Reports and Analysis Exercise

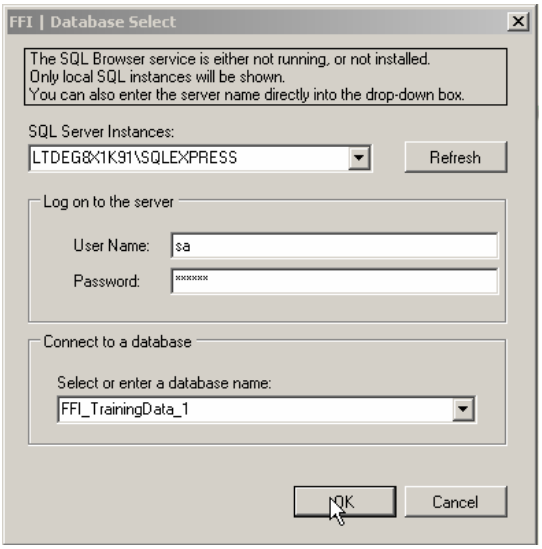
This exercise is designed to give you a brief overview of the summary reports and analysis reports in FFI. It isn't meant to be a complete description of the reports and analysis available but to just to make you generally familiar with what's available.

The Forest project in the training database represents a series of macroplots that have been measured three times:
2001/10/15 = Pretreatment measurements
2002/10/07 = First remeasurement (first year after prescribed fire)
2003/09/05 = Second remeasurement (second year after prescribed fire)

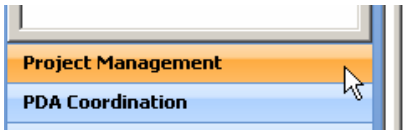
In this example exercise, assume a prescribed fire was applied to the site after the pretreatment data was collected then the macroplots were monitored again one year and two years posttreatment . Some goals of the fire where to: a) kill less than 10% of the total mature trees, b) increase live crown base height of the mature trees, c) reduce the biomass of fine woody debris (FWD), d) maintain the cover of beargrass (XETE) and e) maintain 11 tons/acre of duff.

Setup for Reports and Analysis

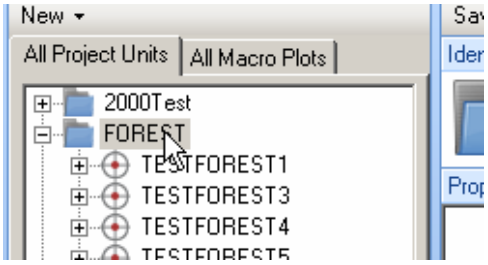
1) Open the Training Database



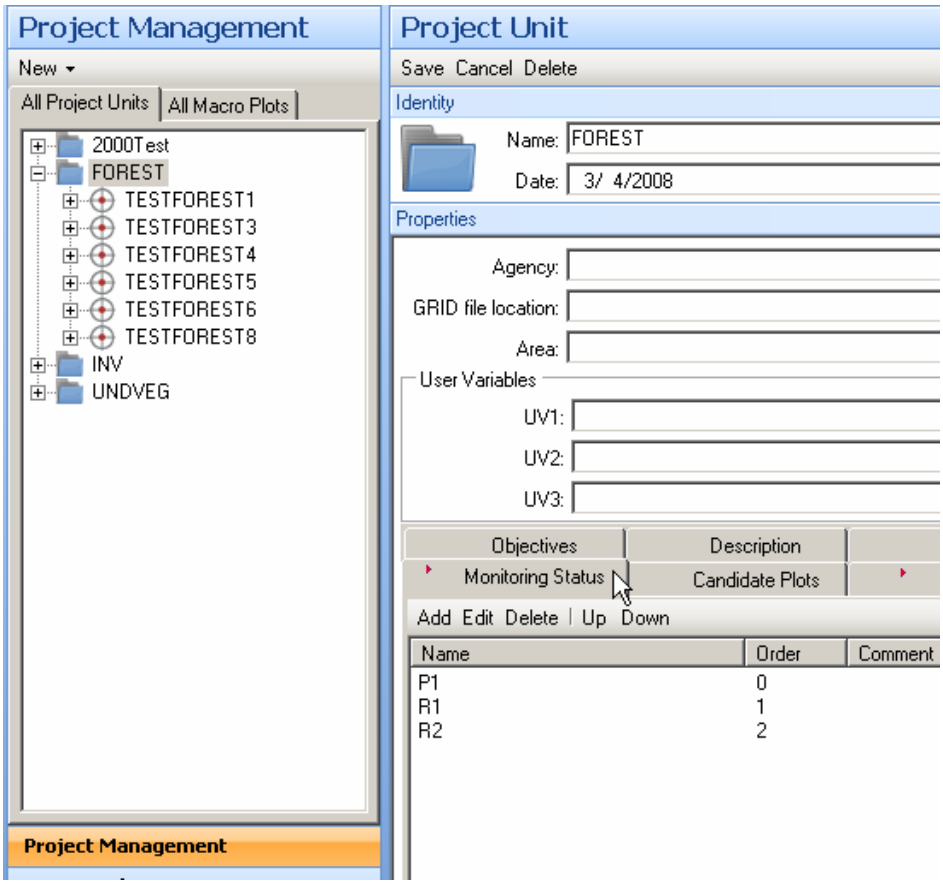
2) Click *Project Management* in the left pane



