

## Appendix 8 Extended Statistical Results

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WARNING Maximum string width exceeded for one or more values. Such values have been truncated to 24 characters.

To avoid truncation, please increase the maximum string data width appropriately in the Data tab of the Edit: Options dialog box.

IMPORT successfully completed. Processed 21 variables and 1048575 cases.

## ▼ Descriptive Statistics

	<u>_4TH_ROOT_FUCO</u>	<u>_4TH_ROO_CHLA</u>	<u>TOC</u>	<u>LN_GLUKOSE_1_</u>
<b>Shapiro-Wilk Statistic</b>	0.989	0.986	0.918	0.988
<b>Shapiro-Wilk p-Value</b>	0.334	0.151	0.000	0.253

▼ Analysis of Variance

Effects coding used for categorical variables in model.  
The categorical values encountered during processing are

Variables	Levels			
SEASON\$ (3 levels)	Spring	Summer	Winter	
BIOFILM_ZONE\$ (4 levels)	Canoe Passage	Inter-causeway	Mid Inter-tidal	Upper Inter-tidal

1,048,434 case(s) are deleted due to missing data.

<b>Dependent Variable</b>	_4TH_ROO_CHLA
<b>N</b>	141
<b>Multiple R</b>	0.678
<b>Squared Multiple R</b>	0.460

Estimates of Effects  $B = (X'X)^{-1}X'Y$

Factor	Level	_4TH_ROO_CHLA
CONSTANT		2.557
SEASON\$	Spring	0.049
SEASON\$	Summer	0.225
BIOFILM_ZONE\$	Canoe Passage	-0.345
BIOFILM_ZONE\$	Inter-causeway	0.037
BIOFILM_ZONE\$	Mid Inter-tidal	0.161
SEASON\$*BIOFILM_ZONE\$	Spring*Canoe Passage	-0.044
SEASON\$*BIOFILM_ZONE\$	Spring*Inter-causeway	0.041
SEASON\$*BIOFILM_ZONE\$	Spring*Mid Inter-tidal	0.094
SEASON\$*BIOFILM_ZONE\$	Summer *Canoe Passage	-0.182
SEASON\$*BIOFILM_ZONE\$	Summer *Inter-causeway	-0.007
SEASON\$*BIOFILM_ZONE\$	Summer *Mid Inter-tidal	-0.049

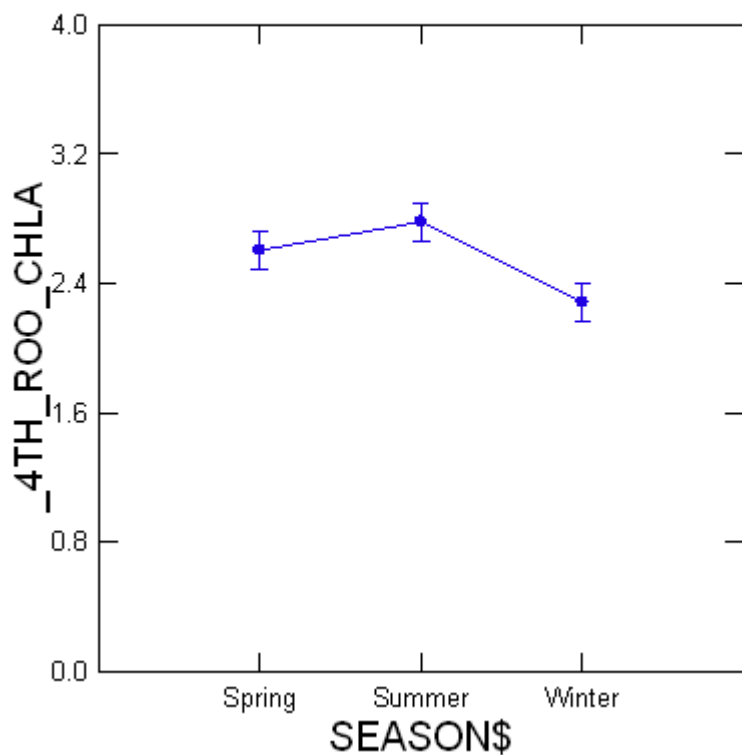
Analysis of Variance

Source	Type III SS	df	Mean Squares	F-Ratio	p-Value
SEASON\$	4.661	2	2.330	17.596	0.000
BIOFILM_ZONE\$	8.113	3	2.704	20.419	0.000
SEASON\$*BIOFILM_ZONE\$	2.595	6	0.432	3.266	0.005
Error	17.085	129	0.132		

Least Squares Means

Factor	Level	LS Mean	Standard Error	N
SEASON\$	Spring	2.606	0.060	47.000
SEASON\$	Summer	2.782	0.060	47.000
SEASON\$	Winter	2.283	0.060	47.000

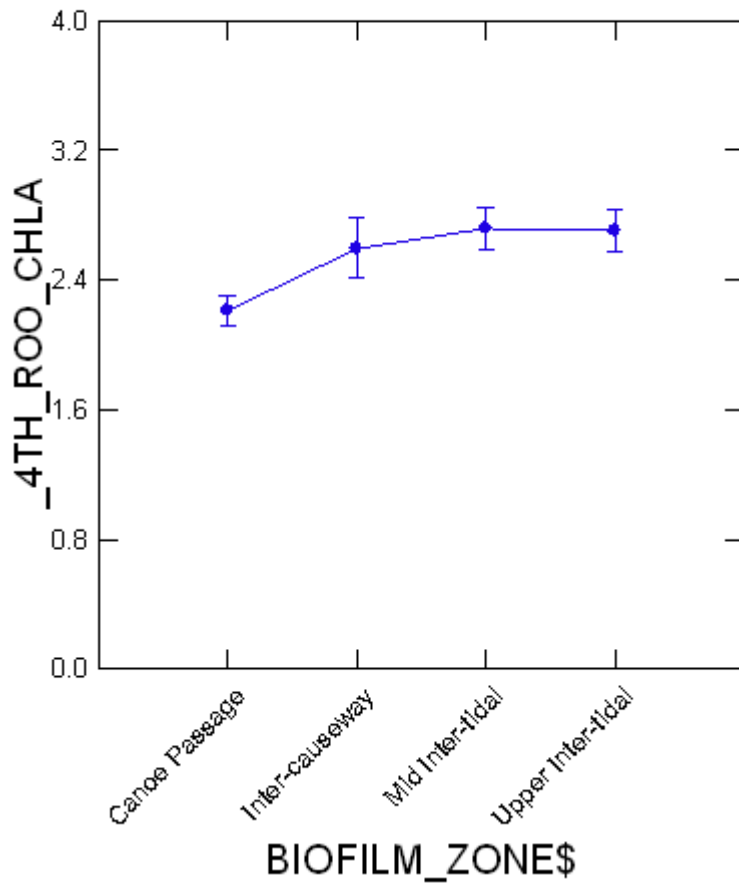
### Least Squares Means



### Least Squares Means

Factor	Level	LS Mean	Standard Error	N
BIOFILM_ZONE\$	Canoe Passage	2.212	0.046	63.000
BIOFILM_ZONE\$	Inter-causeway	2.594	0.094	15.000
BIOFILM_ZONE\$	Mid Inter-tidal	2.718	0.063	33.000
BIOFILM_ZONE\$	Upper Inter-tidal	2.704	0.066	30.000

### Least Squares Means

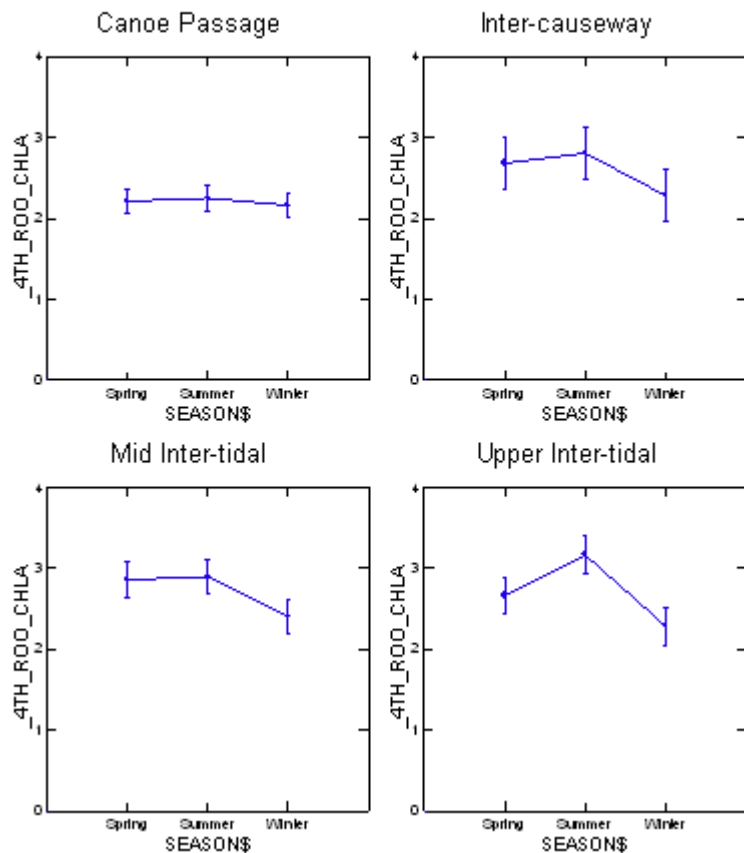


### Least Squares Means

Factor	Level	LS Mean	Standard Error	N
SEASON\$*BIOFILM_ZONES\$	Spring*Canoe Passage	2.216	0.079	21.000
SEASON\$*BIOFILM_ZONES\$	Spring*Inter-causeway	2.684	0.163	5.000
SEASON\$*BIOFILM_ZONES\$	Spring*Mid Inter-tidal	2.862	0.110	11.000
SEASON\$*BIOFILM_ZONES\$	Spring*Upper Inter-tidal	2.662	0.115	10.000
SEASON\$*BIOFILM_ZONES\$	Summer *Canoe Passage	2.255	0.079	21.000
SEASON\$*BIOFILM_ZONES\$	Summer *Inter-causeway	2.811	0.163	5.000
SEASON\$*BIOFILM_ZONES\$	Summer *Mid Inter-tidal	2.894	0.110	11.000
SEASON\$*BIOFILM_ZONES\$	Summer *Upper Inter-tidal	3.167	0.115	10.000
SEASON\$*BIOFILM_ZONES\$	Winter*Canoe Passage	2.164	0.079	21.000
SEASON\$*BIOFILM_ZONES\$	Winter*Inter-causeway	2.286	0.163	5.000
SEASON\$*BIOFILM_ZONES\$	Winter*Mid Inter-tidal	2.399	0.110	11.000

<b>SEASON\$*BIOFILM_ZONES</b>	Winter*Upper Inter-tidal	2.284	0.115	10.000
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### Least Squares Means



WARNING

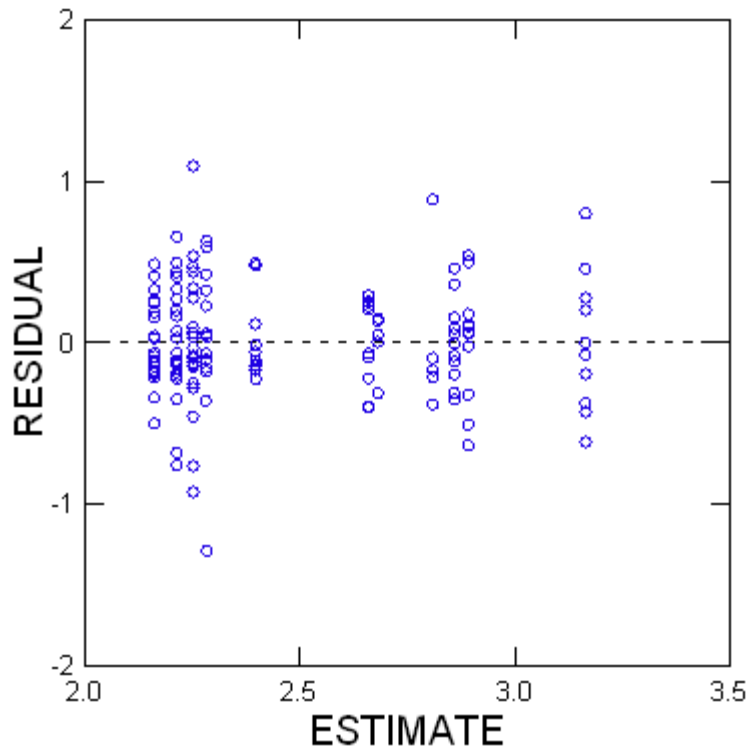
Case 117 is an Outlier (Studentized Residual : -4.222)

<b>Durbin-Watson D-Statistic</b>	1.853
<b>First Order Autocorrelation</b>	0.070

#### Information Criteria

<b>AIC</b>	128.550
<b>AIC (Corrected)</b>	131.416
<b>Schwarz's BIC</b>	166.884

### Plot of Residuals vs. Predicted Values



#### ▼ Hypothesis Tests

Post Hoc Test of \_4TH\_ROO\_CHLA  
 Using least squares means.  
 Using model MSE of 0.132 with 129 df.

#### Tukey's Honestly-Significant-Difference Test

SEASON\$(i)	SEASON\$(j)	Difference	p-Value	95% Confidence Interval	
				Lower	Upper
Spring	Summer	-0.176	0.098	-0.352	0.000
Spring	Winter	0.323	0.000	0.147	0.498
Summer	Winter	0.498	0.000	0.322	0.674

#### ▼ Hypothesis Tests

Post Hoc Test of \_4TH\_ROO\_CHLA  
 Using least squares means.  
 Using model MSE of 0.132 with 129 df.

#### Tukey's Honestly-Significant-Difference Test

BIOFILM_ZONE\$(i-)	BIOFILM_ZONE\$(j-)	Difference	p-Value	95% Confidence Interval	
				Lower	Upper
Canoe Passage	Inter-causeway	-0.382	0.001	-0.651	-0.113
Canoe Passage	Mid Inter-tidal	-0.507	0.000	-0.708	-0.306
Canoe Passage	Upper	-0.493	0.000	-0.700	-0.285



	Inter-tidal				
Inter-causeway	Mid Inter-tidal	-0.125	0.689	-0.416	0.166
Inter-causeway	Upper Inter-tidal	-0.111	0.772	-0.406	0.185
Mid Inter-tidal	Upper Inter-tidal	0.014	0.999	-0.222	0.250

▼ Hypothesis Tests

Post Hoc Test of \_4TH\_ROO\_CHLA  
 Using least squares means.  
 Using model MSE of 0.132 with 129 df.

Tukey's Honestly-Significant-Difference Test

SEASON\$(i)*BIOF-ILM_ZONE\$(i)	SEASON\$(j)*BIOF-ILM_ZONE\$(j)	Difference	p-Value	95% Confidence Interval	
				Lower	Upper
Spring*Canoe Passage	Spring*Inter-causeway	-0.468	0.290	-1.059	0.124
Spring*Canoe Passage	Spring*Mid Inter-tidal	-0.645	0.000	-1.088	-0.203
Spring*Canoe Passage	Spring*Upper Inter-tidal	-0.446	0.064	-0.903	0.011
Spring*Canoe Passage	Summer *Canoe Passage	-0.038	1.000	-0.405	0.329
Spring*Canoe Passage	Summer *Inter-causeway	-0.595	0.047	-1.187	-0.003
Spring*Canoe Passage	Summer *Mid Inter-tidal	-0.678	0.000	-1.121	-0.235
Spring*Canoe Passage	Summer *Upper Inter-tidal	-0.950	0.000	-1.407	-0.494
Spring*Canoe Passage	Winter*Canoe Passage	0.052	1.000	-0.315	0.419
Spring*Canoe Passage	Winter*Inter-causeway	-0.070	1.000	-0.661	0.522
Spring*Canoe Passage	Winter*Mid Inter-tidal	-0.183	0.972	-0.626	0.259
Spring*Canoe Passage	Winter*Upper Inter-tidal	-0.068	1.000	-0.525	0.389
Spring*Inter-causeway	Spring*Mid Inter-tidal	-0.178	0.999	-0.819	0.464
Spring*Inter-causeway	Spring*Upper Inter-tidal	0.022	1.000	-0.629	0.673
Spring*Inter-causeway	Summer *Canoe Passage	0.429	0.426	-0.162	1.021
Spring*Inter-causeway	Summer *Inter-causeway	-0.128	1.000	-0.880	0.625
Spring*Inter-causeway	Summer *Mid Inter-tidal	-0.210	0.996	-0.852	0.431
Spring*Inter-causeway	Summer *Upper Inter-tidal	-0.483	0.391	-1.134	0.169
Spring*Inter-causeway	Winter*Canoe Passage	0.520	0.152	-0.072	1.111
Spring*Inter-causeway	Winter*Inter-causeway	0.398	0.855	-0.354	1.150
Spring*Inter-causeway	Winter*Mid Inter-tidal	0.284	0.954	-0.357	0.926

