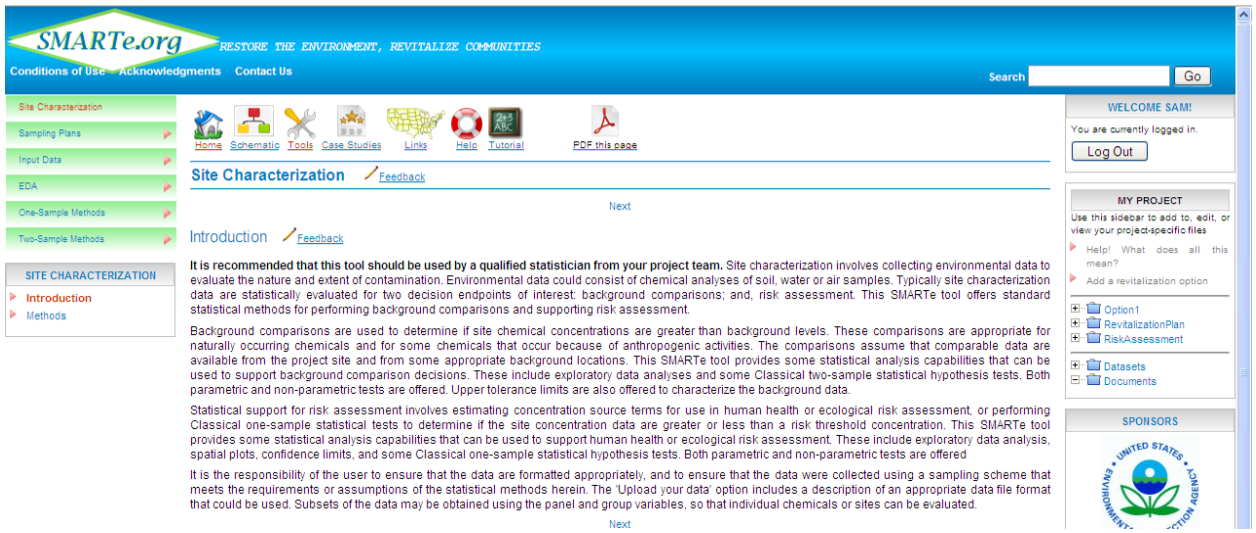
Site Characterization Tool

The SMARTe Site Characterization tool is accessible via the tools menu or the Environmental Management menu in SMARTe. The tool is introduced with a caution regarding its use, and an explanation of its purposes, as shown in the following screen:



The purpose of the Site Characterization tool is twofold: (1) develop a sample design for collecting site characterization data and (2) perform data analysis on uploaded data. The sample design part of the tool helps determine how many samples should be collected to characterize a site with potential contamination. The methods for determining how many samples to collect (and where to collect them) are under "Sampling Plans". There are options for site-only sampling or for sampling at both the site and an area reasonably assumed to be background. The input screen for site-only sampling is shown below. There are input options for determining an appropriate number of samples to collect based on prior knowledge (expected variability of the data) and agreed upon error tolerance limits. SMARTe allows the user to import a map and overlay the sampling locations on their map. The next section of inputs describes the type of sample design that is desired (e.g., simple random, systematic grid, etc.). The final sections address cost estimates for the sampling activities and uploading of any existing data the user might want to include. Note that holding the mouse over any of the requested inputs will result in a definition of the expected item being shown on the user's monitor.

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Sampling -- One Sample

Introduction Feedback

This module provides guidance in setting up sampling plans for single populations; that is, when the interest is comparing a site mean to a pre-defined threshold (action level). An appropriate sample size is calculated, and samples can be located on a map in ESRI shapefile format.

Hypothesis Set-up Options

Null Hypothesis

- (•) Site has higher mean than action level
- ( ) Site has lower mean than action level
- ( ) Site mean equals action level

Action Level 15.0

Lower Bound on Action Level 12.0

Probability of Type I Error 0.05

Probability of Type II error 0.10

Standard Deviation 4.0

Assume normality [x]

Map Set-up Options: + -

Sampling Map None

Map Overlay None

Sampling Placement

- (•) Random
- ( ) Systematic Grid Sample
- ( ) Systematic Triangular Sample
- ( ) Stratified Grid Sample
- ( ) Stratified Triangular Sample
- ( ) Random Dispersal Sample

Draw Axes [ ]

Cost Calculation Options: + -

Calculate costs [x]

Fixed Cost 5000

Sample Cost 500

Existing Data Options: + -

X-axis Coordinates None

Y-axis Coordinates None

Existing Concentrations None

Panel Variable Column None

Grouping Variable Column None

Estimate Standard Deviation from Existing Concentrations [ ]

Submit

WELCOME SAM!

You are currently logged in.

Log Out

MY PROJECT

Use this sidebar to add to, edit, or view your project-specific files

Help! What does all this mean?

