

This is what your data sheet looks like:

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	Disturbed (Chaparral Hall Lawn)				Shannon Index		Less Disturbed (Orange Grove Lawn)			Shannon Index				
2	Species	p-count/total	ln(p)	p*ln(p)			Species	p-count/total	ln(p)	p*ln(p)				
3	1 <i>Trifolium repens</i>	9					1 <i>Trifolium fragiferum</i>	282						
4	2 <i>Lactuca serriola</i>	8					2 <i>Trifolium repens</i>	44						
5	3 <i>Sonchus oleraceus</i>	2					3 <i>Oxalis corniculata</i>	22						
6	4 <i>Trifolium fragiferum</i>	2					4 <i>Medicago lupulina</i>	18						
7	5 <i>Oxalis corniculata</i>	1					5 <i>Medicago polymorpha</i>	15						
8	6 <i>Medicago lupulina</i>	1					6 <i>Lythrum arvense</i>	5						
9	7 <i>Taraxacum officinale</i>	0					7 <i>Rumex crispus</i>	4						
10	8 <i>Polygonum leptophyllum</i>	0			Shannon Index		8 <i>Sonchus oleraceus</i>	4						
11	9 <i>Senecio vulgaris</i>	0					9 <i>Lactuca serriola</i>	4						
12	10 <i>Erigeron canadensis</i>	0					10 <i>Euphorbia maculata</i>	4						
13	11 <i>Polygonum aviculare</i>	0					11 <i>Dichondra micrantha</i>	2						
14	12 <i>Melua parviflora</i>	0					12 <i>Taraxacum officinale</i>	1						
15	13 <i>Synedrella iris</i>	0					13 <i>Cyclopernum leptophyllum</i>	0						
16	14 <i>Cyclopernum leptophyllum</i>	0					14 <i>Cotula australis</i>	1			Shannon Index			
17	15 <i>Dichondra micrantha</i>	0					15 <i>Stellaria spp.</i>	0						
18	16 <i>Euphorbia maculata</i>	0					16 <i>Plantago major</i>	0						
19	17 <i>Portulaca oleracea</i>	0					17 <i>Polygonum leptophyllum</i>	0						
20	18 <i>Lythrum arvense</i>	0					18 <i>Senecio vulgaris</i>	0						
21	19 <i>Capsella bursa-pastoris</i>	0					19 <i>Erigeron canadensis</i>	0						
22	20 <i>Oxalis corniculata</i>	0					20 <i>Polygonum aviculare</i>	0						
23	21 <i>Sonchus oleraceus</i>	0					21 <i>Melua parviflora</i>	0						
24	22 <i>Veronica arvensis</i>	0					22 <i>Synedrella iris</i>	0						
25	23 <i>Trifolium fragiferum</i>	0					23 <i>Portulaca oleracea</i>	0						
26	24 <i>Lemidium didymum</i>	0					24 <i>Capsella bursa-pastoris</i>	0						
27	25 <i>Trifolium repens</i>	0					25 <i>Veronica arvensis</i>	0						
28	26 <i>Lactuca serriola</i>	0					26 <i>Lemidium didymum</i>	0						
29	Total # of Points	480					Total # of Points	480						
30														
31	Genus	925					Genus	693						
32	Bare ground	50					Bare ground	46						
33														
34														
35	Graph													
36	ln(p) Disturbed ln(p) Less Disturbed													
37														
38														
39														
40														
41														
42														
43														
44														
45														
46														
47														
48														
49														
50														
51														
52														
53														
54														
55														
56														
57														
58														
59														
60														
61														
62														

We are using the Shannon index formula, a diversity index that accounts for species richness and evenness: $p \cdot \ln(p)$

We first have to calculate p and $\ln(p)$.

COUNT	A	B	C
1	Disturbed (Chaparral Hall Lawn)		
2	Species		p=count/total
3	1 <i>Trifolium repens</i>	9	=B3/B29
4	2 <i>Lactuca serriola</i>	8	
5	3 <i>Sonchus oleraceus</i>	2	
6	4 <i>Trifolium fragiferum</i>	2	
7	5 <i>Oxalis corniculata</i>	1	
8	6 <i>Medicago lupulina</i>	1	
9	7 <i>Taraxacum officinale</i>	0	
10	8 <i>Polycarpon tetraphyllum</i>	0	
11	9 <i>Senecio vulgaris</i>	0	
12	10 <i>Erigeron canadensis</i>	0	
13	11 <i>Polygonum aviculare</i>	0	
14	12 <i>Malva parviflora</i>	0	
15	13 <i>Sisymbrium irio</i>	0	
16	14 <i>Cyclospermum leptophyllum</i>	0	
17	15 <i>Dichondra micrantha</i>	0	
18	16 <i>Euphorbia maculata</i>	0	
19	17 <i>Portulaca oleracea</i>	0	
20	18 <i>Lysimachia arvensis</i>	0	
21	19 <i>Capsella bursapastoris</i>	0	
22	20 <i>Oxalis corniculata</i>	0	
23	21 <i>Sonchus oleraceus</i>	0	
24	22 <i>Veronica arvensis</i>	0	
25	23 <i>Trifolium fragiferum</i>	0	
26	24 <i>Lepidium didymum</i>	0	
27	25 <i>Trifolium repens</i>	0	
28	26 <i>Lactuca serriola</i>	0	
29	Total # of Points	480	
30			
31	Grass	925	
32	Bare ground	50	
33			

Drag the cell from the right corner down to *Medicago lupulina* to drag the formula down. You may need to add a dollar sign between B and 29 if you get an error. That tells excel to hold that cell in place.

