East Sepulveda Dam Basin

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Location

- Sepulveda Dam Recreation Area (Encino, CA)
  - 30 March, 2017
- Study conducted in same quadrangle as 1989 aerial photograph

1989

2017

History

- Land-use practices were much different in 1989
- The Eastern fields formerly had a much higher overall level of vegetation in NE and SE due to agricultural practices
- Central field had sediment deposit from being used as a dumpsite for lake dredging (little or no vegetation present)

Hypothesis

- The 3 fields of today will not be significantly different from one another as a result of their former land use patterns in the past

Methods

- Quadrat
- Kelway meter
- Penetrometer

Results: Plant Species

Amsinckia intermedia	***Avena fatua***	***Brassica nigra***	***Capsella bursa-pastoris***	***Erodium cicutarium***
Galium aparine	***Hordeum murinum***	***Lupinus succulentus***	***Raphanus raphanistrum***	***Silybum marianum***
Sonchus asper	***Taraxacum erythrospermum***	***Urtica urens***	**(Unidentified)**	**(Bare ground)**

Results: Plant Species

- 14 species identified
- 6 species had less than 5% ground cover
- Only 8 species used for Z-test

Brassica nigra
(Black mustard)

Erodium circutarium
(Coastal heron's bill)

Hordeum murinum (Foxtail barley)

Silybum marianum
(Milkthistle)

Avena fatua
(Wild oats)

Urtica urens
(Dwarf nettle)
(ouchichi!)

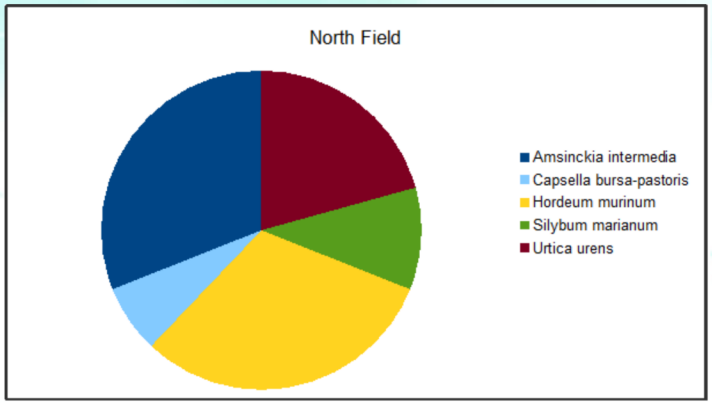
Capsella bursa-pastoris
(Shepherd's purse)

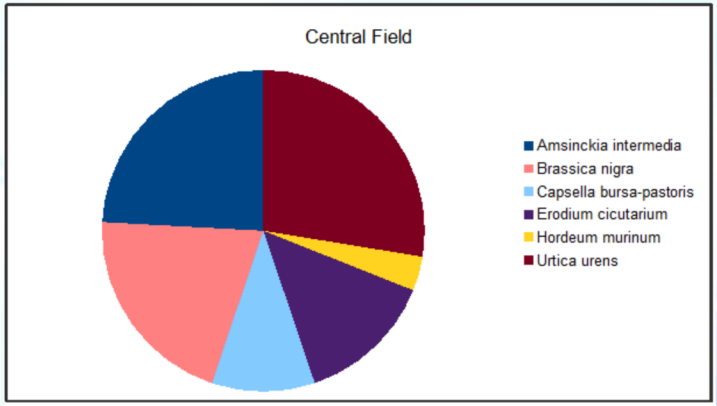
Amsinckia intermedia
(Common fiddleneck)