Add a revitalization option

- Option1
- RevitalizationPlan
- RiskAssessment
- Datasets
- Documents

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The suggested sample size and expected costs are returned on a screen like the one shown below. If a map has been uploaded, then the exact sample locations are identified on the map.

RESULTS

- Sample plan results
- Figure 1.1. Power Graph
- Figure 2.1. Sampling Locations Map
- Sampling Locations Table

Results

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Sample plan results

Sample plan results

Required Sample Size	17
Number of Exisiting Samples	0
Number of Pre-defined Locations	0
Number of New Samples Needed	17
Fixed Cost	5000
Field Sampling Cost	8500
Total Cost	13500

Next

The data analysis part of the Site Characterization tool enables a user to upload their site characterization data, and then look at it with exploratory data analyses such as summary statistics, box plots, and spatial intensity plots.

Summary Statistics:

RESULTS

- Summary statistics for data column result in dataset BkgCompTest.txt.sdml .

Results

Summary statistics for data column result in dataset BkgCompTest.txt.sdml .

analyte	N	Num Detect	Min ND	Max ND	Min Detect	Median	Mean	Max Detect	Std Dev
Arsenic	180	180	NA	NA	0.3	9.75	13.68	107	13.3
Beryllium	180	180	NA	NA	0.25	0.5	0.7449	3.7	0.5394
Copper	122	122	NA	NA	1.25	37.2	428.6	27800	2569

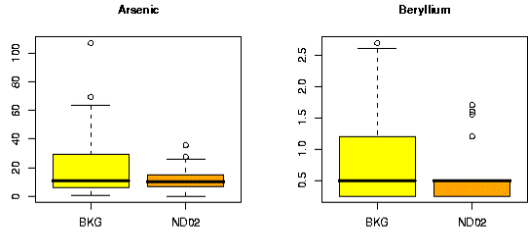
Box Plots:

RESULTS

- Figure 1.1. Boxplot

Results

Figure 1.1. Boxplot



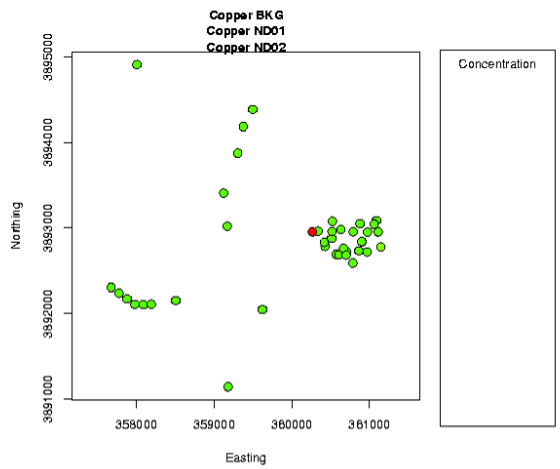
Spatial Intensity Plots:

RESULTS

- Figure 1.1. Intensity Plot

Results

Figure 1.1. Intensity Plot



In addition to exploratory data analysis, many statistical tests are available within this tool. There are tests to compare concentration levels to a threshold or to concentrations at another site or at a background location. These tests are offered for users who have data that follow a known distribution (parametric tests) and for those users who do not know the distribution of their data (non-parametric tests). There are also calculations for confidence intervals and prediction intervals. A partial example of the results of a non-parametric test that indicates the arsenic concentrations on site are greater than the threshold of interest is shown below.

RESULTS

- Wilcoxon Signed Rank test results and interpretation for data column 'result' in dataset 'BkgCompTest.txt.sdml'.
- Wilcoxon Signed Rank test summary statistics for data column 'result' in dataset 'BkgCompTest.txt.sdml'.

Results

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Wilcoxon Signed Rank test results and interpretation for data column 'result' in dataset 'BkgCompTest.txt.sdml'.

Topic	Discussion
Setup	The chosen subset of the result column was analyte Arsenic and location ND02. The subset had a sample size of 77, of which 77 were detects. There was 1 data point equal to the hypothesized location. This point was removed leaving 76 values for the test.
Assumptions	The Wilcoxon Signed Rank test assumes the population distribution is approximately symmetric. EDA plots and summary statistics (mean approximately equal to the median) will indicate whether this assumption is reasonable. If not, then the one-sample Sign test is an alternative. Finally, review the sampling plan to ensure the assumptions of data randomness and independence are met.
Hypotheses	The null hypothesis is that the population location is equal to 12. The alternative hypothesis is that the population location is greater than 12.
Test Statistic	The test statistic is the sum of the ranks of the positive deviations from the hypothesized location. For this data set, the test statistic is 1239.
p-value	The p-value is the probability of observing the computed test statistic (or one more extreme) given the null hypothesis is true. The p-value for this test is 0.8775, which is greater than the significance level of 0.05. An exact p-value could not be found because the data set contained non-detects, values equal to the hypothesized location, or there were tied ranks. A normal approximation to the p-value was calculated instead.
Conclusions	The p-value is greater than the significance level so we fail to reject the null hypothesis.

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