	A	B	C
1	Disturbed (Chaparral Hall Lawn)		
2	Species		p=count/total
3	1 <i>Trifolium repens</i>	9	0.01875
4	2 <i>Lacuca serriola</i>	8	0.01666667
5	3 <i>Sonchus oleraceus</i>	2	0.00416667
6	4 <i>Trifolium fragiferum</i>	2	0.00416667
7	5 <i>Oxalis corniculata</i>	1	0.00208333
8	6 <i>Medicago lupulina</i>	1	0.00208333
9	7 <i>Taraxacum officinale</i>	0	
10	8 <i>Polycarpon tetraphyllum</i>	0	
11	9 <i>Senecio vulgaris</i>	0	
12	10 <i>Erigeron canadensis</i>	0	
13	11 <i>Polygonum aviculare</i>	0	
14	12 <i>Malva parviflora</i>	0	
15	13 <i>Sisymbrium irio</i>	0	
16	14 <i>Cyclospermum leptophyllum</i>	0	
17	15 <i>Dichondra micrantha</i>	0	
18	16 <i>Euphorbia maculata</i>	0	
19	17 <i>Portulaca oleracea</i>	0	
20	18 <i>Lysimachia arvensis</i>	0	
21	19 <i>Capsella bursapastoris</i>	0	
22	20 <i>Oxalis corniculata</i>	0	
23	21 <i>Sonchus oleraceus</i>	0	
24	22 <i>Veronica arvensis</i>	0	
25	23 <i>Trifolium fragiferum</i>	0	
26	24 <i>Lepidium didymum</i>	0	
27	25 <i>Trifolium repens</i>	0	
28	26 <i>Lactuca serriola</i>	0	
29	Total # of Points	480	

Now we need to calculate the natural log, abbreviated as \ln , of p .

LN	A	B	C	D	E
1	Disturbed (Chaparral Hall Lawn)				Sh
2	Species		p=count/total	ln(p)	
3	1 <i>Trifolium repens</i>	9	0.01875	=LN(C3)	
4	2 <i>Lacuca serriola</i>	8	0.01666667		
5	3 <i>Sonchus oleraceus</i>	2	0.00416667		
6	4 <i>Trifolium fragiferum</i>	2	0.00416667		
7	5 <i>Oxalis corniculata</i>	1	0.00208333		
8	6 <i>Medicago lupulina</i>	1	0.00208333		
9	7 <i>Taraxacum officinale</i>	0			Sh
10	8 <i>Polycarpon tetraphyllum</i>	0			
11	9 <i>Senecio vulgaris</i>	0			
12	10 <i>Erigeron canadensis</i>	0			
13	11 <i>Polygonum aviculare</i>	0			
14	12 <i>Malva parviflora</i>	0			
15	13 <i>Sisymbrium irio</i>	0			
16	14 <i>Cyclospermum leptophyllum</i>	0			
17	15 <i>Dichondra micrantha</i>	0			
18	16 <i>Euphorbia maculata</i>	0			
19	17 <i>Portulaca oleracea</i>	0			
20	18 <i>Lysimachia arvensis</i>	0			
21	19 <i>Capsella bursapastoris</i>	0			
22	20 <i>Oxalis corniculata</i>	0			
23	21 <i>Sonchus oleraceus</i>	0			
24	22 <i>Veronica arvensis</i>	0			
25	23 <i>Trifolium fragiferum</i>	0			
26	24 <i>Lepidium didymum</i>	0			
27	25 <i>Trifolium repens</i>	0			
28	26 <i>Lactuca serriola</i>	0			
29	Total # of Points	480			


Again, click and drag.

