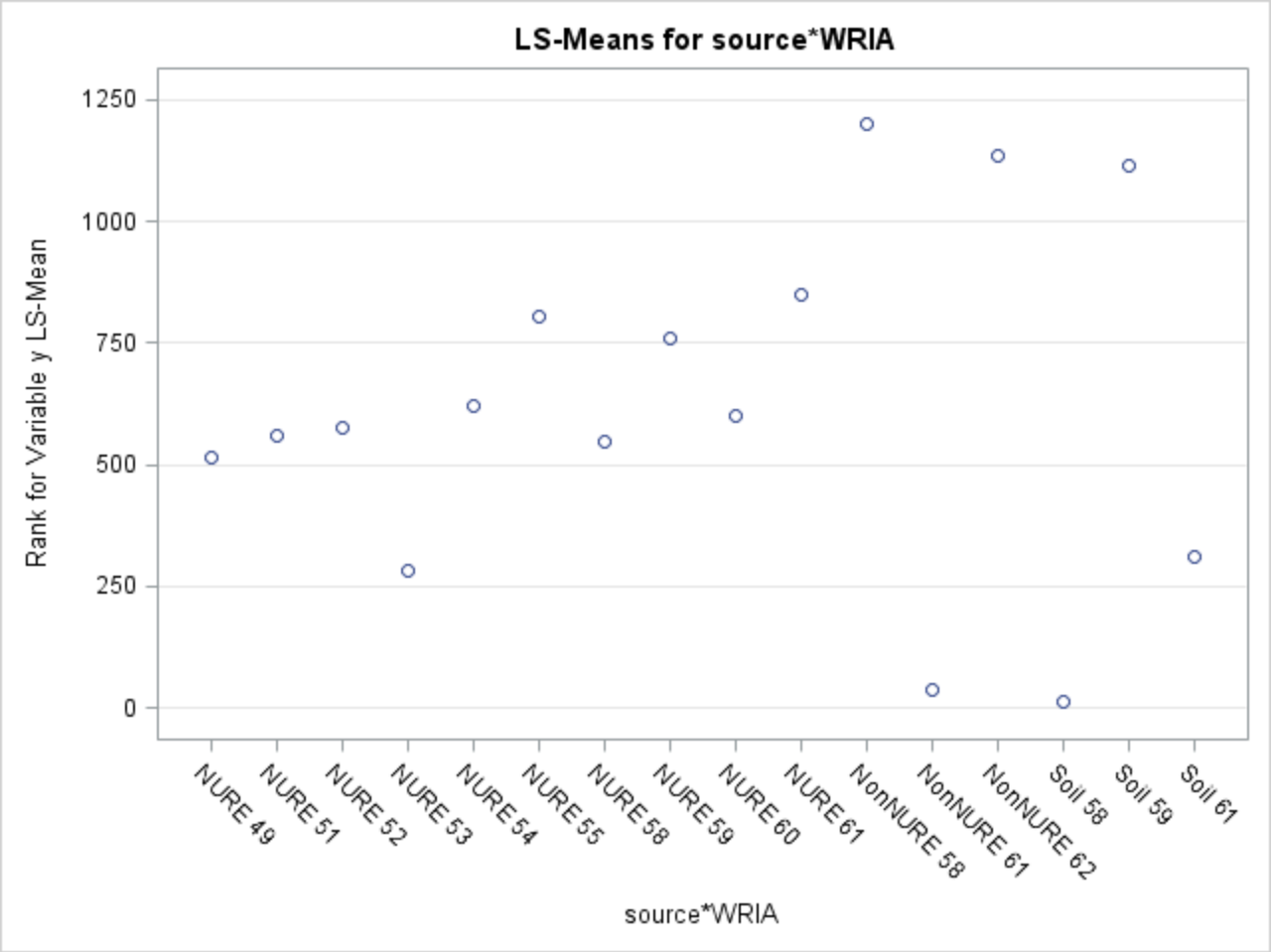
Source	DF	Type I SS	Mean Square	F Value	Pr > F
WRIA	10	18499191.38	1849919.14	15.13	<.0001
source	2	770410.67	385205.33	3.15	0.0431
source*WRIA	3	5424841.70	1808280.57	14.79	<.0001

Source	DF	Type III SS	Mean Square	F Value	Pr > F
WRIA	10	16052873.90	1605287.39	13.13	<.0001
source	2	687244.97	343622.48	2.81	0.0605
source*WRIA	3	5424841.70	1808280.57	14.79	<.0001


Interaction Plot for yrank
Rank for Variable y
1250
1000
750
500
250
0
NURE
NonNURE
Soil
source
WRIA
49
51
52
53
54
55
58
59
60
61
62

The GLM Procedure
Least Squares Means
metal=Silver

source	WRIA	yrank	LSMEAN
NURE	**49**		514.62985
NURE	**51**		561.45000
NURE	**52**		578.16564
NURE	**53**		284.47222
NURE	**54**		619.96296
NURE	**55**		804.01370
NURE	**58**		548.09677
NURE	**59**		758.53846
NURE	**60**		600.14451
NURE	**61**		851.50000
NonNURE	**58**		1201.75000
NonNURE	**61**		36.66667
NonNURE	**62**		1136.33333
Soil	**58**		13.66667
Soil	**59**		1116.00000
Soil	**61**		311.78571



T Comparison Lines for Least Squares Means of source*WRIA

LS-means with the same letter are not significantly different.

		yrank LSMEAN	source	WRIA	LSMEAN Number
	A	1201.750	**NonNURE**	**58**	11
	A				
	A	1136.333	**NonNURE**	**62**	13
	A				
B	A	1116.000	**Soil**	**59**	15
B	A				
B	A	851.500	**NURE**	**61**	10
B					
B		804.014	**NURE**	**55**	6

T Comparison Lines for Least Squares Means of source*WRIA

LS-means with the same letter are not significantly different.

		yrank LSMEAN	source	WRIA	LSMEAN Number
B					
B		758.538	**NURE**	**59**	8
B					
B		619.963	**NURE**	**54**	5
B					
B		600.145	**NURE**	**60**	9
B					
B		578.166	**NURE**	**52**	3
B					
B		561.450	**NURE**	**51**	2
B					
B		548.097	**NURE**	**58**	7
B					
B		514.630	**NURE**	**49**	1
	C	311.786	**Soil**	**61**	16
	C				
D	C	284.472	**NURE**	**53**	4
D					
D		36.667	**NonNURE**	**61**	12
D					
D		13.667	**Soil**	**58**	14

The LINES display does not reflect all significant comparisons. The following additional pairs are significantly different: (10,7) (10,1) (6,5) (6,9) (6,3) (6,2) (6,7) (6,1) (8,7) (8,1) (5,1) (9,1) (4,12)

The GLM Procedure
metal=Thallium

Class Level Information

Class	Levels	Values
source	2	NonNURE Soil
WRIA	10	49 52 53 54 55 58 59 60 61 62

Number of Observations Read	151
Number of Observations Used	151

The GLM Procedure

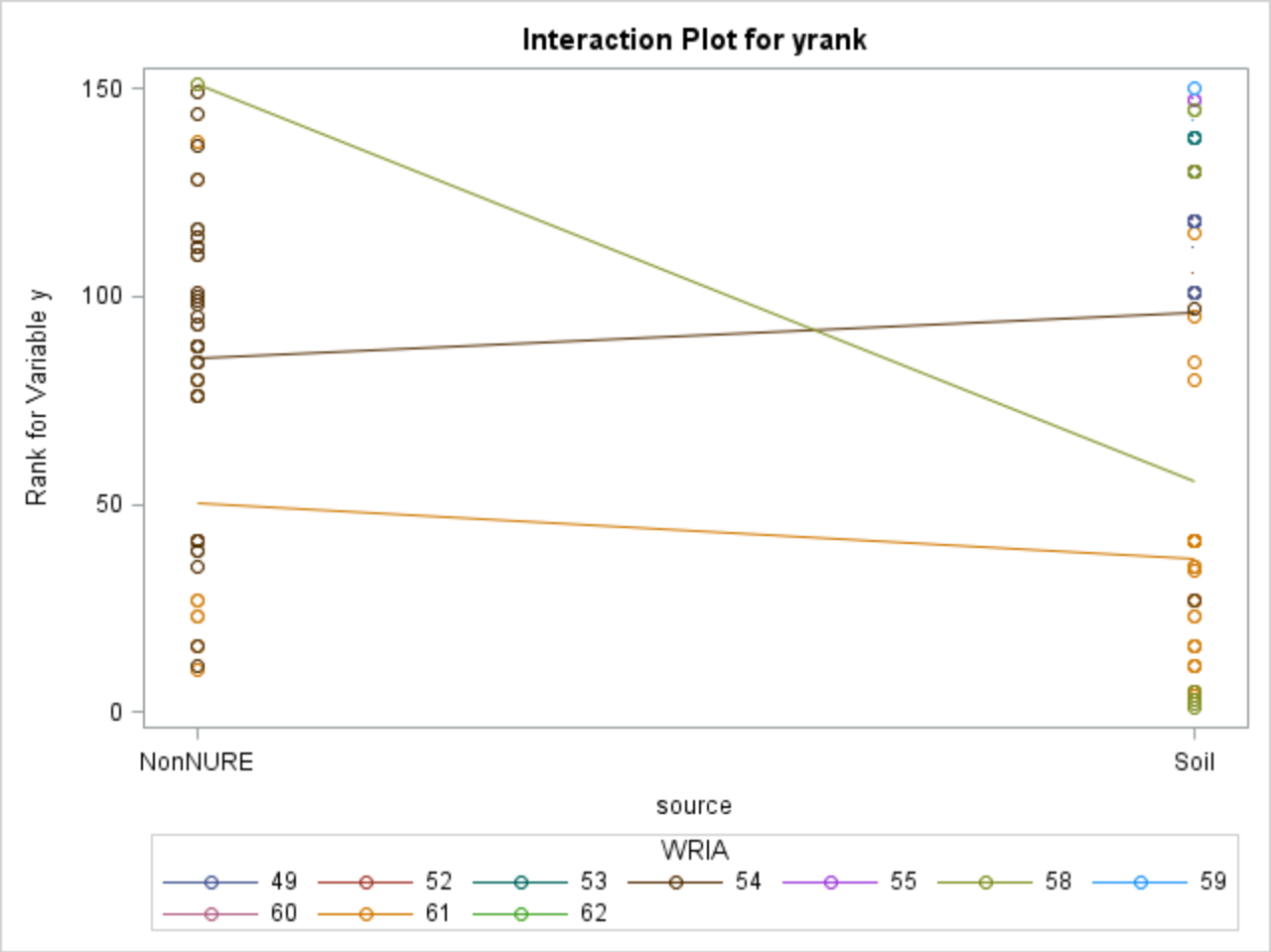
Dependent Variable: yrank Rank for Variable y
metal=Thallium

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	12	169812.9476	14151.0790	14.14	<.0001
Error	138	138061.5955	1000.4463		
Corrected Total	150	307874.5430			