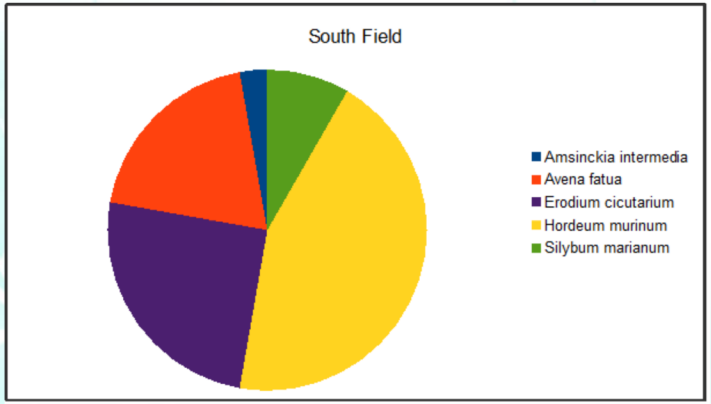
Results: Plant Species Percentage

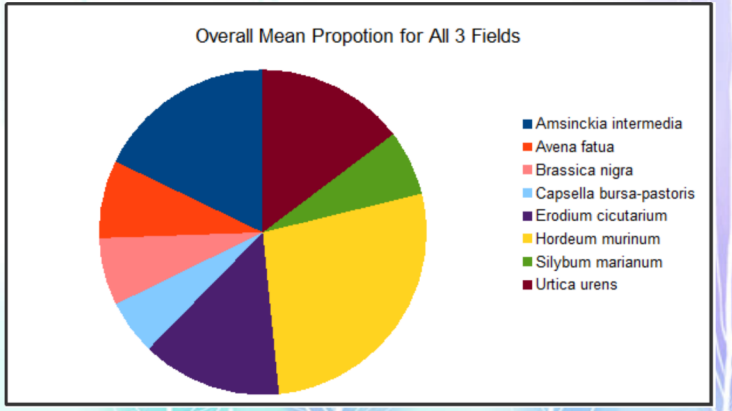
Species	**North**	**Central**	**Southeast**
Amsinckia intermedia	0.45	0.35	0.05
Avena fatua	0	0	0.35
Brassica nigra	0	0.30	0
Capsella bursa-pastoris	0.10	0.15	0
Erodium cicutarium	0	0.20	0.45
Hordeum murinum	0.45	0.05	0.80
Silybum marianum	0.15	0	0.15
Urtica urens	0.30	0.40	0

Results: Plant Species Percentage









Z-Test Figures

Comparison	Effect Size	Probability	Z-calc	Power
Amsinckia intermedia				
NE/C	0.10	0.581	0.21	0.007
NE/SE	0.40	0.851	1.04	0.208
SE/C	0.30	0.791	0.81	0.167
Avena fatua				
NE/C	0	0.500	0	0
NE/SE	-0.34	0.162	-0.99	0.198
SE/C	-0.34	0.162	-0.99	0.198
Brassica nigra				
NE/C	-0.29	0.191	-0.87	0.178
NE/SE	0	0.500	0	0
SE/C	0.29	0.809	0.87	0.178
Capsella bursa-pastoris				
NE/C	-0.05	0.440	-0.15	0.067
NE/SE	0.09	0.656	0.40	0.101
SE/C	0.14	0.703	0.53	0.121

Z-Test Figures

Comparison	Effect Size	Probability	Z-calc	Power
Erodium cicutarium				
NE/C	-0.19	0.257	-0.65	0.140
NE/SE	-0.44	0.110	-1.23	0.241
SE/C	-0.25	0.290	-0.55	0.124
Hordeum murinum				
NE/C	0.40	0.851	1.04	0.208
NE/SE	-0.35	0.219	-0.78	0.161
SE/C	-0.75	0.010	-2.33	0.422
Silybum marianum				
NE/C	0.14	0.703	0.53	0.121
NE/SE	0	0.500	0	0.050
SE/C	-0.14	0.297	-0.53	0.121
Urtica urens				
NE/C	-0.10	0.417	-0.21	0.074
NE/SE	0.30	0.823	0.93	0.178
SE/C	0.40	0.876	1.15	0.219

Significance

- Significant difference in species richness for the quadrats
- 4 most dominant species:
  - *Amsinckia intermedia*, *Hordeum murinum, Erodium cicutarium* and *Urtica urens*
- *Amsinckia intermedia* and *Hordeum murinum* were identified in all 3 fields
  - Dispersal may have been greater overall
- Only *Hordeum murinum* showed a significant change in probability for SE/C fields

Significance

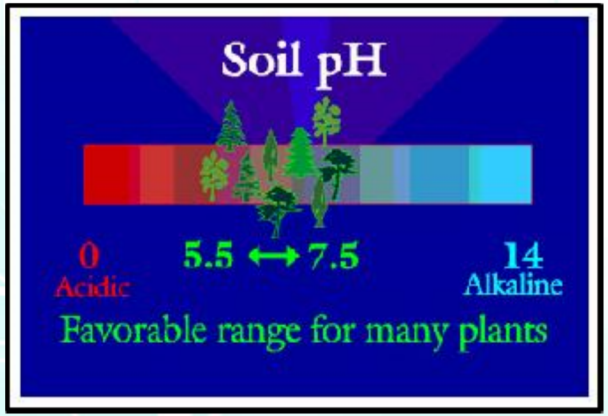
- Visual differences based on the graphs did not coincide with quantitative results
- Other species had similar differences based on the qualitative results