D3				f_x	=LN(C3)
	A	B	C	D	
1	Disturbed (Chaparral Hall Lawn)				
2	Species		p=count/total	ln(p)	
3	1 <i>Trifolium repens</i>	9	0.01875	-3.976561527	
4	2 <i>Lactuca serriola</i>	8	0.016666667	-4.094344562	
5	3 <i>Sonchus oleraceus</i>	2	0.004166667	-5.480638923	
6	4 <i>Trifolium fragiferum</i>	2	0.004166667	-5.480638923	
7	5 <i>Oxalis corniculata</i>	1	0.002083333	-6.173786104	
8	6 <i>Medicago lupulina</i>	1	0.002083333	-6.173786104	
9	7 <i>Taraxacum officinale</i>	0			
10	8 <i>Polycarpon tetraphyllum</i>	0			
11	9 <i>Senecio vulgaris</i>	0			
12	10 <i>Erigeron canadensis</i>	0			
13	11 <i>Polygonum aviculare</i>	0			
14	12 <i>Malva parviflora</i>	0			
15	13 <i>Sisymbrium irio</i>	0			
16	14 <i>Cyclospermum leptophyllum</i>	0			
17	15 <i>Dichondra micrantha</i>	0			
18	16 <i>Euphorbia maculata</i>	0			
19	17 <i>Portulaca oleracea</i>	0			
20	18 <i>Lysimachia arvensis</i>	0			
21	19 <i>Capsella bursapastoris</i>	0			
22	20 <i>Oxalis corniculata</i>	0			
23	21 <i>Sonchus oleraceus</i>	0			
24	22 <i>Veronica arvensis</i>	0			
25	23 <i>Trifolium fragiferum</i>	0			
26	24 <i>Lepidium didymum</i>	0			
27	25 <i>Trifolium repens</i>	0			
28	26 <i>Lactuca serriola</i>	0			
29	Total # of Points	480			

And now we can calculate the Shannon index. Multiply p and ln(p).

LN				f_x	=C3*D3
	A	B	C	D	E
1	Disturbed (Chaparral Hall Lawn)				Shannon Index
2	Species		p=count/total	ln(p)	p*ln(p)
3	1 <i>Trifolium repens</i>	9	0.01875	-3.976561527	=C3*D3
4	2 <i>Lactuca serriola</i>	8	0.016666667	-4.094344562	
5	3 <i>Sonchus oleraceus</i>	2	0.004166667	-5.480638923	
6	4 <i>Trifolium fragiferum</i>	2	0.004166667	-5.480638923	
7	5 <i>Oxalis corniculata</i>	1	0.002083333	-6.173786104	
8	6 <i>Medicago lupulina</i>	1	0.002083333	-6.173786104	
9	7 <i>Taraxacum officinale</i>	0			Shannon Index:
10	8 <i>Polycarpon tetraphyllum</i>	0			
11	9 <i>Senecio vulgaris</i>	0			
12	10 <i>Erigeron canadensis</i>	0			
13	11 <i>Polygonum aviculare</i>	0			
14	12 <i>Malva parviflora</i>	0			
15	13 <i>Sisymbrium irio</i>	0			
16	14 <i>Cyclospermum leptophyllum</i>	0			
17	15 <i>Dichondra micrantha</i>	0			
18	16 <i>Euphorbia maculata</i>	0			
19	17 <i>Portulaca oleracea</i>	0			
20	18 <i>Lysimachia arvensis</i>	0			
21	19 <i>Capsella bursapastoris</i>	0			
22	20 <i>Oxalis corniculata</i>	0			
23	21 <i>Sonchus oleraceus</i>	0			
24	22 <i>Veronica arvensis</i>	0			
25	23 <i>Trifolium fragiferum</i>	0			
26	24 <i>Lepidium didymum</i>	0			
27	25 <i>Trifolium repens</i>	0			
28	26 <i>Lactuca serriola</i>	0			
29	Total # of Points	480			

Again, drag it down.

E3					
	A	B	C	D	E
1	Disturbed (Chaparral Hall Lawn)				Shannon Index
2	Species		p=count/total	ln(p)	p*ln(p)
3	1 <i>Trifolium repens</i>	9	0.01875	-3.976561527	-0.074560529
4	2 <i>Lactuca serriola</i>	8	0.016666667	-4.094344562	-0.068239076
5	3 <i>Sonchus oleraceus</i>	2	0.004166667	-5.480638923	-0.022835996
6	4 <i>Trifolium fragiferum</i>	2	0.004166667	-5.480638923	-0.022835996
7	5 <i>Oxalis corniculata</i>	1	0.002083333	-6.173786104	-0.012862054
8	6 <i>Medicago lupulina</i>	1	0.002083333	-6.173786104	-0.012862054
9	7 <i>Taraxacum officinale</i>	0			Shannon Index: 
10	8 <i>Polycarpon tetraphyllum</i>	0			
11	9 <i>Senecio vulgaris</i>	0			
12	10 <i>Erigeron canadensis</i>	0			
13	11 <i>Polygonum aviculare</i>	0			
14	12 <i>Malva parviflora</i>	0			
15	13 <i>Sisymbrium irio</i>	0			
16	14 <i>Cyclosporum leptophyllum</i>	0			
17	15 <i>Dichondra micrantha</i>	0			
18	16 <i>Euphorbia maculata</i>	0			
19	17 <i>Portulaca oleracea</i>	0			
20	18 <i>Lysimachia arvensis</i>	0			
21	19 <i>Capsella bursapastoris</i>	0			
22	20 <i>Oxalis corniculata</i>	0			
23	21 <i>Sonchus oleraceus</i>	0			
24	22 <i>Veronica arvensis</i>	0			
25	23 <i>Trifolium fragiferum</i>	0			
26	24 <i>Lepidium didymum</i>	0			
27	25 <i>Trifolium repens</i>	0			
28	26 <i>Lactuca serriola</i>	0			
29	Total # of Points	480			