R-Square	Coeff Var	Root MSE	yrank Mean
0.551565	44.80819	31.62983	70.58940

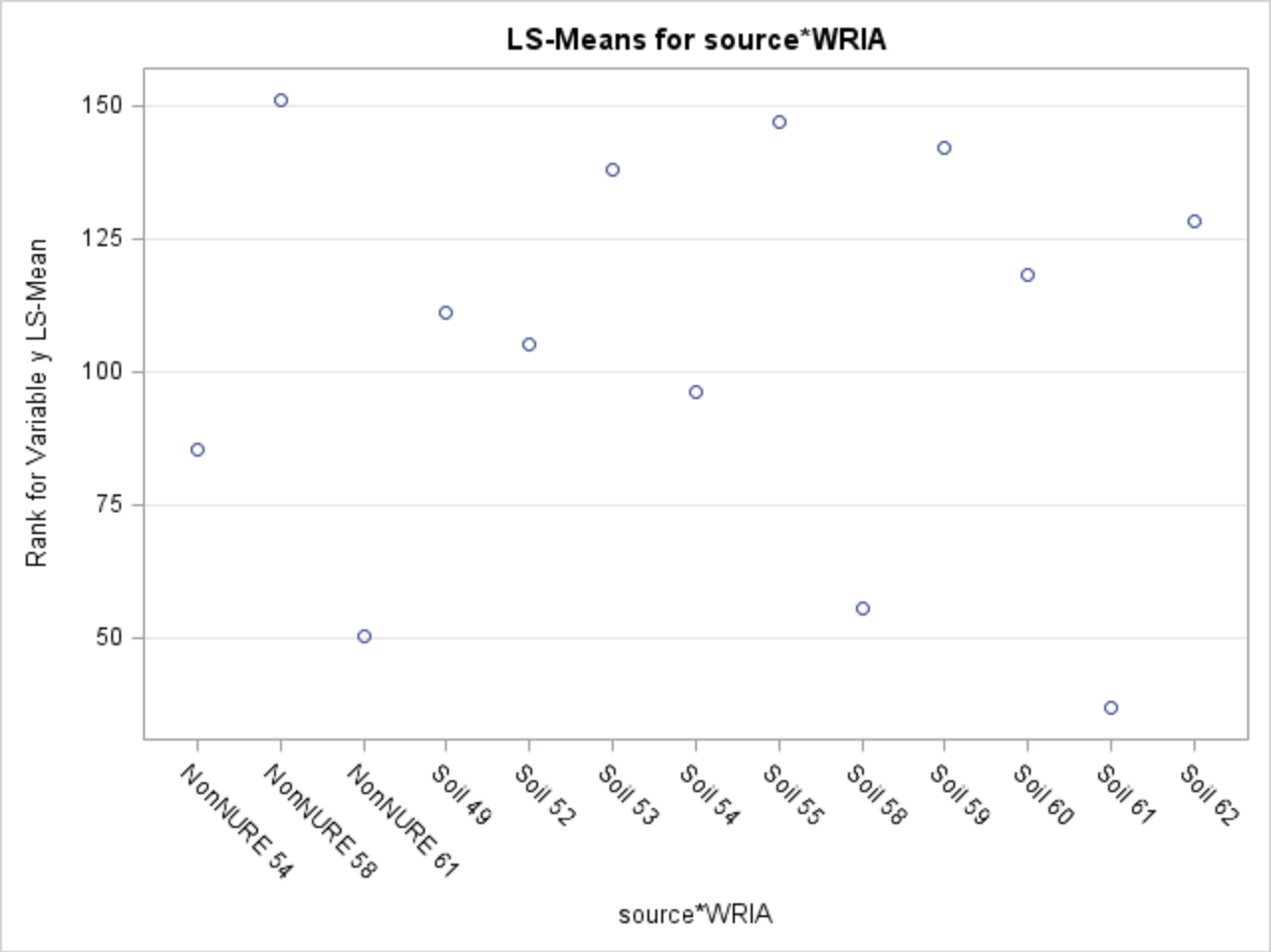
Source	DF	Type I SS	Mean Square	F Value	Pr > F
WRIA	9	159290.4432	17698.9381	17.69	<.0001
source	1	2296.9755	2296.9755	2.30	0.1320
source*WRIA	2	8225.5290	4112.7645	4.11	0.0184

Source	DF	Type III SS	Mean Square	F Value	Pr > F
WRIA	9	141480.4086	15720.0454	15.71	<.0001
source	1	6540.9601	6540.9601	6.54	0.0116
source*WRIA	2	8225.5290	4112.7645	4.11	0.0184


Interaction Plot for yrank
Rank for Variable y
150
100
50
0
NonNURE
Soil
source
WRIA
49
52
53
54
55
58
59
60
61
62

The GLM Procedure
Least Squares Means
metal=Thallium

source	WRIA	yrank	LSMEAN
NonNURE	**54**		85.250000
NonNURE	**58**		151.000000
NonNURE	**61**		50.333333
Soil	**49**		111.200000
Soil	**52**		105.250000
Soil	**53**		138.000000
Soil	**54**		96.000000
Soil	**55**		147.000000
Soil	**58**		55.600000
Soil	**59**		142.000000
Soil	**60**		118.000000
Soil	**61**		36.709091
Soil	**62**		128.333333



T Comparison Lines for Least Squares Means of source*WRIA

LS-means with the same letter are not significantly different.

	yrank LSMEAN	source	WRIA	LSMEAN Number
A	151.0000	**NonNURE**	**58**	2
A				
A	147.0000	**Soil**	**55**	8
A				
A	142.0000	**Soil**	**59**	10
A				
A	138.0000	**Soil**	**53**	6
A				
A	128.3333	**Soil**	**62**	13

T Comparison Lines for Least Squares Means of source*WRIA

LS-means with the same letter are not significantly different.

		yrank LSMEAN	source	WRIA	LSMEAN Number
	A				
B	A	118.0000	**Soil**	**60**	11
B	A				
B	A	111.2000	**Soil**	**49**	4
B	A				
B	A	105.2500	**Soil**	**52**	5
B	A				
B	A	96.0000	**Soil**	**54**	7
B					
B		85.2500	**NonNURE**	**54**	1
	C	55.6000	**Soil**	**58**	9
	C				
	C	50.3333	**NonNURE**	**61**	3
	C				
	C	36.7091	**Soil**	**61**	12

The LINES display does not reflect all significant comparisons. The following additional pairs are significantly different: (4,1)

The GLM Procedure
metal=Zinc

Class Level Information

Class	Levels	Values
source	3	NURE NonNURE Soil
WRIA	11	49 51 52 53 54 55 58 59 60 61 62

Number of Observations Read	1488
Number of Observations Used	1488

The GLM Procedure

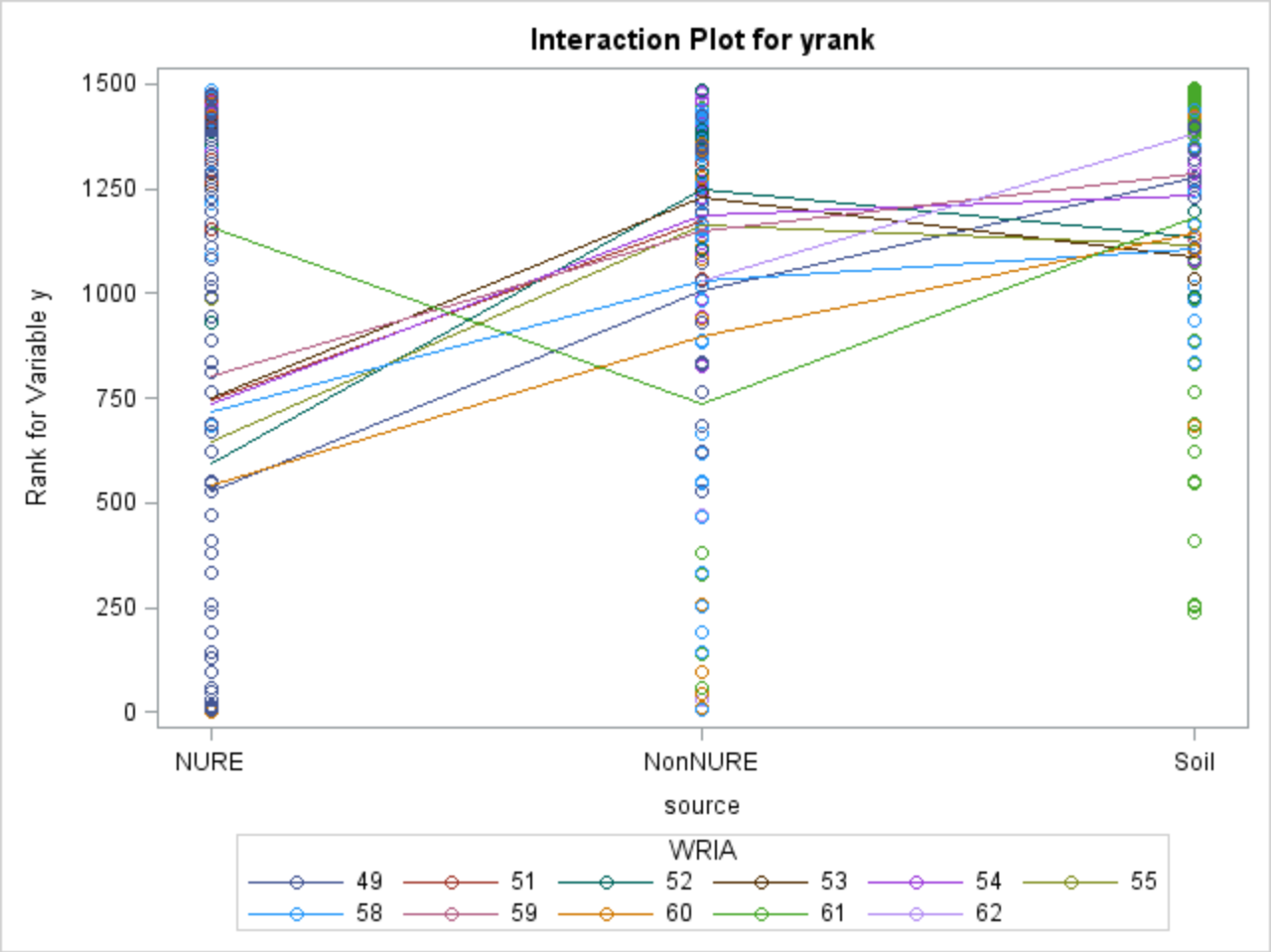
Dependent Variable: yrank Rank for Variable y
metal=Zinc

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	30	76793891.4	2559796.4	18.11	<.0001
Error	1457	205889442.9	141310.5		
Corrected Total	1487	282683334.3			

R-Square	Coeff Var	Root MSE	yrank Mean
0.271660	51.58677	375.9129	728.7003

Source	DF	Type I SS	Mean Square	F Value	Pr > F
WRIA	10	38683251.84	3868325.18	27.37	<.0001
source	2	33045442.44	16522721.22	116.92	<.0001
source*WRIA	18	5065197.15	281399.84	1.99	0.0079