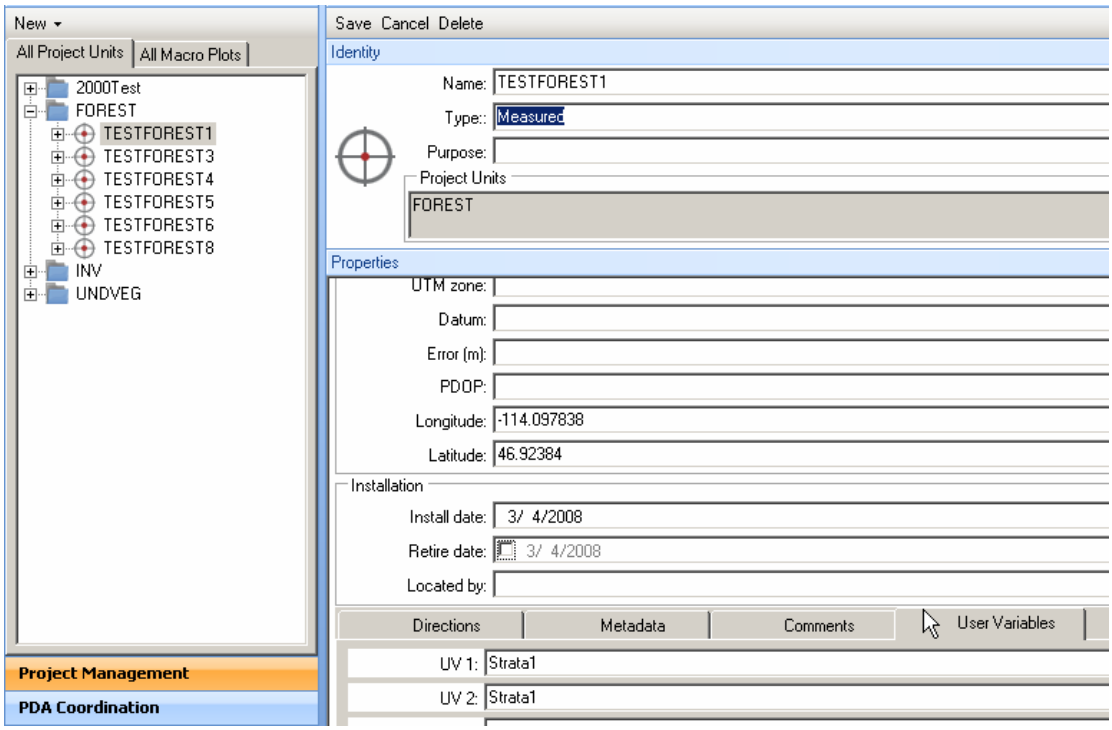
3) Click on the FOREST folder name in the left pane



4) Click on the Monitoring Status tab and if there are no statuses entered add three new Statuses: P1, R1 and R2 (or PreTreatmentYear1, ReMeasureYear1, ReMeasureYear2)

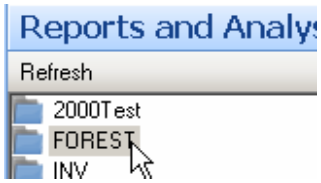


5) For each macroplot, click the macroplot name in the left pane, then scroll to the bottom on the right side and click on the User Variable tab. (If the macroplots are not visible click on the '+' sign next to the Forest folder). Make sure that it says Strata1 in the UV2 field for each macroplot. We will use this UV field to put all macroplots into the same stratum (i.e. get an average for all macroplots for each sample event) when running the reports.