One more step for the Shannon Index. Take the negative sum of the $p \cdot \ln(p)$ values:

SUM						
	A	B	C	D	E	F
1	Disturbed (Chaparral Hall Lawn)				Shannon Index	
2	Species		p=count/total	ln(p)	p*ln(p)	
3	1 <i>Trifolium repens</i>	9	0.01875	-3.976561527	-0.074560529	
4	2 <i>Lactuca serriola</i>	8	0.016666667	-4.094344562	-0.068239076	
5	3 <i>Sonchus oleraceus</i>	2	0.004166667	-5.480638923	-0.022835996	
6	4 <i>Trifolium fragiferum</i>	2	0.004166667	-5.480638923	-0.022835996	
7	5 <i>Oxalis corniculata</i>	1	0.002083333	-6.173786104	-0.012862054	
8	6 <i>Medicago lupulina</i>	1	0.002083333	-6.173786104	-0.012862054	
9	7 <i>Taraxacum officinale</i>	0			Shannon Index:	
10	8 <i>Polycarpon tetraphyllum</i>	0			=SUM(E3:E8)	
11	9 <i>Senecio vulgaris</i>	0			SUM(number1, [nu	
12	10 <i>Erigeron canadensis</i>	0				
13	11 <i>Polygonum aviculare</i>	0				
14	12 <i>Malva parviflora</i>	0				
15	13 <i>Sisymbrium irio</i>	0				
16	14 <i>Cyclosporum leptophyllum</i>	0				
17	15 <i>Dichondra micrantha</i>	0				
18	16 <i>Euphorbia maculata</i>	0				
19	17 <i>Portulaca oleracea</i>	0				
20	18 <i>Lysimachia arvensis</i>	0				
21	19 <i>Capsella bursapastoris</i>	0				
22	20 <i>Oxalis corniculata</i>	0				
23	21 <i>Sonchus oleraceus</i>	0				
24	22 <i>Veronica arvensis</i>	0				
25	23 <i>Trifolium fragiferum</i>	0				
26	24 <i>Lepidium didymum</i>	0				
27	25 <i>Trifolium repens</i>	0				
28	26 <i>Lactuca serriola</i>	0				
29	Total # of Points	480				
30						
31	Grass	925				
32	Bare ground	50				
33						

E10						
	A	B	C	D	E	
1	Disturbed (Chaparral Hall Lawn)				Shannon Index	
2	Species		p=count/total	ln(p)	p*ln(p)	
3	1 <i>Trifolium repens</i>	9	0.01875	-3.976561527	-0.074560529	
4	2 <i>Lactuca serriola</i>	8	0.016666667	-4.094344562	-0.068239076	
5	3 <i>Sonchus oleraceus</i>	2	0.004166667	-5.480638923	-0.022835996	
6	4 <i>Trifolium fragiferum</i>	2	0.004166667	-5.480638923	-0.022835996	
7	5 <i>Oxalis corniculata</i>	1	0.002083333	-6.173786104	-0.012862054	
8	6 <i>Medicago lupulina</i>	1	0.002083333	-6.173786104	-0.012862054	
9	7 <i>Taraxacum officinale</i>	0			Shannon Index:	
10	8 <i>Polycarpon tetraphyllum</i>	0			0.214195704	
11	9 <i>Senecio vulgaris</i>	0				
12	10 <i>Erigeron canadensis</i>	0				
13	11 <i>Polygonum aviculare</i>	0				
14	12 <i>Malva parviflora</i>	0				
15	13 <i>Sisymbrium irio</i>	0				
16	14 <i>Cyclosporum leptophyllum</i>	0				
17	15 <i>Dichondra micrantha</i>	0				
18	16 <i>Euphorbia maculata</i>	0				
19	17 <i>Portulaca oleracea</i>	0				
20	18 <i>Lysimachia arvensis</i>	0				
21	19 <i>Capsella bursapastoris</i>	0				
22	20 <i>Oxalis corniculata</i>	0				
23	21 <i>Sonchus oleraceus</i>	0				
24	22 <i>Veronica arvensis</i>	0				
25	23 <i>Trifolium fragiferum</i>	0				
26	24 <i>Lepidium didymum</i>	0				
27	25 <i>Trifolium repens</i>	0				
28	26 <i>Lactuca serriola</i>	0				
29	Total # of Points	480				
30						
31	Grass	925				
32	Bare ground	50				
33						

Repeat these steps for the less disturbed lawn.

Then, copy and paste your values below to create your graph.