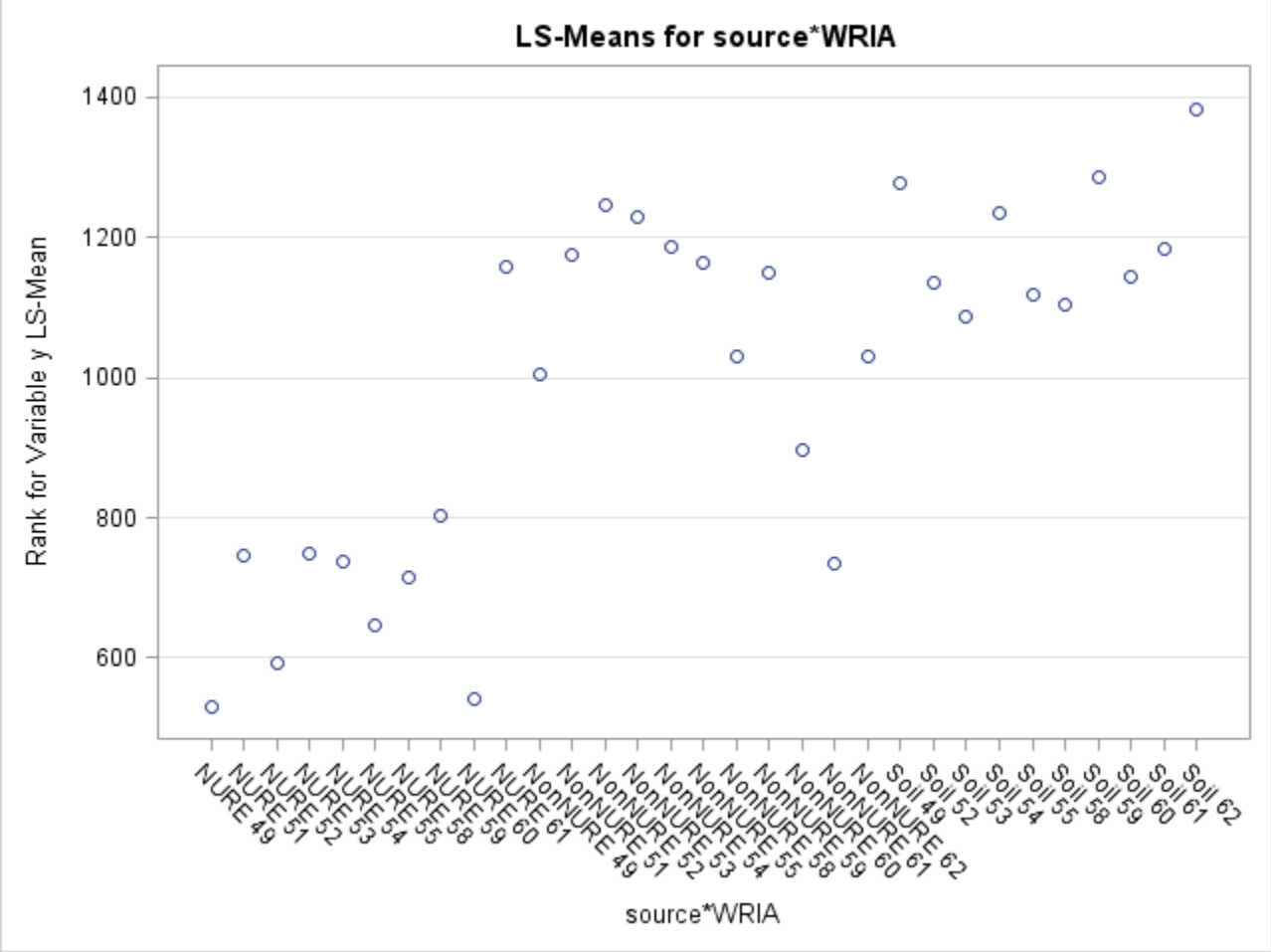
Source	DF	Type III SS	Mean Square	F Value	Pr > F
WRIA	10	1554430.12	155443.01	1.10	0.3584
source	2	11804720.28	5902360.14	41.77	<.0001
source*WRIA	18	5065197.15	281399.84	1.99	0.0079


Interaction Plot for yrank
Rank for Variable y
1500
1250
1000
750
500
250
0
NURE
NonNURE
Soil
source
WRIA
49
51
52
53
54
55
58
59
60
61
62

The GLM Procedure
Least Squares Means
metal=Zinc

source	WRIA	yrank	LSMEAN
NURE	**49**		529.31343
NURE	**51**		745.35000
NURE	**52**		592.31902
NURE	**53**		748.95833
NURE	**54**		738.46667
NURE	**55**		645.50685
NURE	**58**		715.96774
NURE	**59**		801.76923
NURE	**60**		540.53757
NURE	**61**		1158.16667
NonNURE	**49**		1004.36842
NonNURE	**51**		1174.50000
NonNURE	**52**		1247.37500
NonNURE	**53**		1229.16667
NonNURE	**54**		1187.89583
NonNURE	**55**		1162.75000
NonNURE	**58**		1031.25455
NonNURE	**59**		1150.75000
NonNURE	**60**		896.93750
NonNURE	**61**		735.58824
NonNURE	**62**		1031.26316
Soil	**49**		1276.50000
Soil	**52**		1135.25000
Soil	**53**		1087.00000
Soil	**54**		1235.25000

source	WRIA	yrank LSMEAN
Soil	**55**	1117.50000
Soil	**58**	1104.72727
Soil	**59**	1286.50000
Soil	**60**	1143.28571
Soil	**61**	1184.20968
Soil	**62**	1382.90909



T Comparison Lines for Least Squares Means of source*WRIA

LS-means with the same letter are not significantly different.

	yrank LSMEAN	source	WRIA	LSMEAN Number
A	1382.91	**Soil**	**62**	31

T Comparison Lines for Least Squares Means of source*WRIA

LS-means with the same letter are not significantly different.

			yrank	LSMEAN	source	WRIA	LSMEAN Number
	A						
B	A			1286.50	**Soil**	**59**	28
B	A						
B	A			1276.50	**Soil**	**49**	22
B	A						
B	A			1247.38	**NonNURE**	**52**	13
B	A						
B	A			1235.25	**Soil**	**54**	25
B	A						
B	A			1229.17	**NonNURE**	**53**	14
B	A						
B	A			1187.90	**NonNURE**	**54**	15
B	A						
B	A			1184.21	**Soil**	**61**	30
B	A						
B	A	C		1174.50	**NonNURE**	**51**	12
B	A	C					
B	A	C		1162.75	**NonNURE**	**55**	16
B	A	C					
B	A	C		1158.17	**NURE**	**61**	10
B	A	C					
B	A	C		1150.75	**NonNURE**	**59**	18
B	A	C					
B	A	C		1143.29	**Soil**	**60**	29
B	A	C					
B	A	C		1135.25	**Soil**	**52**	23

T Comparison Lines for Least Squares Means of source*WRIA

LS-means with the same letter are not significantly different.

					yrank	LSMEAN	source	WRIA	LSMEAN Number
	B		A	C					
	B	D	A	C		1117.50	**Soil**	**55**	26
	B	D	A	C					
	B	D	A	C		1104.73	**Soil**	**58**	27
	B	D	A	C					
E	B	D	A	C		1087.00	**Soil**	**53**	24
E	B	D		C					
E	B	D		C		1031.26	**NonNURE**	**62**	21
E	B	D		C					
E	B	D		C		1031.25	**NonNURE**	**58**	17
E	B	D		C					
E	B	D		C		1004.37	**NonNURE**	**49**	11
E	B	D		C					
E	B	D		C		896.94	**NonNURE**	**60**	19
E		D		C					
E		D		C		801.77	**NURE**	**59**	8
E		D		C					
E		D		C		748.96	**NURE**	**53**	4
E		D		C					
E		D		C		745.35	**NURE**	**51**	2
E		D		C					
E		D		C		738.47	**NURE**	**54**	5
E		D		C					
E		D		C		735.59	**NonNURE**	**61**	20
E		D		C					
E		D		C		715.97	**NURE**	**58**	7

T Comparison Lines for Least Squares Means of source*WRIA

LS-means with the same letter are not significantly different.

			yrank LSMEAN	source	WRIA	LSMEAN Number
E	D					
E	D		645.51	**NURE**	**55**	6
E						
E		F	592.32	**NURE**	**52**	3
		F				
		F	540.54	**NURE**	**60**	9
		F				
		F	529.31	**NURE**	**49**	1

The LINES display does not reflect all significant comparisons. The following additional pairs are significantly different: (22,19) (13,19) (15,17) (15,19) (30,17) (30,19) (16,4) (16,2) (16,5) (16,20) (16,7) (10,4) (10,2) (10,5) (10,20) (10,7) (18,8) (18,4) (18,2) (18,5) (18,20) (18,7) (29,4) (29,2) (29,5) (29,20) (29,7) (23,4) (23,2) (23,5) (23,7) (27,8) (27,4) (27,2) (27,5) (27,20) (27,7) (27,6) (21,4) (21,2) (21,5) (21,20) (21,7) (21,6) (21,3) (17,8) (17,4) (17,2) (17,5) (17,20) (17,7) (17,6) (17,3) (11,4) (11,2) (11,5) (11,20) (11,7) (11,6) (11,3) (19,6) (19,3) (4,3) (2,3) (5,3) (7,3)

Appendix 2

90th Percentiles – All Preliminary Output

Table 3.1 Aluminum

Pooled	WRIA	source	n	IQR	50th Percentile	75th Percentile	90th Percentile	Lower bound for 90th%ile	Upper Bound For 90th %ile
All			4347	10500	58827	64100	69800	69200	70200
Source	49		366	8280.25	58130	62315	66606.5	64813	67699.5
	51		42	6077	58286.5	61490.25	64845	57149.4	68182.97
	52		395	7346.5	59100	62763	67060	65614	68472
	53		249	7082	57400	61282	64800	63675.2	66460
	54		626	9580.25	59800	64675	71450	69000	73355
	55		175	15696.5	65900	73850	81319.8	78939.6	84019.6
	58		753	12613	57800	64100	69260	68340	70440
	59		101	13600	52500	58200	66500	60700	72600
	60		1442	10775	59700	64775	69700	68910	70300
	61		168	40761.88	54550	61700	67790	66300	69880
	62		30	58980	43250	70580	75435	63040	80249
WRIA		NonNURE	195	59690	23500	69840	74316	72182	75592
		NURE	4046	9800	59060	64000	69366.5	68983	69881.74
		Soil	106	49412.5	20700	65000	72950	65150	75650
None	49	NonNURE	19	8425	71230	73315	76758	67206	85108
	49	NURE	337	7747	57613	61060	64853.2	65075.6	67541.4
	49	Soil	10	5675	68400	72175	77430	77430	89330
	51	NonNURE	2	2475	75735	76972.5			
	51	NURE	40	5964.75	57676.5	61224.75	62325	64100.7	68313.7
	52	NonNURE	8	3355	72547.5	74772.5			
	52	NURE	383	7273	58900	62396.5	65789.4	65105.4	69505.4
	52	Soil	4	14700	78150	84775			
	53	NonNURE	6	8235	66195	70290			
	53	NURE	241	6515	57307	60615	63800	62867	67400
	53	Soil	2	2600	67900	69200			
	54	NonNURE	49	14000	21800	29500	69774	66158	85014
	54	NURE	573	8700	60400	64900	71652.8	75660	79520.4
	54	Soil	4	41550	44000	65225			
	55	NonNURE	4	9962.5	66325	71672.5			
	55	NURE	169	16000	65893	73300	81106.6	80520	86563.1
	55	Soil	2	1150	82050	82625			
	58	NonNURE	55	7585	8840	13500	60876	65291	85932
	58	NURE	687	11703.5	58600	64436.5	69340	70846.2	72134.69