Spring*Inter-causeway	Winter*Upper Inter-tidal	0.400	0.690	-0.252	1.051
Spring*Mid Inter-tidal	Spring*Upper Inter-tidal	0.200	0.984	-0.320	0.719
Spring*Mid Inter-tidal	Summer *Canoe Passage	0.607	0.000	0.164	1.050
Spring*Mid Inter-tidal	Summer *Inter-causeway	0.050	1.000	-0.591	0.692
Spring*Mid Inter-tidal	Summer *Mid Inter-tidal	-0.033	1.000	-0.540	0.475
Spring*Mid Inter-tidal	Summer *Upper Inter-tidal	-0.305	0.748	-0.825	0.215
Spring*Mid Inter-tidal	Winter*Canoe Passage	0.697	0.000	0.255	1.140
Spring*Mid Inter-tidal	Winter*Inter-causeway	0.576	0.129	-0.066	1.217
Spring*Mid Inter-tidal	Winter*Mid Inter-tidal	0.462	0.115	-0.045	0.969
Spring*Mid Inter-tidal	Winter*Upper Inter-tidal	0.578	0.015	0.058	1.097
Spring*Upper Inter-tidal	Summer *Canoe Passage	0.407	0.136	-0.050	0.864
Spring*Upper Inter-tidal	Summer *Inter-causeway	-0.149	1.000	-0.801	0.502
Spring*Upper Inter-tidal	Summer *Mid Inter-tidal	-0.232	0.951	-0.752	0.287
Spring*Upper Inter-tidal	Summer *Upper Inter-tidal	-0.505	0.082	-1.037	0.027
Spring*Upper Inter-tidal	Winter*Canoe Passage	0.498	0.019	0.041	0.955
Spring*Upper Inter-tidal	Winter*Inter-causeway	0.376	0.768	-0.275	1.027
Spring*Upper Inter-tidal	Winter*Mid Inter-tidal	0.262	0.890	-0.257	0.782
Spring*Upper Inter-tidal	Winter*Upper Inter-tidal	0.378	0.461	-0.154	0.910
Summer *Canoe Passage	Summer *Inter-causeway	-0.557	0.088	-1.149	0.035
Summer *Canoe Passage	Summer *Mid Inter-tidal	-0.640	0.000	-1.082	-0.197
Summer *Canoe Passage	Summer *Upper Inter-tidal	-0.912	0.000	-1.369	-0.455
Summer *Canoe Passage	Winter*Canoe Passage	0.090	1.000	-0.277	0.457
Summer *Canoe Passage	Winter*Inter-causeway	-0.031	1.000	-0.623	0.560
Summer *Canoe Passage	Winter*Mid Inter-tidal	-0.145	0.996	-0.588	0.298
Summer *Canoe Passage	Winter*Upper Inter-tidal	-0.030	1.000	-0.487	0.427
Summer *Inter-causeway	Summer *Mid Inter-tidal	-0.083	1.000	-0.724	0.559
Summer *Inter-causeway	Summer *Upper Inter-tidal	-0.355	0.828	-1.007	0.296
Summer *Inter-causeway	Winter*Canoe Passage	0.647	0.018	0.055	1.239
Summer *Inter-causeway	Winter*Inter-causeway	0.526	0.489	-0.227	1.278

Summer *Inter-causeway	Winter*Mid Inter-tidal	0.412	0.624	-0.230	1.053
Summer *Inter-causeway	Winter*Upper Inter-tidal	0.527	0.254	-0.124	1.179
Summer *Mid Inter-tidal	Summer *Upper Inter-tidal	-0.273	0.862	-0.792	0.247
Summer *Mid Inter-tidal	Winter*Canoe Passage	0.730	0.000	0.287	1.173
Summer *Mid Inter-tidal	Winter*Inter-ca- useway	0.608	0.082	-0.033	1.250
Summer *Mid Inter-tidal	Winter*Mid Inter-tidal	0.495	0.064	-0.012	1.002
Summer *Mid Inter-tidal	Winter*Upper Inter-tidal	0.610	0.007	0.090	1.130
Summer *Upper Inter-tidal	Winter*Canoe Passage	1.003	0.000	0.546	1.459
Summer *Upper Inter-tidal	Winter*Inter-ca- useway	0.881	0.001	0.229	1.532
Summer *Upper Inter-tidal	Winter*Mid Inter-tidal	0.767	0.000	0.248	1.287
Summer *Upper Inter-tidal	Winter*Upper Inter-tidal	0.883	0.000	0.351	1.414
Winter*Canoe Passage	Winter*Inter-ca- useway	-0.122	1.000	-0.714	0.470
Winter*Canoe Passage	Winter*Mid Inter-tidal	-0.235	0.851	-0.678	0.207
Winter*Canoe Passage	Winter*Upper Inter-tidal	-0.120	0.999	-0.577	0.337
Winter*Inter-ca- useway	Winter*Mid Inter-tidal	-0.114	1.000	-0.755	0.528
Winter*Inter-ca- useway	Winter*Upper Inter-tidal	0.002	1.000	-0.650	0.653
Winter*Mid Inter-tidal	Winter*Upper Inter-tidal	0.115	1.000	-0.404	0.635

▼ Analysis of Variance

Effects coding used for categorical variables in model.  
The categorical values encountered during processing are

Variables	Levels			
SEASON\$ (3 levels)	Spring	Summer	Winter	
BIOFILM_ZONE\$ (4 levels)	Canoe Passage	Inter-causeway	Mid Inter-tidal	Upper Inter-tidal

1,048,434 case(s) are deleted due to missing data.

<b>Dependent Variable</b>	_4TH_ROOT_FUCO
<b>N</b>	141
<b>Multiple R</b>	0.736
<b>Squared Multiple R</b>	0.542

Estimates of Effects  $B = (X'X)^{-1}X'Y$

Factor	Level	_4TH_ROOT_FUCO
CONSTANT		2.460
SEASON\$	Spring	0.020
SEASON\$	Summer	0.076
BIOFILM_ZONE\$	Canoe Passage	-0.338
BIOFILM_ZONE\$	Inter-causeway	0.186
BIOFILM_ZONE\$	Mid Inter-tidal	0.126
SEASON\$*BIOFILM_ZONE\$	Spring*Canoe Passage	-0.038
SEASON\$*BIOFILM_ZONE\$	Spring*Inter-causeway	-0.060
SEASON\$*BIOFILM_ZONE\$	Spring*Mid Inter-tidal	0.161
SEASON\$*BIOFILM_ZONE\$	Summer *Canoe Passage	-0.070
SEASON\$*BIOFILM_ZONE\$	Summer *Inter-causeway	-0.102
SEASON\$*BIOFILM_ZONE\$	Summer *Mid Inter-tidal	-0.027

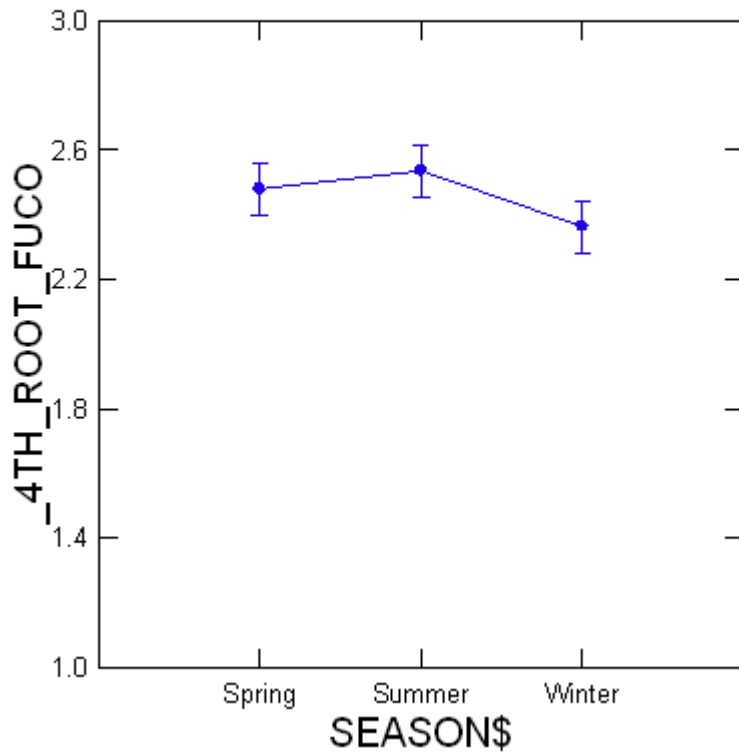
Analysis of Variance

Source	Type III SS	df	Mean Squares	F-Ratio	p-Value
SEASON\$	0.568	2	0.284	4.664	0.011
BIOFILM_ZONE\$	6.960	3	2.320	38.125	0.000
SEASON\$*BIOFILM_ZONE\$	1.688	6	0.281	4.622	0.000
Error	7.850	129	0.061		

Least Squares Means

Factor	Level	LS Mean	Standard Error	N
SEASON\$	Spring	2.480	0.041	47.000
SEASON\$	Summer	2.536	0.041	47.000
SEASON\$	Winter	2.364	0.041	47.000

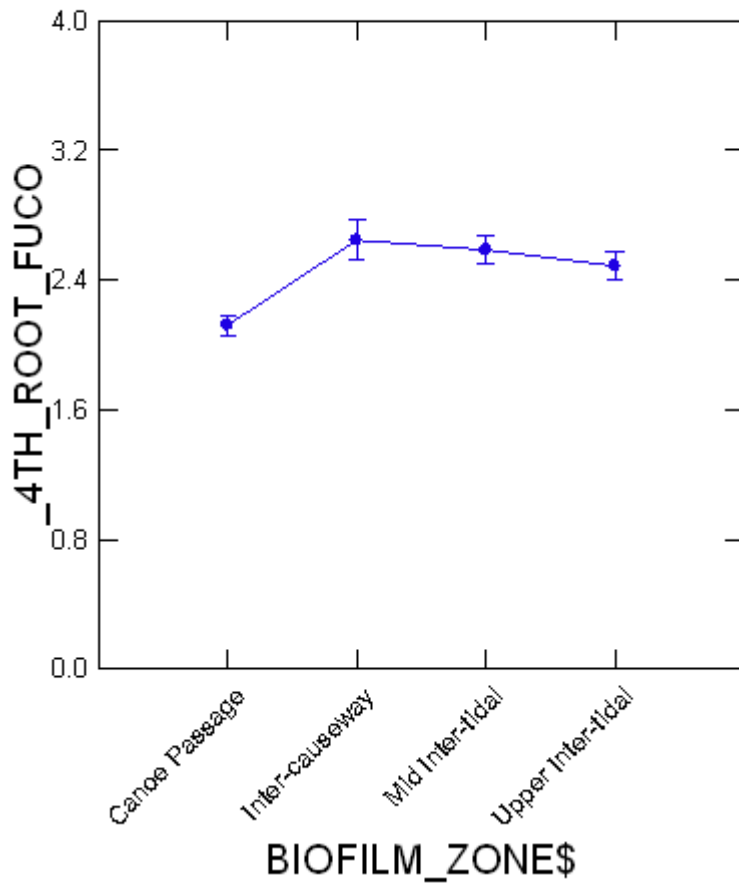
### Least Squares Means



### Least Squares Means

Factor	Level	LS Mean	Standard Error	N
BIOFILM_ZONE\$	Canoe Passage	2.122	0.031	63.000
BIOFILM_ZONE\$	Inter-causeway	2.646	0.064	15.000
BIOFILM_ZONE\$	Mid Inter-tidal	2.586	0.043	33.000
BIOFILM_ZONE\$	Upper Inter-tidal	2.487	0.045	30.000

### Least Squares Means

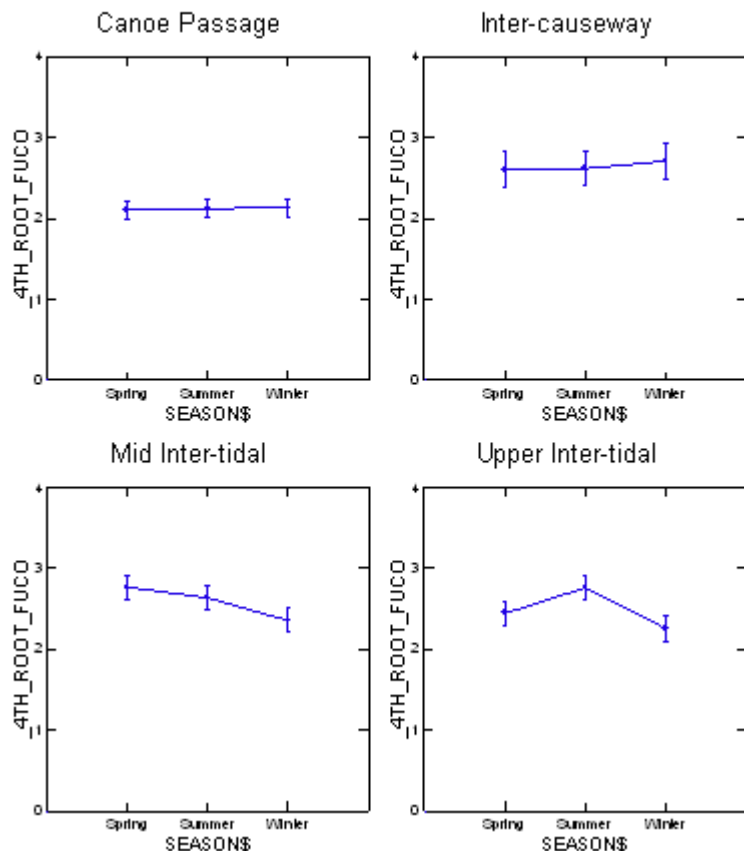


### Least Squares Means

Factor	Level	LS Mean	Standard Error	N
SEASON\$*BIOFILM_ZONES\$	Spring*Canoe Passage	2.104	0.054	21.000
SEASON\$*BIOFILM_ZONES\$	Spring*Inter-causeway	2.606	0.110	5.000
SEASON\$*BIOFILM_ZONES\$	Spring*Mid Inter-tidal	2.768	0.074	11.000
SEASON\$*BIOFILM_ZONES\$	Spring*Upper Inter-tidal	2.444	0.078	10.000
SEASON\$*BIOFILM_ZONES\$	Summer *Canoe Passage	2.128	0.054	21.000
SEASON\$*BIOFILM_ZONES\$	Summer *Inter-causeway	2.620	0.110	5.000
SEASON\$*BIOFILM_ZONES\$	Summer *Mid Inter-tidal	2.635	0.074	11.000
SEASON\$*BIOFILM_ZONES\$	Summer *Upper Inter-tidal	2.762	0.078	10.000
SEASON\$*BIOFILM_ZONES\$	Winter*Canoe Passage	2.133	0.054	21.000
SEASON\$*BIOFILM_ZONES\$	Winter*Inter-causeway	2.711	0.110	5.000
SEASON\$*BIOFILM_ZONES\$	Winter*Mid Inter-tidal	2.356	0.074	11.000

<b>SEASON\$*BIOFILM_ZONES</b>	Winter*Upper Inter-tidal	2.254	0.078	10.000
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### Least Squares Means

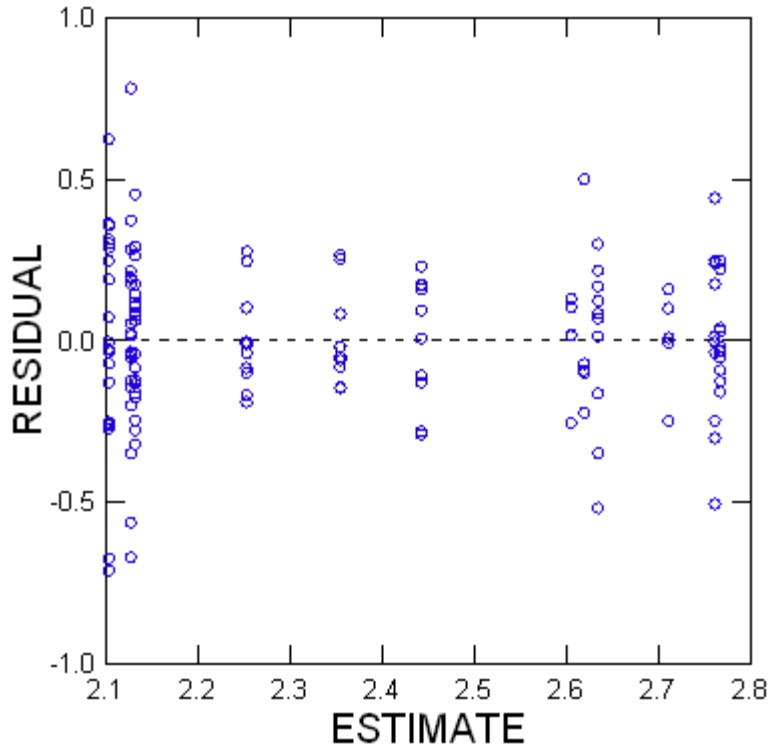


<b>Durbin-Watson D-Statistic</b>	1.652
<b>First Order Autocorrelation</b>	0.169

#### Information Criteria

<b>AIC</b>	18.896
<b>AIC (Corrected)</b>	21.762
<b>Schwarz's BIC</b>	57.230

### Plot of Residuals vs. Predicted Values



#### ▼ Hypothesis Tests

Post Hoc Test of \_4TH\_ROOT\_FUCO  
 Using least squares means.  
 Using model MSE of 0.061 with 129 df.