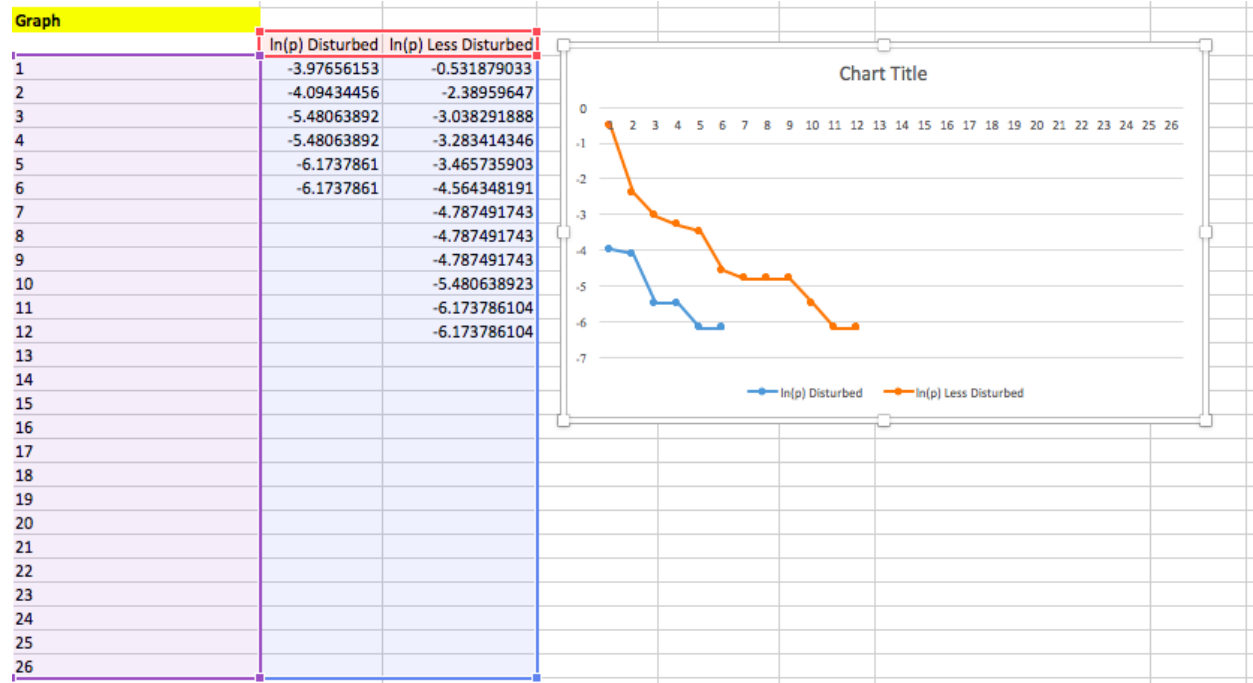
Graph		
	In(p) Disturbed	In(p) Less Disturbed
1	-3.97656153	-0.531879033
2	-4.09434456	-2.38959647
3	-5.48063892	-3.038291888
4	-5.48063892	-3.283414346
5	-6.1737861	-3.465735903
6	-6.1737861	-4.564348191
7		-4.787491743
8		-4.787491743
9		-4.787491743
10		-5.480638923
11		-6.173786104
12		-6.173786104
13		
14		
15		
16		
17		
18		
19		
20		
21		
22		
23		
24		
25		
26		

Select the data and choose a line graph with markers.

The screenshot shows the Microsoft Excel interface with the 'Insert' tab selected. The 'Line' chart type is chosen, and the chart type menu is open, displaying various line graph options. The background spreadsheet contains data for two series: 'In(p) Disturbed' and 'In(p) Less Disturbed'.

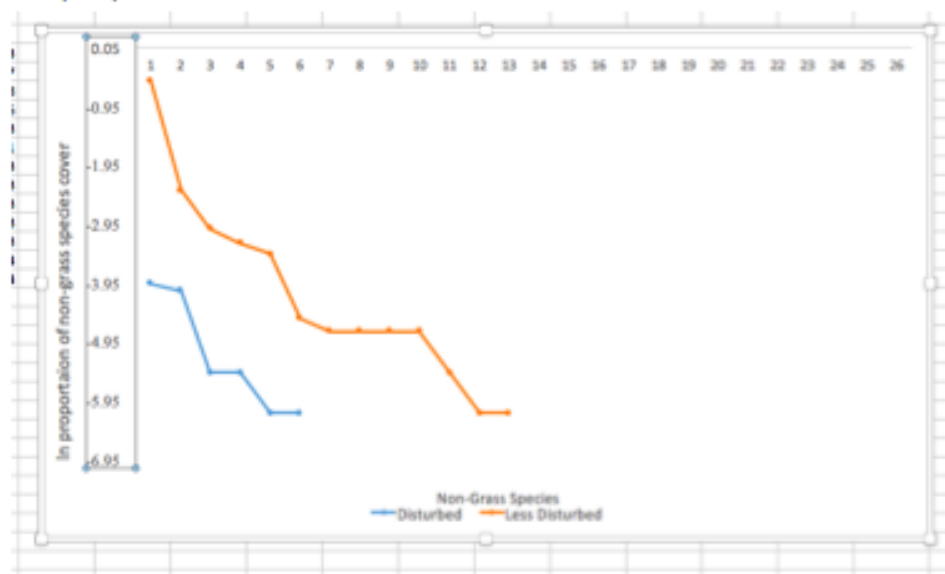
	In(p) Disturbed	In(p) Less Disturbed
1	-3.97656153	-0.531879033
2	-4.09434456	-2.38959647
3	-5.48063892	-3.038291888
4	-5.48063892	-3.283414346
5	-6.1737861	-3.465735903
6	-6.1737861	-4.564348191
7		-4.787491743
8		-4.787491743
9		-4.787491743
10		-5.480638923
11		-6.173786104
12		-6.173786104

