Vegetation Monitoring and Reporting

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GEOG 569 Workshop
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PlatformB

Vegetation Monitoring and Reporting

Work activity for Discovery Park:

1. Provide raster file of the vegetation weed index surface;

2. Provide raster file of the vegetation moisture index surface; and

3. Provide a plant community feature class.

Workflow

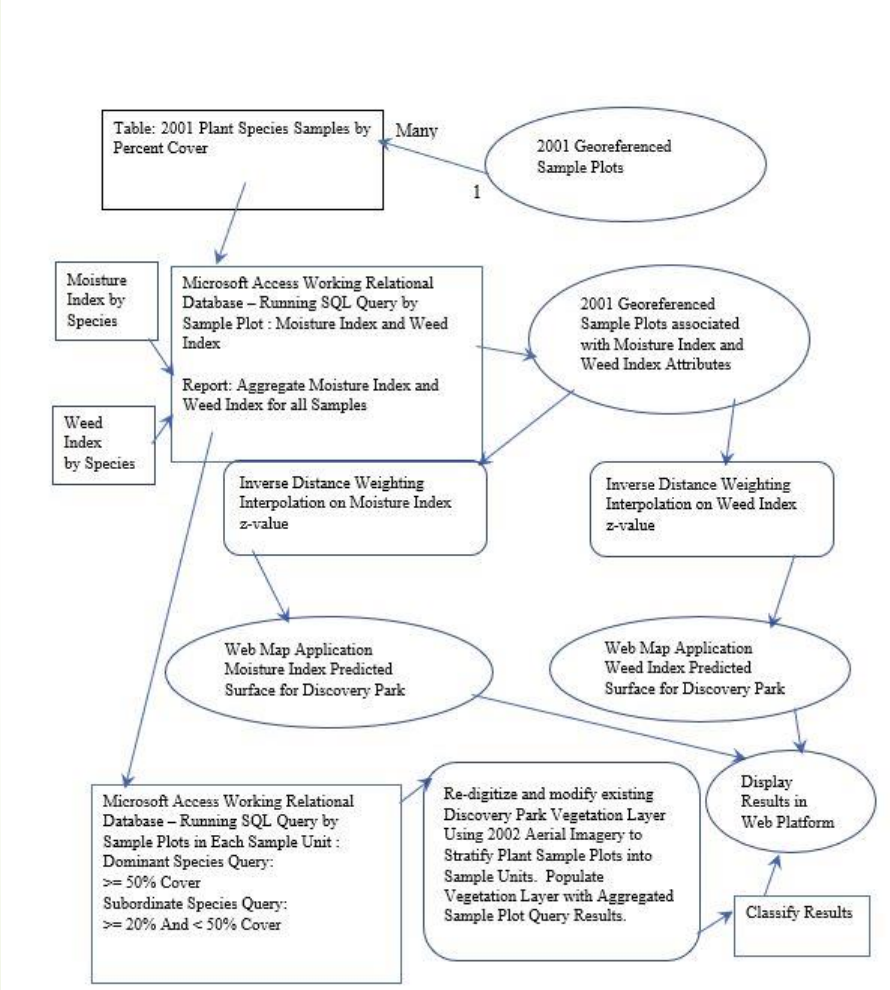
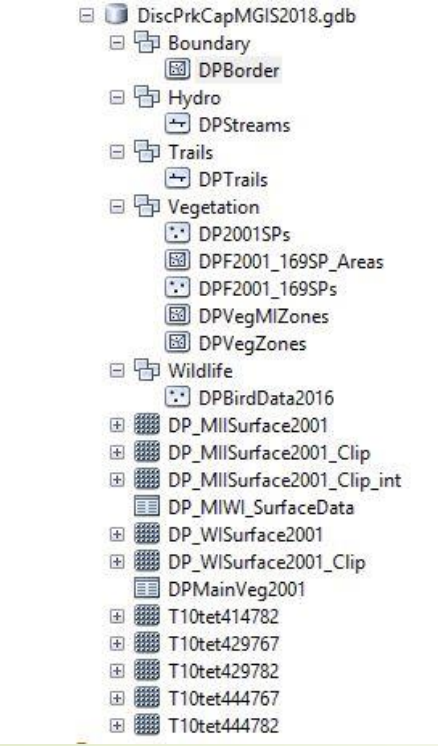


Table: 2001 Plant Species Samples by Percent Cover
Many
1
2001 Georeferenced Sample Plots
Moisture Index by Species
Microsoft Access Working Relational Database – Running SQL Query by Sample Plot : Moisture Index and Weed Index
Report: Aggregate Moisture Index and Weed Index for all Samples
2001 Georeferenced Sample Plots associated with Moisture Index and Weed Index Attributes
Weed Index by Species
Inverse Distance Weighting Interpolation on Moisture Index z-value
Inverse Distance Weighting Interpolation on Weed Index z-value
Web Map Application Moisture Index Predicted Surface for Discovery Park
Web Map Application Weed Index Predicted Surface for Discovery Park
Display Results in Web Platform
Microsoft Access Working Relational Database – Running SQL Query by Sample Plots in Each Sample Unit : Dominant Species Query: >= 50% Cover Subordinate Species Query: >= 20% And < 50% Cover
Re-digitize and modify existing Discovery Park Vegetation Layer Using 2002 Aerial Imagery to Stratify Plant Sample Plots into Sample Units. Populate Vegetation Layer with Aggregated Sample Plot Query Results.
Classify Results