#### Tukey's Honestly-Significant-Difference Test

SEASON\$(i)	SEASON\$(j)	Difference	p-Value	95% Confidence Interval	
				Lower	Upper
Spring	Summer	-0.056	0.596	-0.175	0.063
Spring	Winter	0.117	0.107	-0.002	0.236
Summer	Winter	0.173	0.008	0.054	0.292

#### ▼ Hypothesis Tests

Post Hoc Test of \_4TH\_ROOT\_FUCO  
 Using least squares means.  
 Using model MSE of 0.061 with 129 df.

#### Tukey's Honestly-Significant-Difference Test

BIOFILM_ZONE\$(i-)	BIOFILM_ZONE\$(j-)	Difference	p-Value	95% Confidence Interval	
				Lower	Upper
Canoe Passage	Inter-causeway	-0.524	0.000	-0.706	-0.342
Canoe Passage	Mid Inter-tidal	-0.464	0.000	-0.600	-0.328
Canoe Passage	Upper	-0.365	0.000	-0.505	-0.224



	Inter-tidal				
Inter-causeway	Mid Inter-tidal	0.060	0.864	-0.138	0.257
Inter-causeway	Upper Inter-tidal	0.159	0.172	-0.041	0.360
Mid Inter-tidal	Upper Inter-tidal	0.100	0.379	-0.060	0.259

### ▼ Hypothesis Tests

Post Hoc Test of \_4TH\_ROOT\_FUCO  
Using least squares means.  
Using model MSE of 0.061 with 129 df.

### Tukey's Honestly-Significant-Difference Test

SEASON\$(i)*BIOF-ILM_ZONE\$(i)	SEASON\$(j)*BIOF-ILM_ZONE\$(j)	Difference	p-Value	95% Confidence Interval	
				Lower	Upper
Spring*Canoe Passage	Spring*Inter-causeway	-0.502	0.003	-0.903	-0.100
Spring*Canoe Passage	Spring*Mid Inter-tidal	-0.663	0.000	-0.963	-0.363
Spring*Canoe Passage	Spring*Upper Inter-tidal	-0.339	0.018	-0.649	-0.029
Spring*Canoe Passage	Summer *Canoe Passage	-0.024	1.000	-0.273	0.225
Spring*Canoe Passage	Summer *Inter-causeway	-0.516	0.002	-0.917	-0.115
Spring*Canoe Passage	Summer *Mid Inter-tidal	-0.531	0.000	-0.831	-0.231
Spring*Canoe Passage	Summer *Upper Inter-tidal	-0.658	0.000	-0.967	-0.348
Spring*Canoe Passage	Winter*Canoe Passage	-0.029	1.000	-0.277	0.220
Spring*Canoe Passage	Winter*Inter-causeway	-0.607	0.000	-1.008	-0.206
Spring*Canoe Passage	Winter*Mid Inter-tidal	-0.251	0.209	-0.551	0.049
Spring*Canoe Passage	Winter*Upper Inter-tidal	-0.150	0.917	-0.459	0.160
Spring*Inter-causeway	Spring*Mid Inter-tidal	-0.162	0.988	-0.596	0.273
Spring*Inter-causeway	Spring*Upper Inter-tidal	0.163	0.989	-0.279	0.604
Spring*Inter-causeway	Summer *Canoe Passage	0.478	0.006	0.076	0.879
Spring*Inter-causeway	Summer *Inter-causeway	-0.014	1.000	-0.524	0.496
Spring*Inter-causeway	Summer *Mid Inter-tidal	-0.029	1.000	-0.464	0.406
Spring*Inter-causeway	Summer *Upper Inter-tidal	-0.156	0.992	-0.597	0.286
Spring*Inter-causeway	Winter*Canoe Passage	0.473	0.007	0.072	0.874
Spring*Inter-causeway	Winter*Inter-causeway	-0.105	1.000	-0.615	0.404
Spring*Inter-causeway	Winter*Mid Inter-tidal	0.251	0.770	-0.184	0.685

Spring*Inter-causeway	Winter*Upper Inter-tidal	0.352	0.277	-0.090	0.793
Spring*Mid Inter-tidal	Spring*Upper Inter-tidal	0.324	0.106	-0.028	0.676
Spring*Mid Inter-tidal	Summer *Canoe Passage	0.639	0.000	0.339	0.939
Spring*Mid Inter-tidal	Summer *Inter-causeway	0.147	0.994	-0.287	0.582
Spring*Mid Inter-tidal	Summer *Mid Inter-tidal	0.133	0.984	-0.211	0.476
Spring*Mid Inter-tidal	Summer *Upper Inter-tidal	0.006	1.000	-0.347	0.358
Spring*Mid Inter-tidal	Winter*Canoe Passage	0.635	0.000	0.335	0.935
Spring*Mid Inter-tidal	Winter*Inter-causeway	0.056	1.000	-0.379	0.491
Spring*Mid Inter-tidal	Winter*Mid Inter-tidal	0.412	0.005	0.068	0.756
Spring*Mid Inter-tidal	Winter*Upper Inter-tidal	0.514	0.000	0.161	0.866
Spring*Upper Inter-tidal	Summer *Canoe Passage	0.315	0.042	0.005	0.625
Spring*Upper Inter-tidal	Summer *Inter-causeway	-0.177	0.978	-0.618	0.265
Spring*Upper Inter-tidal	Summer *Mid Inter-tidal	-0.192	0.831	-0.544	0.161
Spring*Upper Inter-tidal	Summer *Upper Inter-tidal	-0.318	0.145	-0.679	0.042
Spring*Upper Inter-tidal	Winter*Canoe Passage	0.310	0.049	0.001	0.620
Spring*Upper Inter-tidal	Winter*Inter-causeway	-0.268	0.705	-0.710	0.174
Spring*Upper Inter-tidal	Winter*Mid Inter-tidal	0.088	1.000	-0.264	0.440
Spring*Upper Inter-tidal	Winter*Upper Inter-tidal	0.189	0.861	-0.171	0.550
Summer *Canoe Passage	Summer *Inter-causeway	-0.492	0.004	-0.893	-0.091
Summer *Canoe Passage	Summer *Mid Inter-tidal	-0.507	0.000	-0.807	-0.207
Summer *Canoe Passage	Summer *Upper Inter-tidal	-0.634	0.000	-0.943	-0.324
Summer *Canoe Passage	Winter*Canoe Passage	-0.005	1.000	-0.253	0.244
Summer *Canoe Passage	Winter*Inter-causeway	-0.583	0.000	-0.984	-0.182
Summer *Canoe Passage	Winter*Mid Inter-tidal	-0.227	0.357	-0.527	0.073
Summer *Canoe Passage	Winter*Upper Inter-tidal	-0.126	0.976	-0.435	0.184
Summer *Inter-causeway	Summer *Mid Inter-tidal	-0.015	1.000	-0.450	0.420
Summer *Inter-causeway	Summer *Upper Inter-tidal	-0.142	0.997	-0.583	0.300
Summer *Inter-causeway	Winter*Canoe Passage	0.487	0.004	0.086	0.888
Summer *Inter-causeway	Winter*Inter-causeway	-0.091	1.000	-0.601	0.419

Summer *Inter-causeway	Winter*Mid Inter-tidal	0.265	0.701	-0.170	0.699
Summer *Inter-causeway	Winter*Upper Inter-tidal	0.366	0.221	-0.075	0.808
Summer *Mid Inter-tidal	Summer *Upper Inter-tidal	-0.127	0.991	-0.479	0.225
Summer *Mid Inter-tidal	Winter*Canoe Passage	0.502	0.000	0.202	0.802
Summer *Mid Inter-tidal	Winter*Inter-ca- useway	-0.076	1.000	-0.511	0.358
Summer *Mid Inter-tidal	Winter*Mid Inter-tidal	0.280	0.248	-0.064	0.623
Summer *Mid Inter-tidal	Winter*Upper Inter-tidal	0.381	0.021	0.029	0.733
Summer *Upper Inter-tidal	Winter*Canoe Passage	0.629	0.000	0.319	0.939
Summer *Upper Inter-tidal	Winter*Inter-ca- useway	0.051	1.000	-0.391	0.492
Summer *Upper Inter-tidal	Winter*Mid Inter-tidal	0.406	0.009	0.054	0.759
Summer *Upper Inter-tidal	Winter*Upper Inter-tidal	0.508	0.000	0.147	0.868
Winter*Canoe Passage	Winter*Inter-ca- useway	-0.578	0.000	-0.980	-0.177
Winter*Canoe Passage	Winter*Mid Inter-tidal	-0.222	0.390	-0.522	0.078
Winter*Canoe Passage	Winter*Upper Inter-tidal	-0.121	0.982	-0.431	0.189
Winter*Inter-ca- useway	Winter*Mid Inter-tidal	0.356	0.239	-0.079	0.791
Winter*Inter-ca- useway	Winter*Upper Inter-tidal	0.457	0.035	0.016	0.899
Winter*Mid Inter-tidal	Winter*Upper Inter-tidal	0.101	0.999	-0.251	0.454

▼ Analysis of Variance

Effects coding used for categorical variables in model.  
The categorical values encountered during processing are

Variables	Levels			
SEASON\$ (3 levels)	Spring	Summer	Winter	
BIOFILM_ZONE\$ (4 levels)	Canoe Passage	Inter-causeway	Mid Inter-tidal	Upper Inter-tidal

1,048,434 case(s) are deleted due to missing data.

<b>Dependent Variable</b>	LN_GLUCOSE_1_
<b>N</b>	141
<b>Multiple R</b>	0.770
<b>Squared Multiple R</b>	0.593

Estimates of Effects  $B = (X'X)^{-1}X'Y$

Factor	Level	LN_GLUCOSE_1_
CONSTANT		8.874
SEASON\$	Spring	-0.225
SEASON\$	Summer	0.289
BIOFILM_ZONE\$	Canoe Passage	-0.480
BIOFILM_ZONE\$	Inter-causeway	0.117
BIOFILM_ZONE\$	Mid Inter-tidal	0.326
SEASON\$*BIOFILM_ZONE\$	Spring*Canoe Passage	0.103
SEASON\$*BIOFILM_ZONE\$	Spring*Inter-causeway	0.262
SEASON\$*BIOFILM_ZONE\$	Spring*Mid Inter-tidal	0.449
SEASON\$*BIOFILM_ZONE\$	Summer *Canoe Passage	-0.026
SEASON\$*BIOFILM_ZONE\$	Summer *Inter-causeway	-0.356
SEASON\$*BIOFILM_ZONE\$	Summer *Mid Inter-tidal	-0.233

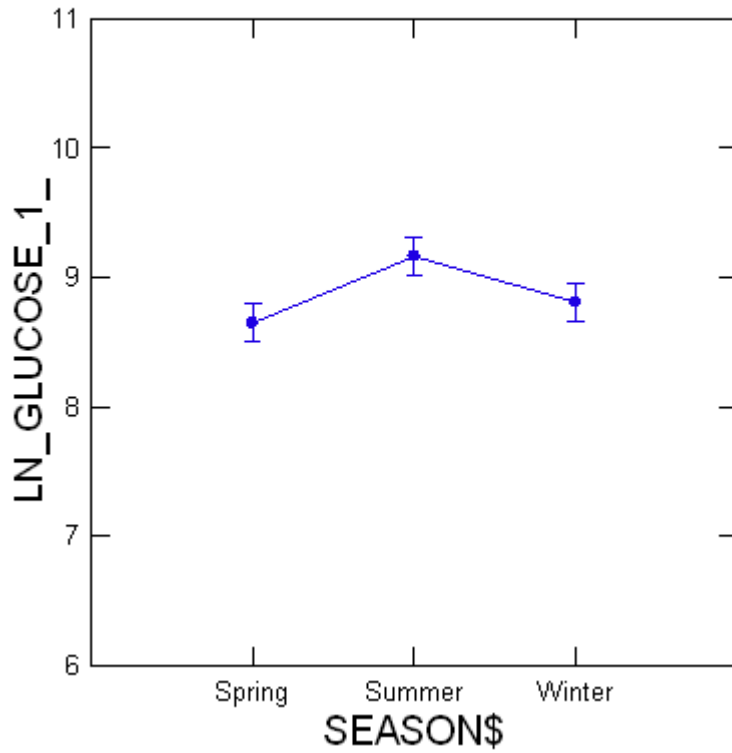
Analysis of Variance

Source	Type III SS	df	Mean Squares	F-Ratio	p-Value
SEASON\$	5.046	2	2.523	12.106	0.000
BIOFILM_ZONE\$	16.326	3	5.442	26.114	0.000
SEASON\$*BIOFILM_ZONE\$	15.448	6	2.575	12.355	0.000
Error	26.883	129	0.208		

Least Squares Means

Factor	Level	LS Mean	Standard Error	N
SEASON\$	Spring	8.649	0.076	47.000
SEASON\$	Summer	9.163	0.076	47.000
SEASON\$	Winter	8.809	0.076	47.000

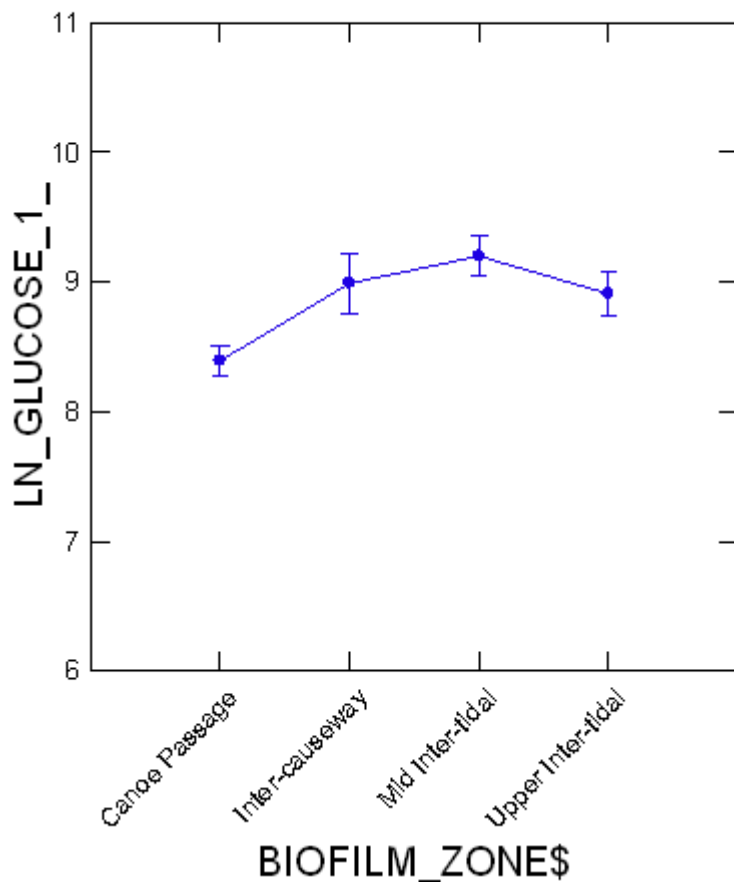
### Least Squares Means



### Least Squares Means

Factor	Level	LS Mean	Standard Error	N
BIOFILM_ZONE\$	Canoe Passage	8.393	0.058	63.000
BIOFILM_ZONE\$	Inter-causeway	8.991	0.118	15.000
BIOFILM_ZONE\$	Mid Inter-tidal	9.200	0.079	33.000
BIOFILM_ZONE\$	Upper Inter-tidal	8.910	0.083	30.000

### Least Squares Means

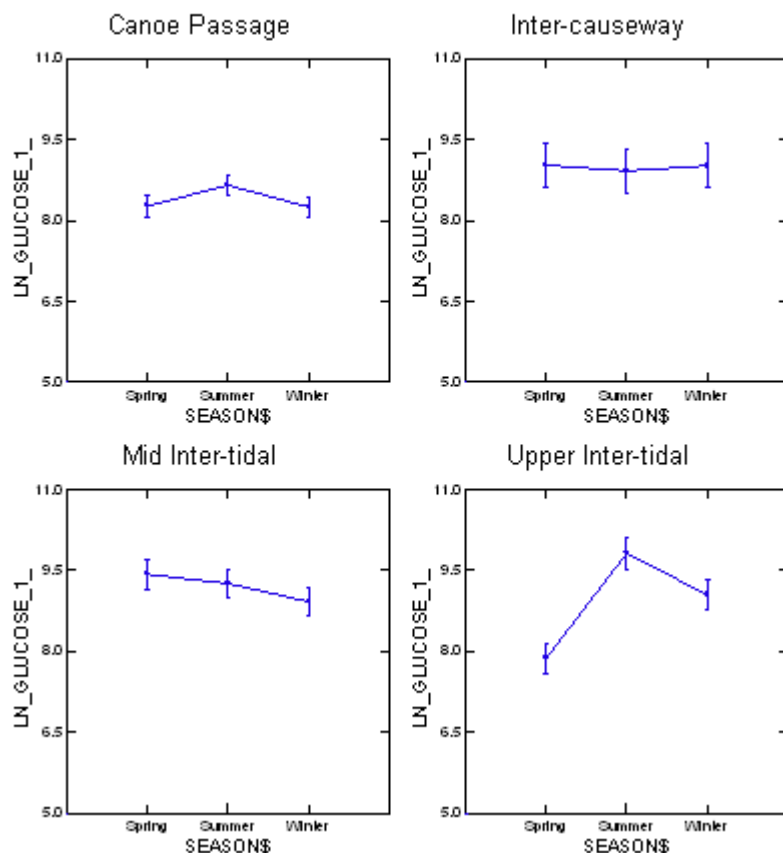


### Least Squares Means

Factor	Level	LS Mean	Standard Error	N
SEASON\$*BIOFILM_ZONE\$	Spring*Canoe Passage	8.272	0.100	21.000
SEASON\$*BIOFILM_ZONE\$	Spring*Inter-ca-useway	9.029	0.204	5.000
SEASON\$*BIOFILM_ZONE\$	Spring*Mid Inter-tidal	9.425	0.138	11.000
SEASON\$*BIOFILM_ZONE\$	Spring*Upper Inter-tidal	7.871	0.144	10.000
SEASON\$*BIOFILM_ZONE\$	Summer *Canoe Passage	8.657	0.100	21.000
SEASON\$*BIOFILM_ZONE\$	Summer *Inter-causeway	8.924	0.204	5.000
SEASON\$*BIOFILM_ZONE\$	Summer *Mid Inter-tidal	9.257	0.138	11.000
SEASON\$*BIOFILM_ZONE\$	Summer *Upper Inter-tidal	9.814	0.144	10.000
SEASON\$*BIOFILM_ZONE\$	Winter*Canoe Passage	8.251	0.100	21.000
SEASON\$*BIOFILM_ZONE\$	Winter*Inter-ca-useway	9.020	0.204	5.000
SEASON\$*BIOFILM_ZONE\$	Winter*Mid Inter-tidal	8.918	0.138	11.000