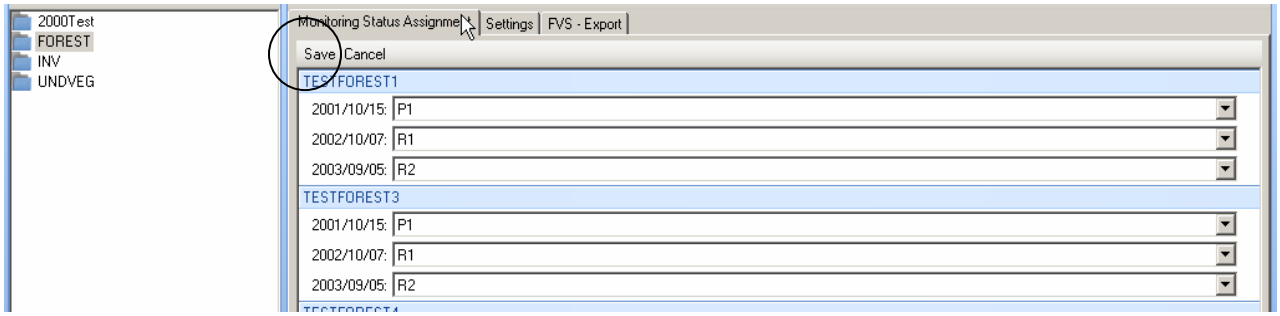


6) Click on *Reports and Analysis* in the left pane.

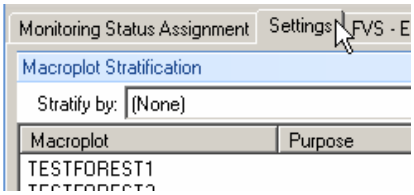
7) Click on the Forest project folder in the left pane.



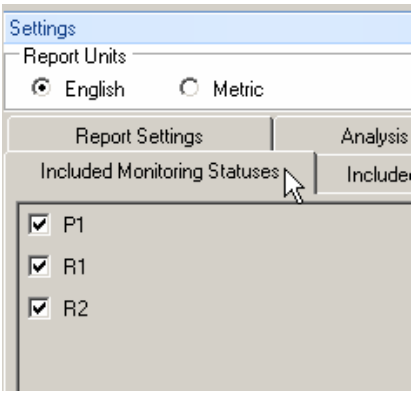
8) Click on the Monitoring Status Assignment tab and, for each macroplot, set the first sample event date to P1, the second to R1 and the third to R2 (or use the Status you picked in Step 4). Setting Monitoring Status identifies the sampling order for the analysis program. **Click Save when done**!



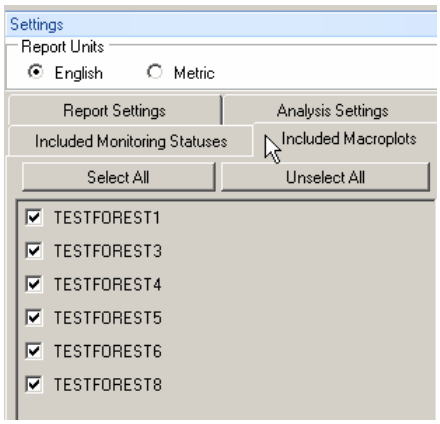
9) Click on the Settings tab and under Report Settings on the right side, select Trees



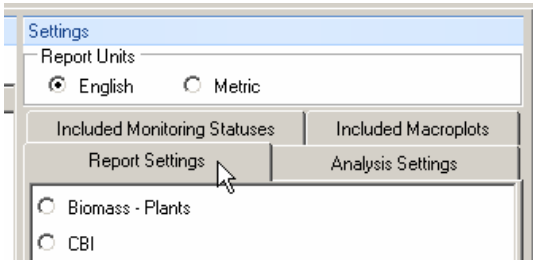
10) Click on the Included Monitoring Statuses tab and make sure all three are checked.