This is the graph you will end up with:

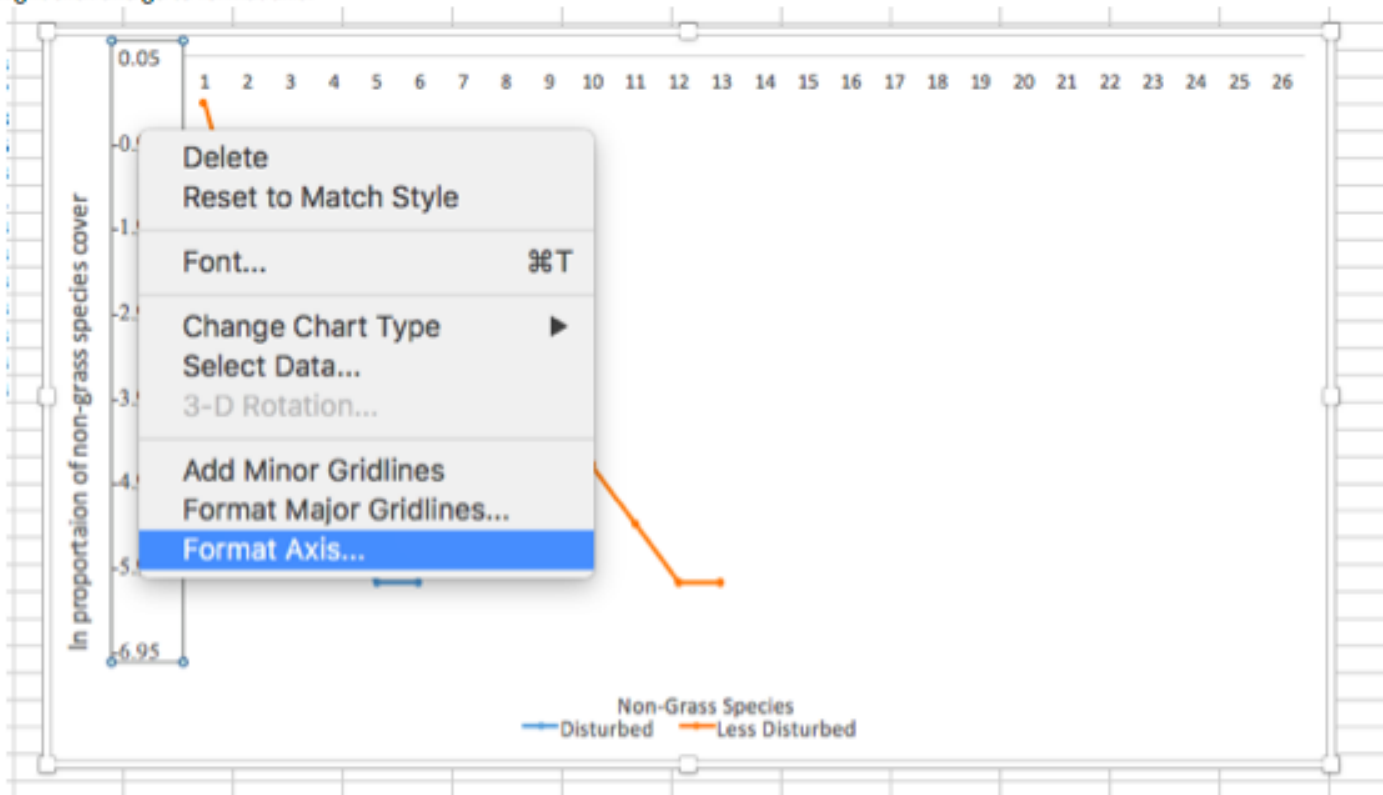


Clean up the graph by getting rid of gridlines, the chart title, and adding x and y axes titles. You may find that your x-axis stubbornly overlaps with one or more of your lines. Here's a fix for that, with my already-fixed graph:

