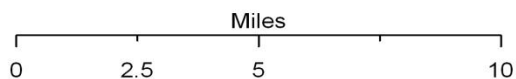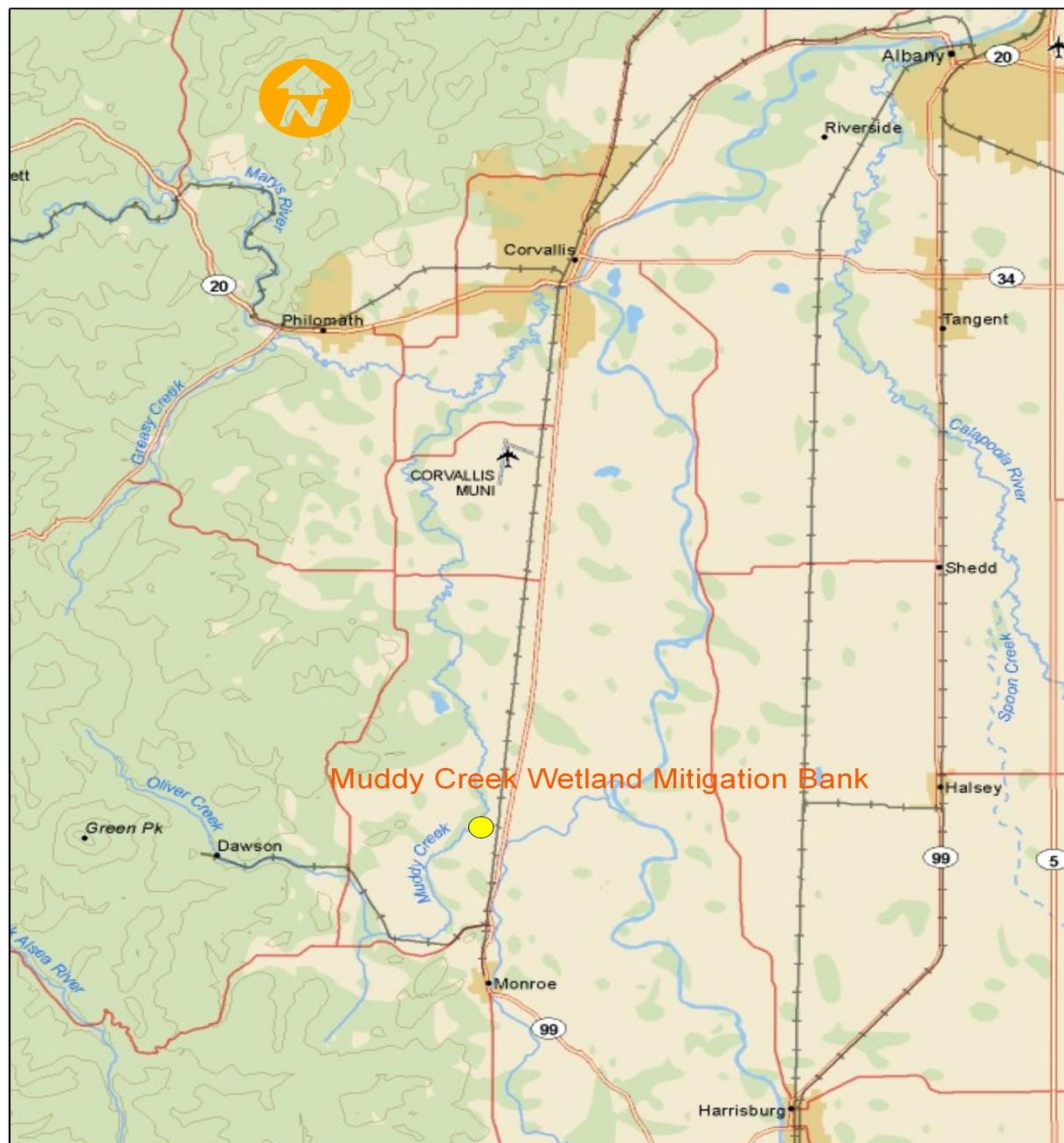# An Analysis of Plant Moisture Indexes and Potentially Dependent Weed Indexes for Native Wetland Prairie Vegetation at the Muddy Creek Wetland Mitigation Bank

