Hood Mountain Seedling Data Analysis

1. **<u>Assignment: Answer the following question: Is there a difference between the burned and bulldozed areas:</u>**
    - In total seedlings of all spp?
    - In the density of Arctostaphylus visida (ARVI) seedlings?
    - In the density of Ceanothus sonomensis (CESO) seedlings?
    - In the density of Hesperocyparis sargentii (HESA) seedlings?
    - Is there an interaction between the species density and the treatment (ie are some species doing particularly well/badly in one treatment vs. the other?)

To do so, follow the instructions below

a. Calculate the total number of seedlings for each species in each transect

Transect #	ARVI 1st year	ARVI 2nd year	ARVI unknown	Total ARVI	CESO 1st year	CESO 2nd year	CESO unknown	Total CESO	HESA 1st year	HESA 2nd year	HESA unknown	Total Hesa
B21	0	0	0	0	0	5	0	5	1	6	0	7
B22	1	5	0	6	0	1	0	1	2	1	0	3
B23	0	0	0	0	0	1	0	1	5	11	0	16
B24	2	12	2	16	0	1	0	1	4	7	0	11
B25	3	2	0	5	2	2	0	4	2	2	0	4
B26	8	0	0	8	1	2	0	3	2	0	1	3
B27	86	7	0	93	0	1	0	1	4	1	0	5
B28	19	11	0	30	3	3	0	6	11	3	0	14
B29	0	0	0	0	3	2	0	5	9	2	0	11
B30	0	0	0	0	2	2	0	4	1	1	0	2
D1	4	12	0	16	1	4	0	5	7	12	0	19
D2	48	15	0	63	2	0	0	2	26	8	12	46
D3	21	12	0	33	1	1	0	2	9	2	0	11
D4	31	2	2	35	3	2	0	5	7	1	0	8
D5	84	25	0	109	1	0	0	1	20	10	0	30
D6	17	2	0	19	1	1	0	2	5	5	0	10
D7	119	9	0	128	13	1	0	14	3	9	3	15
D8	19	35	0	54	10	7	0	17	2	8	0	10

b. Organize the data so that it is in the format to calculate an ANOVA.

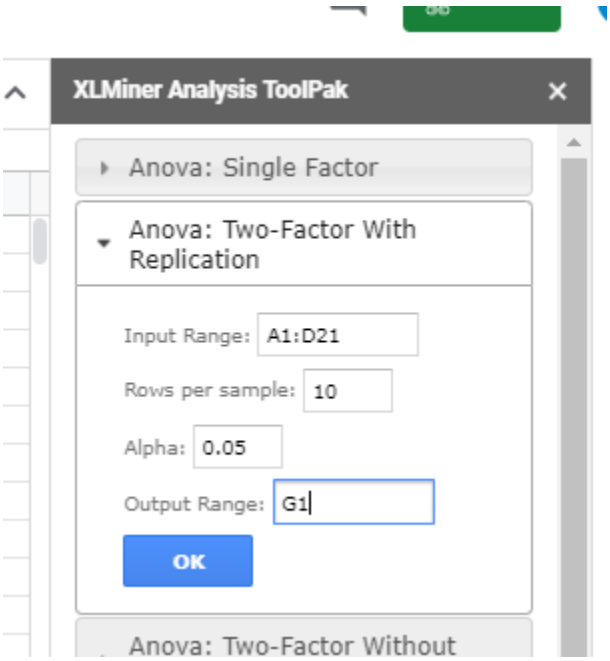
ANOVAs require the same number of samples in each treatment. In other words, the same number of transects in the burned and dozed sections.

One way to solve that problem is to calculate the average for each species and put them in as the ''missing'' two transects for the dozed treatment.

Careful – when you calculate the average for the second D-added, that you aren't calculating the average including the first D-added

Transect #	Total ARVI	Total CESO	Total Hesa
B21	0	5	7
B22	6	1	3
B23	0	1	16
B24	16	1	11
B25	5	4	4
B26	8	3	3
B27	93	1	5
B28	30	6	14
B29	0	5	11
B30	0	4	2
D1	16	5	19
D2	63	2	46
D3	33	2	11
D4	35	5	8
D5	109	1	30
D6	19	2	10
D7	128	14	15
D8	54	17	10
D- added	57.125	6	18.625
D- added	57.125	6	18.625

c. Hopefully you have already XL Miner as one of your add-ons. Click 'Start' and then select "ANOVA Two Factor with Replication" . Fill in the information in this manner
Input Range= the cells with your data- including the headers
Rows per sample= # of transects- this should be 10 each
Output range= where you want the ANOVA to be in your spreadsheet.



d. You will now have the ANOVA table which will allow you to do two things

- Answer the questions above about differences in seedling density and burned vs. bulldozed.
- Create graphs.

(You will have to rename the headers , colored in orange at the top) because Google Sheets does something weird.)