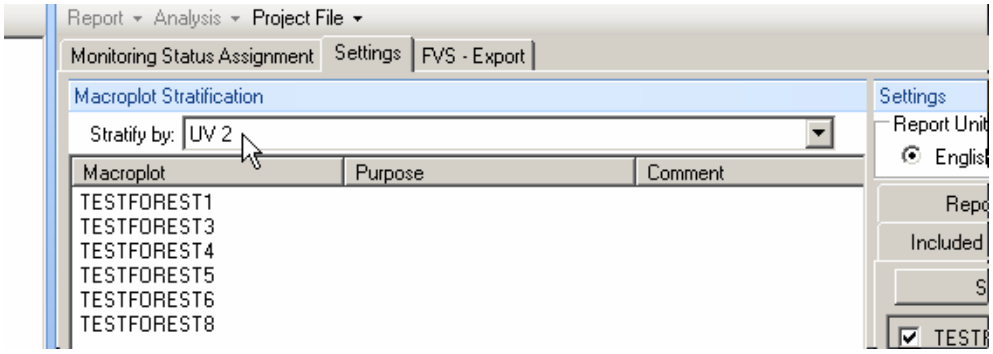
11) Click on the Included Macroplots tab and make sure all macroplots are selected.



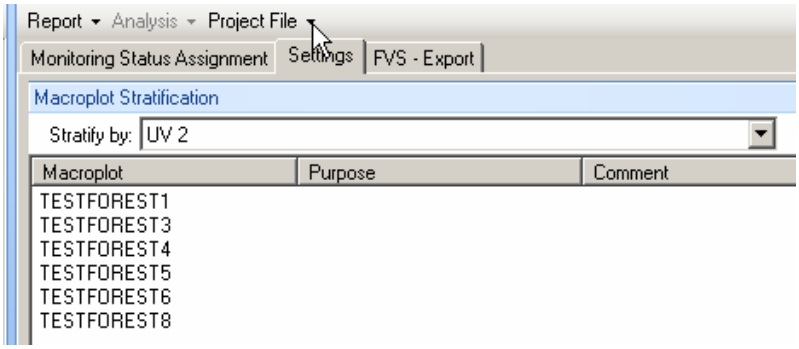
12) Click on the Report Settings tab. This tab must be selected to create a report.



13) In the Stratify by field select: UV2. This will group all the macroplots into one stratum for each monitoring status.



14) If you want to save all the settings you can Export the Project File at this time.

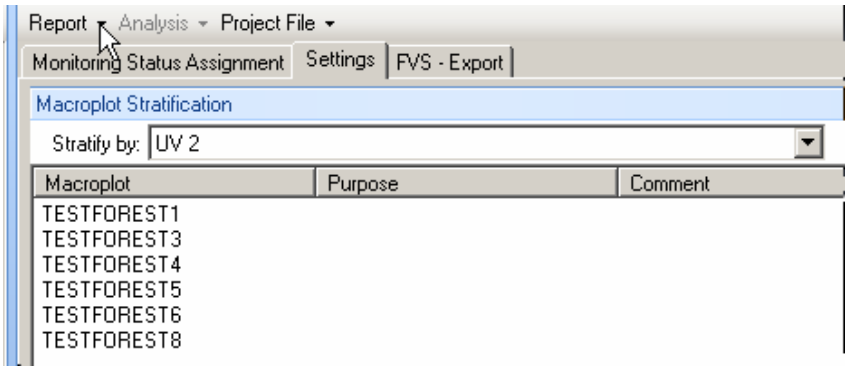


Creating Summary Reports

Tree Density

The summary reports in FFI present macroplot attribute values summarized to the macroplot level or they present a mean attribute value by stratum. In this next example macroplots are summarized by UV2 so the reports will summarize average tree density by the stratum.

15) At the top of the page click Report > View Report to see the Tree summary report.



Trees Strata Summary

Strata	Monitoring Status	Trees (per acre)	Basal Area (sq. ft. / acre)	Avg. Live Crown Base Height (ft.)	Avg. Height (ft.)	QMD (in.)	Saplings (per acre)	Seedlings (per acre)	Total Trees (per acre)	Snags (per acre)
		Mature Trees								
Strata1	P1	48.5	39.2	27.0	64.8	11.8	50.2	412.5	373.7	0.2
Strata1	R1	36.8	39.0	37.7	72.0	13.2	50.2	525.0	437.0	1.3
Strata1	R2	31.8	36.8	38.0	74.4	13.8	50.2	525.0	432.0	1.8

Seedling and sapling density includes live and dead trees.

When the summary opens you will see on the right side that the data has been summarized to Strata 1 for each monitoring status. That means all of the data on the six macroplots you selected in Step11 have been grouped together and the values under each heading represent the average

across all six macroplots in the stratum. Remember the Strata1 assignment was stored at the macroplot level (Step 5).