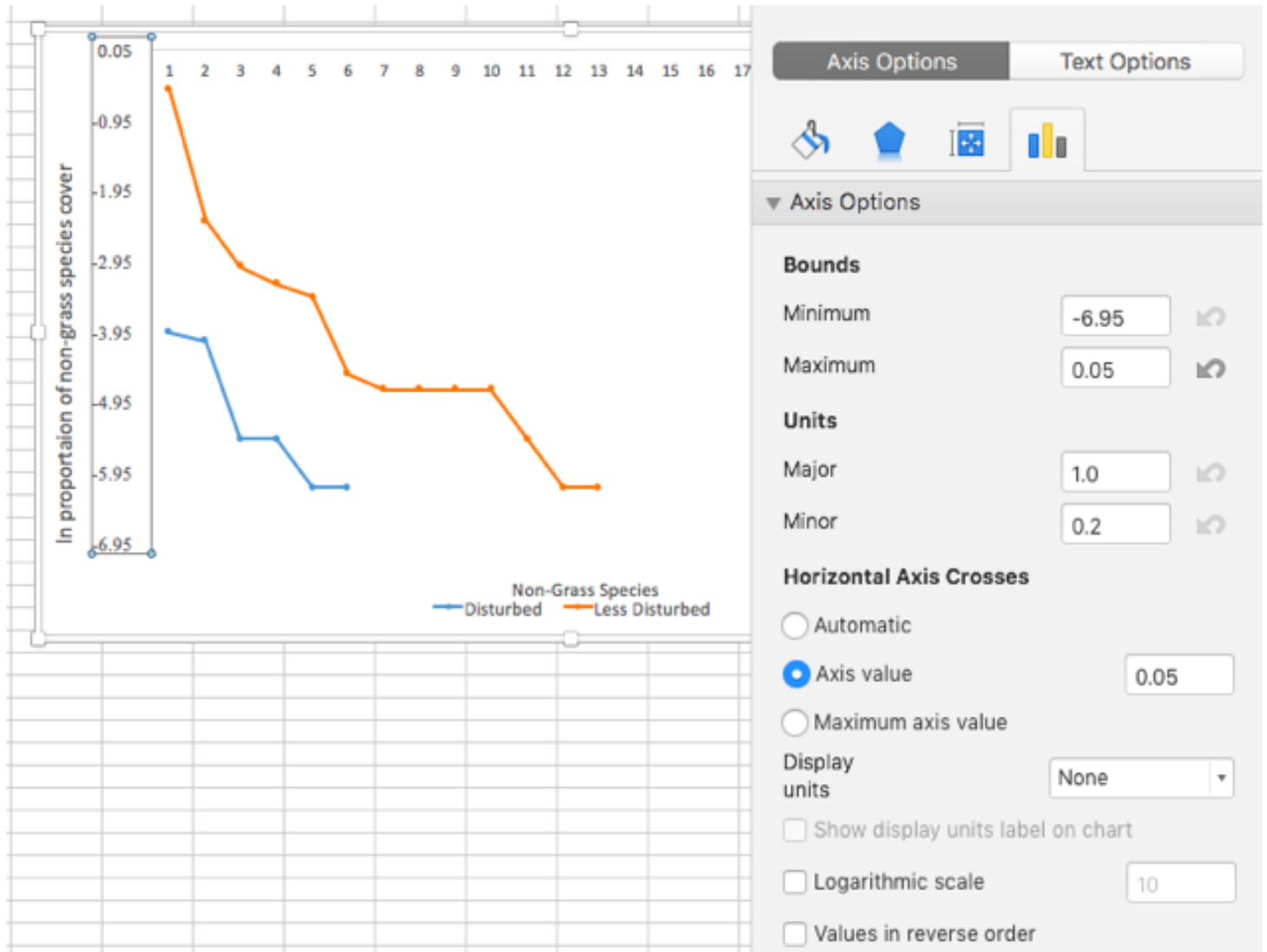
Select your y-axis.