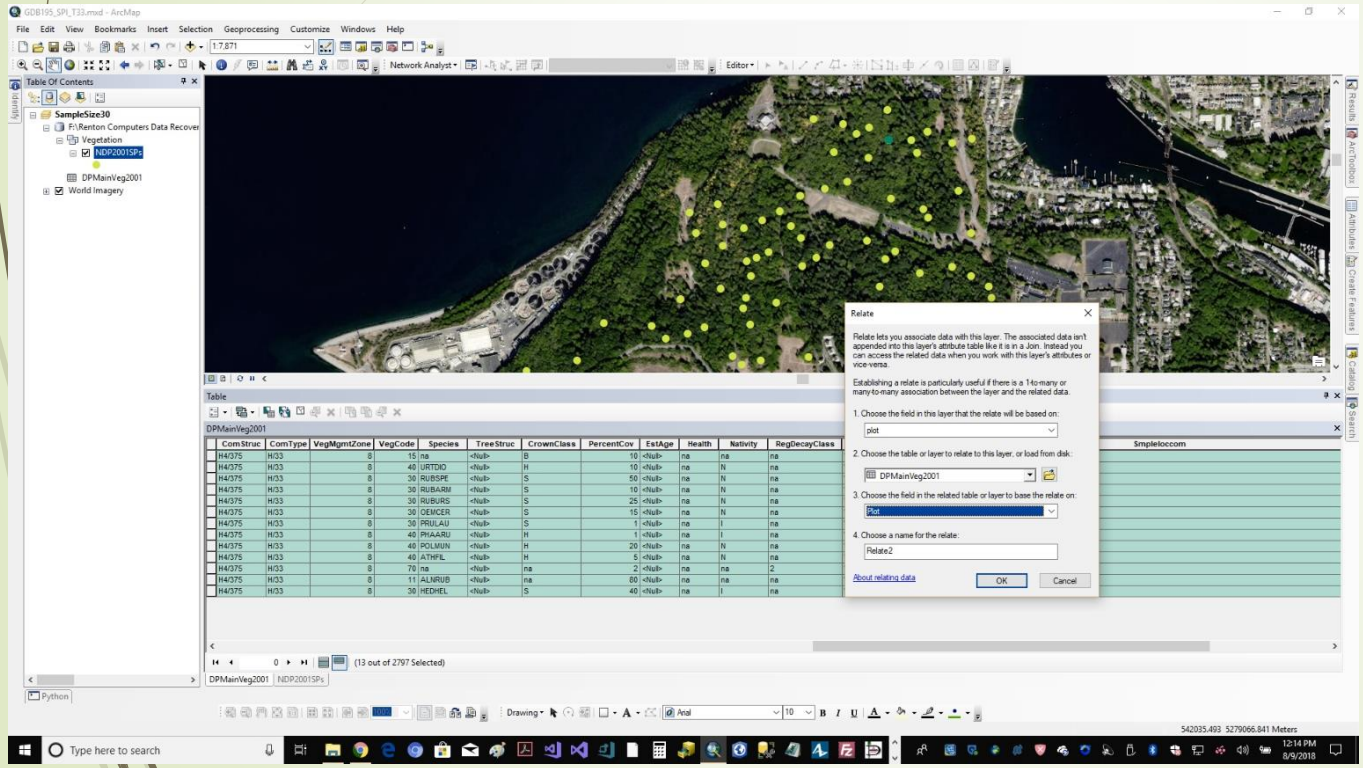
Geodatabase



CHIEF DATA SOURCES

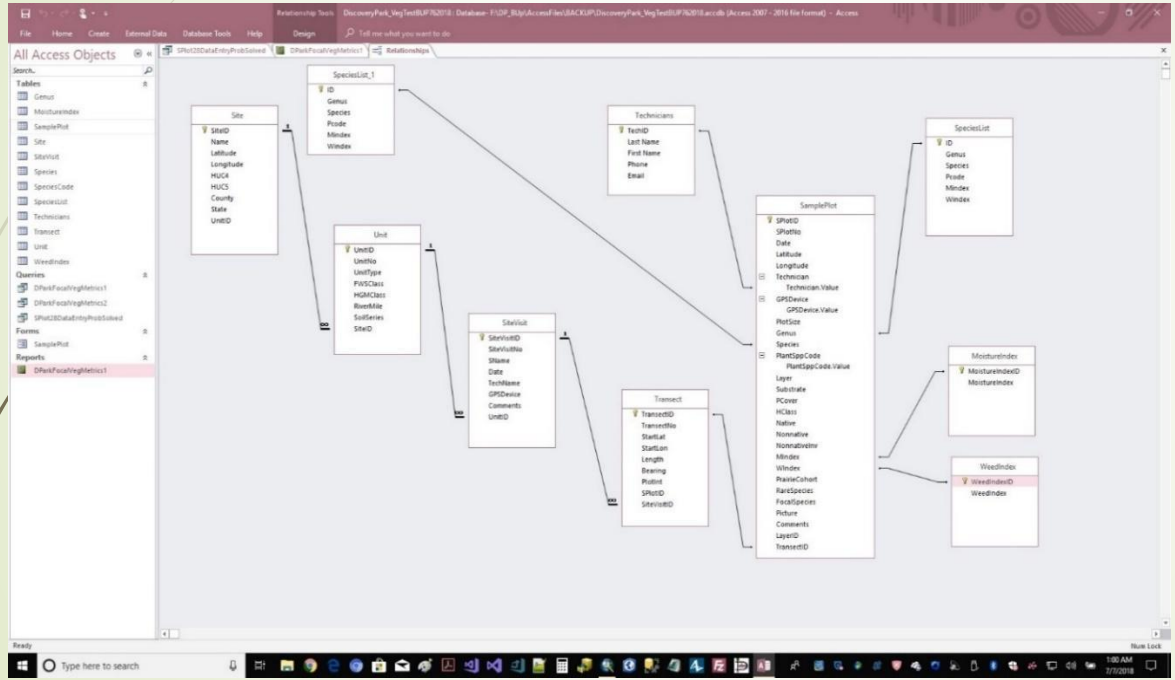
ICF - Jon Walker
Seattle Audubon Society - Jenn Lang
Friends of Discovery Park – Garrett Esperum

ArcMap - Relates



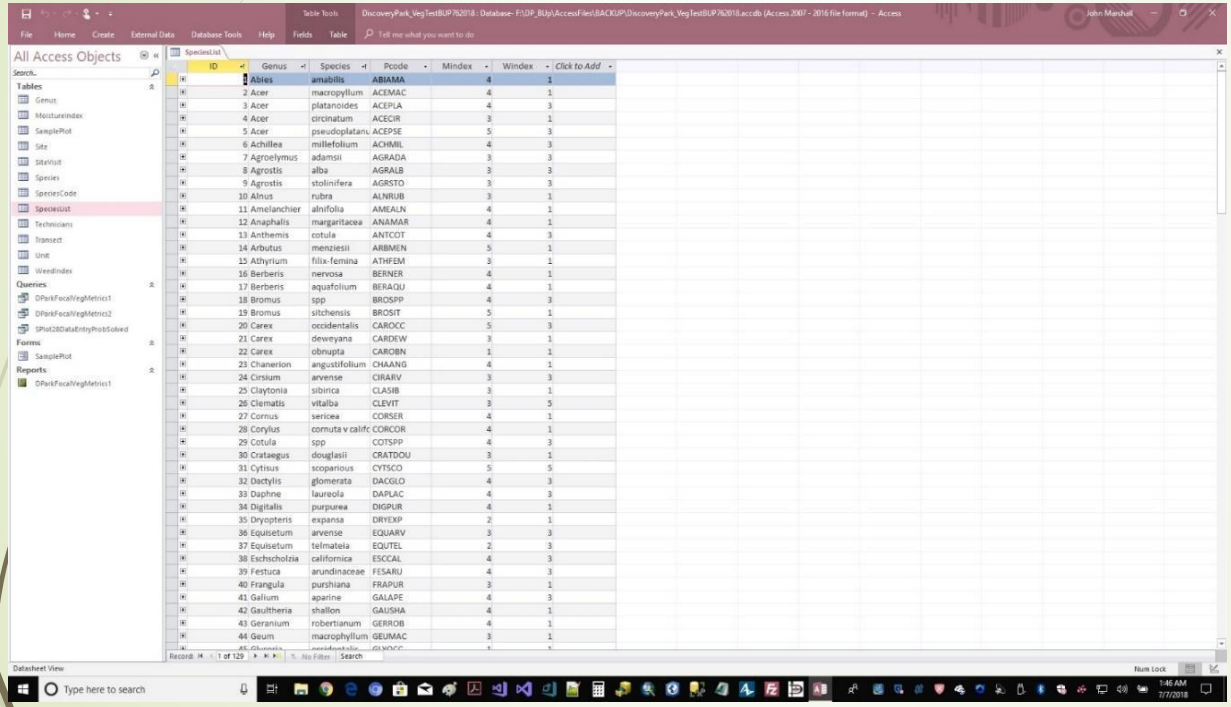
Relate 2001 Sample Plot Feature Class to 2001 Plant Sample Records Table on Plot Field