Pooled	WRIA	source	n	IQR	50th Percentile	75th Percentile	90th Percentile	Lower bound for 90th%ile	Upper Bound For 90th %ile
	58	Soil	11	53875	12732	64700	70200	70200	111550
	59	NonNURE	12	27290	59922.5	70437.5	77510	77585	88199.62
	59	NURE	84	11125	51800	56475	60770	58790	68790
	59	Soil	5	47821	29770	72300			
	60	NonNURE	16	65685	7660	70965	74170	70380	82905
	60	NURE	1419	10600	59700	64700	69700	72018.8	74308.8
	60	Soil	7	24510.5	16589	39681.5			
	61	NonNURE	5	50850	65550	66850			
	61	NURE	113	10200	59700	64200	68680	66600	78320
	61	Soil	50	5495.75	17550	20675	24870	17581.6	30163.4
	62	NonNURE	19	62420	43150	70570	75990	81550	95384
	62	Soil	11	42257.25	58300	68950	74600	74600	125650

WRIA 61 excluded

Pooled	WRIA	source	n	IQR	50th Percentile	75th Percentile	90th Percentile	Lower bound for 90th%ile	Upper Bound For 90th %ile
All			4179	10310	58907	64100	69900	69300	703
WRIA		NonNURE	190	59720	23400	69845	74261	72117	754
		NURE	3933	9753	59042	63953	69400	68920	699
		Soil	56	50350.75	63900	71225	80750	77400	88848.739

Table 3.2 Antimony

Pooled	WRIA	source	n	IQR	50th Percentile	75th Percentile	90th Percentile	Lower bound for 90th%ile	Upper Bound For 90th %ile
All			111	0.745	0.42	0.945	1.68	1.37	2.15
WRIA		NonNURE	14	0.299875	0.16	0.370625	2.533	-1.934	4.796
		Soil	97	0.8	0.49	1	1.614	1.238	2.018
Source	49		10	0.23	0.635	0.7425	2.028	1.686	3.377
	52		4	0.0825	0.395	0.4375	0.469		
	53		2	0.1	1.03	1.08	1.11		
	54		2	0.04	0.83	0.85	0.862		
	55		2	0.025	0.265	0.2775	0.285		
	58		11	0.88	0.286667	1.115	1.4	-0.6	1.79

Pooled	WRIA	source	n	IQR	50th Percentile	75th Percentile	90th Percentile	Lower bound for 90th%ile	Upper Bound For 90th %ile
	59		3	1.275	0.52	1.76	2.504		
	60		2	0	0.64	0.64	0.64		
	61		69	0.53	0.2	0.73	1.704	1.418	2.18
	62		6	0.235	0.945	1.1075	1.175		
None	49	Soil	10	0.23	0.635	0.7425	2.028	2.028	3.708
	52	Soil	4	0.0825	0.395	0.4375			
	53	Soil	2	0.1	1.03	1.08			
	54	Soil	2	0.04	0.83	0.85			
	55	Soil	2	0.025	0.265	0.2775			
	58	NonNURE	1	0	3.4	3.4			
	58	Soil	10	0.8025	0.278333	1.025	1.22	1.22	1.9245
	59	Soil	3	1.275	0.52	1.76			
	60	Soil	2	0	0.64	0.64			
	61	NonNURE	13	0.2435	0.15	0.3125	0.486	-0.788	5.906
	61	Soil	56	0.85	0.22	1.05	1.74	1.465	2.3825
	62	Soil	6	0.235	0.945	1.1075			

WRIA 61 excluded

Pooled	WRIA	source	n	IQR	50th Percentile	75th Percentile	90th Percentile	Lower bound for 90th%ile	Upper Bound For 90th %ile
All			42	0.5975	0.64	0.995	1.38	0	1.732
WRIA		NonNURE	1	0	3.4	3.4	3.4	3.4	3.4
		Soil	41	0.56	0.64	0.95	1.2	0.03	1.39

Table 3.3 Arsenic

Pooled	WRIA	source	n	IQR	50th Percentile	75th Percentile	90th Percentile	Lower bound for 90th%ile	Upper Bound For 90th %ile
All			1284	4	3	5	8.176	7.352	8.597244
WRIA		NonNURE	181	4.5	4.6	6.8	14.7	11.1	19.8
		NURE	1004	3	2	4	7	6	8
		Soil	99	4.88	5.765	8.23	10.992	8.484	12.462

Pooled	WRIA	source	n	IQR	50th Percentile	75th Percentile	90th Percentile	Lower bound for 90th%ile	Upper Bound For 90th %ile
source	49		272	3	2	4	7	5	9
	51		32	1.325	2	3	3	2.4	3.1
	52		165	3	2	4	6	5	7
	53		74	3	3	5	6.07	3.3	6.14
	54		185	3	4	6	9.6	4.64	11.48
	55		80	3	3	5	6.64	4.28	8.18
	58		192	5	3	6	8.95	8.4	10.7
	59		14	4.2	4.65	6.3	9	5.8	12
	60		170	2.6	2	3.6	9	7	12.9
	61		76	6.5825	4.8	8.8575	10.995	8.84	12.38
	62		24	4.05	5.3	6.575	9.07	-12.37	11.64
None	49	NonNURE	19	1.65	2.2	3.05	9.99	0.31	39.61
	49	NURE	243	3	2	4	6	9.122683	15
	49	Soil	10	1.75	3.6	4.525	17.77	17.77	35.77
	51	NonNURE	2	0.85	2.75	3.175			
	51	NURE	30	1.5	2	2.75	3	-2	3
	52	NonNURE	8	1.575	2.65	3.075			
	52	NURE	153	3	2	4	6	3	8
	52	Soil	4	0.9	2.85	3.2			
	53	NonNURE	6	2.2	5.75	7.525			
	53	NURE	66	2.75	3	4.75	6	3	6
	53	Soil	2	0.15	8.85	8.925			
	54	NonNURE	48	4.9625	5.4	8.5	20.06	-18.635	30.375
	54	NURE	133	3	4	6	7	7	13.4
	54	Soil	4	2.75	5.15	6.425			
	55	NonNURE	4	1.55	6.55	7.575			
	55	NURE	74	2.75	3	4.75	6	5.4	9.4
	55	Soil	2	0.05	2.65	2.675			
	58	NonNURE	38	2.1	5.1	6.35	8.8	2.54	13.955
	58	NURE	144	4	2	5	9	10.15	15
	58	Soil	10	1.47125	6.41	7.10625	7.864	7.864	9.299
	59	NonNURE	11	4.45	5.3	6.95	9.6	9.6	15.5
	59	Soil	3	1.1	2.1	3.05			
	60	NonNURE	12	12.15	3.85	14.75	17.6	15.44	43.425
	60	NURE	156	2	1	3	7.5	8.75	12
	60	Soil	2	0.15	4.55	4.625			
	61	NonNURE	15	2.525	2.15	3.8	7.64	8.88	14.98
	61	NURE	5	2	2	3			
	61	Soil	56	5.7525	6.215	9.5275	11.57	11.8	16.975

Pooled	WRIA	source	n	IQR	50th Percentile	75th Percentile	90th Percentile	Lower bound for 90th%ile	Upper Bound For 90th %ile
	62	NonNURE	18	3.375	4.5	5.3	9.44	2.09	33.345
	62	Soil	6	0.85	6.85	7.425			

WRIA 61 excluded

Pooled	WRIA	source	n	IQR	50th Percentile	75th Percentile	90th Percentile	Lower bound for 90th%ile	Upper Bound For 90th %ile
All			1208	4	3	5	8	7.44	9
WRIA		NonNURE	166	4.725	4.65	7.175	15.25	11.35	20.5
		NURE	999	3	2	4	7	6	8
		Soil	43	3.6125	5.28	6.8125	8.612	1.444	10.339

Table 3.4 Barium

Pooled	WRIA	source	n	IQR	50th Percentile	75th Percentile	90th Percentile	Lower bound for 90th%ile	Upper Bound For 90th %ile
All			281	565	264	698	864	801	899
WRIA		NonNURE	194	518.75	201.5	635.75	810.2	766.405	869.4
		Soil	87	654	362	826.5	982.4	884.8	1095.2
Source	49		29	165	759	863	960.4	880.8	1053.2
	51		2	139.5	765.5	835.25	877.1		
	52		12	250.75	854.25	1072.5	1137	1084	1342.45
	53		8	99	636.5	687.5	770.9		
	54		52	136	165.5	262.25	594.1	562.2	839.4
	55		6	39.5	634	644.75	665		
	58		65	130.6	146	218	820.4	623.9024	1084.6
	59		15	383	594	680.5	766.4	738.8	888
	60		18	855.35	385	910.75	999.2	938.4	1130.4
	61		49	245.05	218	383.05	523.596	295.42	637.592
	62		25	547	477	649	861.2	785.2	1080.2
None	49	NonNURE	19	157	721	816	863.6	850	958
	49	Soil	10	182.5	895	964.25	1035	1035	1166.55
	51	NonNURE	2	139.5	765.5	835.25			
	52	NonNURE	8	51.375	831	849.125			

Pooled	WRIA	source	n	IQR	50th Percentile	75th Percentile	90th Percentile	Lower bound for 90th%ile	Upper Bound For 90th %ile
	52	Soil	4	55	1125	1152.5			
	53	NonNURE	6	99.25	612.5	646.75			
	53	Soil	2	26.5	781.5	794.75			
	54	NonNURE	48	114	159	236	564.7	530.1	746.6
	54	Soil	4	203.25	227.5	396.25			
	55	NonNURE	4	58.5	619.5	651.75			
	55	Soil	2	9.5	636.5	641.25			
	58	NonNURE	55	127.2	146	201	728.6	494.4	951.7
	58	Soil	10	748.5	151	874.5	1010	1010	1688.832
	59	NonNURE	12	295	588	640.25	704.9	705.7	843.075
	59	Soil	3	396.15	768	781			
	60	NonNURE	16	808.3	134.5	856	935	887.5	1166.5
	60	Soil	2	22	1008	1019			
	61	NonNURE	5	403	448	600			
	61	Soil	44	198.25	213.5	335	432.4	412.8538	748.8946
	62	NonNURE	19	446.8	391	530.5	600	516	761.8
	62	Soil	6	43	860.5	891			

WRIA 61 excluded

Pooled	WRIA	source	n	IQR	50th Percentile	75th Percentile	90th Percentile	Lower bound for 90th%ile	Upper Bound For 90th %ile
All			232	607	374.5	739.75	885.2	812.8	919.2
WRIA		NonNURE	189	521	201	637	813.6	772.4	886.6
		Soil	43	327.5	845	964	1076	972	1174.729

Table 3.5 Beryllium

Pooled	WRIA	source	n	IQR	50th Percentile	75th Percentile	90th Percentile	Lower bound for 90th%ile	Upper Bound For 90th %ile
All			1459	1	1.5	2	2.5		
WRIA		NonNURE	197	1.47	1	2	2	1.244033	2
		NURE	1163	1	1.5	2	2.5		
		Soil	99	1.235	0.6	1.7	2.12	1.84	2.34
Source	49		361	0.8	1.5	1.8	2		