<b>SEASON\$*BIOFILM_ZONES</b>	Winter*Upper Inter-tidal	9.046	0.144	10.000
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### Least Squares Means



WARNING

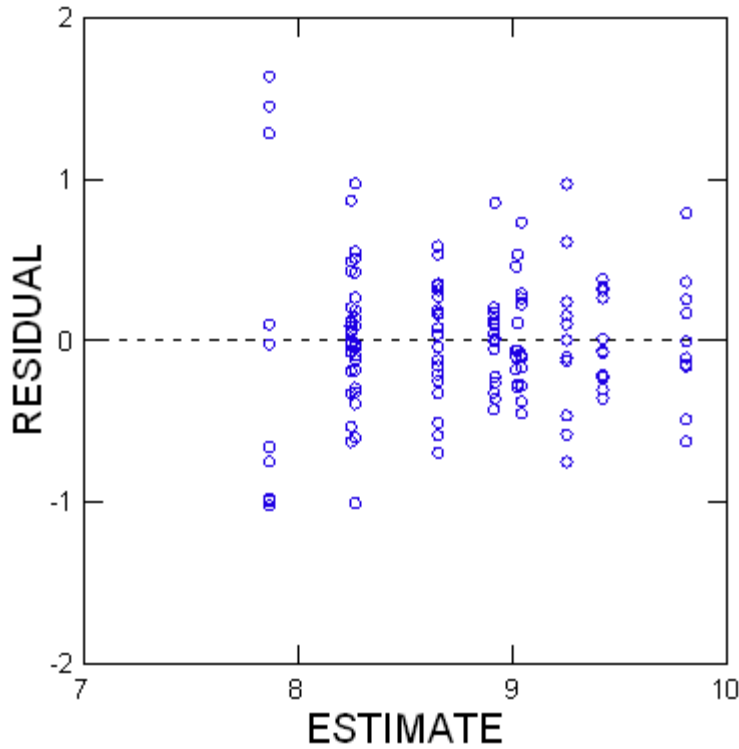
Case 1,048,556 is an Outlier (Studentized Residual : 3.978)

<b>Durbin-Watson D-Statistic</b>	1.932
<b>First Order Autocorrelation</b>	0.024

#### Information Criteria

<b>AIC</b>	192.464
<b>AIC (Corrected)</b>	195.330
<b>Schwarz's BIC</b>	230.798

### Plot of Residuals vs. Predicted Values



#### ▼ Hypothesis Tests

Post Hoc Test of LN\_GLUPOSE\_1\_  
 Using least squares means.  
 Using model MSE of 0.208 with 129 df.

#### Tukey's Honestly-Significant-Difference Test

SEASON\$(i)	SEASON\$(j)	Difference	p-Value	95% Confidence Interval	
				Lower	Upper
Spring	Summer	-0.514	0.000	-0.735	-0.293
Spring	Winter	-0.160	0.293	-0.380	0.061
Summer	Winter	0.354	0.003	0.133	0.575

#### ▼ Hypothesis Tests

Post Hoc Test of LN\_GLUPOSE\_1\_  
 Using least squares means.  
 Using model MSE of 0.208 with 129 df.

#### Tukey's Honestly-Significant-Difference Test

BIOFILM_ZONE\$(i-)	BIOFILM_ZONE\$(j-)	Difference	p-Value	95% Confidence Interval	
				Lower	Upper
Canoe Passage	Inter-causeway	-0.597	0.000	-0.934	-0.261
Canoe Passage	Mid Inter-tidal	-0.806	0.000	-1.059	-0.554
Canoe Passage	Upper	-0.517	0.000	-0.777	-0.257



	Inter-tidal				
Inter-causeway	Mid Inter-tidal	-0.209	0.455	-0.574	0.156
Inter-causeway	Upper Inter-tidal	0.081	0.944	-0.290	0.452
Mid Inter-tidal	Upper Inter-tidal	0.290	0.057	-0.006	0.586

▼ Hypothesis Tests

Post Hoc Test of LN\_GLUKOSE\_1\_  
 Using least squares means.  
 Using model MSE of 0.208 with 129 df.

Tukey's Honestly-Significant-Difference Test

SEASON\$(i)*BIOF-ILM_ZONE\$(i)	SEASON\$(j)*BIOF-ILM_ZONE\$(j)	Difference	p-Value	95% Confidence Interval	
				Lower	Upper
Spring*Canoe Passage	Spring*Inter-causeway	-0.757	0.041	-1.499	-0.014
Spring*Canoe Passage	Spring*Mid Inter-tidal	-1.153	0.000	-1.708	-0.598
Spring*Canoe Passage	Spring*Upper Inter-tidal	0.401	0.487	-0.172	0.974
Spring*Canoe Passage	Summer *Canoe Passage	-0.385	0.209	-0.846	0.075
Spring*Canoe Passage	Summer *Inter-causeway	-0.652	0.152	-1.394	0.090
Spring*Canoe Passage	Summer *Mid Inter-tidal	-0.985	0.000	-1.540	-0.430
Spring*Canoe Passage	Summer *Upper Inter-tidal	-1.542	0.000	-2.115	-0.969
Spring*Canoe Passage	Winter*Canoe Passage	0.021	1.000	-0.440	0.481
Spring*Canoe Passage	Winter*Inter-causeway	-0.748	0.046	-1.491	-0.006
Spring*Canoe Passage	Winter*Mid Inter-tidal	-0.647	0.008	-1.202	-0.091
Spring*Canoe Passage	Winter*Upper Inter-tidal	-0.774	0.001	-1.347	-0.201
Spring*Inter-causeway	Spring*Mid Inter-tidal	-0.396	0.906	-1.201	0.409
Spring*Inter-causeway	Spring*Upper Inter-tidal	1.158	0.000	0.341	1.975
Spring*Inter-causeway	Summer *Canoe Passage	0.372	0.896	-0.371	1.114
Spring*Inter-causeway	Summer *Inter-causeway	0.105	1.000	-0.839	1.048
Spring*Inter-causeway	Summer *Mid Inter-tidal	-0.228	0.999	-1.033	0.577
Spring*Inter-causeway	Summer *Upper Inter-tidal	-0.785	0.073	-1.602	0.032
Spring*Inter-causeway	Winter*Canoe Passage	0.777	0.031	0.035	1.520
Spring*Inter-causeway	Winter*Inter-causeway	0.009	1.000	-0.935	0.952
Spring*Inter-causeway	Winter*Mid Inter-tidal	0.110	1.000	-0.694	0.915

Spring*Inter-causeway	Winter*Upper Inter-tidal	-0.017	1.000	-0.834	0.800
Spring*Mid Inter-tidal	Spring*Upper Inter-tidal	1.554	0.000	0.902	2.206
Spring*Mid Inter-tidal	Summer *Canoe Passage	0.768	0.000	0.212	1.323
Spring*Mid Inter-tidal	Summer *Inter-causeway	0.501	0.669	-0.304	1.306
Spring*Mid Inter-tidal	Summer *Mid Inter-tidal	0.168	0.999	-0.468	0.804
Spring*Mid Inter-tidal	Summer *Upper Inter-tidal	-0.389	0.727	-1.041	0.263
Spring*Mid Inter-tidal	Winter*Canoe Passage	1.174	0.000	0.618	1.729
Spring*Mid Inter-tidal	Winter*Inter-causeway	0.405	0.893	-0.400	1.209
Spring*Mid Inter-tidal	Winter*Mid Inter-tidal	0.506	0.278	-0.130	1.143
Spring*Mid Inter-tidal	Winter*Upper Inter-tidal	0.379	0.759	-0.273	1.031
Spring*Upper Inter-tidal	Summer *Canoe Passage	-0.786	0.000	-1.359	-0.213
Spring*Upper Inter-tidal	Summer *Inter-causeway	-1.053	0.002	-1.870	-0.236
Spring*Upper Inter-tidal	Summer *Mid Inter-tidal	-1.386	0.000	-2.038	-0.734
Spring*Upper Inter-tidal	Summer *Upper Inter-tidal	-1.943	0.000	-2.610	-1.276
Spring*Upper Inter-tidal	Winter*Canoe Passage	-0.380	0.573	-0.953	0.193
Spring*Upper Inter-tidal	Winter*Inter-causeway	-1.149	0.000	-1.966	-0.332
Spring*Upper Inter-tidal	Winter*Mid Inter-tidal	-1.047	0.000	-1.699	-0.396
Spring*Upper Inter-tidal	Winter*Upper Inter-tidal	-1.175	0.000	-1.842	-0.508
Summer *Canoe Passage	Summer *Inter-causeway	-0.267	0.991	-1.009	0.476
Summer *Canoe Passage	Summer *Mid Inter-tidal	-0.599	0.021	-1.155	-0.044
Summer *Canoe Passage	Summer *Upper Inter-tidal	-1.157	0.000	-1.730	-0.584
Summer *Canoe Passage	Winter*Canoe Passage	0.406	0.147	-0.054	0.866
Summer *Canoe Passage	Winter*Inter-causeway	-0.363	0.910	-1.105	0.379
Summer *Canoe Passage	Winter*Mid Inter-tidal	-0.261	0.930	-0.816	0.294
Summer *Canoe Passage	Winter*Upper Inter-tidal	-0.388	0.539	-0.962	0.185
Summer *Inter-causeway	Summer *Mid Inter-tidal	-0.333	0.972	-1.137	0.472
Summer *Inter-causeway	Summer *Upper Inter-tidal	-0.890	0.019	-1.707	-0.073
Summer *Inter-causeway	Winter*Canoe Passage	0.673	0.120	-0.070	1.415
Summer *Inter-causeway	Winter*Inter-causeway	-0.096	1.000	-1.040	0.847

Summer *Inter-causeway	Winter*Mid Inter-tidal	0.005	1.000	-0.799	0.810
Summer *Inter-causeway	Winter*Upper Inter-tidal	-0.122	1.000	-0.939	0.695
Summer *Mid Inter-tidal	Summer *Upper Inter-tidal	-0.557	0.182	-1.209	0.094
Summer *Mid Inter-tidal	Winter*Canoe Passage	1.005	0.000	0.450	1.561
Summer *Mid Inter-tidal	Winter*Inter-ca- useway	0.236	0.998	-0.568	1.041
Summer *Mid Inter-tidal	Winter*Mid Inter-tidal	0.338	0.851	-0.298	0.974
Summer *Mid Inter-tidal	Winter*Upper Inter-tidal	0.211	0.996	-0.441	0.863
Summer *Upper Inter-tidal	Winter*Canoe Passage	1.563	0.000	0.990	2.136
Summer *Upper Inter-tidal	Winter*Inter-ca- useway	0.794	0.066	-0.023	1.611
Summer *Upper Inter-tidal	Winter*Mid Inter-tidal	0.896	0.000	0.244	1.547
Summer *Upper Inter-tidal	Winter*Upper Inter-tidal	0.768	0.009	0.101	1.436
Winter*Canoe Passage	Winter*Inter-ca- useway	-0.769	0.035	-1.511	-0.027
Winter*Canoe Passage	Winter*Mid Inter-tidal	-0.667	0.005	-1.222	-0.112
Winter*Canoe Passage	Winter*Upper Inter-tidal	-0.794	0.000	-1.368	-0.221
Winter*Inter-ca- useway	Winter*Mid Inter-tidal	0.102	1.000	-0.703	0.906
Winter*Inter-ca- useway	Winter*Upper Inter-tidal	-0.025	1.000	-0.843	0.792
Winter*Mid Inter-tidal	Winter*Upper Inter-tidal	-0.127	1.000	-0.779	0.525

### ▼ Nonparametric: Kruskal-Wallis Test

#### Kruskal-Wallis One-way Analysis of Variance for 72 Cases

The categorical values encountered during processing are

Variables	Levels		
SEASON\$ (3 levels)	Spring	Summer	Winter

Dependent Variable	TOTAL_LIPID_MG_- M_2
Grouping Variable	SEASON\$

Group	Count	Rank Sum
Spring	24	1,025.000
Summer	24	1,012.000
Winter	24	591.000

Kruskal-Wallis Test Statistic: 11.598

The p-value is 0.003 assuming chi-square distribution with 2 df.

#### Conover-Inman Test for All Pairwise Comparisons

Group(i)	Group(j)	Statistic	p-Value
Spring	Summer	0.097	0.923
Spring	Winter	3.226	0.002
Summer	Winter	3.129	0.003

#### Dwass-Steel-Chritchlow-Fligner Test for All Pairwise Comparisons

Group(i)	Group(j)	Statistic	p-Value
Spring	Summer	-0.204	0.989
Spring	Winter	-4.141	0.010
Summer	Winter	-4.170	0.009

### ▼ Nonparametric: Kruskal-Wallis Test

#### Kruskal-Wallis One-way Analysis of Variance for 72 Cases

The categorical values encountered during processing are

Variables	Levels		
LOCATION\$ (3 levels)	Canoe Passage	Intercauseway	Upper Inter-tidal

Dependent Variable	TOTAL_LIPID_MG_- M_2
Grouping Variable	LOCATION\$

Group	Count	Rank Sum
Canoe Passage	30	979.000

Intercauseway	6	77.000
Upper Inter-tidal	36	1,572.000

Kruskal-Wallis Test Statistic: 12.918

The p-value is 0.002 assuming chi-square distribution with 2 df.

#### Conover-Inman Test for All Pairwise Comparisons

Group(i)	Group(j)	Statistic	p-Value
<b>Canoe Passage</b>	Intercauseway	2.306	0.024
<b>Canoe Passage</b>	Upper Inter-tidal	2.324	0.023
<b>Intercauseway</b>	Upper Inter-tidal	3.642	0.001

#### Dwass-Steel-Chritchlow-Fligner Test for All Pairwise Comparisons

Group(i)	Group(j)	Statistic	p-Value
<b>Canoe Passage</b>	Intercauseway	-29.655	0.000
<b>Canoe Passage</b>	Upper Inter-tidal	6.684	0.000
<b>Intercauseway</b>	Upper Inter-tidal	37.464	0.000

▼ File: Untitled1.syz

WARNING Maximum string width exceeded for one or more values. Such values have been truncated to 24 characters.  
To avoid truncation, please increase the maximum string data width appropriately in the Data tab of the Edit: Options dialog box.

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Successfully saved file U:\YVR\307071\00790\_HEMM\_CCIP BIOFL\10\_Eng\15\_L\_and\_E\10\_Env\_Mgmt\BIOFILM\Tier 4\Data\Annual Variability\Chemical\Analysis\Systat Analysis\Annual Variability Database.syz  
Processed 21 Variables and 1048575 Cases.

▼ Nonparametric: Kruskal-Wallis Test

**Kruskal-Wallis One-way Analysis of Variance for 1,048,575 Cases**

The categorical values encountered during processing are

Variables	Levels		
SEASONS\$ (3 levels)	Spring	Summer	Winter

Dependent Variable	TOC
Grouping Variable	SEASONS\$

Group	Count	Rank Sum
Spring	47	3,785.000
Summer	47	3,724.000
Winter	47	2,502.000

Kruskal-Wallis Test Statistic: 13.360  
The p-value is 0.001 assuming chi-square distribution with 2 df.

**Conover-Inman Test for All Pairwise Comparisons**

Group(i)	Group(j)	Statistic	p-Value
Spring	Summer	0.161	0.872
Spring	Winter	3.382	0.001
Summer	Winter	3.221	0.002

**Dwass-Steel-Chritchlow-Fligner Test for All Pairwise Comparisons**

Group(i)	Group(j)	Statistic	p-Value
Spring	Summer	.	.
Spring	Winter	.	.
Summer	Winter	.	.