Microsoft Access Database



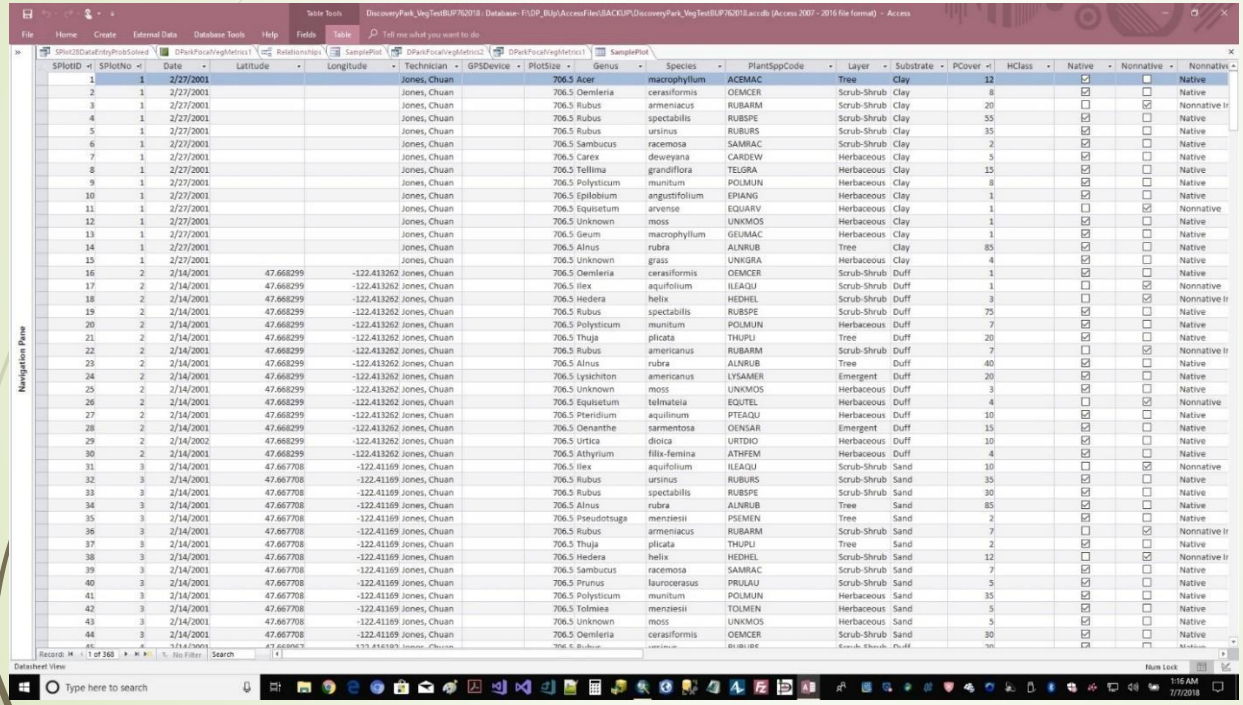
Entity Relationships

Microsoft Access Database



Plant Species Moisture and Weed Indexes

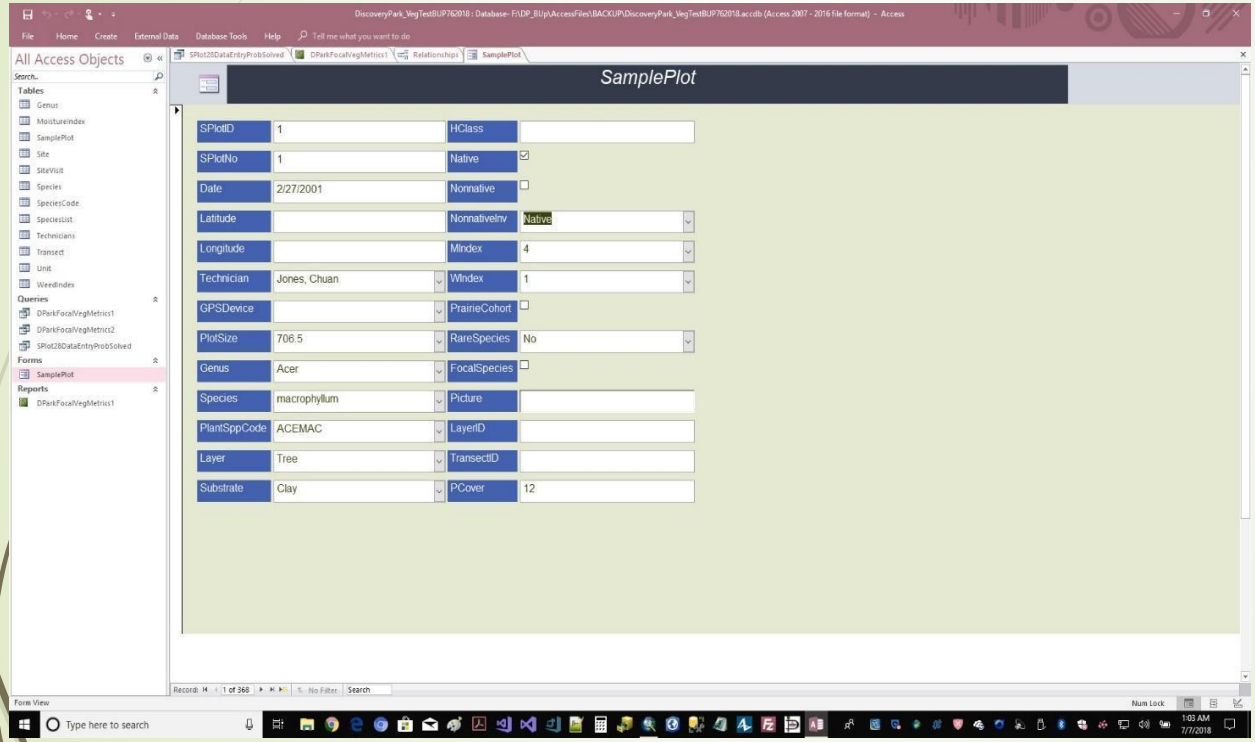
Microsoft Access Database



SPlotID	SPlotNo	Date	Latitude	Longitude	Technician	GPSDevice	PlotSize	Genus	Species	PlantSppCode	Layer	Substrate	PCover	HClass	Native	Nonnative	Nonnative
1	1	2/27/2001			Jones, Chuan		706.5	Acer	macrophyllum	ACEMAC	Tree	Clay	12		☑	☐	Native
2	1	2/27/2001			Jones, Chuan		706.5	Oemleria	cerasiformis	OEMCER	Scrub-Shrub	Clay	8		☑	☐	Native
3	1	2/27/2001			Jones, Chuan		706.5	Rubus	armeniacus	RUBARM	Scrub-Shrub	Clay	20		☐	☑	Nonnative Ir
4	1	2/27/2001			Jones, Chuan		706.5	Rubus	spectabilis	RUBSPE	Scrub-Shrub	Clay	55		☑	☐	Native
5	1	2/27/2001			Jones, Chuan		706.5	Rubus	ursinus	RUBURS	Scrub-Shrub	Clay	35		☑	☐	Native
6	1	2/27/2001			Jones, Chuan		706.5	Sambucus	racemosa	SAMRAC	Scrub-Shrub	Clay	2		☑	☐	Native
7	1	2/27/2001			Jones, Chuan		706.5	Carex	deweyana	CARDEW	Herbaceous	Clay	5		☑	☐	Native
8	1	2/27/2001			Jones, Chuan		706.5	Tellima	grandiflora	TELGRA	Herbaceous	Clay	15		☑	☐	Native
9	1	2/27/2001			Jones, Chuan		706.5	Polysticum	munitum	POLMUN	Herbaceous	Clay	8		☑	☐	Native
10	1	2/27/2001			Jones, Chuan		706.5	Epilobium	angustifolium	EPIANG	Herbaceous	Clay	1		☑	☐	Native
11	1	2/27/2001			Jones, Chuan		706.5	Equisetum	arvense	EQUARV	Herbaceous	Clay	1		☐	☑	Nonnative
12	1	2/27/2001			Jones, Chuan		706.5	Unknown	moss	UNKMOS	Herbaceous	Clay	1		☑	☐	Native
13	1	2/27/2001			Jones, Chuan		706.5	Geum	macrophyllum	GEUMAC	Herbaceous	Clay	1		☑	☐	Native
14	1	2/27/2001			Jones, Chuan		706.5	Alnus	rubra	ALNRUB	Tree	Clay	85		☑	☐	Native
15	1	2/27/2001			Jones, Chuan		706.5	Unknown	grass	UNKGRA	Herbaceous	Clay	4		☑	☐	Native
16	2	2/14/2001	47.668299	-122.413262	Jones, Chuan		706.5	Oemleria	cerasiformis	OEMCER	Scrub-Shrub	Duff	1		☑	☐	Native
17	2	2/14/2001	47.668299	-122.413262	Jones, Chuan		706.5	Ilex	aquifolium	ILEAQU	Scrub-Shrub	Duff	1		☐	☑	Nonnative
18	2	2/14/2001	47.668299	-122.413262	Jones, Chuan		706.5	Hedera	helix	HEDHEL	Scrub-Shrub	Duff	3		☐	☑	Nonnative Ir
19	2	2/14/2001	47.668299	-122.413262	Jones, Chuan		706.5	Rubus	spectabilis	RUBSPE	Scrub-Shrub	Duff	75		☑	☐	Native
20	2	2/14/2001	47.668299	-122.413262	Jones, Chuan		706.5	Polysticum	munitum	POLMUN	Herbaceous	Duff	7		☑	☐	Native
21	2	2/14/2001	47.668299	-122.413262	Jones, Chuan		706.5	Thuja	plicata	THUPLI	Tree	Duff	20		☑	☐	Native
22	2	2/14/2001	47.668299	-122.413262	Jones, Chuan		706.5	Rubus	americanus	RUBARM	Scrub-Shrub	Duff	7		☐	☑	Nonnative Ir
23	2	2/14/2001	47.668299	-122.413262	Jones, Chuan		706.5	Alnus	rubra	ALNRUB	Tree	Duff	40		☑	☐	Native
24	2	2/14/2001	47.668299	-122.413262	Jones, Chuan		706.5	Lysichiton	americanus	LYSAMER	Emergent	Duff	20		☑	☐	Native
25	2	2/14/2001	47.668299	-122.413262	Jones, Chuan		706.5	Unknown	moss	UNKMOS	Herbaceous	Duff	3		☑	☐	Native
26	2	2/14/2001	47.668299	-122.413262	Jones, Chuan		706.5	Equisetum	telmateia	EQUTEL	Herbaceous	Duff	4		☐	☑	Nonnative
27	2	2/14/2001	47.668299	-122.413262	Jones, Chuan		706.5	Pteridium	aquilinum	PTEAQU	Herbaceous	Duff	10		☑	☐	Native
28	2	2/14/2001	47.668299	-122.413262	Jones, Chuan		706.5	Oenanthe	sarmentosa	OENSAR	Emergent	Duff	15		☑	☐	Native
29	2	2/14/2002	47.668299	-122.413262	Jones, Chuan		706.5	Urtica	dioica	URTDIO	Herbaceous	Duff	10		☑	☐	Native
30	2	2/14/2001	47.668299	-122.413262	Jones, Chuan		706.5	Athyrium	filix-femina	ATHFEM	Herbaceous	Duff	4		☑	☐	Native
31	3	2/14/2001	47.667708	-122.41169	Jones, Chuan		706.5	Ilex	aquifolium	ILEAQU	Scrub-Shrub	Sand	10		☐	☑	Nonnative
32	3	2/14/2001	47.667708	-122.41169	Jones, Chuan		706.5	Rubus	ursinus	RUBURS	Scrub-Shrub	Sand	35		☑	☐	Native
33	3	2/14/2001	47.667708	-122.41169	Jones, Chuan		706.5	Rubus	spectabilis	RUBSPE	Scrub-Shrub	Sand	30		☑	☐	Native
34	3	2/14/2001	47.667708	-122.41169	Jones, Chuan		706.5	Alnus	rubra	ALNRUB	Tree	Sand	85		☑	☐	Native
35	3	2/14/2001	47.667708	-122.41169	Jones, Chuan		706.5	Pseudotsuga	menziesii	PSEMEN	Tree	Sand	2		☑	☐	Native
36	3	2/14/2001	47.667708	-122.41169	Jones, Chuan		706.5	Rubus	armeniacus	RUBARM	Scrub-Shrub	Sand	7		☐	☑	Nonnative Ir
37	3	2/14/2001	47.667708	-122.41169	Jones, Chuan		706.5	Thuja	plicata	THUPLI	Tree	Sand	2		☑	☐	Native
38	3	2/14/2001	47.667708	-122.41169	Jones, Chuan		706.5	Hedera	helix	HEDHEL	Scrub-Shrub	Sand	12		☐	☑	Nonnative Ir
39	3	2/14/2001	47.667708	-122.41169	Jones, Chuan		706.5	Sambucus	racemosa	SAMRAC	Scrub-Shrub	Sand	7		☑	☐	Native
40	3	2/14/2001	47.667708	-122.41169	Jones, Chuan		706.5	Prunus	laurocerasus	PRULAU	Scrub-Shrub	Sand	5		☑	☐	Native
41	3	2/14/2001	47.667708	-122.41169	Jones, Chuan		706.5	Polysticum	munitum	POLMUN	Herbaceous	Sand	35		☑	☐	Native
42	3	2/14/2001	47.667708	-122.41169	Jones, Chuan		706.5	Tolmiea	menziesii	TOLMEN	Herbaceous	Sand	5		☑	☐	Native
43	3	2/14/2001	47.667708	-122.41169	Jones, Chuan		706.5	Unknown	moss	UNKMOS	Herbaceous	Sand	5		☑	☐	Native
44	3	2/14/2001	47.667708	-122.41169	Jones, Chuan		706.5	Oemleria	cerasiformis	OEMCER	Scrub-Shrub	Sand	30		☑	☐	Native