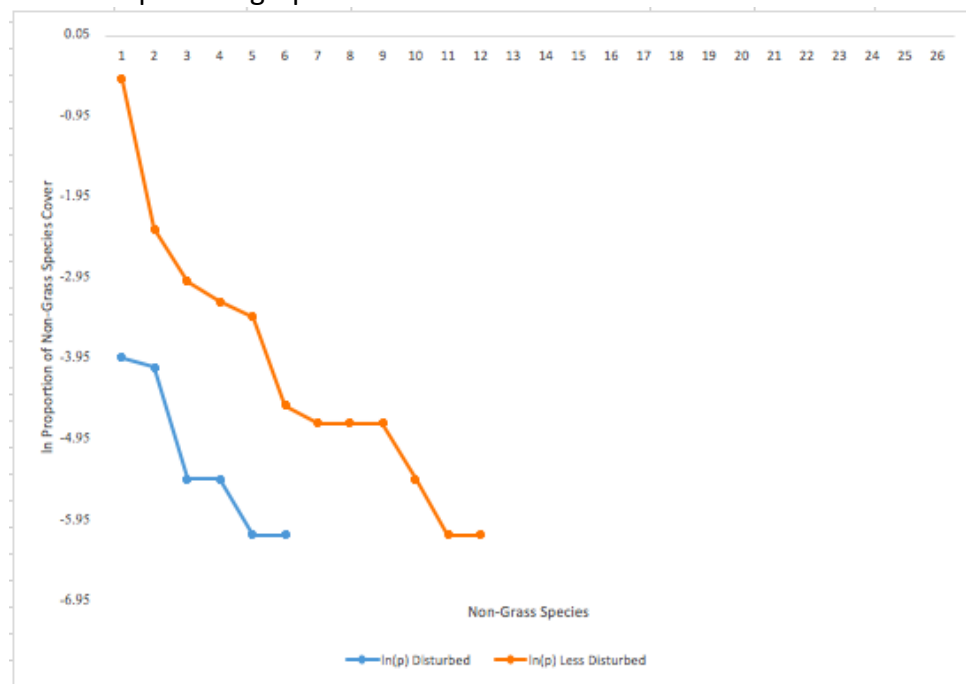
Right click and go to format axis.



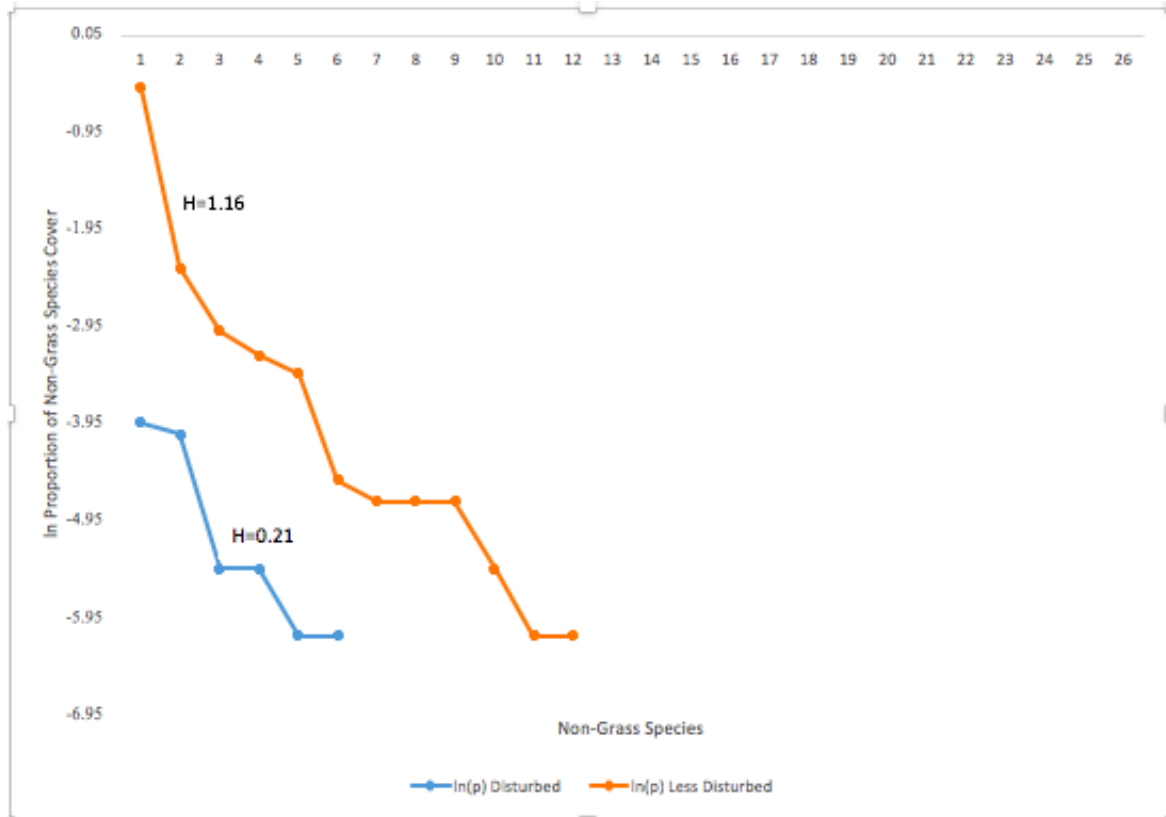
Adjust the maximum value slightly higher than 0 (I have it at 0.05), and adjust where the x-axis crosses the y-axis (I also have that at 0.05 because I don't want the axis to get in the way of the data line). Whatever you set the number to be will be where it crosses the y-axis, so you can force it go a little higher and not overlap with your data on the graph.



You end up with a graph like this one.



Use textboxes to add the Shannon index values next to the corresponding line.



The next step is data interpretation. Please look over the assignment directions on Canvas to find the questions I would like you to answer on your excel sheet.

After you have looked over all of the material, let me know if you have any questions.