▼ Nonparametric: Kruskal-Wallis Test

**Kruskal-Wallis One-way Analysis of Variance for 1,048,575 Cases**

The categorical values encountered during processing are

Variables	Levels			
BIOFILM_ZONE\$ (4 levels)	Canoe Passage	Inter-causeway	Mid Inter-tidal	Upper Inter-tidal

Dependent Variable	TOC
Grouping Variable	BIOFILM_ZONE\$

Group	Count	Rank Sum
Canoe Passage	63	2,574.000
Inter-causeway	15	853.000
Mid Inter-tidal	33	3,342.000
Upper Inter-tidal	30	3,242.000

Kruskal-Wallis Test Statistic: 78.932  
The p-value is 0.000 assuming chi-square distribution with 3 df.

**Conover-Inman Test for All Pairwise Comparisons**

Group(i)	Group(j)	Statistic	p-Value
Canoe Passage	Inter-causeway	2.043	0.043
Canoe Passage	Mid Inter-tidal	10.309	0.000
Canoe Passage	Upper Inter-tidal	11.110	0.000
Inter-causeway	Mid Inter-tidal	5.229	0.000
Inter-causeway	Upper Inter-tidal	5.937	0.000
Mid Inter-tidal	Upper Inter-tidal	0.988	0.325

**Dwass-Steel-Chritchlow-Fligner Test for All Pairwise Comparisons**

Group(i)	Group(j)	Statistic	p-Value
Canoe Passage	Inter-causeway	.	.
Canoe Passage	Mid Inter-tidal	.	.
Canoe Passage	Upper Inter-tidal	.	.
Inter-causeway	Mid Inter-tidal	.	.
Inter-causeway	Upper Inter-tidal	.	.
Mid Inter-tidal	Upper Inter-tidal	.	.

▼ Analysis of Variance

Effects coding used for categorical variables in model.  
The categorical values encountered during processing are

Variables	Levels			
SEASON\$ (3 levels)	Spring	Summer	Winter	
BIOFILM_ZONE\$ (4 levels)	Canoe Passage	Inter-causeway	Mid Inter-tidal	Upper Inter-tidal

1 case(s) are deleted due to missing data.

Dependent Variable	LN_ABUNDNACE__1-
N	67
Multiple R	0.760
Squared Multiple R	0.577

Estimates of Effects  $B = (X'X)^{-1}X'Y$

Factor	Level	LN_ABUNDNACE__1-
CONSTANT		22.369
SEASON\$	Spring	0.000
SEASON\$	Summer	-0.139
BIOFILM_ZONE\$	Canoe Passage	-0.650
BIOFILM_ZONE\$	Inter-causeway	-0.153
BIOFILM_ZONE\$	Mid Inter-tidal	0.232
SEASON\$*BIOFILM_ZONE\$	Spring*Canoe Passage	0.400
SEASON\$*BIOFILM_ZONE\$	Spring*Inter-causeway	0.594
SEASON\$*BIOFILM_ZONE\$	Spring*Mid Inter-tidal	0.118
SEASON\$*BIOFILM_ZONE\$	Summer*Canoe Passage	-0.031
SEASON\$*BIOFILM_ZONE\$	Summer*Inter-causeway	-0.907
SEASON\$*BIOFILM_ZONE\$	Summer*Mid Inter-tidal	-0.188

Analysis of Variance

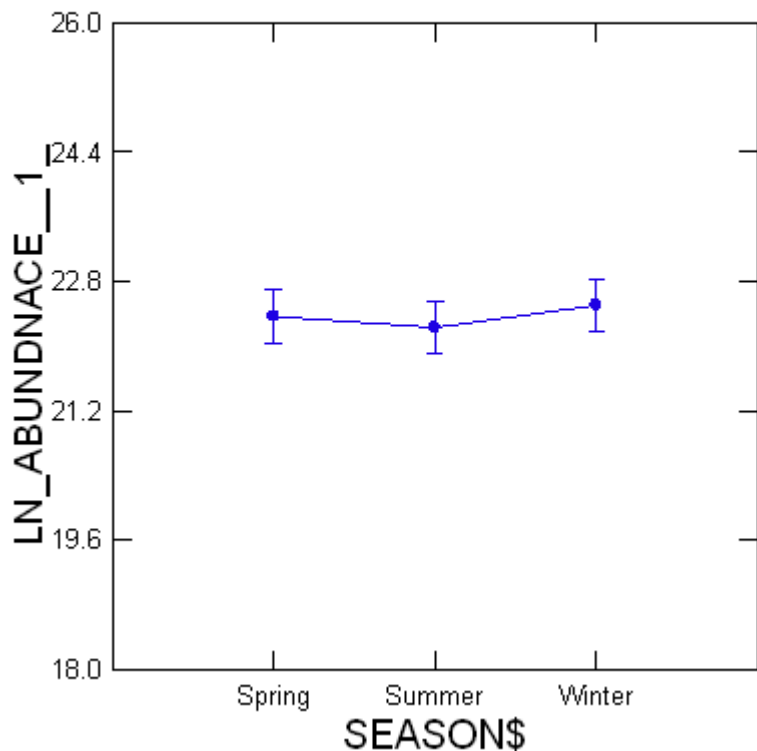
Source	Type III SS	df	Mean Squares	F-Ratio	p-Value
SEASON\$	0.698	2	0.349	0.712	0.495
BIOFILM_ZONE\$	17.275	3	5.758	11.756	0.000
SEASON\$*BIOFILM_ZONE\$	19.143	6	3.191	6.514	0.000
Error	26.941	55	0.490		

Least Squares Means

Factor	Level	LS Mean	Standard Error	N
SEASON\$	Spring	22.370	0.164	22.000
SEASON\$	Summer	22.231	0.164	22.000

<b>SEASON\$</b>	Winter	22.508	0.164	23.000
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### Least Squares Means

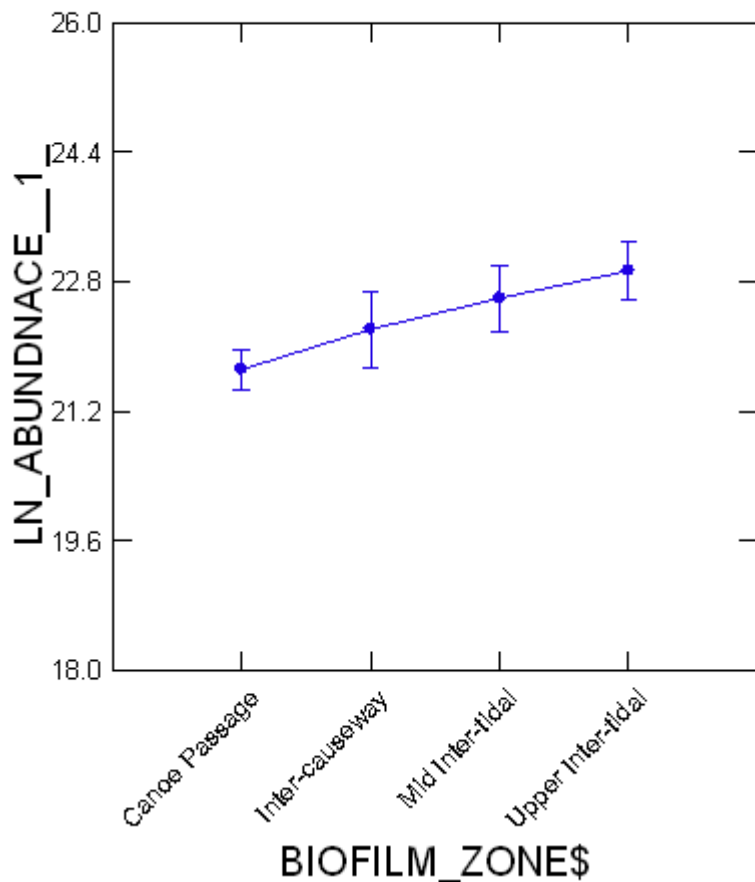


### Least Squares Means

Factor	Level	LS Mean	Standard Error	N
<b>BIOFILM_ZONE\$</b>	Canoe Passage	21.719	0.126	31.000
<b>BIOFILM_ZONE\$</b>	Inter-causeway	22.217	0.233	9.000
<b>BIOFILM_ZONE\$</b>	Mid Inter-tidal	22.601	0.202	12.000
<b>BIOFILM_ZONE\$</b>	Upper Inter-tidal	22.940	0.181	15.000



### Least Squares Means

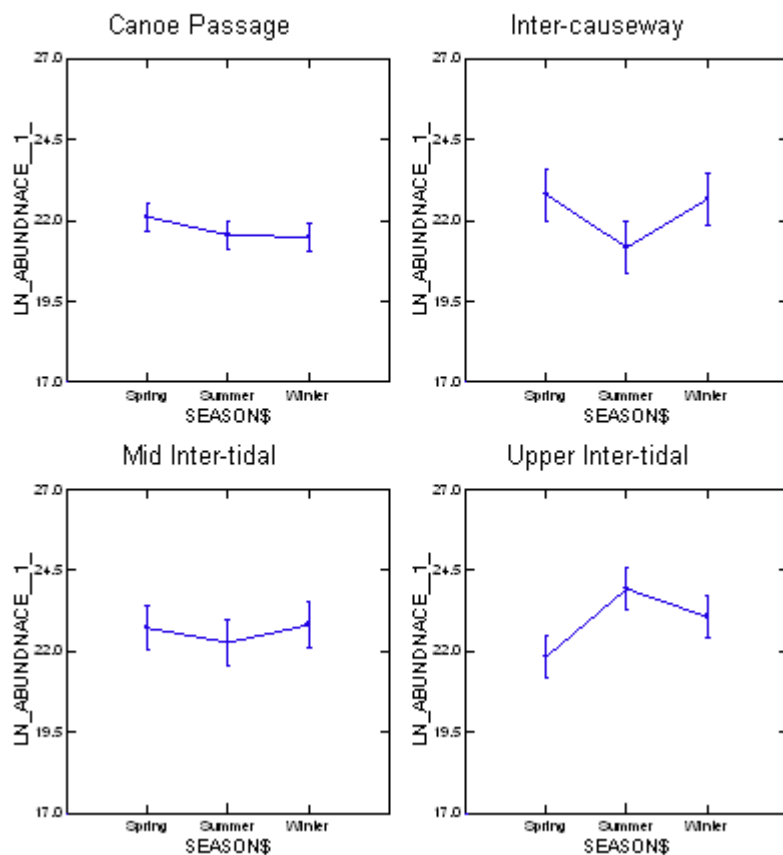


### Least Squares Means

Factor	Level	LS Mean	Standard Error	N
SEASON\$*BIOFILM_ZONES\$	Spring*Canoe Passage	22.120	0.221	10.000
SEASON\$*BIOFILM_ZONES\$	Spring*Inter-causeway	22.811	0.404	3.000
SEASON\$*BIOFILM_ZONES\$	Spring*Mid Inter-tidal	22.719	0.350	4.000
SEASON\$*BIOFILM_ZONES\$	Spring*Upper Inter-tidal	21.828	0.313	5.000
SEASON\$*BIOFILM_ZONES\$	Summer*Canoe Passage	21.550	0.221	10.000
SEASON\$*BIOFILM_ZONES\$	Summer*Inter-causeway	21.171	0.404	3.000
SEASON\$*BIOFILM_ZONES\$	Summer*Mid Inter-tidal	22.275	0.350	4.000
SEASON\$*BIOFILM_ZONES\$	Summer*Upper Inter-tidal	23.928	0.313	5.000
SEASON\$*BIOFILM_ZONES\$	Winter*Canoe Passage	21.488	0.211	11.000
SEASON\$*BIOFILM_ZONES\$	Winter*Inter-causeway	22.668	0.404	3.000
SEASON\$*BIOFILM_ZONES\$	Winter*Mid Inter-tidal	22.810	0.350	4.000

<b>SEASON\$*BIOFILM_ZONES</b>	Winter*Upper Inter-tidal	23.063	0.313	5.000
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### Least Squares Means

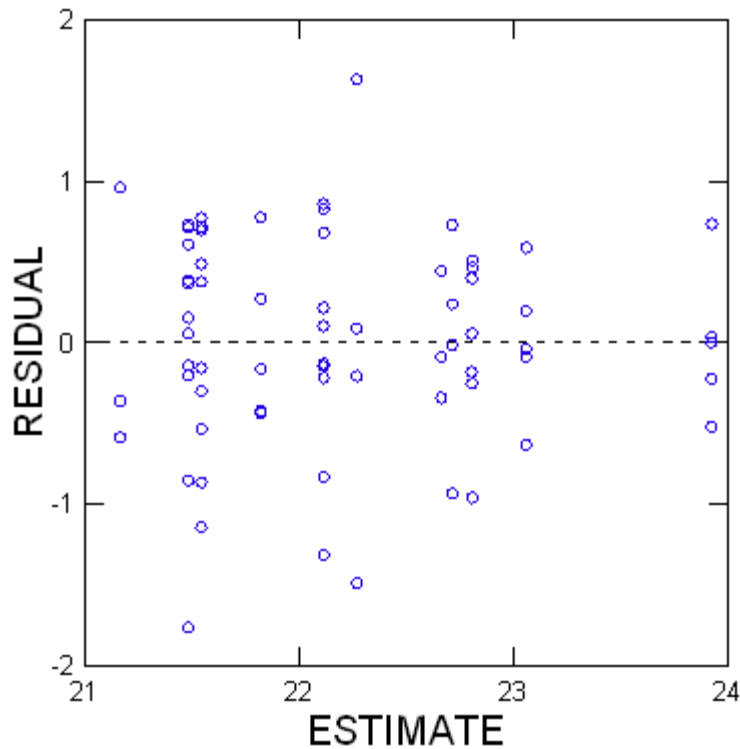


<b>Durbin-Watson D-Statistic</b>	2.165
<b>First Order Autocorrelation</b>	-0.098

#### Information Criteria

<b>AIC</b>	155.097
<b>AIC (Corrected)</b>	161.965
<b>Schwarz's BIC</b>	183.758

### Plot of Residuals vs. Predicted Values



#### ▼ Hypothesis Tests

Post Hoc Test of LN\_ABUNDNACE\_\_1\_  
 Using least squares means.  
 Using model MSE of 0.490 with 55 df.

#### Tukey's Honestly-Significant-Difference Test

SEASON\$(i)	SEASON\$(j)	Difference	p-Value	95% Confidence Interval	
				Lower	Upper
Spring	Summer	0.139	0.822	-0.370	0.647
Spring	Winter	-0.138	0.823	-0.641	0.365
Summer	Winter	-0.277	0.462	-0.780	0.226

#### ▼ Hypothesis Tests

Post Hoc Test of LN\_ABUNDNACE\_\_1\_  
 Using least squares means.  
 Using model MSE of 0.490 with 55 df.

#### Tukey's Honestly-Significant-Difference Test

BIOFILM_ZONE\$(i-)	BIOFILM_ZONE\$(j-)	Difference	p-Value	95% Confidence Interval	
				Lower	Upper
Canoe Passage	Inter-causeway	-0.497	0.250	-1.200	0.205
Canoe Passage	Mid Inter-tidal	-0.882	0.003	-1.513	-0.252
Canoe Passage	Upper	-1.221	0.000	-1.804	-0.637

	Inter-tidal				
Inter-causeway	Mid Inter-tidal	-0.385	0.600	-1.202	0.433
Inter-causeway	Upper Inter-tidal	-0.723	0.080	-1.505	0.059
Mid Inter-tidal	Upper Inter-tidal	-0.338	0.599	-1.057	0.380

▼ Hypothesis Tests

Post Hoc Test of LN\_ABUNDNACE\_\_1\_  
 Using least squares means.  
 Using model MSE of 0.490 with 55 df.