Sample Plot Table

Microsoft Access Database



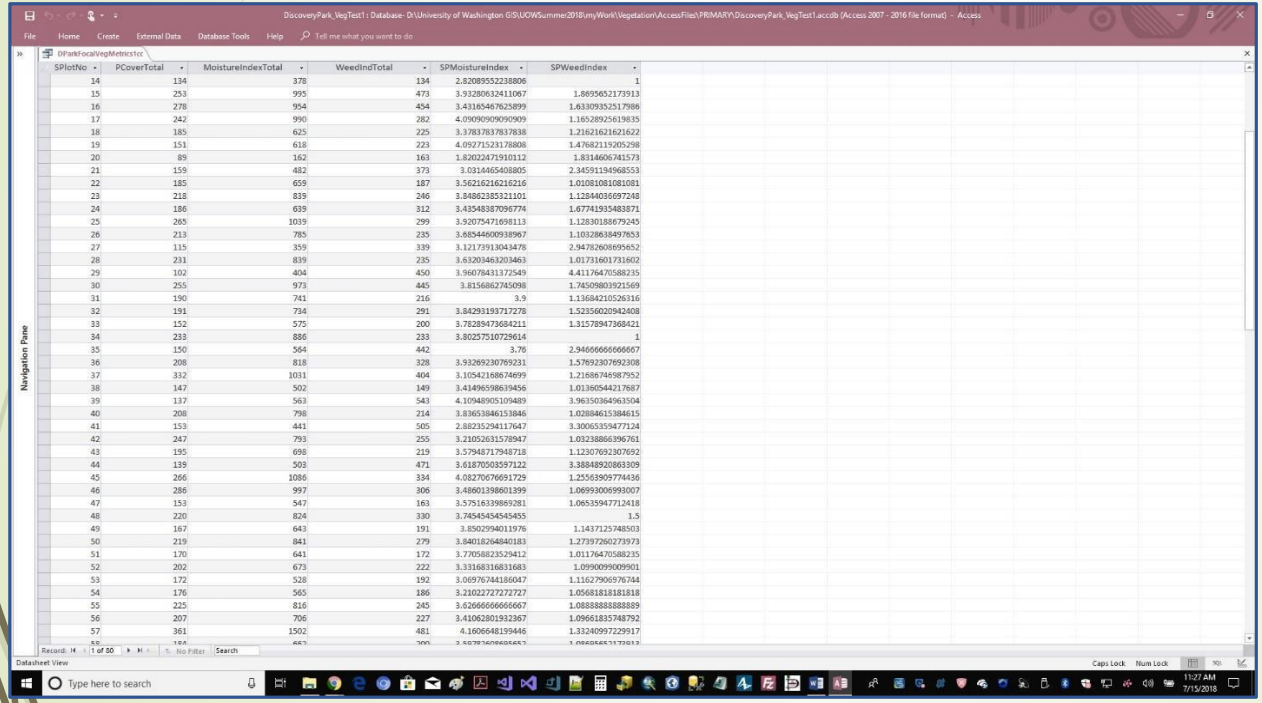
Data Entry Form

Microsoft Access Database

```
SELECT SamplePlot.SPlotNo,
Sum(SamplePlot.PCover) AS PCoverTotal,
Sum([PCover]*[MIndex]) AS MoistureIndexTotal,
Sum([PCover]*[WIndex]) AS WeedIndTotal,
([MoistureIndexTotal]/[PCoverTotal]) AS
SPMoistureIndex, ([WeedIndTotal]/[PCoverTotal]) AS
SPWeedIndex, SamplePlot.Latitude,
SamplePlot.Longitude
FROM SamplePlot
GROUP BY SamplePlot.SPlotNo, SamplePlot.Latitude,
SamplePlot.Longitude;
```

SQL Query

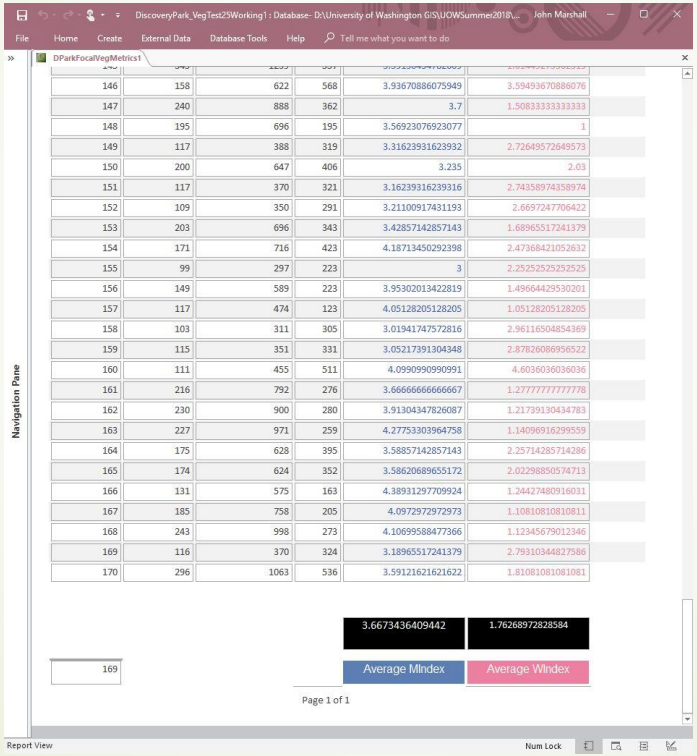
Microsoft Access Database



SPlotNo	PCoverTotal	MoistureIndexTotal	WeedIndTotal	SPMoistureIndex	SPWeedIndex
14	134	378	134	2.82089552238806	1
15	253	995	473	3.93280632411067	1.86956521739130
16	278	954	454	3.43165467625899	1.63309352517986
17	242	990	282	4.09090909090909	1.16528925619835
18	185	625	225	3.37837837837838	1.21621621621622
19	151	618	223	4.09271523178808	1.47682119205298
20	89	162	163	1.82022471910112	1.83146067415730
21	159	482	373	3.031446540880 5	2.34591194968553
22	185	659	187	3.56216216216216	1.01081081081081
23	218	839	246	3.84862385321101	1.12844036697248
24	186	639	312	3.43548387096774	1.67741935483871
25	265	1039	299	3.92075471698113	1.12830188679245
26	213	785	235	3.68544600938967	1.10328638497653
27	115	359	339	3.12173913043478	2.94782608695652
28	231	839	235	3.63203463203463	1.01731601731602
29	102	404	450	3.96078431372549	4.41176470588235
30	255	973	445	3.8156862745098	1.74509803921569
31	190	741	216	3.9	1.13684210526316
32	191	734	291	3.84293193717278	1.52356020942408
33	152	575	200	3.78289473684211	1.31578947368421
34	233	886	233	3.80257510729614	1
35	150	564	442	3.76	2.94666666666667
36	208	818	328	3.93269230769231	1.57692307692308
37	332	1031	404	3.10542168674699	1.21686746987952
38	147	502	149	3.41496598639456	1.01360544217687
39	137	563	543	4.10948905109489	3.96350364963504
40	208	798	214	3.83653846153846	1.02884615384615
41	153	441	505	2.88235294117647	3.30065359477124
42	247	793	255	3.21052631578947	1.03238866396761
43	195	698	219	3.57948717948718	1.12307692307692
44	139	503	471	3.61870503597122	3.38848920863309
45	266	1086	334	4.08270676691729	1.25563909774436
46	286	997	306	3.48601398601399	1.06993006993007
47	153	547	163	3.57516339869281	1.06535947712418
48	220	824	330	3.74545454545455	1.5
49	167	643	191	3.8502994011976	1.14371257485503
50	219	841	279	3.84018264840183	1.27397260273973
51	170	641	172	3.77058823529412	1.01176470588235
52	202	673	222	3.33168316831683	1.0990099009901
53	172	528	192	3.06976744186047	1.11627906976744
54	176	565	186	3.21022727272727	1.05681818181818
55	225	816	245	3.62666666666667	1.08888888888889
56	207	706	227	3.41062801932367	1.09661835748792
57	361	1502	481	4.16066481994464	1.33240997229917
58	184	657	200	3.57282608695652	1.08695652173913

SQL Query Results

Microsoft Access Database



146	158	622	568	3.93670886075949	3.59493670886076
147	240	888	362	3.7	1.50833333333333
148	195	696	195	3.56923076923077	1
149	117	388	319	3.31623931623932	2.72649572649573
150	200	647	406	3.235	2.03
151	117	370	321	3.16239316239316	2.74358974358974
152	109	350	291	3.21100917431193	2.6697247706422
153	203	696	343	3.42857142857143	1.68965517241379
154	171	716	423	4.18713450292398	2.47368421052632
155	99	297	223	3	2.25252525252525
156	149	589	223	3.95302013422819	1.49664429530201
157	117	474	123	4.05128205128205	1.05128205128205
158	103	311	305	3.01941747572816	2.96116504854369
159	115	351	331	3.05217391304348	2.87826086956522
160	111	455	511	4.0990990990991	4.6036036036036
161	216	792	276	3.66666666666667	1.27777777777778
162	230	900	280	3.91304347826087	1.21739130434783
163	227	971	259	4.27753303964758	1.14096916299559
164	175	628	395	3.58857142857143	2.25714285714286
165	174	624	352	3.58620689655172	2.02298850574713
166	131	575	163	4.38931297709924	1.24427480916031
167	185	758	205	4.0972972972973	1.10810810810811
168	243	998	273	4.10699588477366	1.12345679012346
169	116	370	324	3.18965517241379	2.79310344827586
170	296	1063	536	3.59121621621622	1.81081081081081