Pooled	WRIA	source	n	IQR	50th Percentile	75th Percentile	90th Percentile	Lower bound for 90th%ile	Upper Bound For 90th %ile
	51		42	0.5	2	2	2.5	2.05	3
	52		174	1	2	2.5	3	3	3.5
	53		80	0.5	2	2	2.5	2.5	3
	54		188	0.8	1.5	1.8	2.5	2.47	3
	55		80	1	1.5	2	3.31	2.62	4.12
	58		219	1	1.5	2	2.5	2.5	2.5
	59		28	1	1.75	2	2.5	1.7	3
	60		189	1	1.5	2	2.5	2.5	3
	61		79	0.27	0.5	0.67	1.5	1	2.199899
	62		19	0.95	2	2.55	4	3	5.9
None	49	NonNURE	19	0	1	1	1.2	2	3
	49	NURE	332	1	1.5	2	2	2.5	3
	49	Soil	10	0.45	1.65	1.8	1.91	1.91	2.155
	51	NonNURE	2	0	2	2			
	51	NURE	40	0.5	2	2	2.5	1.55	2.55
	52	NonNURE	8	1	2	2			
	52	NURE	162	1	2	2.5	3	2.5	3
	52	Soil	4	0.075	1.8	1.825			
	53	NonNURE	6	0.75	1	1.75			
	53	NURE	72	0.5	2	2	2.5	2	2.5
	53	Soil	2	0.1	2.3	2.35			
	54	NonNURE	49	0.89	1.1	1.8	2.12	-1.6	6.4
	54	NURE	135	0.5	1.5	1.5	2.5	2.3	2.8
	54	Soil	4	1.3575	1.535	2.225			
	55	NonNURE	4	0.25	2	2.25			
	55	NURE	74	1	1.5	2	3	4	5
	55	Soil	2	0.05	3.35	3.375			
	58	NonNURE	53	0.37	0.51	0.7	1	1.6	3
	58	NURE	156	0.5	2	2	2.5	2	2.5
	58	Soil	10	1.4575	0.47	1.85	2.26	2.26	3.8035
	59	NonNURE	12	1.135	2	2	2.9	2.9	4.9
	59	NURE	13	0.5	1.5	2	2	1.9	2.7
	59	Soil	3	1.15	2.4	2.45			
	60	NonNURE	14	1.6275	0.71	2	2	2	2
	60	NURE	173	1	1.5	2	2.5	2	2.5
	60	Soil	2	0	1.7	1.7			
	61	NonNURE	17	0.41	0.45	0.64	1.76	2	3.2
	61	NURE	6	0.5	1.75	2			
	61	Soil	56	0.1725	0.5	0.6	0.72	0.625	1.35

Pooled	WRIA	source	n	IQR	50th Percentile	75th Percentile	90th Percentile	Lower bound for 90th%ile	Upper Bound For 90th %ile
	62	NonNURE	13	2	2	3	4	3.8	5.8
	62	Soil	6	0.175	1.85	1.975			

WRIA 61 excluded

Pooled	WRIA	source	n	IQR	50th Percentile	75th Percentile	90th Percentile	Lower bound for 90th%ile	Upper Bound For 90th %ile
All			1380	1	1.5	2	2.5		
WRIA		NonNURE	180	1.405	1	2	2	1	2
		NURE	1157	1	1.5	2	2.5		
		Soil	43	0.75	1.8	2.05	2.4	1.6	2.62

Table 3.6 Bismuth

Pooled	WRIA	source	n	IQR	50th Percentile	75th Percentile	90th Percentile	Lower bound for 90th%ile	Upper Bound For 90th %ile
All			76	0.37625	0.325	0.60125	1.205	0.125	1.71
WRIA		NonNURE	40	0.54375	0.565	0.895	2.057	-3.016	3.084
		Soil	36	0.1525	0.225	0.3125	0.43	0.32	0.545
Source	49		10	0.045	0.14	0.1675	0.171	0.162	0.19
	52		4	0.08	0.125	0.165	0.174		
	53		2	0.005	0.325	0.3275	0.329		
	54		44	0.505	0.52	0.83	1.871	-2.059	2.742
	55		2	0.01	0.28	0.285	0.288		
	58		4	0.0725	0.215	0.2575	0.289		
	59		2	0.055	0.505	0.5325	0.549		
	60		2	0	0.21	0.21	0.21		
	62		6	0.12	0.26	0.3725	0.455		
None	49	Soil	10	0.045	0.14	0.1675	0.171	0.171	0.191
	52	Soil	4	0.08	0.125	0.165			
	53	Soil	2	0.005	0.325	0.3275			
	54	NonNURE	40	0.54375	0.565	0.895	2.057	-26.157	4.442786
	54	Soil	4	0.0725	0.335	0.39			
	55	Soil	2	0.01	0.28	0.285			

Pooled	WRIA	source	n	IQR	50th Percentile	75th Percentile	90th Percentile	Lower bound for 90th%ile	Upper Bound For 90th %ile
	58	Soil	4	0.0725	0.215	0.2575			
	59	Soil	2	0.055	0.505	0.5325			
	60	Soil	2	0	0.21	0.21			
	62	Soil	6	0.12	0.26	0.3725			

WRIA 61 excluded

Pooled	WRIA	source	n	IQR	50th Percentile	75th Percentile	90th Percentile	Lower bound for 90th%ile	Upper Bound For 90th %ile
All			76	0.37625	0.325	0.60125	1.205	0.06	1.695
WRIA		NonNURE	40	0.54375	0.565	0.895	2.057	0	3.084
		Soil	36	0.1525	0.225	0.3125	0.43	0.32	0.544874

Table 3.7 Cadmium

Pooled	WRIA	source	n	IQR	50th Percentile	75th Percentile	90th Percentile	Lower bound for 90th%ile	Upper Bound For 90th %ile
All			273	1.77	0.57	2	2		
WRIA		NonNURE	155	1.695	2	2	2		
		Soil	118	0.5985	0.335	0.7985	2.421	1.147	3.851748
Source	49		29	1.7	2	2	2		
	51		2	0	2	2	2		
	52		12	1.825	2	2	2		
	53		8	0.475	2	2	2		
	54		52	0.285	0.235	0.4525	2	2	3.451975
	55		6	1.425	2	2	2		
	58		34	1.7	0.57	2	2	2	2
	59		15	1.6445	2	2	2		
	60		15	1.5645	0.794	2	2	2	2
	61		77	1.404	0.53	1.604	2.902	1.546	3.804
	62		23	1.55	1.4	2	2		
None	49	NonNURE	19	0	2	2	2	2	2
	49	Soil	10	0.1	0.3	0.3	0.4	0.4	0.5
	51	NonNURE	2	0	2	2			

Pooled	WRIA	source	n	IQR	50th Percentile	75th Percentile	90th Percentile	Lower bound for 90th%ile	Upper Bound For 90th %ile
	52	NonNURE	8	0	2	2			
	52	Soil	4	0.025	0.1	0.125			
	53	NonNURE	6	0	2	2			
	53	Soil	2	0	0.1	0.1			
	54	NonNURE	48	0.33	0.245	0.4975	2	-1.14	2
	54	Soil	4	0.03	0.2	0.215			
	55	NonNURE	4	0	2	2			
	55	Soil	2	0	0.1	0.1			
	58	NonNURE	23	1.46	0.85	2	2	2	2
	58	Soil	11	0.1475	0.233333	0.35	0.5	0.5	1.182493
	59	NonNURE	10	0	2	2	2		
	59	Soil	5	0.2	0.2	0.3			
	60	NonNURE	8	0	2	2			
	60	Soil	7	0.3035	0.409	0.5445			
	61	NonNURE	15	0.2805	0.19	0.41	2	2	3.598
	61	Soil	62	1.314125	0.715	1.614125	3.616	-1.322	5.638
	62	NonNURE	12	0	2	2	2		
	62	Soil	11	0.201	0.4	0.5	0.592	0.592	0.7015

WRIA 61 excluded

Pooled	WRIA	source	n	IQR	50th Percentile	75th Percentile	90th Percentile	Lower bound for 90th%ile	Upper Bound For 90th %ile
All			196	1.77	0.586	2	2		
WRIA		NonNURE	140	1.655	2	2	2		
		Soil	56	0.205	0.2525	0.4	0.5	0.373	0.5945

Table 3.8 Chromium

Pooled	WRIA	source	n	IQR	50th Percentile	75th Percentile	90th Percentile	Lower bound for 90th%ile	Upper Bound For 90th %ile
All			1491	30	30	50	90	80	95
WRIA		NonNURE	206	16.475	18.2	29	43	35	50.95
		NURE	1167	40	30	60	105	100	120
		Soil	118	13.412	16.15	26.262	46	41.7	60.69776
Source	49		362	20	25	40	60	50	69.1
	51		42	17.5	27.5	38.75	50	-13	60
	52		176	45	40	65	102.5	70	120
	53		80	53.75	90	110	120.5	90.5	121
	54		187	14.6	25	30	80	73	88
	55		80	11.25	25	30	35	30	40
	58		222	25	30	45	69.8	55.6	84.6
	59		30	34.75	32.5	49.75	70	60	89.9
	60		197	50	45	75	151	-3	180
	61		85	15.1	14.7	25	35.46	-10.08	43.32
	62		30	11.525	18.5	24.925	46.4	42	67.76925
None	49	NonNURE	19	18.5	27	35.5	67.8	86.2	145.6
	49	NURE	333	20	25	40	60	55	90
	49	Soil	10	13	34.5	44.25	51.8	51.8	74.8
	51	NonNURE	2	13	20	26.5			
	51	NURE	40	16.25	27.5	40	50	2	146.75
	52	NonNURE	8	52.75	43	80.5			
	52	NURE	164	45	40	65	103.5	92	182
	52	Soil	4	0.75	15	15.25			
	53	NonNURE	6	13.75	24.5	31.75			
	53	NURE	72	41.25	95	115	124.5	139.5	184.5
	53	Soil	2	3	21	22.5			
	54	NonNURE	48	6.45	14.425	18.925	26.045	24.09	33.5525
	54	NURE	135	30	25	50	85	88.5	118
	54	Soil	4	32.7	25.85	47			
	55	NonNURE	4	5	32.5	34.75			
	55	NURE	74	10	25	30	35	30	48.25
	55	Soil	2	1.5	13.5	14.25			
	58	NonNURE	55	14.35	20.9	27.25	33.86	31	72.6
	58	NURE	156	25	35	50	75	98.75	143.75
	58	Soil	11	31.31667	15.5	46	52	52	86.6
	59	NonNURE	12	17.05	23.85	33.75	48.6	48.8	69.8
	59	NURE	13	30	50	70	78	80	99

Pooled	WRIA	source	n	IQR	50th Percentile	75th Percentile	90th Percentile	Lower bound for 90th%ile	Upper Bound For 90th %ile
	59	Soil	5	1.651	14.495	14.651			
	60	NonNURE	16	14.525	17	27.5	51	42.5	102.5
	60	NURE	174	60	45	85	163.5	-149.5	578.75
	60	Soil	7	34.92525	26.148	46.5			
	61	NonNURE	17	6.8	7.1	12	37.8	23.4	88.2
	61	NURE	6	60	107.5	122.5			
	61	Soil	62	12.9	14.8675	23.75	28.41	22.03	32.61008
	62	NonNURE	19	13.25	16.4	23.85	39.6	43.6	76.9
	62	Soil	11	6.37825	21.303	25.15375	46	46	72.34625