Geography 575

John Marshall

Muddy Creek Wetland Mitigation Bank Location Map

Muddy Creek Wetland Mitigation Bank

Miles

0   2.5   5   10

Bing World Base Map

USFWS MCB Geodatabase

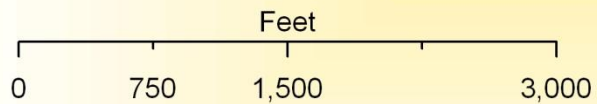# Muddy Creek Wetland Mitigation Bank
Elevations - Mean Sea Level

Feet

0   250   500   1,000

Bing Hybrid Base Map

Benton County Assessor's Office GIS

Muddy Creek Wetland Mitigation Bank Soils Series

Feet

| 0 | 750 | 1,500 | 3,000 |

Bing Hybrid Basemap
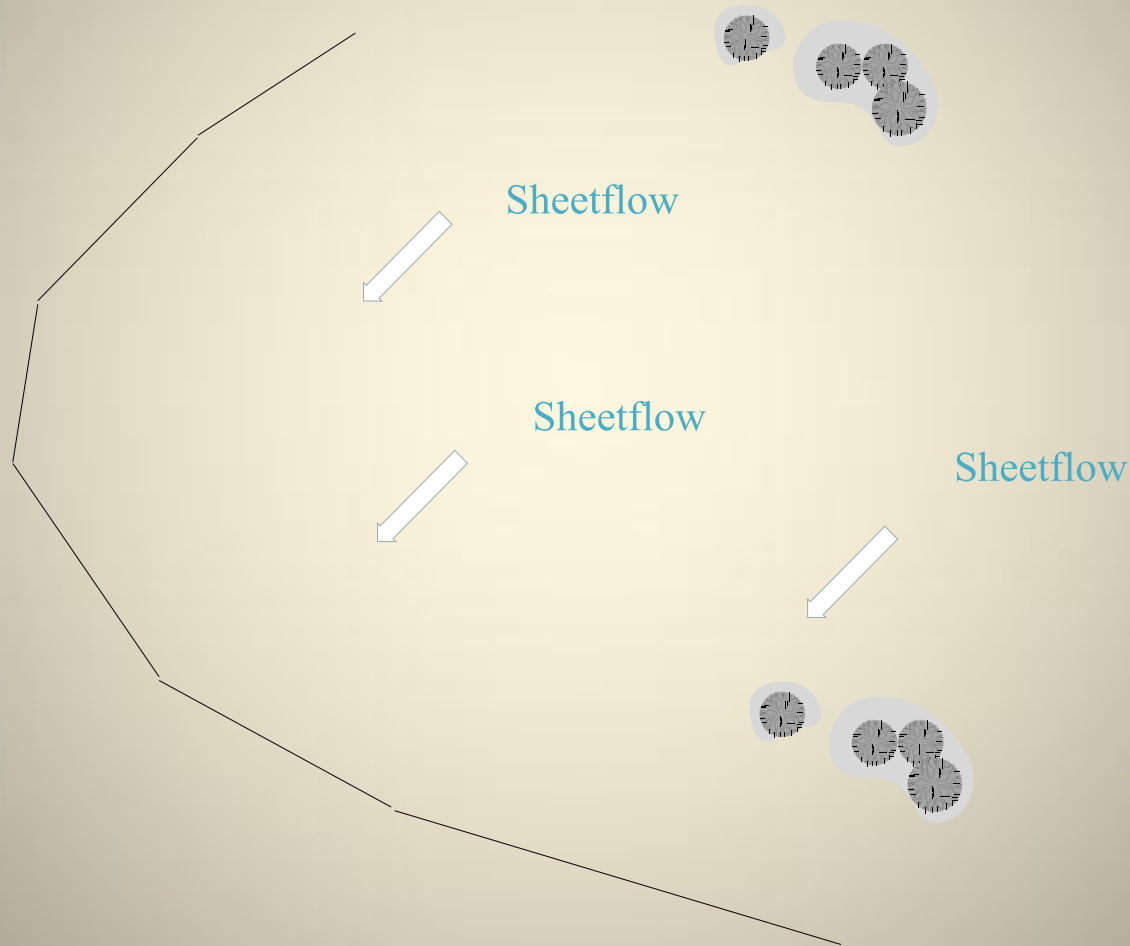
Benton County Assessor's Office GIS

NRCS Soil Survey Geographic database (SSURGO)