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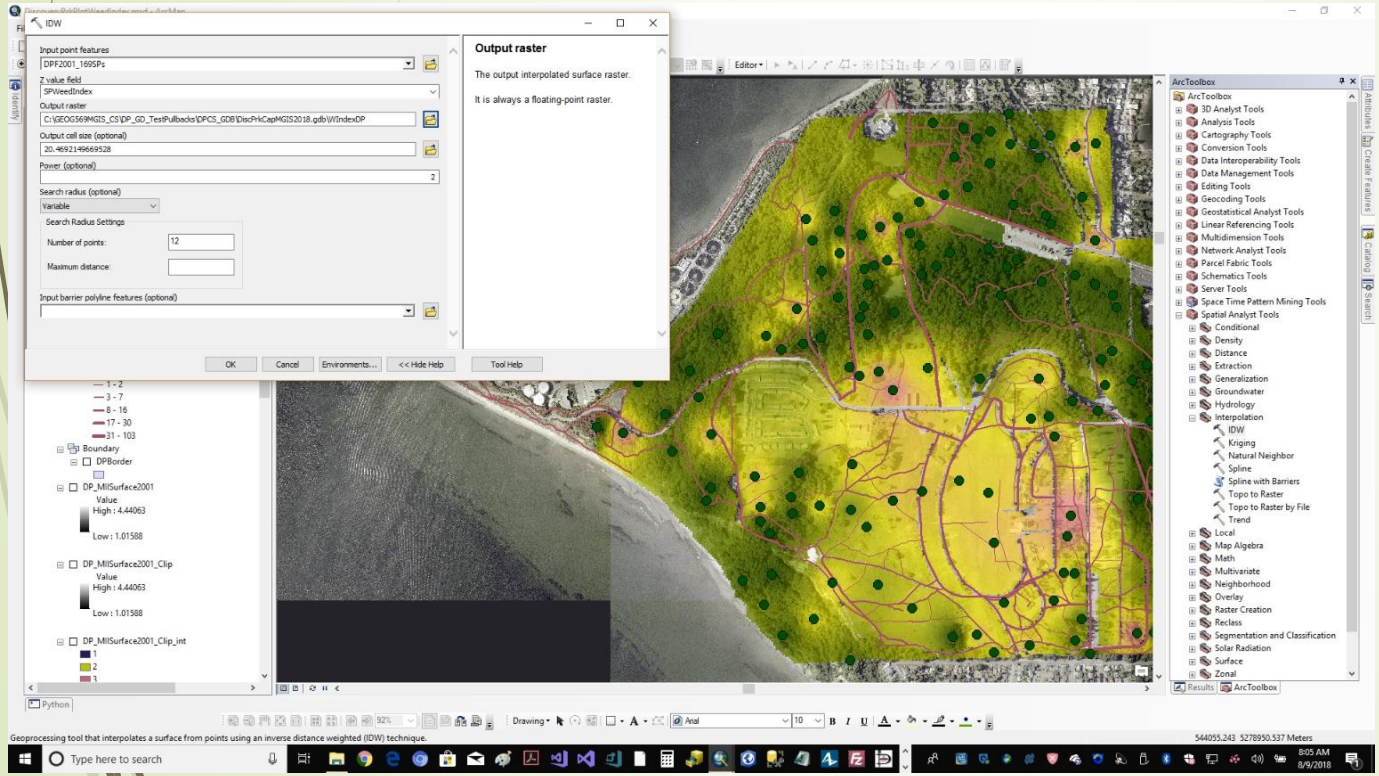
Report Informed by SQL Query Results