WRIA 61 excluded

Pooled	WRIA	source	n	IQR	50th Percentile	75th Percentile	90th Percentile	Lower bound for 90th%ile	Upper Bound For 90th %ile
All			1406	30	30	50	90	80	95
WRIA		NonNURE	189	15.9	19	29	42.4	32.4	49.7
		NURE	1161	40	30	60	100	90	110
		Soil	56	21.388	20.2755	36	50.5	33	55.5

Table 3.9 Copper

Pooled	WRIA	source	n	IQR	50th Percentile	75th Percentile	90th Percentile	Lower bound for 90th%ile	Upper Bound For 90th %ile
All			1411	10	12	18	25	23	26
WRIA		NonNURE	206	12.625	14.55	21	27	20.5126	30
		NURE	1087	9	12	17	24	22	26
		Soil	118	12.4	14.05	21.65	31.81	28.72	38.465
Source	49		364	10.025	11	18.025	31	27	36
	51		42	6	10	14	20	14.5	26
	52		154	10	11	17	21	17.3	22
	53		80	4	13	14.25	17	16.9	19
	54		187	5.5	13	16.5	20	16.76605	21.6
	55		79	7	9	13	17	14.8	19.8
	58		165	10.8	12.7	18.8	23.96	21.92	26.22

Pooled	WRIA	source	n	IQR	50th Percentile	75th Percentile	90th Percentile	Lower bound for 90th%ile	Upper Bound For 90th %ile
	59		29	8.883	13.3	19	23.76	18.32	28.20379
	60		196	14.775	13	22	32	29	36
	61		85	15.6	11.9175	21.7	32.02	29.74	40.56
	62		30	12.475	15.75	22.125	29.4	18.2	36.4
None	49	NonNURE	19	18.5	10	21.5	35.2	36	58.8
	49	NURE	335	10	11	18	29.6	30.6	42.6
	49	Soil	10	8.15	21.6	26.375	49.34	49.34	81.14
	51	NonNURE	2	1.5	7.5	8.25			
	51	NURE	40	6	10	14	20.1	-3.5	24.5
	52	NonNURE	8	6.875	11	14.375			
	52	NURE	142	10	11	17	21	22	28.05
	52	Soil	4	5.225	11.65	14.25			
	53	NonNURE	6	4.25	15	16.75			
	53	NURE	72	3.25	13	14	17	13.9	18.45
	53	Soil	2	0.1	10.2	10.25			
	54	NonNURE	48	6.6125	16.175	19.9	28.95	20.925	50.33
	54	NURE	135	5	13	15	17.6	19	22
	54	Soil	4	12.425	18.8	28.1			
	55	NonNURE	4	4.75	12.5	14.75			
	55	NURE	73	7	9	13	16.6	16.8	23.8
	55	Soil	2	1	10.6	11.1			
	58	NonNURE	55	12.25	16	21.75	24.24	19.91	29.58
	58	NURE	99	10.5	10	17	21	21	27.4
	58	Soil	11	3.825	14.8	16.6	26.5	26.5	45
	59	NonNURE	12	8.55	18.5	21.65	26.42	26.08	38.99
	59	NURE	12	5.5	11.5	14.5	21.4	21.4	35.59496
	59	Soil	5	3.183	12.7	13.3			
	60	NonNURE	16	22	12.5	27.45	41	44	76
	60	NURE	173	14	14	22	31.8	33	42
	60	Soil	7	6.352	8.023	12.411			
	61	NonNURE	17	6.2	3.15	8.2	15.6	12	39.64
	61	NURE	6	10	21.5	24.25			
	61	Soil	62	15.291	13.25	22.375	32.23	33.18	39.58
	62	NonNURE	19	10.85	15.5	21.85	29.8	15.4	47.65
	62	Soil	11	17.83	17.9	24.35	27.7	27.7	45.7

WRIA 61 excluded

Pooled	WRIA	source	n	IQR	50th Percentile	75th Percentile	90th Percentile	Lower bound for 90th%ile	Upper Bound For 90th %ile
All			1326	9.9	12	17.9	25	23.1	26.7
WRIA		NonNURE	189	11.9	15.5	21.2	27.3	21.4	30.6
		NURE	1081	9	12	17	24	22	26
		Soil	56	9.30775	14.9	19.4205	27.7	8.1	33.8

Table 3.10 Indium

Pooled	WRIA	source	n	IQR	50th Percentile	75th Percentile	90th Percentile	Lower bound for 90th%ile	Upper Bound For 90th %ile
All			34	0.02	0.05	0.06	0.06	0.05	0.06
WRIA		Soil	34	0.02	0.05	0.06	0.06	0.05	0.06
Source	49		10	0	0.04	0.04	0.051	0.042	0.062
	52		4	0.0125	0.025	0.0325	0.037		
	53		2	0	0.05	0.05	0.05		
	54		2	0	0.06	0.06	0.06		
	55		2	0	0.05	0.05	0.05		
	58		4	0.015	0.065	0.0725	0.077		
	59		2	0	0.04	0.04	0.04		
	60		2	0	0.04	0.04	0.04		
	62		6	0.0075	0.06	0.06	0.06		
None	49	Soil	10	0	0.04	0.04	0.051	0.051	0.071
	52	Soil	4	0.0125	0.025	0.0325			
	53	Soil	2	0	0.05	0.05			
	54	Soil	2	0	0.06	0.06			
	55	Soil	2	0	0.05	0.05			
	58	Soil	4	0.015	0.065	0.0725			
	59	Soil	2	0	0.04	0.04			
	60	Soil	2	0	0.04	0.04			
	62	Soil	6	0.0075	0.06	0.06			

WRIA 61 excluded

Pooled	WRIA	source	n	IQR	50th Percentile	75th Percentile	90th Percentile	Lower bound for 90th%ile	Upper Bound For 90th %ile
All			34	0.02	0.05	0.06	0.06	0.05	0.06
WRIA		Soil	34	0.02	0.05	0.06	0.06	0.05	0.06

Table 3.11 Iron

Pooled	WRIA	source	n	IQR	50th Percentile	75th Percentile	90th Percentile	Lower bound for 90th%ile	Upper Bound For 90th %ile
All			4289	12393	29840	36900	44629	43851.14	45558
WRIA		NonNURE	194	13225	20900	28850	36640	32160	39280
		NURE	3989	12200	30400	37400	45100	44221.37	46100
		Soil	106	9525	21250	25575	30350	26000	33164.5
source	49		364	15313.5	28710	38700	50473	46400	55748.9
	51		42	8340.25	24753.5	30048.5	36617.7	19711.4	42090.4
	52		393	13700	31300	38600	47880	45349.43	50360
	53		249	11413	39100	45980	54500	46900	56813.84
	54		619	9950	34400	39650	47860	45520	50473.6
	55		173	7740	28393	32940	38142.4	36118.4	39630.2
	58		745	10300	28300	34100	41280	39360	43048
	59		99	8743	28000	32300	35900	33800	37260
	60		1413	10500	27600	34000	41880	40777.4	43576.96
	61		162	14225	30350	37850	42550	41300	44600
	62		30	15088	24661	30225	34220	31740	37840
none	49	NonNURE	19	11850	29500	35550	46240	48160	68060
	49	NURE	335	16050	28860	39270	50953	47497.8	63702.9
	49	Soil	10	6100	26850	30300	32400	32400	41110
	51	NonNURE	2	16950	37750	46225			
	51	NURE	40	7526.75	24753.5	29331.5	34895.3	13428.7	43680.91
	52	NonNURE	8	19325	27975	39800			
	52	NURE	381	13300	31400	38600	48400	52273	60326
	52	Soil	4	1225	16850	17675			

Pooled	WRIA	source	n	IQR	50th Percentile	75th Percentile	90th Percentile	Lower bound for 90th%ile	Upper Bound For 90th %ile
	53	NonNURE	6	6150	32400	35025			
	53	NURE	241	11600	39260	46600	54900	59747	66500
	53	Soil	2	1600	23000	23800			
	54	NonNURE	48	7900	19750	25475	36220	26680	51410
	54	NURE	567	9250	34800	39900	48384	52674.9	62674.34
	54	Soil	4	15875	24350	33350			
	55	NonNURE	4	5200	27550	30700			
	55	NURE	167	7760	28400	33086.5	38171.8	37136.8	42929.8
	55	Soil	2	550	21950	22225			
	58	NonNURE	55	9600	15600	20150	30760	31960	41500
	58	NURE	679	9750	28840	34550	42020	44540	49451.45
	58	Soil	11	12150	16700	27300	29100	29100	44800
	59	NonNURE	12	11850	26100	32025	37770	35060	71660
	59	NURE	82	8100	28650	32675	35900	31699.3	39709.3
	59	Soil	5	2300	21478	21600			
	60	NonNURE	16	14692.5	22700	26800	33800	31200	43975
	60	NURE	1390	10375	27710	34075	41952.3	45475.08	49410
	60	Soil	7	8002	13679	20575.5			
	61	NonNURE	5	16400	28000	29600			
	61	NURE	107	10400	34800	40250	43624	48820	57850
	61	Soil	50	8331.25	19200	23956.25	26950	8668.9	29333.9
	62	NonNURE	19	14600	24200	28500	32560	21760	41956.72
	62	Soil	11	14031.5	25122	32900	35300	35300	40500

WRIA 61 excluded

Pooled	WRIA	source	n	IQR	50th Percentile	75th Percentile	90th Percentile	Lower bound for 90th%ile	Upper Bound For 90th %ile
All			4127	12286.5	29800	36823	44800	44000	45759.8
WRIA		NonNURE	189	13000	20800	28700	36960	32280	39900
		NURE	3882	12151.75	30200	37200	45100	44200	46009.75
		Soil	56	10400	21650	26850	32900	28800	36700