Tukey's Honestly-Significant-Difference Test

SEASON\$(i)*BIOF-ILM_ZONE\$(i)	SEASON\$(j)*BIOF-ILM_ZONE\$(j)	Difference	p-Value	95% Confidence Interval	
				Lower	Upper
Spring*Canoe Passage	Spring*Inter-causeway	-0.692	0.934	-2.264	0.881
Spring*Canoe Passage	Spring*Mid Inter-tidal	-0.599	0.948	-2.012	0.814
Spring*Canoe Passage	Spring*Upper Inter-tidal	0.292	1.000	-1.016	1.600
Spring*Canoe Passage	Summer*Canoe Passage	0.570	0.799	-0.498	1.638
Spring*Canoe Passage	Summer*Inter-causeway	0.949	0.652	-0.623	2.521
Spring*Canoe Passage	Summer*Mid Inter-tidal	-0.155	1.000	-1.568	1.258
Spring*Canoe Passage	Summer*Upper Inter-tidal	-1.808	0.001	-3.117	-0.500
Spring*Canoe Passage	Winter*Canoe Passage	0.631	0.649	-0.412	1.675
Spring*Canoe Passage	Winter*Inter-causeway	-0.548	0.988	-2.120	1.024
Spring*Canoe Passage	Winter*Mid Inter-tidal	-0.691	0.875	-2.104	0.722
Spring*Canoe Passage	Winter*Upper Inter-tidal	-0.944	0.385	-2.252	0.364
Spring*Inter-causeway	Spring*Mid Inter-tidal	0.092	1.000	-1.732	1.916
Spring*Inter-causeway	Spring*Upper Inter-tidal	0.984	0.739	-0.761	2.728
Spring*Inter-causeway	Summer*Canoe Passage	1.262	0.236	-0.310	2.834
Spring*Inter-causeway	Summer*Inter-causeway	1.641	0.180	-0.309	3.591
Spring*Inter-causeway	Summer*Mid Inter-tidal	0.537	0.997	-1.287	2.361
Spring*Inter-causeway	Summer*Upper Inter-tidal	-1.117	0.567	-2.861	0.627
Spring*Inter-causeway	Winter*Canoe Passage	1.323	0.169	-0.233	2.878
Spring*Inter-causeway	Winter*Inter-causeway	0.143	1.000	-1.807	2.093
Spring*Inter-causeway	Winter*Mid Inter-tidal	0.001	1.000	-1.823	1.825

Spring*Inter-ca- useway	Winter*Upper Inter-tidal	-0.252	1.000	-1.996	1.492
Spring*Mid Inter-tidal	Spring*Upper Inter-tidal	0.891	0.755	-0.711	2.493
Spring*Mid Inter-tidal	Summer*Canoe Passage	1.170	0.198	-0.243	2.583
Spring*Mid Inter-tidal	Summer*Inter-ca- useway	1.549	0.171	-0.276	3.373
Spring*Mid Inter-tidal	Summer*Mid Inter-tidal	0.445	0.999	-1.244	2.133
Spring*Mid Inter-tidal	Summer*Upper Inter-tidal	-1.209	0.318	-2.811	0.393
Spring*Mid Inter-tidal	Winter*Canoe Passage	1.231	0.133	-0.164	2.625
Spring*Mid Inter-tidal	Winter*Inter-ca- useway	0.051	1.000	-1.773	1.875
Spring*Mid Inter-tidal	Winter*Mid Inter-tidal	-0.091	1.000	-1.780	1.597
Spring*Mid Inter-tidal	Winter*Upper Inter-tidal	-0.344	1.000	-1.946	1.258
Spring*Upper Inter-tidal	Summer*Canoe Passage	0.278	1.000	-1.030	1.586
Spring*Upper Inter-tidal	Summer*Inter-ca- useway	0.657	0.978	-1.087	2.401
Spring*Upper Inter-tidal	Summer*Mid Inter-tidal	-0.447	0.998	-2.049	1.155
Spring*Upper Inter-tidal	Summer*Upper Inter-tidal	-2.100	0.001	-3.611	-0.590
Spring*Upper Inter-tidal	Winter*Canoe Passage	0.339	0.999	-0.949	1.627
Spring*Upper Inter-tidal	Winter*Inter-ca- useway	-0.840	0.885	-2.584	0.904
Spring*Upper Inter-tidal	Winter*Mid Inter-tidal	-0.983	0.630	-2.585	0.619
Spring*Upper Inter-tidal	Winter*Upper Inter-tidal	-1.236	0.212	-2.746	0.275
Summer*Canoe Passage	Summer*Inter-ca- useway	0.379	1.000	-1.193	1.951
Summer*Canoe Passage	Summer*Mid Inter-tidal	-0.725	0.836	-2.138	0.688
Summer*Canoe Passage	Summer*Upper Inter-tidal	-2.379	0.000	-3.687	-1.071
Summer*Canoe Passage	Winter*Canoe Passage	0.061	1.000	-0.982	1.105
Summer*Canoe Passage	Winter*Inter-ca- useway	-1.119	0.406	-2.691	0.453
Summer*Canoe Passage	Winter*Mid Inter-tidal	-1.261	0.123	-2.674	0.152
Summer*Canoe Passage	Winter*Upper Inter-tidal	-1.514	0.011	-2.822	-0.206
Summer*Inter-ca- useway	Summer*Mid Inter-tidal	-1.104	0.648	-2.928	0.720
Summer*Inter-ca- useway	Summer*Upper Inter-tidal	-2.758	0.000	-4.502	-1.013
Summer*Inter-ca- useway	Winter*Canoe Passage	-0.318	1.000	-1.873	1.238
Summer*Inter-ca- useway	Winter*Inter-ca- useway	-1.497	0.294	-3.447	0.452

Summer*Inter-ca- useway	Winter*Mid Inter-tidal	-1.640	0.117	-3.464	0.184
Summer*Inter-ca- useway	Winter*Upper Inter-tidal	-1.893	0.023	-3.637	-0.149
Summer*Mid Inter-tidal	Summer*Upper Inter-tidal	-1.654	0.037	-3.256	-0.052
Summer*Mid Inter-tidal	Winter*Canoe Passage	0.786	0.740	-0.608	2.181
Summer*Mid Inter-tidal	Winter*Inter-ca- useway	-0.394	1.000	-2.218	1.430
Summer*Mid Inter-tidal	Winter*Mid Inter-tidal	-0.536	0.994	-2.225	1.153
Summer*Mid Inter-tidal	Winter*Upper Inter-tidal	-0.789	0.869	-2.391	0.813
Summer*Upper Inter-tidal	Winter*Canoe Passage	2.440	0.000	1.152	3.728
Summer*Upper Inter-tidal	Winter*Inter-ca- useway	1.260	0.383	-0.484	3.004
Summer*Upper Inter-tidal	Winter*Mid Inter-tidal	1.118	0.436	-0.484	2.720
Summer*Upper Inter-tidal	Winter*Upper Inter-tidal	0.865	0.721	-0.646	2.375
Winter*Canoe Passage	Winter*Inter-ca- useway	-1.180	0.311	-2.735	0.376
Winter*Canoe Passage	Winter*Mid Inter-tidal	-1.322	0.078	-2.716	0.072
Winter*Canoe Passage	Winter*Upper Inter-tidal	-1.575	0.006	-2.863	-0.287
Winter*Inter-ca- useway	Winter*Mid Inter-tidal	-0.142	1.000	-1.966	1.682
Winter*Inter-ca- useway	Winter*Upper Inter-tidal	-0.395	1.000	-2.139	1.349
Winter*Mid Inter-tidal	Winter*Upper Inter-tidal	-0.253	1.000	-1.855	1.349

## ▼ Analysis of Variance

Effects coding used for categorical variables in model.  
The categorical values encountered during processing are

Variables	Levels			
SEASON\$ (3 levels)	Spring	Summer	Winter	
BIOFILM_ZONE\$ (4 levels)	Canoe Passage	Inter-causeway	Mid Inter-tidal	Upper Inter-tidal

1 case(s) are deleted due to missing data.

Dependent Variable	DIVERSITY
N	67
Multiple R	0.819
Squared Multiple R	0.670

### Estimates of Effects $B = (X'X)^{-1}X'Y$

Factor	Level	DIVERSITY
CONSTANT		1.661
SEASON\$	Spring	-0.344
SEASON\$	Summer	0.013
BIOFILM_ZONE\$	Canoe Passage	0.068
BIOFILM_ZONE\$	Inter-causeway	0.092
BIOFILM_ZONE\$	Mid Inter-tidal	0.013
SEASON\$*BIOFILM_ZONE\$	Spring*Canoe Passage	-0.083
SEASON\$*BIOFILM_ZONE\$	Spring*Inter-causeway	0.154
SEASON\$*BIOFILM_ZONE\$	Spring*Mid Inter-tidal	0.032
SEASON\$*BIOFILM_ZONE\$	Summer*Canoe Passage	-0.029
SEASON\$*BIOFILM_ZONE\$	Summer*Inter-causeway	-0.156
SEASON\$*BIOFILM_ZONE\$	Summer*Mid Inter-tidal	0.080

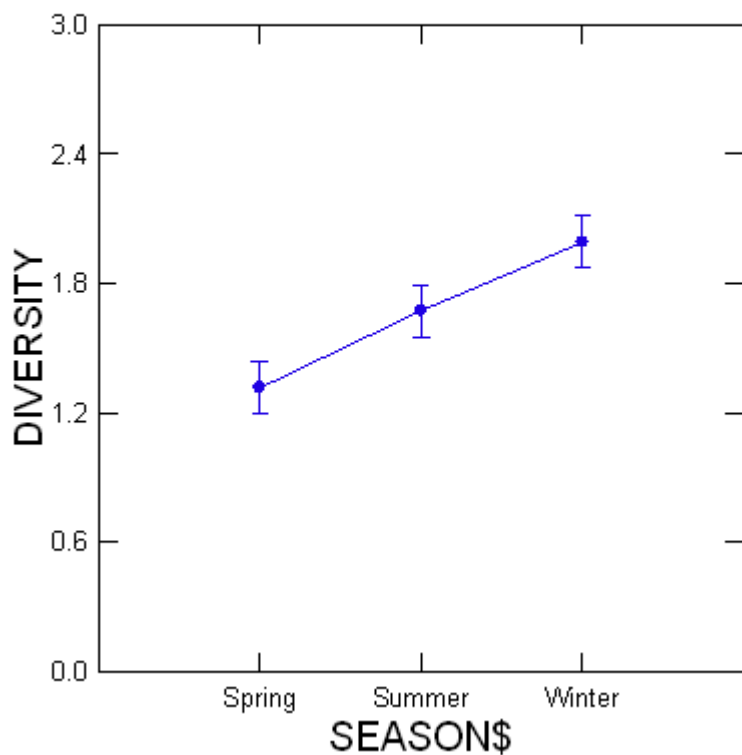
### Analysis of Variance

Source	Type III SS	df	Mean Squares	F-Ratio	p-Value
SEASON\$	4.151	2	2.076	31.250	0.000
BIOFILM_ZONE\$	0.662	3	0.221	3.322	0.026
SEASON\$*BIOFILM_ZONE\$	0.496	6	0.083	1.245	0.298
Error	3.653	55	0.066		

### Least Squares Means

Factor	Level	LS Mean	Standard Error	N
SEASON\$	Spring	1.317	0.061	22.000
SEASON\$	Summer	1.674	0.061	22.000
SEASON\$	Winter	1.992	0.060	23.000

### Least Squares Means

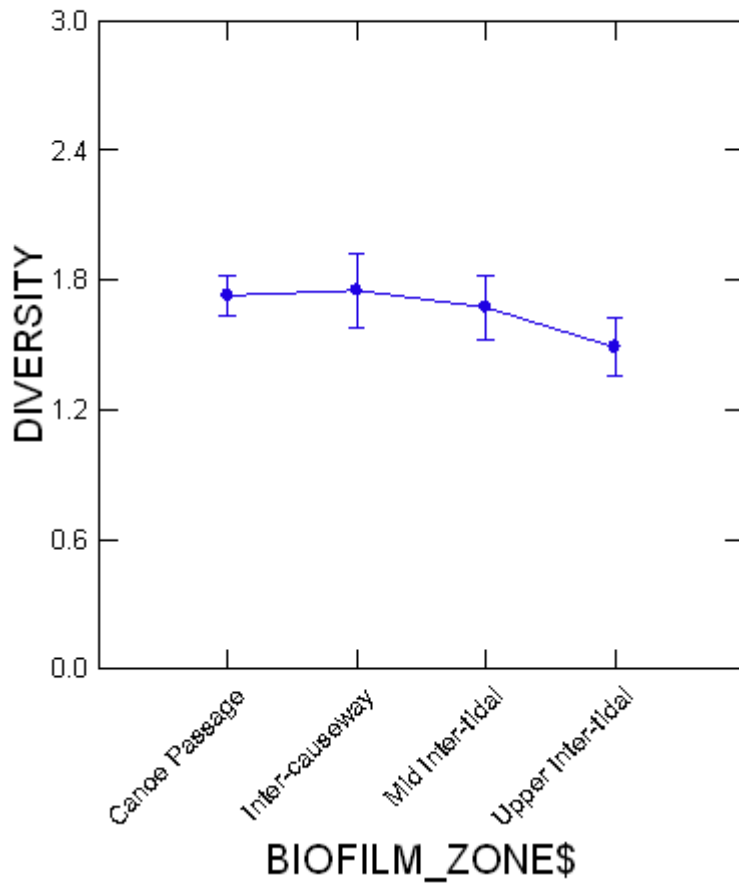


### Least Squares Means

Factor	Level	LS Mean	Standard Error	N
BIOFILM_ZONE\$	Canoe Passage	1.728	0.046	31.000
BIOFILM_ZONE\$	Inter-causeway	1.752	0.086	9.000
BIOFILM_ZONE\$	Mid Inter-tidal	1.674	0.074	12.000
BIOFILM_ZONE\$	Upper Inter-tidal	1.488	0.067	15.000



### Least Squares Means

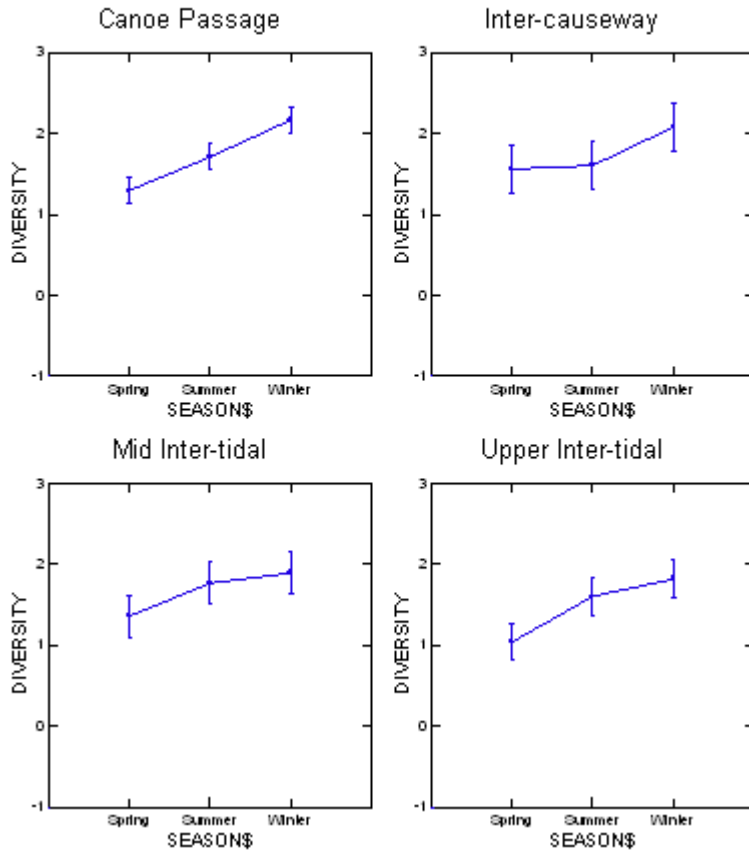


### Least Squares Means

Factor	Level	LS Mean	Standard Error	N
SEASON\$*BIOFILM_ZONES\$	Spring*Canoe Passage	1.301	0.081	10.000
SEASON\$*BIOFILM_ZONES\$	Spring*Inter-causeway	1.563	0.149	3.000
SEASON\$*BIOFILM_ZONES\$	Spring*Mid Inter-tidal	1.362	0.129	4.000
SEASON\$*BIOFILM_ZONES\$	Spring*Upper Inter-tidal	1.041	0.115	5.000
SEASON\$*BIOFILM_ZONES\$	Summer*Canoe Passage	1.713	0.081	10.000
SEASON\$*BIOFILM_ZONES\$	Summer*Inter-causeway	1.609	0.149	3.000
SEASON\$*BIOFILM_ZONES\$	Summer*Mid Inter-tidal	1.767	0.129	4.000
SEASON\$*BIOFILM_ZONES\$	Summer*Upper Inter-tidal	1.607	0.115	5.000
SEASON\$*BIOFILM_ZONES\$	Winter*Canoe Passage	2.171	0.078	11.000
SEASON\$*BIOFILM_ZONES\$	Winter*Inter-causeway	2.085	0.149	3.000
SEASON\$*BIOFILM_ZONES\$	Winter*Mid Inter-tidal	1.893	0.129	4.000

<b>SEASON\$*BIOFILM_ZONES</b>	Winter*Upper Inter-tidal	1.817	0.115	5.000
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### Least Squares Means

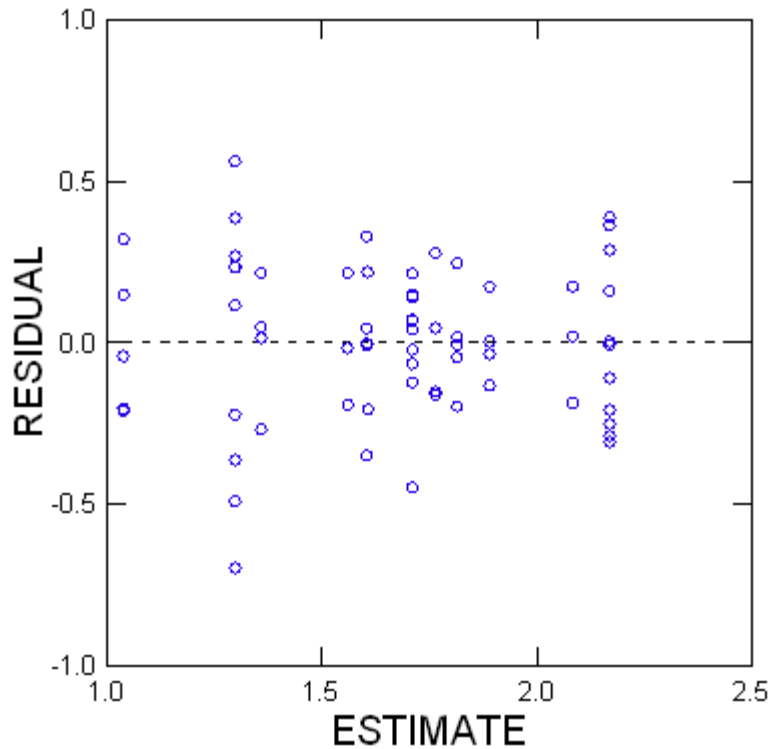


<b>Durbin-Watson D-Statistic</b>	2.390
<b>First Order Autocorrelation</b>	-0.201

#### Information Criteria

<b>AIC</b>	21.224
<b>AIC (Corrected)</b>	28.092
<b>Schwarz's BIC</b>	49.885

### Plot of Residuals vs. Predicted Values



#### ▼ Hypothesis Tests

Post Hoc Test of DIVERSITY  
 Using least squares means.  
 Using model MSE of 0.066 with 55 df.