Look over the summary report and try to answer these questions:
Question 1) Did the treatment appear to be successful in the general goal of killing less than 10% of the total number of mature trees?

Question 2) Looking at this report can you tell how many seedlings the fire killed?

Question 3) Does the number of snags post fire seem correct (Hint: look at the data entry forms and compare the Single Tree plot size and the Snag Plot size.)?

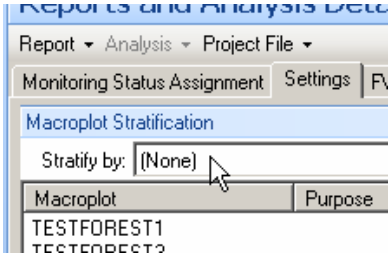
16) Close the report.

17) If not already selected click on *Reports and Analysis*, then Settings tab at the top of the page. Click the Report Settings tab. Select Trees by Species, stratify by UV2 and click Report > View Report to see the next summary.

Question 4) By the second re-measurement the which species of mature trees saw the greatest mortality?

18) Close the report.

19) Build the Tree by Species summary report again but this time set the Strata by field to "(None)".



Note that the tree species are listed for each macroplot and each monitoring status, not summarized to the stratum as they were in the previous report. This step is just to show how the reports look when macroplots are not stratified.

20) Close the report.

Creating Analysis Reports

The parametric analysis reports in FFI use an 'F-Test' and 'Dunnett's multiple comparison procedure with a control' to identify significant differences in Report Attributes. First, the F-test is used to note if there are any significant differences in the attribute means. If significant differences are noted with the F-test then FFI uses the Dunnett's procedure for determining the means that are significantly different. In FFI the 'control' attribute used for the Dunnett's

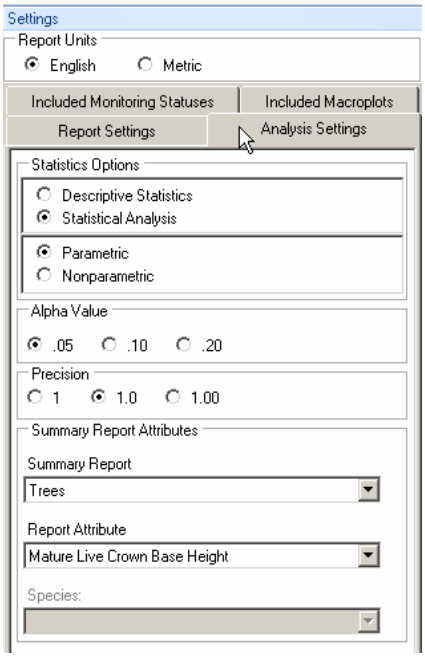
procedure is always the top-most monitoring status selected on the Included Monitoring Statuses tab (Step 10). The statistical tests are made by comparing each subsequent monitoring status to the control. The p-value for each comparison is presented at the bottom of the report.

For datasets with data that is not normally distributed, non-parametric equivalents of the F-test and Dunnett's procedure are also available. FFI uses Friedman's chi-square, non-parametric multiple comparisons based on Friedman's Rank Sums and a distribution free confidence interval for the non-parametric comparisons.

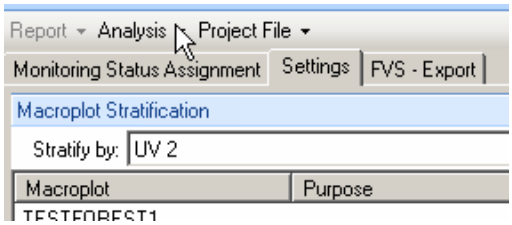
To make parametric or non-parametric comparisons the FFI analysis procedures requires at least four macroplots with data for each sample event to produce the Dunnett's statistics. Any sample events with missing data can not be included in a test.

Mature Live Crown Base Height

21) If not already selected, click on the Analysis Settings tab on the right.
Select: Statistical Analysis, Parametric, Alpha=0.05, Precision=1.0
Select Summary Report = Trees, Report Attribute = Mature Live Crown Base Height.



22) Select UV2 in the Strata by field and click Analysis > View Report.