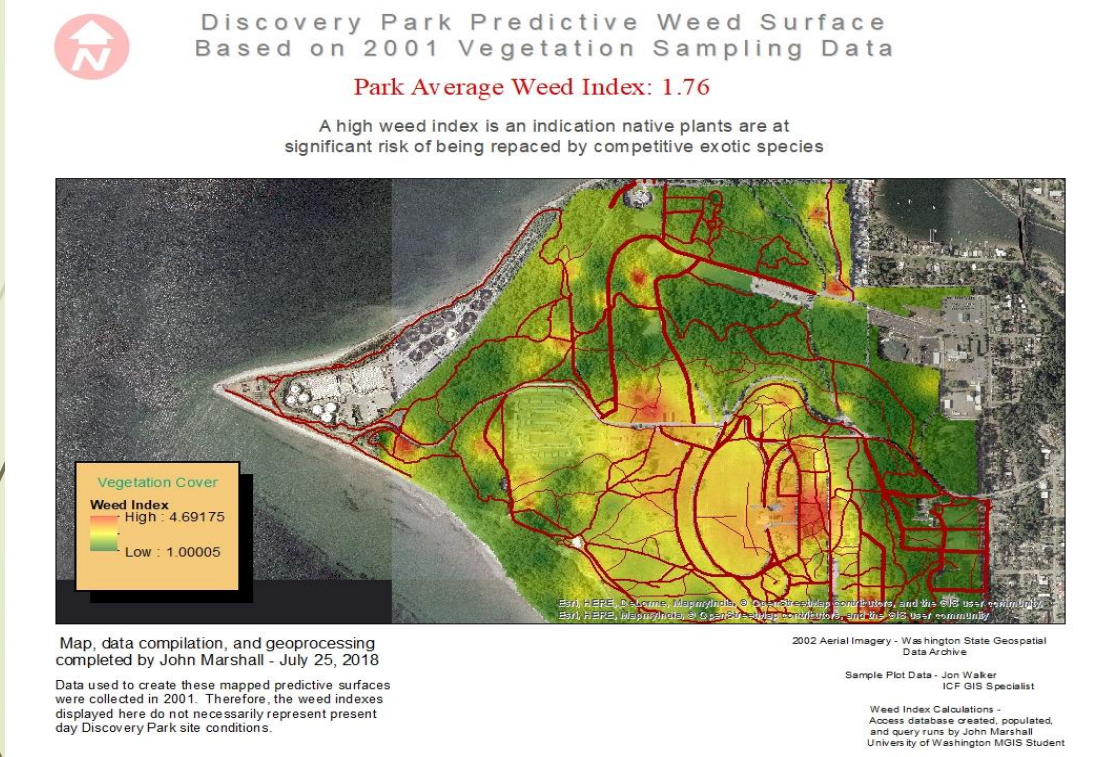
ArcMap - Spatial Analyst: Interpolation



Inverse Distance Weighting Tool

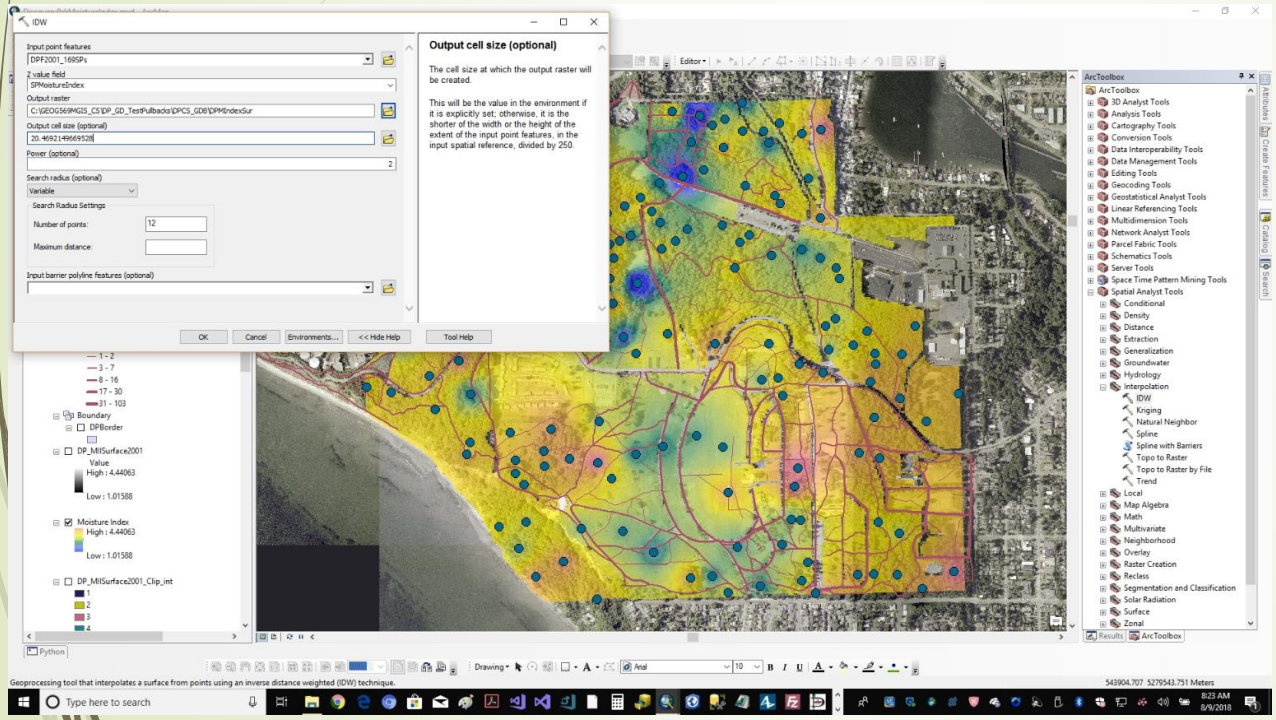
Weed Index Z-factor

ArcMap – Weed Index Predicted Surface



Weed Index Surface Map for Discovery Park

ArcMap - Spatial Analyst: Interpolation

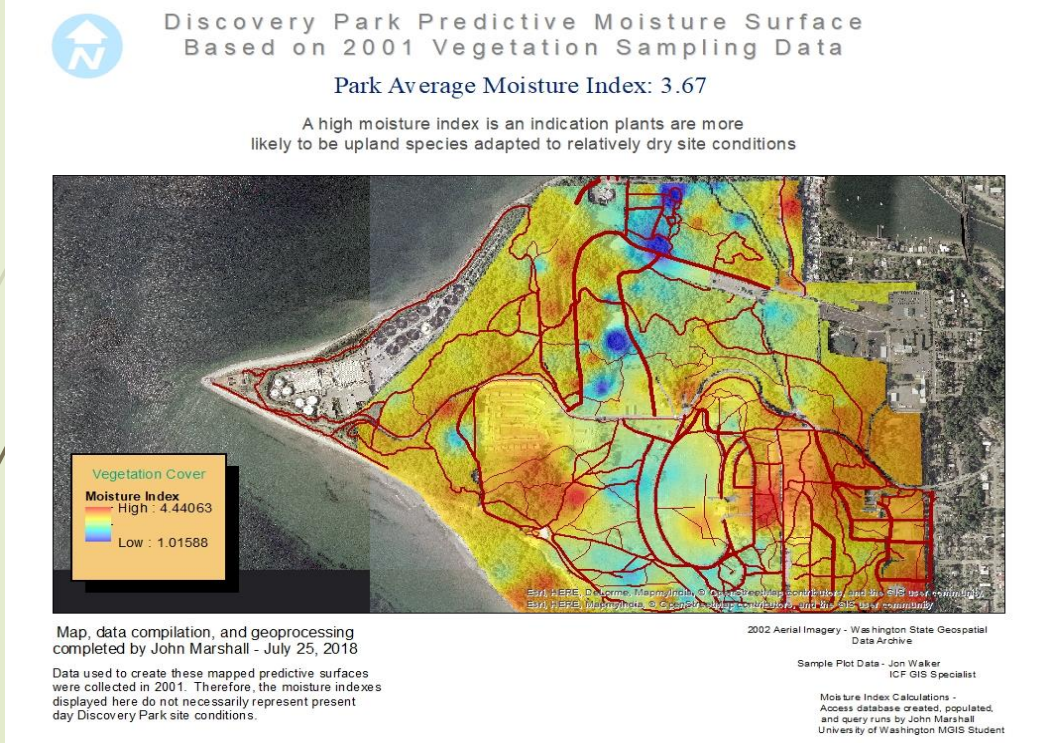


Inverse Distance Weighting Tool

Moisture Index

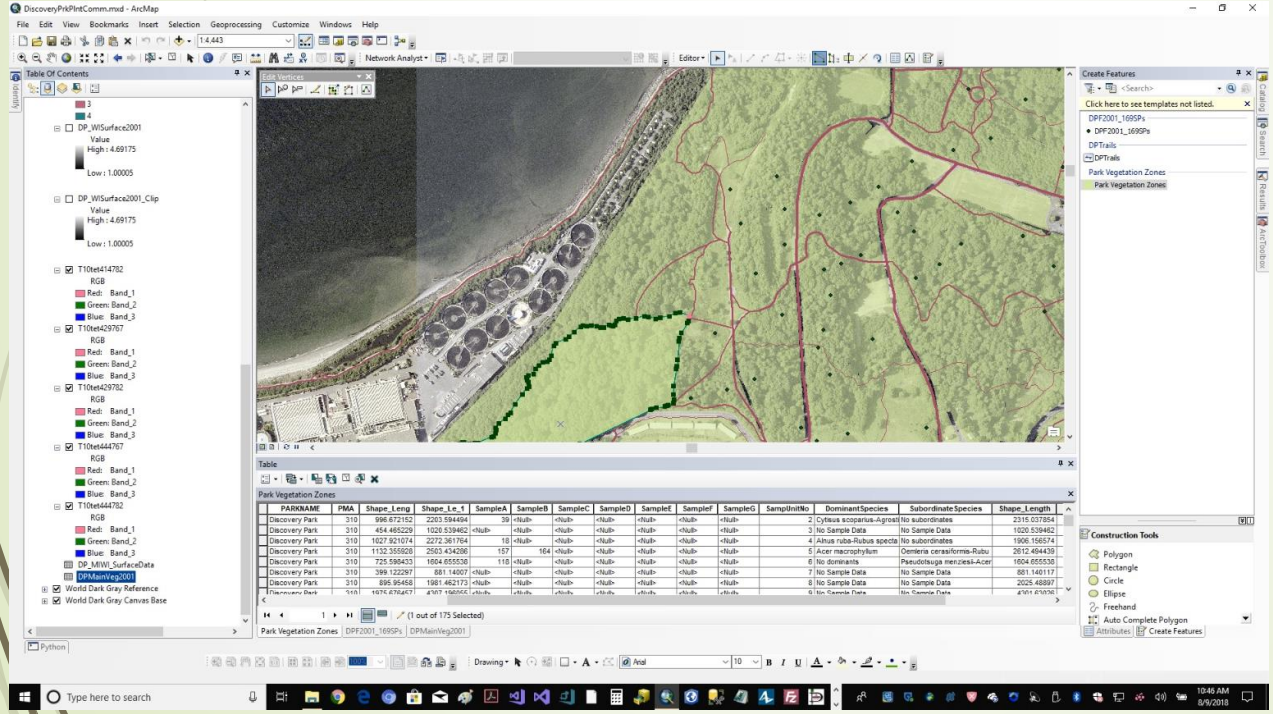
Z-factor

ArcMap – Moisture Index Predicted Surface



Moisture Index Surface Map for Discovery Park

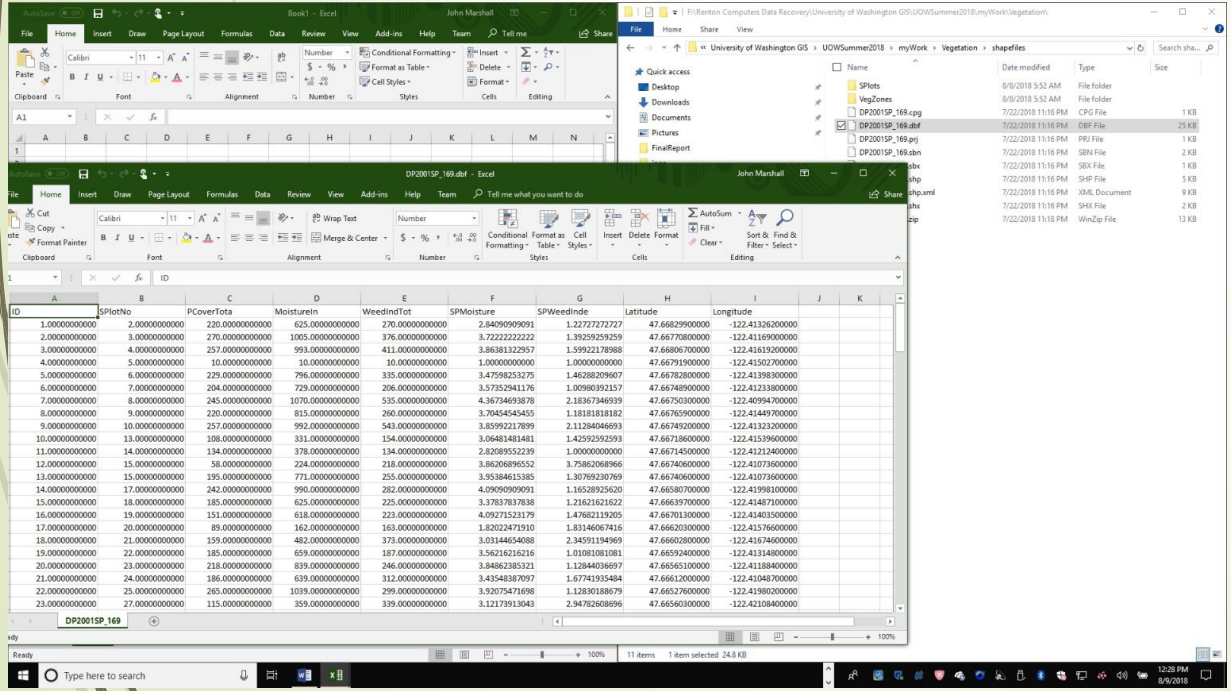
ArcMap – Re-Digitizing and Editing Vegetation Feature Class