Table 3.12 Lead

Pooled	WRIA	source	n	IQR	50th Percentile	75th Percentile	90th Percentile	Lower bound for 90th%ile	Upper Bound For 90th %ile
All			1486	10	15	20	25	21.5	25
WRIA		NonNURE	205	13.3	18	24.5	33	30	35.4
		NURE	1163	5	10	15	24	23	28
		Soil	118	25.52925	21.1	38.30425	85.82725	65.3995	109.3995
Source	49		361	5	10	15	25	25	30
	51		42	10	15	20	25	11	30
	52		174	10	15	20	25	25	29.3
	53		80	10	10	20	24	19.8	28
	54		187	5	10	15	21.56	18.12	23.12
	55		80	5	15	15	20.2	9.937301	24.9
	58		221	10	15	20	34	31	38
	59		30	10	20	25	33	30.0295	41
	60		196	5	10	15	23.5	22	27
	61		85	41	24.107	50	98.88	72.76	121.92
	62		30	17.3	21.15	30.5	35.07	25.36985	39.14
None	49	NonNURE	19	2.5	19	20.5	30.4	24.8	44.6
	49	NURE	332	5	10	15	20	20	25
	49	Soil	10	2.375	13.7	14.775	27.5	27.5	42.4
	51	NonNURE	2	2	26	27			
	51	NURE	40	10	15	20	25	11	36
	52	NonNURE	8	6.5	25	28.5			
	52	NURE	162	10	15	20	25	20	25
	52	Soil	4	2.375	15.3	16.675			
	53	NonNURE	6	2.75	23	24			
	53	NURE	72	10	10	20	20	24.5	34.5
	53	Soil	2	0.35	15.35	15.525			
	54	NonNURE	48	9.35	16.85	22.125	25	-15.85	35
	54	NURE	135	5	10	15	20	15	20
	54	Soil	4	7.75	17.45	21.9			
	55	NonNURE	4	9.5	27	32.25			
	55	NURE	74	5	15	15	18.5	15	25
	55	Soil	2	0.85	29.65	30.075			
	58	NonNURE	54	16.4	14.75	24.6	36.4	29.835	43.71
	58	NURE	156	10	15	20	30	26.25	41.25
	58	Soil	11	12.355	12.1	22.25	26.3	26.3	45.09
	59	NonNURE	12	10.95	20.75	28.5	33	31.6	51.6
	59	NURE	13	10	20	25	25	24	32

Pooled	WRIA	source	n	IQR	50th Percentile	75th Percentile	90th Percentile	Lower bound for 90th%ile	Upper Bound For 90th %ile
	59	Soil	5	5.1	21.501	23.2			
	60	NonNURE	16	17.7	17.85	24	26.5	10.9	49.1
	60	NURE	173	5	10	15	20	25	30
	60	Soil	7	12.98575	17.4	28.15175			
	61	NonNURE	17	6	5.8	9.9	32.1	29.4	55.88
	61	NURE	6	8.75	22.5	25			
	61	Soil	62	63.875	29.8785	76.125	105.8295	111.063	157.5217
	62	NonNURE	19	19.25	20	31	33.4	34.44	38.94
	62	Soil	11	10.438	22.3	26.75	43.1335	43.1335	78.1335

WRIA 61 excluded

Pooled	WRIA	source	n	IQR	50th Percentile	75th Percentile	90th Percentile	Lower bound for 90th%ile	Upper Bound For 90th %ile
All			1401	10	14.7	20	25	25	25
WRIA		NonNURE	188	12.625	18.9	24.925	33.3	30.21	36.6
		NURE	1157	5	10	15	20	15	20
		Soil	56	11.575	16.25	24.5	32.2045	25.969	38.209

Table 3.13 Manganese

Pooled	WRIA	source	n	IQR	50th Percentile	75th Percentile	90th Percentile	Lower bound for 90th%ile	Upper Bound For 90th %ile
All			4341	341	687	880	1130	1100	1150
WRIA		NonNURE	194	360.5	548	753.75	918.9	827.8	969.7294
		NURE	4041	334	690	880	1130	1110	1160
		Soil	106	721.75	652	1155	1592.25	1145.15	1953.015
Source	49		364	352.5	673.5	875.75	1093	972	1150.99
	51		42	232	557.5	734.25	971.8	514.8	1194.6
	52		395	349.5	660	850	1100	1020	1180
	53		246	203.75	700	800	970	926	1035
	54		625	290	730	900	1164.4	1088.8	1248.8
	55		175	360	660	872	1166.8	1077.6	1312.2
	58		753	391	690	911	1150	1070.05	1180

Pooled	WRIA	source	n	IQR	50th Percentile	75th Percentile	90th Percentile	Lower bound for 90th%ile	Upper Bound For 90th %ile
	59		101	330	620	800	1120	940	1270
	60		1442	350	670	870	1110	1050.025	1140
	61		168	353.25	746	933.25	1255.25	980.5	1370.5
	62		30	680.4	831	1193.4	1884.26	629.19	2567.52
None	49	NonNURE	19	325.5	611	783.5	882.8	857.2	1049.318
	49	NURE	335	377.5	681	902	1113.6	1153.2	1340.2
	49	Soil	10	174.25	645.5	743.5	827.1	827.1	1191.85
	51	NonNURE	2	192	584	680			
	51	NURE	40	208	557.5	720.75	981.3	696.2	1293.2
	52	NonNURE	8	178.25	656	752			
	52	NURE	383	349	660	850	1100	1144	1360
	52	Soil	4	475.75	477.5	778			
	53	NonNURE	6	146.5	502.5	576.5			
	53	NURE	238	198.5	710	808.5	973	976	1143.25
	53	Soil	2	14	448	455			
	54	NonNURE	48	343.375	646.5	868.875	1200	-7049	2415.2
	54	NURE	573	280	740	900	1154.8	1255.2	1411.2
	54	Soil	4	80.5	630	666			
	55	NonNURE	4	378.75	681	892.75			
	55	NURE	169	364	660	874	1178	972	1402
	55	Soil	2	54	576	603			
	58	NonNURE	55	349	428	599	878.6	-64.4	1152.6
	58	NURE	687	390	710	940	1180	1287	1568.5
	58	Soil	11	187.7167	387	551.55	660	660	904.5
	59	NonNURE	12	345.5	592.5	758.75	879.5	868.2	1258.15
	59	NURE	84	326.25	615	805	1087	936.5	1382
	59	Soil	5	1356.7	668	2023.7			
	60	NonNURE	16	391	490	572	621	634	714
	60	NURE	1419	350	670	870	1110	1289	1440
	60	Soil	7	411.15	770.68	1045.985			
	61	NonNURE	5	229	501	720			
	61	NURE	113	250	760	910	1180	1164.4	1580.4
	61	Soil	50	787	579.5	1155	1570.05	1464.82	2501.195
	62	NonNURE	19	448.5	636	831	923	-1668.2	1675.5
	62	Soil	11	421.5167	1210	1588.317	2492.9	2492.9	4156.6

WRIA 61 excluded

Pooled	WRIA	source	n	IQR	50th Percentile	75th Percentile	90th Percentile	Lower bound for 90th%ile	Upper Bound For 90th %ile
All			4173	335	680	871	1129.4	1108.8	1158.8
WRIA		NonNURE	189	375	548	767	923	836	970
		NURE	3928	340	690	880	1127.9	1105.8	1155.8
		Soil	56	572	663.5	1100	1588.317	152.9333	1996.633

Table 3.14 Mercury

Pooled	WRIA	source	n	IQR	50th Percentile	75th Percentile	90th Percentile	Lower bound for 90th%ile	Upper Bound For 90th %ile
All			208	0.03275	0.0275	0.05275	0.1	0.08	0.117
WRIA		NonNURE	111	0.03	0.03	0.05	0.12	0.11	0.141
		Soil	97	0.05	0.023	0.06	0.0844	0.0688	0.0988
source	49		29	0.01	0.02	0.02	0.031	0.022	0.042
	51		2	0	0.02	0.02	0.02		
	52		12	0.01	0.02	0.03	0.03	-0.01	0.031
	53		8	0.01	0.02	0.0275	0.053		
	54		11	0.01	0.02	0.03	0.04	0.04	0.05
	55		6	0.015	0.02	0.035	0.04		
	58		31	0.11	0.03	0.12	0.24	0.19	0.36
	59		13	0.04	0.04	0.07	0.132	0.054	0.206
	60		8	0.01	0.02	0.03	0.033		
	61		70	0.0535	0.0365	0.06775	0.09	0.075	0.1
	62		18	0.0675	0.05	0.1	0.106	0.092	0.14
none	49	NonNURE	19	0	0.02	0.02	0.031	0.031	0.051
	49	Soil	10	0	0.01	0.01	0.022	0.022	0.052
	51	NonNURE	2	0	0.02	0.02			
	52	NonNURE	8	0.01	0.025	0.03			
	52	Soil	4	0.0225	0.015	0.0325			
	53	NonNURE	6	0.0225	0.02	0.0425			
	53	Soil	2	0	0.01	0.01			
	54	NonNURE	9	0.01	0.03	0.03			
	54	Soil	2	0	0.01	0.01			
	55	NonNURE	4	0.02	0.03	0.04			
	55	Soil	2	0	0.02	0.02			
	58	NonNURE	21	0.094	0.11	0.12	0.27	-2.23	0.46

Pooled	WRIA	source	n	IQR	50th Percentile	75th Percentile	90th Percentile	Lower bound for 90th%ile	Upper Bound For 90th %ile
	58	Soil	10	0.001375	0.0095	0.01	0.021	0.021	0.041
	59	NonNURE	10	0.03625	0.045	0.0675	0.147	0.147	0.3005
	59	Soil	3	0.045	0.02	0.06			
	60	NonNURE	6	0.0075	0.02	0.0275			
	60	Soil	2	0.005	0.025	0.0275			
	61	NonNURE	14	0.0292	0.0078	0.035	0.081	0.0873	0.1593
	61	Soil	56	0.0505	0.0495	0.07	0.09	0.06	0.128987
	62	NonNURE	12	0.06	0.055	0.1	0.1	0.098	0.118
	62	Soil	6	0.0275	0.04	0.0575			

WRIA 61 excluded

Pooled	WRIA	source	n	IQR	50th Percentile	75th Percentile	90th Percentile	Lower bound for 90th%ile	Upper Bound For 90th %ile
All			138	0.02	0.02	0.04	0.11	0.1	0.157
WRIA		NonNURE	97	0.03	0.03	0.05	0.12	0.078	0.14
		Soil	41	0.01	0.01	0.02	0.05	0	0.07

Table 3.15 Nickel

Pooled	WRIA	source	n	IQR	50th Percentile	75th Percentile	90th Percentile	Lower bound for 90th%ile	Upper Bound For 90th %ile
All			1486	11	12	18	27	24	29
WRIA		NonNURE	204	10.675	14.9	20.675	26.7	21.5	29.3
		NURE	1164	10	10	17	27	24	29
		Soil	118	13.55	16.009	23.25	30.5	24.3	34.69496
source	49		364	10	10	17	25	20.27	28
	51		42	9.5	13	17.5	22.7	-16.9	27.4
	52		175	11	10	16	23	18	26
	53		80	8	10.75	15	22	19	26.9
	54		186	5	10	12	17	14	19
	55		79	5	5	10	15	13	19.6
	58		220	13.15	14.35	21.15	30	25	32.5
	59		30	12.9	14	21.375	25.2	19.9	28.9