Project Unit_____**FOREST**
Summary Report_____**Trees**
Report Attribute_____**Mature Live Crown Base Height**
Units_____**Feet**

Strata: Strata1

Plot	P1 Attr	R1 Attr	Diff	%Diff	R2 Attr	Diff	%Diff
TESTFOREST1	27.2	51.7	24.5	90.0	51.7	24.5	90.0
TESTFOREST3	26.4	34.8	8.4	31.6	38.0	11.6	43.9
TESTFOREST4	24.8	33.0	8.2	33.1	31.0	6.2	25.0
TESTFOREST5	27.6	35.0	7.4	26.8	36.7	9.1	32.9
TESTFOREST6	27.6	37.4	9.8	35.7	36.1	8.5	31.0
TESTFOREST8	28.7	34.4	5.7	20.0	34.4	5.7	20.0
Mean	27.0	37.7			38.0		
SDev	1.3	7.0			7.1		
N	6.0	6.0			6.0		
CI-Lower	25.7	30.4			30.5		
CI-Upper	28.4	45.0			45.5		

F-Value = 6.91 Prob = 0.0075 Alpha =.05 (Settings Dialog Box)

P1 to R1: p <= .01
P1 to R2: p <= .01

Each analysis report includes a header stating the Project being analyzed (Forest), the Summary Report being examined (Trees), the Report Attribute (Mature Live Crown Base Height) and the Units of the attribute (Feet).

In this example all of the macroplots were stratified by Strata 1, then the average Mature Live Crown Base Height (MLCBH) was calculated across all macroplots in the stratum for each monitoring status. The result is shown in the row labeled ‘Mean’ in the analysis table.

Near the bottom of the analysis report you will see that the F-value calculated for this analysis was 6.91. The probability of this F-value is 0.0075. That probability is lower than the Alpha value set in Step 21 (0.05) and indicates there are significant differences in the attribute means. When the F-test is significant FFI then produces p-values for the Dunnett’s comparison at the bottom of the report. In the example, the mean MLCBH for P1 (27.0 ft) is tested against R1 (37.7 ft) and then the mean MLCBH for P1 (27.0 ft) is tested against R2 (38.0 ft). The attribute means are considered significantly different if the p-value for the Dunnett’s procedure is less than the significance level you chose (usually 0.01 or 0.05).

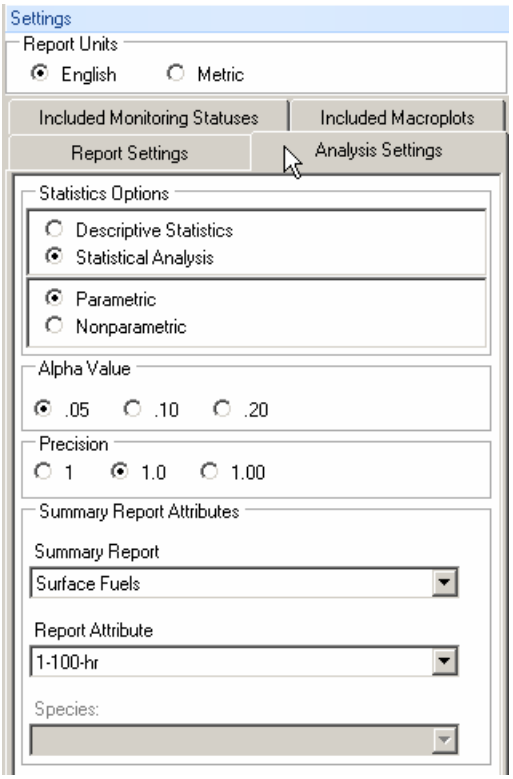
Question 5) Looking at the analysis report were there any significant differences in Live Crown Base Height after the fire treatment at the 0.05 significance level?

23) Close the report

Biomass of Fine Woody Debris (FWD)

24) If not already selected, click on the Analysis Settings tab on the right.
Select: Statistical Analysis, Parametric, Alpha=0.05, Precision=1.0

Select Summary Report = Surface Fuels, Report Attribute = 1-100 hr



25) Click Analysis > View report

Project Unit_____**FOREST**
Summary Report_____**Surface Fuels**
Report Attribute_____**1-100-hr**
Units_____**Tons per Acre**