Conclusion

- Inconsistency of the Z-test results was possibly due to a Type 2 error
  - Sample sizes were not large enough
- Quantitative figures didn't match with qualitative results due to differences in the fields that were not numerically detected
- May have rejected null hypothesis due to presence of a *false negative*
- Larger sample size may have provided more significant results

Results: pH & Moisture Level

- The pH was consistently between 4.5 and 5
- Ideal range for most plants is between 5.5 and 7.5



Location	pH	Moisture
Quadrat 1 - NE	5	60%
Quadrat 2 - NE	4.5	70%
Quadrat 3- C	4.5	70%
Quadrat 4 - C	4.5	65%
Quadrat 5 - SE	5	60%
Quadrat 6 - SE	5	55%

Conclusion

- 4 of the observed species may have been negatively impacted by the low pH levels since their ideal range was pH 5+

- Soil pH in each quadrat may be due to antecedent land use, but there is not enough evidence to support this theory

Hypothesis

- There is no significant difference in soil compaction between the eastern 3 fields of the Sepulveda Dam Basin

Results: Raw Data

Location	Sample 1	Sample 2	Sample 3
Quadrat 1 - NE	0.75 kg/cm^2	1.0 kg/cm^2	0.5 kg/cm^2
Quadrat 2 - NE	3.5 kg/cm^2	3.0 kg/cm^2	4.0 kg/cm^2
Quadrat 3 - C	4.0 kg/cm^2	4.5 kg/cm^2	4.0 kg/cm^2
Quadrat 4 - C	2.5 kg/cm^2	4.5 kg/cm^2	4.0 kg/cm^2
Quadrat 5 - SE	3.5 kg/cm^2	4.0 kg/cm^2	4.5 kg/cm^2
Quadrat 6 - SE	4.5+ kg/cm^2	4.5+ kg/cm^2	4.5+ kg/cm^2

Results: T-test Data

t-test of the difference of two means				C.M. Rodrigue (2017)
	Sample 1	Sample 2	DF	pooled
sample sizes (n)	6	6	10	12
means ($\bar{X}$)	2.130	3.920		3.025
st devs (s)	1.550	0.740		1.215
variances (s^2)	2.403	0.548		1.475
$t = (\bar{X}_1 - \bar{X}_2)/(\sigma_{\bar{x}_1 - \bar{x}_2})$				
Numerator: diff. of means ($\bar{X}_1 - \bar{X}_2$)	-1.790			
Denominator: SE or ($\sigma_{\bar{x}_1 - \bar{x}_2}$)				
SE incorporating PVE *	0.701			
SE as SVE *	0.701			
Use SVE if:				
If one of the n > 1.5 times the other				
If the standard deviations are so different as to violate the assumption of variance homoskedasticity				
	How would you know that? Bartlett's test (below) can compare variances just with the means and variances given above. If Bartlett's T is bigger than the critical X^2 statistic, you should report the t-statistic based on the SVE. If it is smaller than the critical X^2 statistic, you use the t statistic that includes the PVE.			
	t_{calc}	t_{crit}	**2-tailed p**	
t based on the PVE and its p-value	**-2.553**	2.228	**0.029**	
t based on the SVE and its p-value	**-2.553**	2.228	**0.029**	
Bartlett T (T_{calc})	**2.433**			
numerator		2.515		
1st term			3.887	
2nd term			1.371	
denominator		1.034		
critical statistic X^2	**3.841**		*alpha (α) =*	0.050
Cohen's d (effect size)	**-1.474**			