#### Tukey's Honestly-Significant-Difference Test

SEASON\$(i)	SEASON\$(j)	Difference	p-Value	95% Confidence Interval	
				Lower	Upper
Spring	Summer	-0.357	0.000	-0.545	-0.170
Spring	Winter	-0.675	0.000	-0.860	-0.490
Summer	Winter	-0.318	0.001	-0.503	-0.132

#### ▼ Hypothesis Tests

Post Hoc Test of DIVERSITY  
 Using least squares means.  
 Using model MSE of 0.066 with 55 df.

#### Tukey's Honestly-Significant-Difference Test

BIOFILM_ZONE\$(i-)	BIOFILM_ZONE\$(j-)	Difference	p-Value	95% Confidence Interval	
				Lower	Upper
Canoe Passage	Inter-causeway	-0.024	0.995	-0.283	0.235
Canoe Passage	Mid Inter-tidal	0.055	0.924	-0.177	0.287
Canoe Passage	Upper	0.240	0.023	0.025	0.455

	Inter-tidal				
Inter-causeway	Mid Inter-tidal	0.079	0.899	-0.222	0.380
Inter-causeway	Upper Inter-tidal	0.264	0.083	-0.024	0.552
Mid Inter-tidal	Upper Inter-tidal	0.185	0.259	-0.079	0.450

▼ Hypothesis Tests

Post Hoc Test of DIVERSITY  
 Using least squares means.  
 Using model MSE of 0.066 with 55 df.

Tukey's Honestly-Significant-Difference Test

SEASON\$(i)*BIOF-ILM_ZONE\$(i)	SEASON\$(j)*BIOF-ILM_ZONE\$(j)	Difference	p-Value	95% Confidence Interval	
				Lower	Upper
Spring*Canoe Passage	Spring*Inter-causeway	-0.262	0.921	-0.841	0.317
Spring*Canoe Passage	Spring*Mid Inter-tidal	-0.061	1.000	-0.581	0.459
Spring*Canoe Passage	Spring*Upper Inter-tidal	0.260	0.789	-0.222	0.741
Spring*Canoe Passage	Summer*Canoe Passage	-0.412	0.032	-0.805	-0.019
Spring*Canoe Passage	Summer*Inter-causeway	-0.308	0.801	-0.887	0.270
Spring*Canoe Passage	Summer*Mid Inter-tidal	-0.466	0.120	-0.986	0.054
Spring*Canoe Passage	Summer*Upper Inter-tidal	-0.306	0.579	-0.788	0.176
Spring*Canoe Passage	Winter*Canoe Passage	-0.871	0.000	-1.255	-0.486
Spring*Canoe Passage	Winter*Inter-causeway	-0.784	0.001	-1.363	-0.206
Spring*Canoe Passage	Winter*Mid Inter-tidal	-0.592	0.014	-1.112	-0.071
Spring*Canoe Passage	Winter*Upper Inter-tidal	-0.516	0.026	-0.998	-0.034
Spring*Inter-causeway	Spring*Mid Inter-tidal	0.201	0.997	-0.471	0.873
Spring*Inter-causeway	Spring*Upper Inter-tidal	0.521	0.221	-0.121	1.164
Spring*Inter-causeway	Summer*Canoe Passage	-0.150	0.999	-0.729	0.429
Spring*Inter-causeway	Summer*Inter-causeway	-0.047	1.000	-0.765	0.671
Spring*Inter-causeway	Summer*Mid Inter-tidal	-0.204	0.996	-0.876	0.468
Spring*Inter-causeway	Summer*Upper Inter-tidal	-0.044	1.000	-0.686	0.598
Spring*Inter-causeway	Winter*Canoe Passage	-0.609	0.028	-1.182	-0.036
Spring*Inter-causeway	Winter*Inter-causeway	-0.523	0.371	-1.241	0.195
Spring*Inter-causeway	Winter*Mid Inter-tidal	-0.330	0.871	-1.001	0.342

Spring*Inter-ca- useway	Winter*Upper Inter-tidal	-0.254	0.968	-0.897	0.388
Spring*Mid Inter-tidal	Spring*Upper Inter-tidal	0.321	0.781	-0.269	0.910
Spring*Mid Inter-tidal	Summer*Canoe Passage	-0.351	0.486	-0.872	0.169
Spring*Mid Inter-tidal	Summer*Inter-ca- useway	-0.248	0.981	-0.919	0.424
Spring*Mid Inter-tidal	Summer*Mid Inter-tidal	-0.405	0.541	-1.027	0.217
Spring*Mid Inter-tidal	Summer*Upper Inter-tidal	-0.245	0.955	-0.835	0.345
Spring*Mid Inter-tidal	Winter*Canoe Passage	-0.810	0.000	-1.323	-0.296
Spring*Mid Inter-tidal	Winter*Inter-ca- useway	-0.724	0.024	-1.395	-0.052
Spring*Mid Inter-tidal	Winter*Mid Inter-tidal	-0.531	0.165	-1.153	0.091
Spring*Mid Inter-tidal	Winter*Upper Inter-tidal	-0.455	0.287	-1.045	0.135
Spring*Upper Inter-tidal	Summer*Canoe Passage	-0.672	0.001	-1.153	-0.190
Spring*Upper Inter-tidal	Summer*Inter-ca- useway	-0.568	0.131	-1.210	0.074
Spring*Upper Inter-tidal	Summer*Mid Inter-tidal	-0.726	0.005	-1.315	-0.136
Spring*Upper Inter-tidal	Summer*Upper Inter-tidal	-0.566	0.043	-1.122	-0.009
Spring*Upper Inter-tidal	Winter*Canoe Passage	-1.130	0.000	-1.605	-0.656
Spring*Upper Inter-tidal	Winter*Inter-ca- useway	-1.044	0.000	-1.686	-0.402
Spring*Upper Inter-tidal	Winter*Mid Inter-tidal	-0.851	0.000	-1.441	-0.261
Spring*Upper Inter-tidal	Winter*Upper Inter-tidal	-0.776	0.001	-1.332	-0.220
Summer*Canoe Passage	Summer*Inter-ca- useway	0.104	1.000	-0.475	0.683
Summer*Canoe Passage	Summer*Mid Inter-tidal	-0.054	1.000	-0.574	0.467
Summer*Canoe Passage	Summer*Upper Inter-tidal	0.106	1.000	-0.375	0.588
Summer*Canoe Passage	Winter*Canoe Passage	-0.458	0.008	-0.843	-0.074
Summer*Canoe Passage	Winter*Inter-ca- useway	-0.372	0.560	-0.951	0.207
Summer*Canoe Passage	Winter*Mid Inter-tidal	-0.180	0.989	-0.700	0.341
Summer*Canoe Passage	Winter*Upper Inter-tidal	-0.104	1.000	-0.586	0.378
Summer*Inter-ca- useway	Summer*Mid Inter-tidal	-0.157	1.000	-0.829	0.514
Summer*Inter-ca- useway	Summer*Upper Inter-tidal	0.003	1.000	-0.640	0.645
Summer*Inter-ca- useway	Winter*Canoe Passage	-0.562	0.059	-1.135	0.011
Summer*Inter-ca- useway	Winter*Inter-ca- useway	-0.476	0.514	-1.194	0.242

Summer*Inter-ca- useway	Winter*Mid Inter-tidal	-0.283	0.950	-0.955	0.388
Summer*Inter-ca- useway	Winter*Upper Inter-tidal	-0.208	0.993	-0.850	0.435
Summer*Mid Inter-tidal	Summer*Upper Inter-tidal	0.160	0.999	-0.430	0.750
Summer*Mid Inter-tidal	Winter*Canoe Passage	-0.405	0.259	-0.918	0.109
Summer*Mid Inter-tidal	Winter*Inter-ca- useway	-0.319	0.895	-0.990	0.353
Summer*Mid Inter-tidal	Winter*Mid Inter-tidal	-0.126	1.000	-0.748	0.496
Summer*Mid Inter-tidal	Winter*Upper Inter-tidal	-0.050	1.000	-0.640	0.540
Summer*Upper Inter-tidal	Winter*Canoe Passage	-0.565	0.008	-1.039	-0.090
Summer*Upper Inter-tidal	Winter*Inter-ca- useway	-0.479	0.337	-1.121	0.164
Summer*Upper Inter-tidal	Winter*Mid Inter-tidal	-0.286	0.881	-0.876	0.304
Summer*Upper Inter-tidal	Winter*Upper Inter-tidal	-0.210	0.977	-0.766	0.346
Winter*Canoe Passage	Winter*Inter-ca- useway	0.086	1.000	-0.487	0.659
Winter*Canoe Passage	Winter*Mid Inter-tidal	0.279	0.781	-0.235	0.792
Winter*Canoe Passage	Winter*Upper Inter-tidal	0.354	0.333	-0.120	0.829
Winter*Inter-ca- useway	Winter*Mid Inter-tidal	0.193	0.998	-0.479	0.864
Winter*Inter-ca- useway	Winter*Upper Inter-tidal	0.268	0.953	-0.374	0.911
Winter*Mid Inter-tidal	Winter*Upper Inter-tidal	0.075	1.000	-0.514	0.665

### ▼ Nonparametric: Kruskal-Wallis Test

#### Kruskal-Wallis One-way Analysis of Variance for 68 Cases

The categorical values encountered during processing are

Variables	Levels		
SEASON\$ (3 levels)	Spring	Summer	Winter

Dependent Variable	EVENNESS
Grouping Variable	SEASON\$

Group	Count	Rank Sum
Spring	22	648.000
Summer	22	761.000
Winter	23	869.000

Kruskal-Wallis Test Statistic: 2.084

The p-value is 0.353 assuming chi-square distribution with 2 df.

#### Conover-Inman Test for All Pairwise Comparisons

Group(i)	Group(j)	Statistic	p-Value
Spring	Summer	0.875	0.385
Spring	Winter	1.434	0.156
Summer	Winter	0.550	0.584

#### Dwass-Steel-Chritchlow-Fligner Test for All Pairwise Comparisons

Group(i)	Group(j)	Statistic	p-Value
Spring	Summer	2.158	0.279
Spring	Winter	3.436	0.040
Summer	Winter	1.557	0.513

### ▼ Nonparametric: Kruskal-Wallis Test

#### Kruskal-Wallis One-way Analysis of Variance for 68 Cases

The categorical values encountered during processing are

Variables	Levels			
BIOFILM_ZONE\$ (4 levels)	Canoe Passage	Inter-causeway	Mid Inter-tidal	Upper Inter-tidal

Dependent Variable	EVENNESS
Grouping Variable	BIOFILM_ZONE\$

Group	Count	Rank Sum
Canoe Passage	31	1,044.000
Inter-causeway	9	460.500
Mid Inter-tidal	12	418.500

Upper Inter-tidal	15	355.000
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Kruskal-Wallis Test Statistic: 11.237

The p-value is 0.011 assuming chi-square distribution with 3 df.

#### Conover-Inman Test for All Pairwise Comparisons

Group(i)	Group(j)	Statistic	p-Value
<b>Canoe Passage</b>	Inter-causeway	2.543	0.013
<b>Canoe Passage</b>	Mid Inter-tidal	0.194	0.847
<b>Canoe Passage</b>	Upper Inter-tidal	1.752	0.085
<b>Inter-causeway</b>	Mid Inter-tidal	2.034	0.046
<b>Inter-causeway</b>	Upper Inter-tidal	3.590	0.001
<b>Mid Inter-tidal</b>	Upper Inter-tidal	1.593	0.116

#### Dwass-Steel-Chritchlow-Fligner Test for All Pairwise Comparisons

Group(i)	Group(j)	Statistic	p-Value
<b>Canoe Passage</b>	Inter-causeway	-17.154	0.000
<b>Canoe Passage</b>	Mid Inter-tidal	-15.049	0.000
<b>Canoe Passage</b>	Upper Inter-tidal	-14.133	0.000
<b>Inter-causeway</b>	Mid Inter-tidal	1.558	0.688
<b>Inter-causeway</b>	Upper Inter-tidal	2.150	0.425
<b>Mid Inter-tidal</b>	Upper Inter-tidal	0.552	0.980



## ▼ Descriptive Statistics

	LN_RICHNESS__1_	LN_ABUNDNACE__1-	EVENNESS	DIVERSITY
<b>Shapiro-Wilk Statistic</b>	0.986	0.994	0.915	0.974
<b>Shapiro-Wilk p-Value</b>	0.674	0.991	0.000	0.166

▼ Analysis of Variance

Effects coding used for categorical variables in model.  
The categorical values encountered during processing are

Variables	Levels			
SEASON\$ (3 levels)	Spring	Summer	Winter	
BIOFILM_ZONE\$ (4 levels)	Canoe Passage	Inter-causeway	Mid Inter-tidal	Upper Inter-tidal

1 case(s) are deleted due to missing data.

<b>Dependent Variable</b>	LN_RICHNESS__1__
<b>N</b>	67
<b>Multiple R</b>	0.917
<b>Squared Multiple R</b>	0.841

Estimates of Effects  $B = (X'X)^{-1}X'Y$

Factor	Level	LN_RICHNESS__1__
CONSTANT		2.648
SEASON\$	Spring	-0.430
SEASON\$	Summer	0.006
BIOFILM_ZONE\$	Canoe Passage	0.138
BIOFILM_ZONE\$	Inter-causeway	-0.063
BIOFILM_ZONE\$	Mid Inter-tidal	-0.001
SEASON\$*BIOFILM_ZONE\$	Spring*Canoe Passage	0.009
SEASON\$*BIOFILM_ZONE\$	Spring*Inter-causeway	0.070
SEASON\$*BIOFILM_ZONE\$	Spring*Mid Inter-tidal	0.001
SEASON\$*BIOFILM_ZONE\$	Summer*Canoe Passage	0.002
SEASON\$*BIOFILM_ZONE\$	Summer*Inter-causeway	-0.031
SEASON\$*BIOFILM_ZONE\$	Summer*Mid Inter-tidal	-0.008

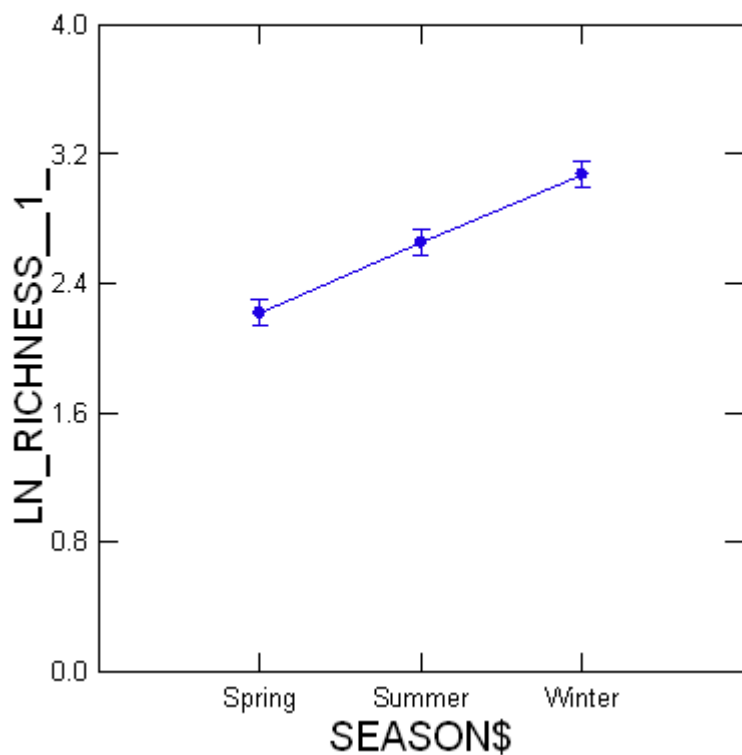
Analysis of Variance

Source	Type III SS	df	Mean Squares	F-Ratio	p-Value
SEASON\$	6.655	2	3.328	107.085	0.000
BIOFILM_ZONE\$	0.609	3	0.203	6.533	0.001
SEASON\$*BIOFILM_ZONE\$	0.073	6	0.012	0.390	0.882
Error	1.709	55	0.031		

Least Squares Means

Factor	Level	LS Mean	Standard Error	N
SEASON\$	Spring	2.218	0.041	22.000
SEASON\$	Summer	2.654	0.041	22.000
SEASON\$	Winter	3.073	0.041	23.000