Strata: Strata1

Plot	P1 Attr	R1 Attr	Diff	%Diff	R2 Attr	Diff	%Diff
TESTFOREST1	11.4	6.0	-5.4	-47.1	8.2	-3.2	-28.5
TESTFOREST3	2.4	1.4	-1.0	-42.7	1.5	-0.8	-34.4
TESTFOREST4	5.9	1.4	-4.5	-76.6	2.2	-3.7	-62.3
TESTFOREST5	4.0	2.0	-1.9	-49.2	2.9	-1.1	-27.1
TESTFOREST6	3.0	1.4	-1.6	-53.4	1.6	-1.4	-47.3
TESTFOREST8	5.5	2.2	-3.2	-59.0	3.5	-2.0	-36.1
Mean	5.4	2.4			3.3		
SDev	3.3	1.8			2.5		
N	6.0	6.0			6.0		
CI-Lower	1.9	0.5			0.7		
CI-Upper	8.8	4.3			5.9		

F-Value = 2.03 Prob = 0.1659 Alpha =.05 (Settings Dialog Box)

Question 6) Did the treatment meet the general goal of reducing FWD biomass?

26) Close the report.

Using the Analysis Reports to view species specific reports

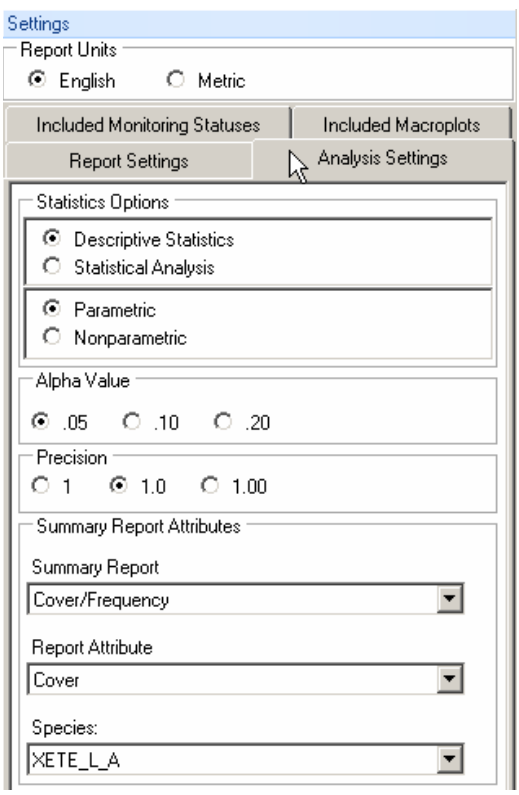
Cover of beargrass (XETE)

27) On the Report Settings tab select Cover/Frequency, stratify by UV2 and click Report > View Report to view the Cover/Frequency summary.

Examine the report to see how the cover of XETE responded to the simulated fire. You'll see it is difficult to compare the cover values across monitoring status because of all the species in the Cover/Frequency Report. By using the Analysis Reports you can get view average cover for individual species more easily.

28) Close the report.

29) Click the Analysis Settings tab.
Select: Descriptive statistics, Parametric, Precision = 1.0 (when using descriptive statistics Alpha value is not used)
Select Summary Report = Cover/Frequency, Report Attribute = Cover, Species = XETE_L_A (L=live and A=aerial cover).



30) Click Analysis > View report

You will see in the report header that the percent cover of XETE_L_A is the attribute being reported. The table shows that in the pretreatment sampling XETE was found on four of the six macroplots in the project. (A species must be present on a macroplot for a least one of the sampling events for the macroplot to appear in the report table, thus two macroplots are not listed.) In the first re-measurement it was found on two macroplots and by the second re-measurement it was on was seen on the four macroplots again. Note that when a species is not sampled on a macroplot FFI reports "***" and the mean value only includes the macroplots where the attribute was present.

Project Unit_____**FOREST**
Summary Report_____**Cover/Frequency**
Report Attribute_____**Cover**
Units_____**Percent**
Species_____**XETE_L_A**

Strata: Strata1

Plot	P1 Attr	R1 Attr	Diff	%Diff	R2 Attr	Diff	%Diff
TESTFOREST3	24.8	15.2	-9.6	-38.7	20.0	-4.8	-19.4
TESTFOREST4	20.8	***	***	***	20.0	-0.8	-3.8
TESTFOREST6	3.6	5.6	2.0	55.6	2.4	-1.2	-33.3
TESTFOREST8	5.6	***	***	***	5.6	0.0	0.0
Mean	13.7	10.4			12.0		
SDev	10.7	6.8			9.3		
N	4.0	2.0			4.0		
CI-Lower	-3.3	-32.7			-2.8		
CI-Upper	30.7	53.5			26.8		

Question 7) Was the general goal of maintaining XETE cover successful by the second re-measurement?