* PVE = Pooled Variance Estimate (fusing weighted sample variances into a single estimate of the population variance)
* SVE = Separate Variance Estimate (estimating population variance with separate sample variances)

t-test of the difference of two means				C.M. Rodrigue (2017)
	Sample 1	Sample 2	DF	pooled
sample sizes (n)	6	6	10	12
means ($\bar{X}$)	2.130	4.250		3.190
st devs (s)	1.550	0.420		1.136
variances (s^2)	2.403	0.176		1.289
$t = (\bar{X}_1 - \bar{X}_2)/(\sigma_{\bar{x}_1 - \bar{x}_2})$				
Numerator: diff. of means ($\bar{X}_1 - \bar{X}_2$)	-2.120			
Denominator: SE or ($\sigma_{\bar{x}_1 - \bar{x}_2}$)				
SE incorporating PVE *	0.656			
SE as SVE *	0.656			
Use SVE if:				
If one of the n > 1.5 times the other				
If the standard deviations are so different as to violate the assumption of variance homoskedasticity				
	How would you know that? Bartlett's test (below) can compare variances just with the means and variances given above. If Bartlett's T is bigger than the critical X^2 statistic, you should report the t-statistic based on the SVE. If it is smaller than the critical X^2 statistic, you use the t statistic that includes the PVE.			
	t_{calc}	t_{crit}	**2-tailed p**	
t based on the PVE and its p-value	**-3.234**	2.228	**0.009**	
t based on the SVE and its p-value	**-3.234**	2.228	**0.009**	
Bartlett T (T_{calc})	**6.610**			
numerator		6.835		
1st term			2.542	
2nd term			-4.292	
denominator		1.034		
critical statistic X^2	**3.841**		*alpha (α) =*	0.050
Cohen's d (effect size)	**-1.867**			

* PVE = Pooled Variance Estimate (fusing weighted sample variances into a single estimate of the population variance)
* SVE = Separate Variance Estimate (estimating population variance with separate sample variances)

t-test of the difference of two means				C.M. Rodrigue (2017)
	Sample 1	Sample 2	DF	pooled
sample sizes (n)	6	6	10	12
means ($\bar{X}$)	3.920	4.250		4.085
st devs (s)	0.740	0.420		0.602
variances (s^2)	0.548	0.176		0.362
$t = (\bar{X}_1 - \bar{X}_2)/(\sigma_{\bar{x}_1 - \bar{x}_2})$				
Numerator: diff. of means ($\bar{X}_1 - \bar{X}_2$)	-0.330			
Denominator: SE or ($\sigma_{\bar{x}_1 - \bar{x}_2}$)				
SE incorporating PVE *	0.347			
SE as SVE *	0.347			
Use SVE if:				
If one of the n > 1.5 times the other				
If the standard deviations are so different as to violate the assumption of variance homoskedasticity				
	How would you know that? Bartlett's test (below) can compare variances just with the means and variances given above. If Bartlett's T is bigger than the critical X^2 statistic, you should report the t-statistic based on the SVE. If it is smaller than the critical X^2 statistic, you use the t statistic that includes the PVE.			
	t_{calc}	t_{crit}	**2-tailed p**	
t based on the PVE and its p-value	**-0.950**	2.228	**0.365**	
t based on the SVE and its p-value	**-0.950**	2.228	**0.365**	
Bartlett T (T_{calc})	**1.475**			
numerator		1.525		
1st term			-10.161	
2nd term			-11.686	
denominator		1.034		
critical statistic X^2	**3.841**		*alpha (α) =*	0.050
Cohen's d (effect size)	**-0.548**			

* PVE = Pooled Variance Estimate (fusing weighted sample variances into a single estimate of the population variance)
* SVE = Separate Variance Estimate (estimating population variance with separate sample variances)

Results: Statistical Data

T-Test

Fields	t-calc	Probability	Effect Size	Power
C vs SE	0.950	0.365	0.548	0.076
NE vs SE	3.234	0.009	1.867	0.435
NE vs C	2.553	0.029	1.474	0.294

Significance

- Northeast vs Central➔*retain* the null hypothesis
- Northeast vs Southeast➔*retain* the null hypothesis
- Central vs Southeast➔*reject* the null hypothesis

Bias

Type II Error

- Leads to conclusion that a supposed effect or relationship does not exist when in fact it does

- May be compared with a *false negative* where and actual “hit” was rejected by the test as a “miss”

Conclusion

- Low sample sizes lead to inconsistencies
- Difference in soil compaction and/or previous land use may be the reason for differences in vegetation
- Central/Southeast may not show a significant difference if a larger sample size was used
- The presence of high effect size and low power indicates that a greater sample size is needed to provide more accurate data

Possible reason why there were so many dead bunnies at Sepulveda Dam Basin