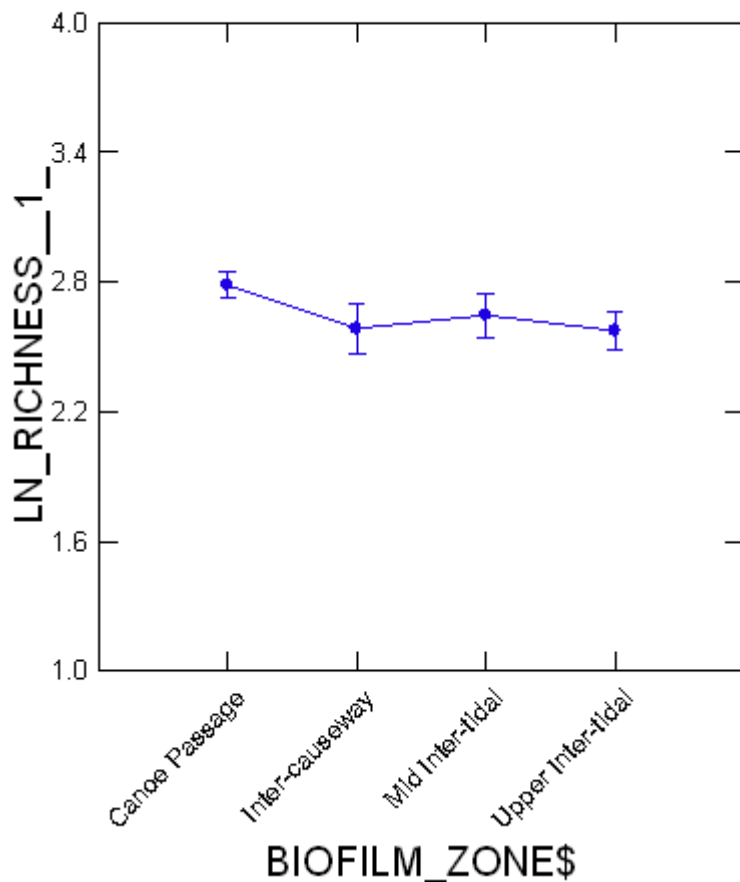
### Least Squares Means



### Least Squares Means

Factor	Level	LS Mean	Standard Error	N
BIOFILM_ZONE\$	Canoe Passage	2.786	0.032	31.000
BIOFILM_ZONE\$	Inter-causeway	2.585	0.059	9.000
BIOFILM_ZONE\$	Mid Inter-tidal	2.647	0.051	12.000
BIOFILM_ZONE\$	Upper Inter-tidal	2.574	0.046	15.000

### Least Squares Means

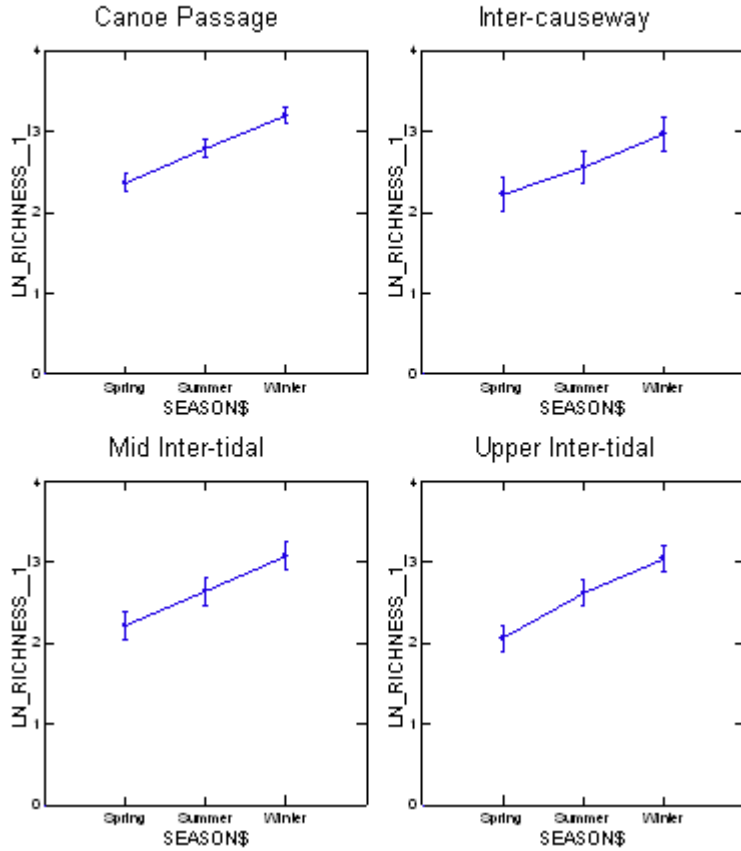


### Least Squares Means

Factor	Level	LS Mean	Standard Error	N
SEASON\$*BIOFILM_ZONES\$	Spring*Canoe Passage	2.365	0.056	10.000
SEASON\$*BIOFILM_ZONES\$	Spring*Inter-causeway	2.225	0.102	3.000
SEASON\$*BIOFILM_ZONES\$	Spring*Mid Inter-tidal	2.218	0.088	4.000
SEASON\$*BIOFILM_ZONES\$	Spring*Upper Inter-tidal	2.063	0.079	5.000
SEASON\$*BIOFILM_ZONES\$	Summer*Canoe Passage	2.794	0.056	10.000
SEASON\$*BIOFILM_ZONES\$	Summer*Inter-causeway	2.559	0.102	3.000
SEASON\$*BIOFILM_ZONES\$	Summer*Mid Inter-tidal	2.645	0.088	4.000
SEASON\$*BIOFILM_ZONES\$	Summer*Upper Inter-tidal	2.617	0.079	5.000
SEASON\$*BIOFILM_ZONES\$	Winter*Canoe Passage	3.200	0.053	11.000
SEASON\$*BIOFILM_ZONES\$	Winter*Inter-causeway	2.971	0.102	3.000
SEASON\$*BIOFILM_ZONES\$	Winter*Mid Inter-tidal	3.078	0.088	4.000

<b>SEASON\$*BIOFILM_ZONES</b>	Winter*Upper Inter-tidal	3.042	0.079	5.000
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### Least Squares Means

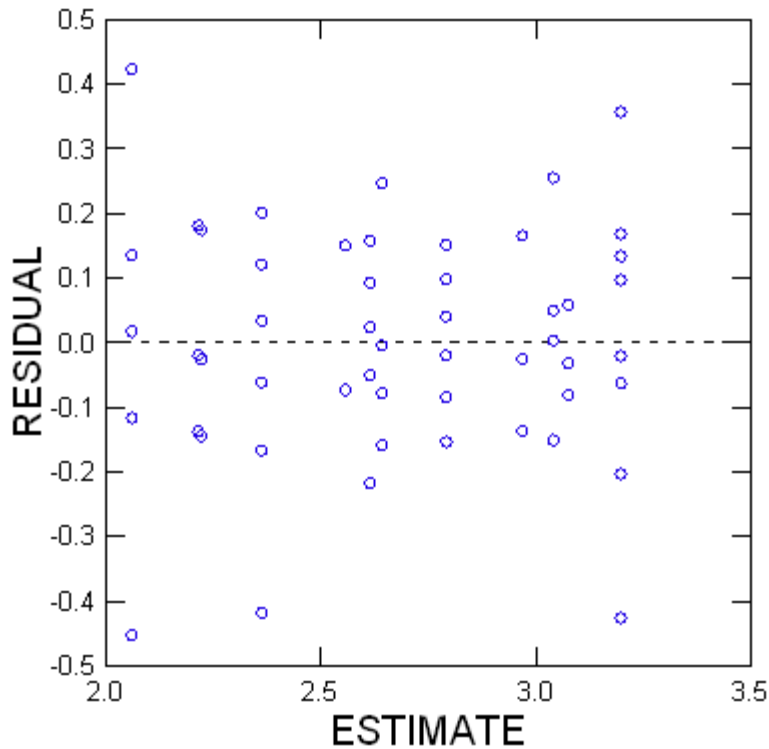


<b>Durbin-Watson D-Statistic</b>	2.280
<b>First Order Autocorrelation</b>	-0.146

#### Information Criteria

<b>AIC</b>	-29.667
<b>AIC (Corrected)</b>	-22.799
<b>Schwarz's BIC</b>	-1.006

### Plot of Residuals vs. Predicted Values



#### ▼ Hypothesis Tests

Post Hoc Test of LN\_RICHNESS\_\_1\_  
 Using least squares means.  
 Using model MSE of 0.031 with 55 df.

#### Tukey's Honestly-Significant-Difference Test

SEASON\$(i)	SEASON\$(j)	Difference	p-Value	95% Confidence Interval	
				Lower	Upper
Spring	Summer	-0.436	0.000	-0.564	-0.308
Spring	Winter	-0.855	0.000	-0.982	-0.728
Summer	Winter	-0.419	0.000	-0.546	-0.293

#### ▼ Hypothesis Tests

Post Hoc Test of LN\_RICHNESS\_\_1\_  
 Using least squares means.  
 Using model MSE of 0.031 with 55 df.

#### Tukey's Honestly-Significant-Difference Test

BIOFILM_ZONE\$(i-)	BIOFILM_ZONE\$(j-)	Difference	p-Value	95% Confidence Interval	
				Lower	Upper
Canoe Passage	Inter-causeway	0.201	0.020	0.024	0.378
Canoe Passage	Mid Inter-tidal	0.139	0.105	-0.019	0.298
Canoe Passage	Upper	0.212	0.002	0.065	0.359

	Inter-tidal				
Inter-causeway	Mid Inter-tidal	-0.062	0.856	-0.268	0.144
Inter-causeway	Upper Inter-tidal	0.011	0.999	-0.186	0.208
Mid Inter-tidal	Upper Inter-tidal	0.073	0.712	-0.108	0.254

### ▼ Hypothesis Tests

Post Hoc Test of LN\_RICHNESS\_\_1\_

Using least squares means.

Using model MSE of 0.031 with 55 df.

### Tukey's Honestly-Significant-Difference Test

SEASON\$(i)*BIOF-ILM_ZONE\$(i)	SEASON\$(j)*BIOF-ILM_ZONE\$(j)	Difference	p-Value	95% Confidence Interval	
				Lower	Upper
Spring*Canoe Passage	Spring*Inter-causeway	0.140	0.986	-0.256	0.536
Spring*Canoe Passage	Spring*Mid Inter-tidal	0.147	0.956	-0.209	0.503
Spring*Canoe Passage	Spring*Upper Inter-tidal	0.302	0.102	-0.028	0.631
Spring*Canoe Passage	Summer*Canoe Passage	-0.429	0.000	-0.698	-0.160
Spring*Canoe Passage	Summer*Inter-causeway	-0.194	0.872	-0.590	0.202
Spring*Canoe Passage	Summer*Mid Inter-tidal	-0.280	0.262	-0.636	0.076
Spring*Canoe Passage	Summer*Upper Inter-tidal	-0.251	0.303	-0.581	0.078
Spring*Canoe Passage	Winter*Canoe Passage	-0.835	0.000	-1.098	-0.572
Spring*Canoe Passage	Winter*Inter-causeway	-0.606	0.000	-1.002	-0.210
Spring*Canoe Passage	Winter*Mid Inter-tidal	-0.713	0.000	-1.069	-0.357
Spring*Canoe Passage	Winter*Upper Inter-tidal	-0.677	0.000	-1.007	-0.348
Spring*Inter-causeway	Spring*Mid Inter-tidal	0.007	1.000	-0.453	0.466
Spring*Inter-causeway	Spring*Upper Inter-tidal	0.161	0.981	-0.278	0.601
Spring*Inter-causeway	Summer*Canoe Passage	-0.569	0.001	-0.965	-0.173
Spring*Inter-causeway	Summer*Inter-causeway	-0.334	0.473	-0.826	0.157
Spring*Inter-causeway	Summer*Mid Inter-tidal	-0.420	0.104	-0.879	0.039
Spring*Inter-causeway	Summer*Upper Inter-tidal	-0.392	0.124	-0.831	0.048
Spring*Inter-causeway	Winter*Canoe Passage	-0.975	0.000	-1.367	-0.583
Spring*Inter-causeway	Winter*Inter-causeway	-0.746	0.000	-1.237	-0.255
Spring*Inter-causeway	Winter*Mid Inter-tidal	-0.853	0.000	-1.312	-0.394

Spring*Inter-ca- useway	Winter*Upper Inter-tidal	-0.818	0.000	-1.257	-0.378
Spring*Mid Inter-tidal	Spring*Upper Inter-tidal	0.155	0.975	-0.249	0.558
Spring*Mid Inter-tidal	Summer*Canoe Passage	-0.576	0.000	-0.932	-0.220
Spring*Mid Inter-tidal	Summer*Inter-ca- useway	-0.341	0.341	-0.801	0.118
Spring*Mid Inter-tidal	Summer*Mid Inter-tidal	-0.427	0.048	-0.852	-0.002
Spring*Mid Inter-tidal	Summer*Upper Inter-tidal	-0.399	0.056	-0.802	0.005
Spring*Mid Inter-tidal	Winter*Canoe Passage	-0.982	0.000	-1.333	-0.631
Spring*Mid Inter-tidal	Winter*Inter-ca- useway	-0.753	0.000	-1.213	-0.294
Spring*Mid Inter-tidal	Winter*Mid Inter-tidal	-0.860	0.000	-1.285	-0.435
Spring*Mid Inter-tidal	Winter*Upper Inter-tidal	-0.824	0.000	-1.228	-0.421
Spring*Upper Inter-tidal	Summer*Canoe Passage	-0.730	0.000	-1.060	-0.401
Spring*Upper Inter-tidal	Summer*Inter-ca- useway	-0.496	0.015	-0.935	-0.057
Spring*Upper Inter-tidal	Summer*Mid Inter-tidal	-0.581	0.000	-0.985	-0.178
Spring*Upper Inter-tidal	Summer*Upper Inter-tidal	-0.553	0.000	-0.934	-0.173
Spring*Upper Inter-tidal	Winter*Canoe Passage	-1.137	0.000	-1.461	-0.812
Spring*Upper Inter-tidal	Winter*Inter-ca- useway	-0.908	0.000	-1.347	-0.468
Spring*Upper Inter-tidal	Winter*Mid Inter-tidal	-1.014	0.000	-1.418	-0.611
Spring*Upper Inter-tidal	Winter*Upper Inter-tidal	-0.979	0.000	-1.359	-0.599
Summer*Canoe Passage	Summer*Inter-ca- useway	0.235	0.677	-0.161	0.631
Summer*Canoe Passage	Summer*Mid Inter-tidal	0.149	0.952	-0.207	0.505
Summer*Canoe Passage	Summer*Upper Inter-tidal	0.177	0.791	-0.152	0.507
Summer*Canoe Passage	Winter*Canoe Passage	-0.406	0.000	-0.669	-0.143
Summer*Canoe Passage	Winter*Inter-ca- useway	-0.177	0.926	-0.573	0.219
Summer*Canoe Passage	Winter*Mid Inter-tidal	-0.284	0.243	-0.640	0.072
Summer*Canoe Passage	Winter*Upper Inter-tidal	-0.249	0.319	-0.578	0.081
Summer*Inter-ca- useway	Summer*Mid Inter-tidal	-0.086	1.000	-0.545	0.374
Summer*Inter-ca- useway	Summer*Upper Inter-tidal	-0.057	1.000	-0.497	0.382
Summer*Inter-ca- useway	Winter*Canoe Passage	-0.641	0.000	-1.032	-0.249
Summer*Inter-ca- useway	Winter*Inter-ca- useway	-0.412	0.184	-0.903	0.079



Summer*Inter-ca- useway	Winter*Mid Inter-tidal	-0.519	0.015	-0.978	-0.059
Summer*Inter-ca- useway	Winter*Upper Inter-tidal	-0.483	0.020	-0.922	-0.044
Summer*Mid Inter-tidal	Summer*Upper Inter-tidal	0.028	1.000	-0.375	0.432
Summer*Mid Inter-tidal	Winter*Canoe Passage	-0.555	0.000	-0.906	-0.204
Summer*Mid Inter-tidal	Winter*Inter-ca- useway	-0.326	0.409	-0.786	0.133
Summer*Mid Inter-tidal	Winter*Mid Inter-tidal	-0.433	0.043	-0.858	-0.008
Summer*Mid Inter-tidal	Winter*Upper Inter-tidal	-0.398	0.057	-0.801	0.006
Summer*Upper Inter-tidal	Winter*Canoe Passage	-0.583	0.000	-0.908	-0.259
Summer*Upper Inter-tidal	Winter*Inter-ca- useway	-0.355	0.229	-0.794	0.085
Summer*Upper Inter-tidal	Winter*Mid Inter-tidal	-0.461	0.013	-0.865	-0.058
Summer*Upper Inter-tidal	Winter*Upper Inter-tidal	-0.426	0.016	-0.806	-0.045
Winter*Canoe Passage	Winter*Inter-ca- useway	0.229	0.696	-0.163	0.621
Winter*Canoe Passage	Winter*Mid Inter-tidal	0.122	0.988	-0.229	0.473
Winter*Canoe Passage	Winter*Upper Inter-tidal	0.158	0.879	-0.167	0.482
Winter*Inter-ca- useway	Winter*Mid Inter-tidal	-0.107	1.000	-0.566	0.353
Winter*Inter-ca- useway	Winter*Upper Inter-tidal	-0.071	1.000	-0.511	0.368
Winter*Mid Inter-tidal	Winter*Upper Inter-tidal	0.035	1.000	-0.368	0.439

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