ADD FIELDS

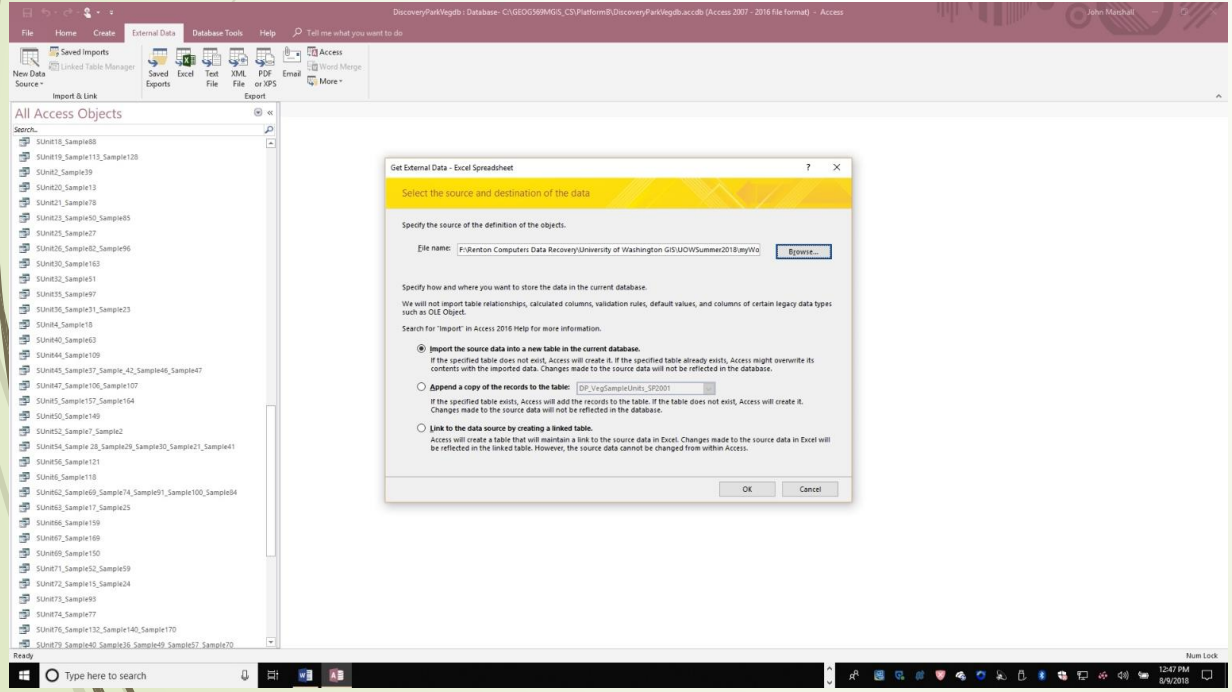
SampleA
SampleB
SampleC
SampleD
SampleE
SampleF
SampleG
SampUnitNo

Transferring Data Between Feature Class Attribute Tables into Microsoft Access Database



Export Feature Class to Shapefile
Drag and Drop dbf File into Blank Excel Worksheet

Transferring Data Between Feature Class Attribute Tables into Microsoft Access Database



Import Excel Worksheet Into Access Database

Microsoft Access Database

SELECT SamplePlot.SPlotNo, SamplePlot.Genus, SamplePlot.Species, SamplePlot.PCover
FROM SamplePlot
WHERE (((SamplePlot.SPlotNo)=8) AND ((SamplePlot.PCover)>=50));

SUnit105_Sample8

SPlotNo	Genus	Species	PCover
8	Acer	macrophyllum	90
8	Hedera	helix	65
*			

Query Dominant Species

Microsoft Access Database

SELECT SamplePlot.SPlotNo, SamplePlot.Genus, SamplePlot.Species, SamplePlot.PCover
FROM SamplePlot
WHERE (((SamplePlot.SPlotNo)=8) AND ((SamplePlot.PCover)>=20 And (SamplePlot.PCover)<50));

SUnit105_Sample8

SPlotNo	Genus	Species	PCover
8	Holodiscus	discolor	20
8	Polysticum	munitum	35
*			

Query
Subordinate
Species

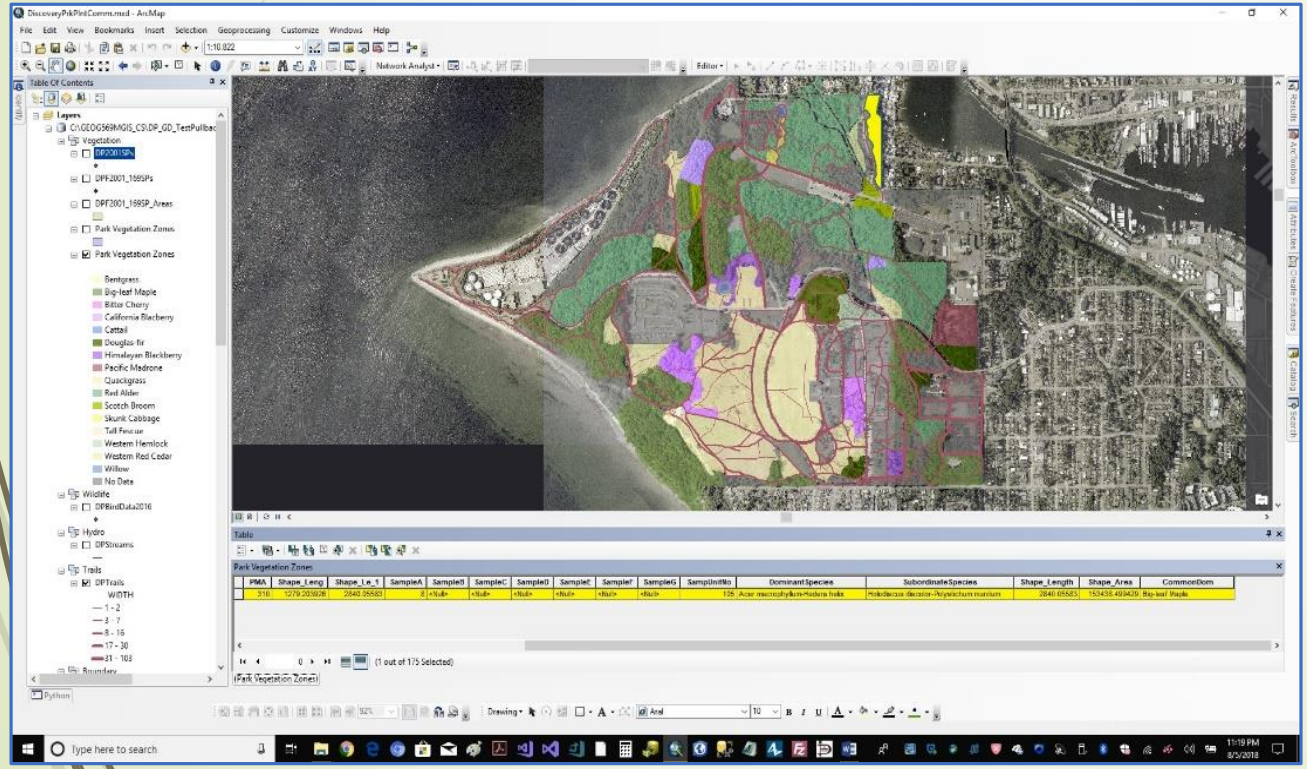
Microsoft Access Database

DP_VegSampleUnits_SP2001

SampUnitNo	FULL_LATIN
1	No dominants/Cytisus scoparius-Agrostis alba-Poa spp
2	Cytisus scoparius-Agrostis alba/No subordinates
3	No Sample Data
4	Alnus ruba-Rubus spectabilis/No subordinates
5	Acer macrophyllum/Oemleria cerasiformis-Rubus ursinus-Robinia pseudocacia-Agrostis alba
6	No dominants/Pseudotsuga menziesii-Acer macrophyllum-Alnus rubra
7	No Sample Data
8	No Sample Data
9	No Sample Data

Populating Sample Units with Dominant and Subordinate Plant Species Associations

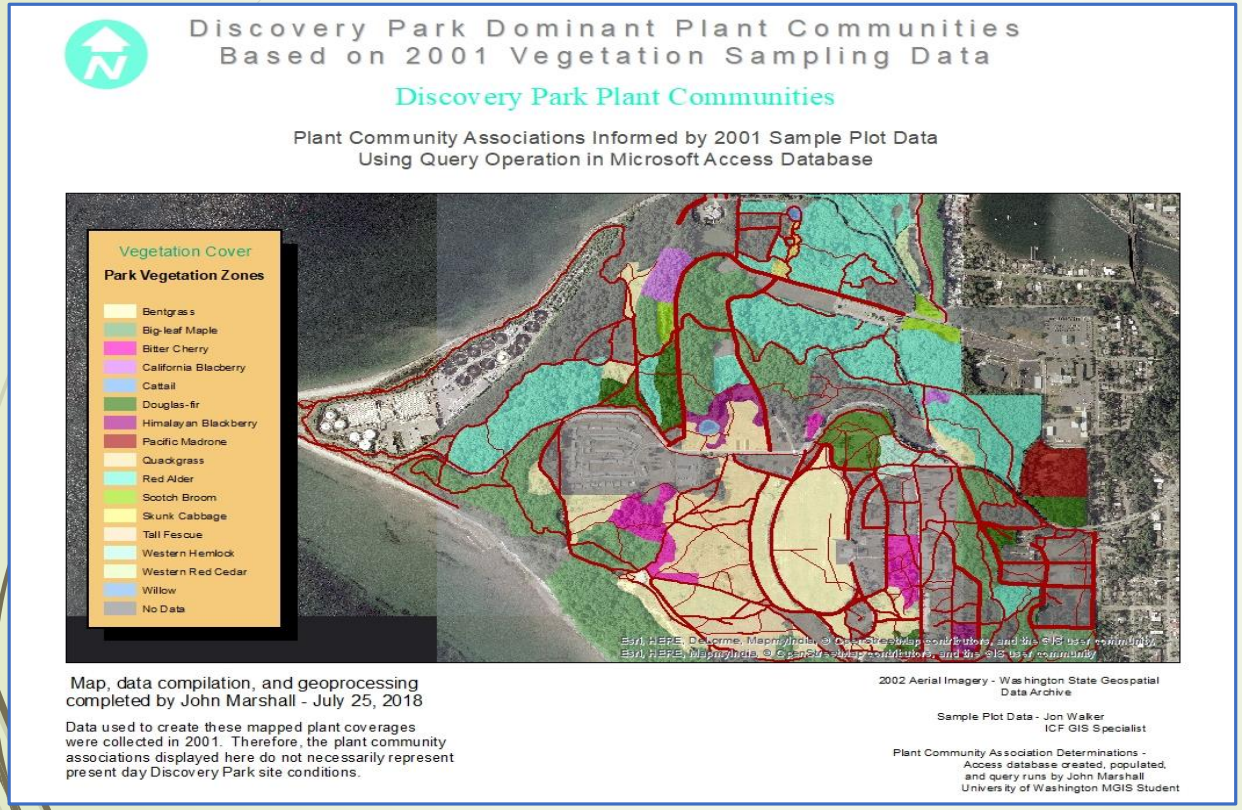
ArcMap – Re-Digitizing and Editing Vegetation Feature Class