Sample= treatment= burned vs. bulldozed

Column = species

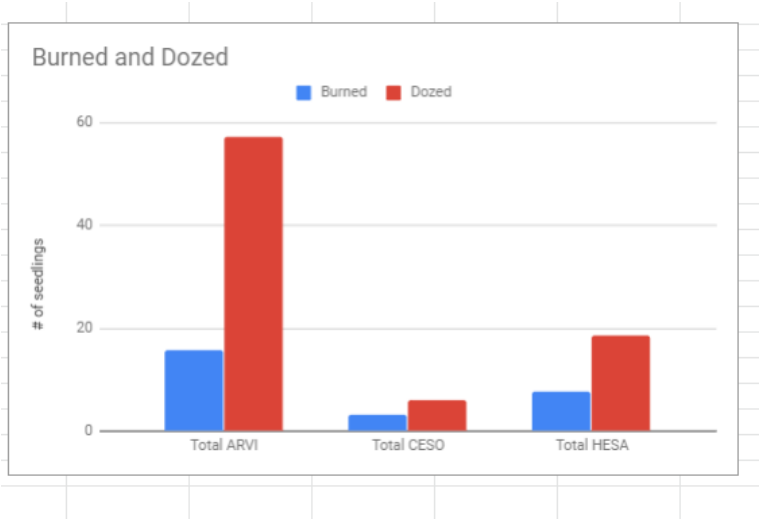
Anova: Two-Factor With Replication

SUMMARY	Total ARVI	Total CESO	Total HESA	Total
B21				
Count	10	10	10	30
Sum	158	31	76	265
Average	15.8	3.1	7.6	8.833333333
Variance	825.9555556	3.877777778	25.37777778	294.0057471
D1				
Count	10	10	10	30
Sum	571.25	60	186.25	817.5
Average	57.125	6	18.625	27.25
Variance	1330.541667	28.88888889	134.6527778	952.8081897
Total				
Count	20	20	20	
Sum	729.25	91	262.25	
Average	36.4625	4.55	13.1125	
Variance	1470.908059	17.73421053	107.7909539	

ANOVA

Source of Variatio	*SS*	*df*	*MS*	*F*	*P-value*
Sample	5087.604167	1	5087.604167	12.99352879	0.000681996808
Columns	10912.97708	2	5456.488542	13.93564409	0.000013184925
Interaction	4100.977083	2	2050.488542	5.23686219	0.008342515846
Within	21143.65	54	391.5490741		
Total	41245.20833	59			

Graphs



2. Assignment: Now you are going to do the same type of analysis but answering different questions:

a. Is there a difference in 1st year vs. 2nd year seedlings in the burned vs. bulldozed areas?

- For ARVI?
- For CESO?
- For HESA?
- For all seedlings together

3. Assignment: Answer the following question:

- Is there a difference in surface temperature between the burned and bulldozed areas?
- Is there a difference in the soil moisture between the burned and bulldozed areas? (we will not be able to answer this question until we enter the dry weight of the soil on Monday)
- You will need to work with the temperature and moisture spreadsheet.

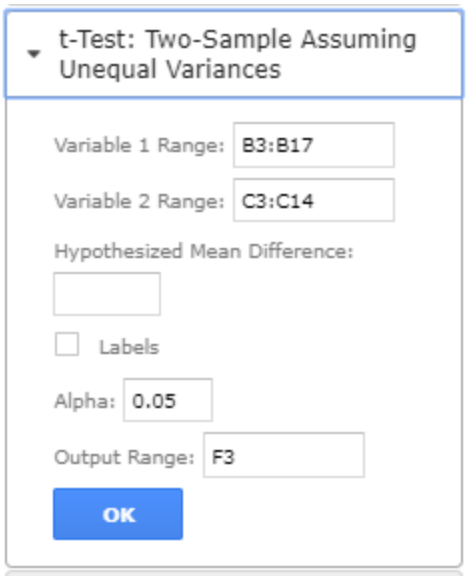
a. Surface Soil Temperature

- First clean up the data by
- Copying the data to another worksheet
- Removing all but the surface temperature data
- It should look something like this:

	Dozed	Burned
	42.5	50.4
	41.5	54.8
	48.9	52.2
	49	55
	46.6	41.5
	44.5	56.7
	39	51.9
	37.4	56.7
	49.2	49.7
	46.7	56.7
	48.4	56.1
	47.7	56.6
	49.4	
	40.1	
	48.1	
	52.5	

b. Calculate the statistics and graph the data

c. Because we are only examining one variable, surface soil temperature, we can do a t-test instead of an ANOVA.



(if we were looking at treatment and we had more than 2 treatments, then we would need to do an ANOVA. For example, burned, dozed and unrestored and dozed and restoration)

From Xl Miner, select t-test: Two-Sample Assuming Unequal Variances .
Variable 1= Burned
Variable 2= Dozed

This will give you the average for each treatment as well as the p values.
'one tail ' means that you are just asking is one of the treatments hotter/colder than the other. 'two-tail' means that you are asking if the treatments are different than each other without specifiying which direction you are predicting.

We DID think that the burned area was hotter so we should use the one-tail p-value to answer our question above.

t-Test: Two-Sample Assuming Unequal Variances

	Variable 1	*Variable 2*
Mean	45.26666667	53.19166667
Variance	16.96952381	20.19901515
Observations	15	12
Hypothesized Me	0	
df	22	
t Stat	-4.723833339	
P(T<=t) one-tail	0.000051519144	
t Critical one-tail	1.717144335	
P(T<=t) two-tail	0.000103038289	
t Critical two-tail	2.073873058	

d. Do the same analysis for the soil moisture.