Question 8) Is there enough data to get statistical inference of XETE cover using the FFI analysis tools?

31) Close the report.

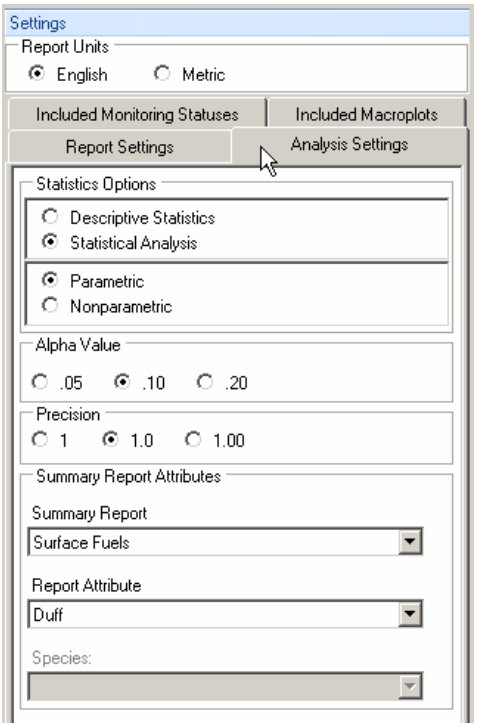
Using the Confidence Intervals (CI) for One-sample t-tests

In some cases treatment will be applied in the hope an attribute will meet some target value. The FFI confidence intervals in the analysis reports can be used to make these inferences.

Biomass of Duff

32) If not already selected, click on the Analysis Settings tab.
Select: Statistical Analysis, Parametric, Alpha = 0.10, Precision = 1.0

Select Summary Report = Surface Fuels, Report Attribute = Duff.



33) Make sure UV2 is selected in the Strata by field, then click Analysis > View Report

Project Unit_____**FOREST**
Summary Report_____**Surface Fuels**
Report Attribute_____**Duff**
Units_____**Tons per Acre**

Strata: Strata1

Plot	P1 Attr	R1 Attr	Diff	%Diff	R2 Attr	Diff	%Diff
TESTFOREST1	15.8	10.7	-5.1	-32.3	13.0	-2.9	-18.1
TESTFOREST3	8.5	6.9	-1.5	-18.2	7.9	-0.6	-7.4
TESTFOREST4	16.8	12.5	-4.4	-25.9	11.6	-5.3	-31.4
TESTFOREST5	11.5	10.9	-0.6	-5.4	10.8	-0.7	-6.3
TESTFOREST6	9.3	6.1	-3.2	-34.2	8.1	-1.3	-13.7
TESTFOREST8	18.4	8.6	-9.8	-53.3	11.7	-6.7	-36.5
Mean	13.4	9.3			10.5		
SDev	4.2	2.5			2.1		
N	6.0	6.0			6.0		
CI-Lower	10.0	7.3			8.8		
CI-Upper	16.8	11.3			12.2		

F-Value = 2.88 Prob = 0.0872 Alpha =.10 (Settings Dialog Box)

P1 to R1: .01 < p <= .05
P1 to R2: p > .05

At the bottom of the report FFI includes two confidence interval values: CI-Upper and CI-Lower. When a target value is greater than CI-Lower and less than CI-Upper in can be interpreted that you are 95% certain the target was met. The target of 11 tons/acre of duff was seen in the pretreatment sampling because it is great than 10.0 (CI-Lower) and less than 16.8 (CI-Upper).

Question 9) Was the general goal of maintaining 11.0 tons/per acre of duff after the fire treatment met at the time of the second re-measurement?

Caution: A statistician will tell you that the definition of a confidence interval is different than stated above. The interpretation we suggest in FFI is useful and accurate but not technically correct.

Question 10) Note that in this example Alpha=0.10. Would there have been a significant difference in the mean duff biomass between treatments if it had been set to 0.05?

Review Results

Review the answers to see how well the treatment did at meeting the general goals of the project.

Was the treatment successful in the general goal of killing less than 10% of the total number of mature trees (Q1)?

Looking at the analysis report were there any significant differences in Live Crown Base Height after the fire treatment at the 0.05 significance level (Q5)?

Did the treatment meet the general goal of reducing FWD biomass (Q6)?

Was the general goal of maintaining XETE cover successful (Q7)?

Was the general goal of maintaining 11.0 tons/per acre of duff after the fire treatment met (Q9)?

Is there litigation in your future?