ADD FIELDS

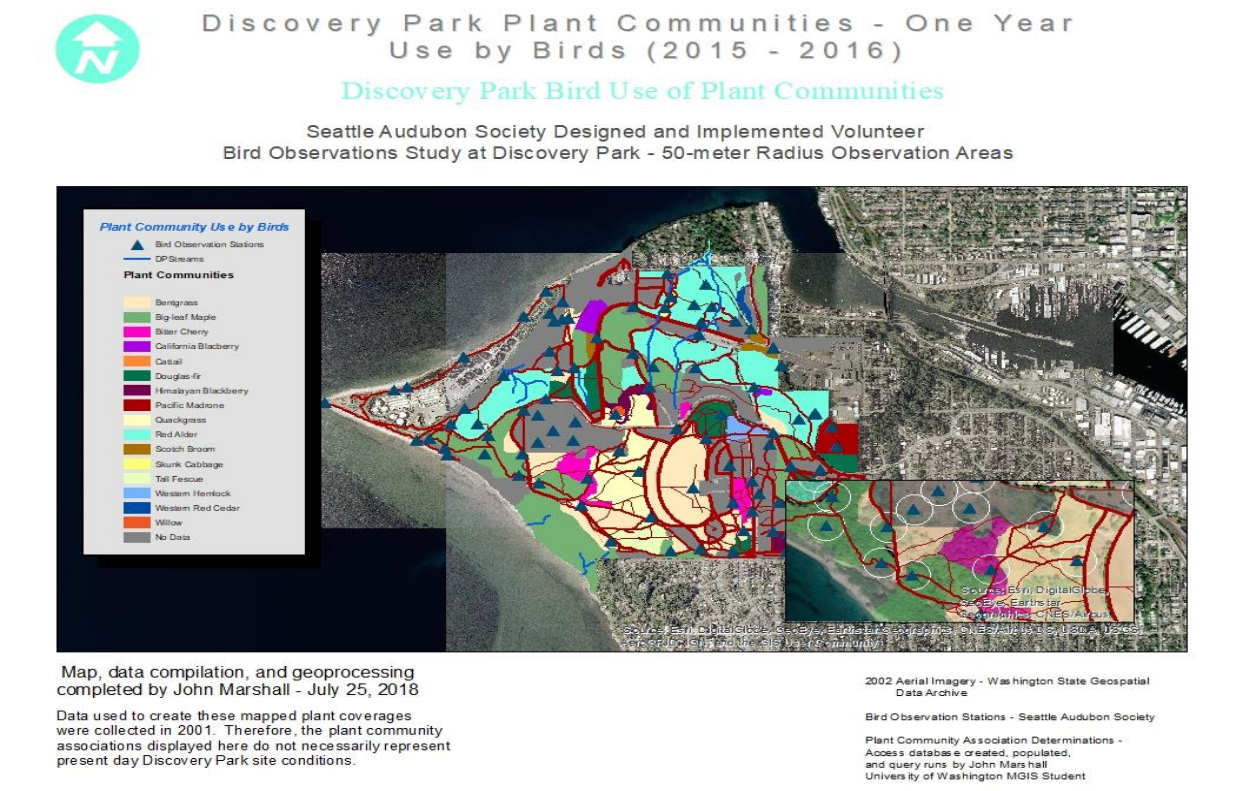
DominantSpecies
SubordinateSpecies

ArcMap – Plant Community



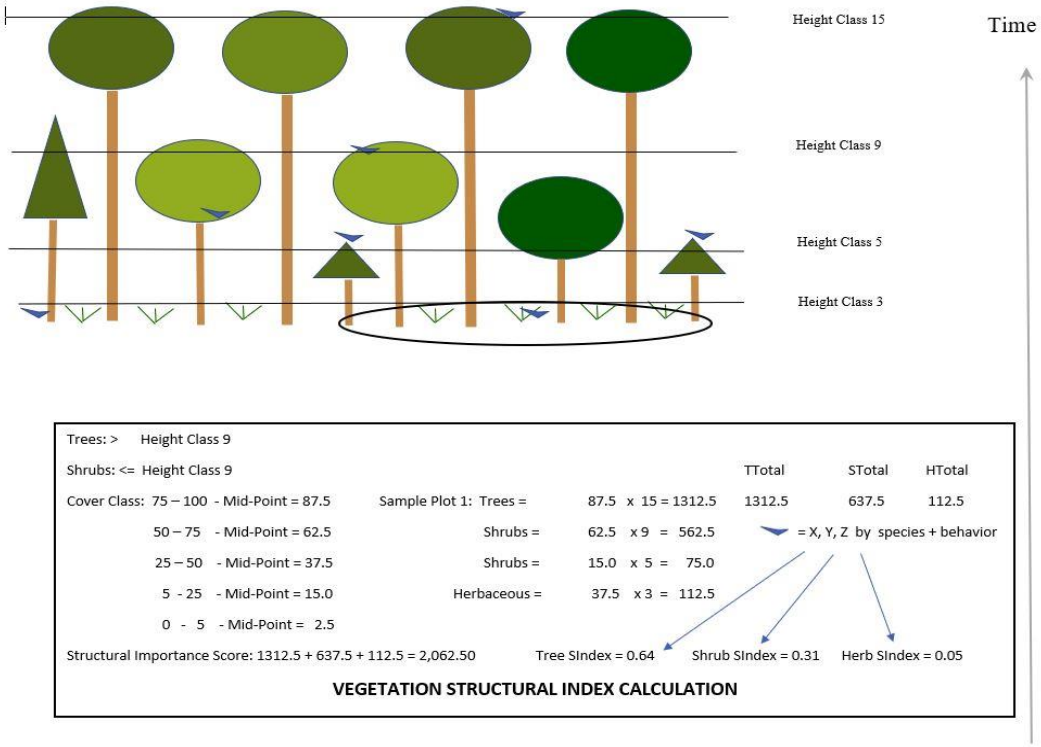
Plant Community Map for Discovery Park

ArcMap – Plant Community Use by Birds



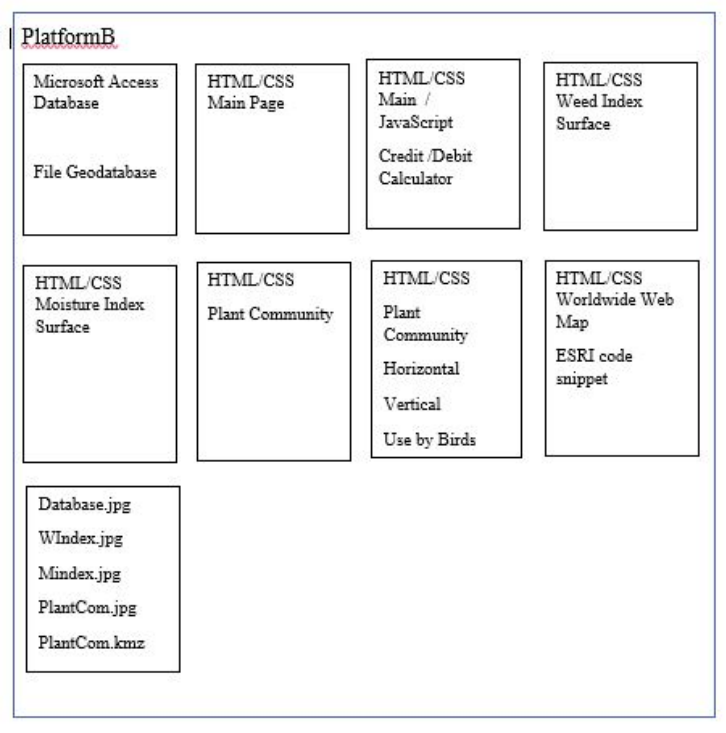
Plant Community Use by Birds Map (Horizontal) for Discovery Park

ArcMap – Plant Community Use by Birds



Plant Community Use by Birds Diagram (Vertical) for Discovery Park

PlatformB



Non-hosted
Multi-HTML / CSS / Java Script
Web Page Platform

Conclusions

A comprehensive present day vegetation sampling effort is overdue at Discovery Park

Moisture, weed, and possibly structural vegetation indexes should be included in the monitoring metrics

Plant community associations should be updated and mapped

A relational database in an enterprise SDE environment is needed to archive, calculate, and report key vegetation metrics

Both horizontal and vertical use of vegetation by wildlife (focus on birds) should be given full consideration in monitoring decisions

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US Army Corps of Engineers - Wetland Indicator Plant List

http://wetland-plants.usace.army.mil/nwpl_static/species/species.html?DET=001100#

US Department of Agriculture - Natural Resource Conservation Service Plant Database

https://plants.sc.egov.usda.gov/java/

Questions?