Pooled	WRIA	source	n	IQR	50th Percentile	75th Percentile	90th Percentile	Lower bound for 90th%ile	Upper Bound For 90th %ile
	60		195	15	15	25	47	29.8	57
	61		85	15.7	15	23.7	36.88	16.16	44.58
	62		30	8.7515	17.05	21.8265	25.84	24.54555	29.68
None	49	NonNURE	19	5.5	16	18	24.1	17.7	49.7
	49	NURE	335	12	10	17	25	29.2	44.2
	49	Soil	10	5.25	19.6	22.45	29.78	29.78	45.18
	51	NonNURE	2	0	16	16			
	51	NURE	40	10	13	18	23.7	-6.3	58.7
	52	NonNURE	8	15.375	18.5	25.375			
	52	NURE	163	10	10	15	23	9	33
	52	Soil	4	1.525	9.55	10.425			
	53	NonNURE	6	3.25	15.5	16.75			
	53	NURE	72	8	10	15	22	23	29.1
	53	Soil	2	0.1	11.6	11.65			
	54	NonNURE	47	5.05	12	15	26.36	-137.89	72.58
	54	NURE	135	5	10	12	15	14	19
	54	Soil	4	5.475	14.85	18.5			
	55	NonNURE	4	7	19.5	22.25			
	55	NURE	73	2	5	7	12	13	18
	55	Soil	2	0.2	7.9	8			
	58	NonNURE	54	8.925	17.45	21.25	25.79	27.01	43.15672
	58	NURE	155	12	13	19	30	31	44.5
	58	Soil	11	10.83333	13	23.5	28.6	28.6	54.45
	59	NonNURE	12	9.675	21	24.825	27.9	25.5	54.79307
	59	NURE	13	9	12	17	21.2	21.4	30.59496
	59	Soil	5	2.388	9.3	10.588			
	60	NonNURE	16	12.575	16.4	22.25	24.55	21.55	31.2
	60	NURE	172	14	15	25.5	49.7	51.2	88.95
	60	Soil	7	14.44875	15.718	22.5			
	61	NonNURE	17	6.9	7	10.8	19.8	-3.6	63.36
	61	NURE	6	49.5	46	70			
	61	Soil	62	14	18.415	23.7	32.6745	24.027	51.127
	62	NonNURE	19	8.3	16	21.45	24.28	24.12	29.12
	62	Soil	11	11.303	17.618	23.553	26.2	26.2	32.9945

WRIA 61 excluded

Pooled	WRIA	source	n	IQR	50th Percentile	75th Percentile	90th Percentile	Lower bound for 90th%ile	Upper Bound For 90th %ile
All			1401	10.7	12	17.7	27	25.4	29
WRIA		NonNURE	187	9.8	15	21	26.4	20.66	28.7
		NURE	1158	10	10	17	25.6	21.2	26.2
		Soil	56	11.775	15.05	21.6	28.07225	20.2445	32.8395

Table 3.16 Silver

Pooled	WRIA	source	n	IQR	50th Percentile	75th Percentile	90th Percentile	Lower bound for 90th%ile	Upper Bound For 90th %ile
All			1250	0.3	0.4	0.5	0.8	0.8	0.9
WRIA		NonNURE	22	0.950875	0.183	0.97	1.4	0.91	1.898
		NURE	1165	0.2	0.4	0.5	0.8	0.8	0.9
		Soil	63	0.1805	0.2	0.25	0.612	0.16	0.894
source	49		335	0.3	0.3	0.5	0.7	0.6	0.8
	51		40	0.2	0.4	0.5	0.6	0.4	0.7
	52		163	0.2	0.4	0.5	0.6	0.5	0.6
	53		72	0.2	0.2	0.3	0.4	0.3	0.4
	54		135	0.3	0.4	0.6	0.86	0.62	1.02
	55		73	0.5	0.6	0.8	1	0.54	1.1
	58		165	0.2	0.4	0.5	0.7	0.49	0.8
	59		14	0.375	0.55	0.775	0.87	-0.66	1.07
	60		173	0.3	0.4	0.6	0.8	0.5	0.9
	61		74	0.234	0.2	0.3	0.6	0.5	0.744
	62		6	0.6125	0.915	1.3	1.6		
None	49	NURE	335	0.3	0.3	0.5	0.7	0.670756	1
	51	NURE	40	0.2	0.4	0.5	0.6	0.61	0.81
	52	NURE	163	0.2	0.4	0.5	0.6	0.78	0.98
	53	NURE	72	0.2	0.2	0.3	0.4	0.4	0.6
	54	NURE	135	0.3	0.4	0.6	0.86	0.89	1.42
	55	NURE	73	0.5	0.6	0.8	1	1.26	1.76
	58	NonNURE	4	0.555	1.195	1.525			
	58	NURE	155	0.2	0.4	0.5	0.7	-1.5	0.9
	58	Soil	6	0.01375	0.0375	0.045			
	59	NURE	13	0.3	0.5	0.7	0.88	0.6	2.32

Pooled	WRIA	source	n	IQR	50th Percentile	75th Percentile	90th Percentile	Lower bound for 90th%ile	Upper Bound For 90th %ile
	59	Soil	1	0	0.8	0.8			
	60	NURE	173	0.3	0.4	0.6	0.8	0.48	1.58
	61	NonNURE	12	0.013	0.01975	0.0305	0.0818	0.0666	0.3206
	61	NURE	6	0.1	0.55	0.6			
	61	Soil	56	0.172875	0.2	0.2775	0.57	0.38	1.13
	62	NonNURE	6	0.6125	0.915	1.3			

WRIA 61 excluded

Pooled	WRIA	source	n	IQR	50th Percentile	75th Percentile	90th Percentile	Lower bound for 90th%ile	Upper Bound For 90th %ile
All			1176	0.225	0.4	0.5	0.8	0.8	0.9
WRIA		NonNURE	10	0.55	0.995	1.4	1.81	1.72	2.58
		NURE	1159	0.2	0.4	0.5	0.8	0.8	0.9
		Soil	7	0.015833	0.04	0.048333	0.35	0	0.66

Table 3.17 Thallium

Pooled	WRIA	source	n	IQR	50th Percentile	75th Percentile	90th Percentile	Lower bound for 90th%ile	Upper Bound For 90th %ile
All			151	0.14	0.21	0.325	0.52	0.44	0.64
WRIA		NonNURE	53	0.11	0.23	0.31	0.41	0.14	0.5
		Soil	98	0.22375	0.2	0.4	0.6	0.57	0.77
source	49		10	0.1	0.4	0.4	0.4	0.4	0.4
	52		4	0.025	0.3	0.325	0.37		
	53		2	0	0.6	0.6	0.6		
	54		44	0.1025	0.24	0.3125	0.473	0.314	0.626
	55		2	0	0.8	0.8	0.8		
	58		11	0.385	0.12	0.5	0.7	-3	0.9
	59		3	1.65	0.6	2.25	3.24		
	60		2	0	0.4	0.4	0.4		
	61		67	0.04	0.2	0.2	0.214	0.154	0.228
	62		6	0.175	0.55	0.6	0.65		

Pooled	WRIA	source	n	IQR	50th Percentile	75th Percentile	90th Percentile	Lower bound for 90th%ile	Upper Bound For 90th %ile
None	49	Soil	10	0.1	0.4	0.4	0.4	0.4	0.4
	52	Soil	4	0.025	0.3	0.325			
	53	Soil	2	0	0.6	0.6			
	54	NonNURE	40	0.1	0.24	0.31	0.383	0.166	0.7235
	54	Soil	4	0.2625	0.38	0.5			
	55	Soil	2	0	0.8	0.8			
	58	NonNURE	1	0	4.4	4.4			
	58	Soil	10	0.3875	0.12	0.5	0.52	0.52	0.891
	59	Soil	3	1.65	0.6	2.25			
	60	Soil	2	0	0.4	0.4			
	61	NonNURE	12	0.055	0.17	0.2125	0.391	0.392	0.773
	61	Soil	55	0.03	0.2	0.2	0.2	0.1655	0.246
	62	Soil	6	0.175	0.55	0.6			

WRIA 61 excluded

Pooled	WRIA	source	n	IQR	50th Percentile	75th Percentile	90th Percentile	Lower bound for 90th%ile	Upper Bound For 90th %ile
All			84	0.205	0.3	0.4325	0.6	0.43	0.686
WRIA		NonNURE	41	0.1	0.24	0.31	0.41	0	0.5
		Soil	43	0.25	0.4	0.55	0.68	0.56	0.76

Table 3.18 Zinc

Pooled	WRIA	source	n	IQR	50th Percentile	75th Percentile	90th Percentile	Lower bound for 90th%ile	Upper Bound For 90th %ile
All			1488	33	40	60	86.3	80.6	90.6
WRIA		NonNURE	206	37.2	64.55	84.375	101	88	106.3
		NURE	1165	25	35	50	67	64	69
		Soil	117	64	80	121	224.765	129.93	308.5506
Source	49		364	25	32	47	67	57	69.9
	51		42	48	40	73.75	98	4.5	114.3
	52		175	25	37	50	65.6	51.2	73

Pooled	WRIA	source	n	IQR	50th Percentile	75th Percentile	90th Percentile	Lower bound for 90th%ile	Upper Bound For 90th %ile
	53		80	15	42	52	71.2	62.4	87.4
	54		187	25.15	47	62.15	85.52	70.89336	96.1
	55		79	28	37	55	73	66	85
	58		221	38	48	68	92.3	81.6	101.6
	59		29	29.2	62	68.2	113.848	57.264	156.896
	60		196	22.5	32	47.5	71	63.25	82.105
	61		85	86	80	130	251.47	132.44	311.22
	62		30	60.0425	70.05	114.2175	133.585	108.753	151.88
None	49	NonNURE	19	35	54	77	90.2	71.4	100.9
	49	NURE	335	23	32	45	63.8	61.1	82
	49	Soil	10	18.25	79.5	88.75	104.3	104.3	124.9572
	51	NonNURE	2	13.5	68.5	75.25			
	51	NURE	40	46.25	40	71.25	98.7	-111.5	143.35
	52	NonNURE	8	23.125	91.5	97.875			
	52	NURE	163	21	35	46	61.6	53	74
	52	Soil	4	13	61.5	68.75			
	53	NonNURE	6	10.75	73	78.75			
	53	NURE	72	12.75	40	47.75	55	72.3	97.3
	53	Soil	2	3.5	58.5	60.25			
	54	NonNURE	48	32.9	70.1	90.65	115.9	-5.3	202.75
	54	NURE	135	15	40	50	65.4	40.5	83
	54	Soil	4	11.6	76.5	80.5			
	55	NonNURE	4	28.75	68	83.75			
	55	NURE	73	24	35	51	67	74.4	90.6
	55	Soil	2	1	60	60.5			
	58	NonNURE	55	39.4	65.8	85.4	100.36	104.5	130.6
	58	NURE	155	35	40	60	80	73.4	130.5
	58	Soil	11	19.2	59	69	91	91	151.9311
	59	NonNURE	12	12.15	64	69.125	109.79	89	384.8
	59	NURE	13	32	38	65	86.6	91.4	127.4
	59	Soil	4	52.6175	88.905	115.8675			
	60	NonNURE	16	46.625	59.35	78.625	86.4	87.5	100.8
	60	NURE	173	20	32	45	61	54.4	81.4
	60	Soil	7	30.533	59.895	89.485			
	61	NonNURE	17	56.6	42	80.6	98.8	82	130.72
	61	NURE	6	58	73.5	110			
	61	Soil	62	130.3036	98.9375	185.29	346.6	340.7	483.595
	62	NonNURE	19	18.5	58	70.05	80.96	-64	148.49
	62	Soil	11	27.425	122	132.425	138.85	138.85	152.48

WRIA 61 excluded

Pooled	WRIA	source	n	IQR	50th Percentile	75th Percentile	90th Percentile	Lower bound for 90th%ile	Upper Bound For 90th %ile
All			1403	30	40	57	80	75.1	83
WRIA		NonNURE	189	35.8	65.5	85	101.2	88.2	108.039
		NURE	1159	25	35	50	67	64	69
		Soil	55	46.5	71	105.5	125.736	118.472	137.898