Soils

Awbrig - Hydric

Waldo - Hydric

Coburg - Upland

Muddy Creek Wetland Mitigation Bank Boundary

Curvilinear Berms Used to Capture Sheetflow
and Temporarily Backup Surface Water

Sheetflow

Sheetflow

Sheetflow

Cross-section View of Plant Moisture Index Across Elevation Gradient

Hypothesis:

Moisture Index –   1.0 to 2.0 - Emergent Wetland - Weed Index High
                     2.0 to 3.0 - Wetland Prairie – Weed Index Low
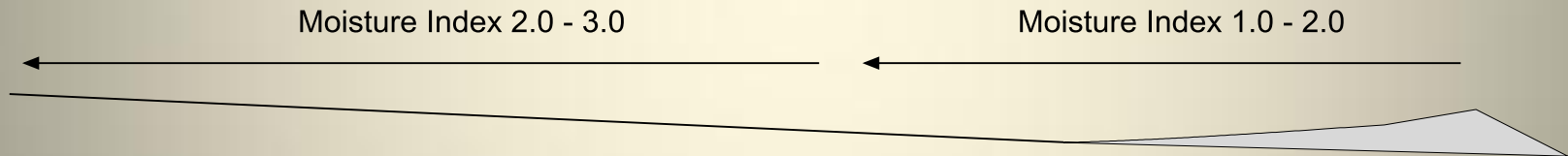   > 3.0   - Upland – Weed Index High

Moisture Index 2.0 - 3.0   Moisture Index 1.0 - 2.0

Table 2. Geodatabase Design and Data Organization.

ID	Data_Layer	Spatial_Type	Feature_Class	ArcInfo_Type	Feature_Dataset	Geodatabase
1	Property	Area	Property Boundary	Polygon Feature Class	Project	Weed/Moisture Index Relationship
2	Soils	Area	Soil Series	Polygon Feature Class	Project	Weed/Moisture Index Relationship
3	Vegetation Mindex	Point	Sample Plot Moisture Indexes	Point Feature Class	Project	Weed/Moisture Index Relationship
4	Vegetation Windex	Point	Sample Plot Weed Indexes	Point Feature Class	Project	Weed/Moisture Index Relationship
5	Vegetation Mclass	Area	Moisture Classes	Raster	Project	Weed/Moisture Index Relationship
6	Vegetation Wclass	Area	Weed Classes	Raster	Project	Weed/Moisture Index Relationship
7	Topography	Line	Elevation Contours	Polyline Feature Class	Project	Weed/Moisture Index Relationship

Vegetation Manager (VEMA)

Preparing Data for Analysis

ID	Number_	Date_	Lat	Lon	MIndex	WIndex
1	1	28-May-08	44.36806	-123.299	1.6	1.2
3	2	28-May-08	44.36807	-123.299	1.299999	2
2	3	28-May-08	44.36806	-123.3	1.6	2.299999
4	4	28-May-08	44.36811	-123.301	1.399999	1.2
5	5	28-May-08	44.36814	-123.303	1.6	1.899999
7	6	28-May-08	44.36875	-123.298	1.5	1.799999
9	7	28-May-08	44.36878	-123.299	2.2	1.399999
10	8	28-May-08	44.36879	-123.3	1.6	1.2
8	9	28-May-08	44.36878	-123.3	2.099999	1.299999
11	10	28-May-08	44.36881	-123.301	1	0
13	11	28-May-08	44.36884	-123.302	1.7	1.899999
14	12	28-May-08	44.36884	-123.303	1.7	2.099999
15	13	28-May-08	44.36885	-123.303	1.5	2.599999
21	15	28-May-08	44.36941	-123.299	1.799999	1.2
25	16	28-May-08	44.36941	-123.3	2	1
24	18	28-May-08	44.36941	-123.3	1.799999	2.099999
27	19	28-May-08	44.36942	-123.301	1.899999	1.5
20	20	28-May-08	44.36939	-123.301	1.6	2.5
32	21	28-May-08	44.37011	-123.298	1.7	1.899999
31	22	29-May-08	44.3701	-123.299	1.6	2.099999
30	23	29-May-08	44.37006	-123.3	1.5	2.799999
29	24	29-May-08	44.37003	-123.3	1.899999	1.399999
33	25	29-May-08	44.37075	-123.299	1.1	1.1
35	26	29-May-08	44.37077	-123.299	1.1	1
36	27	29-May-08	44.37077	-123.3	1.799999	1
34	28	29-May-08	44.37077	-123.3	2.2	1.399999
37	29	29-May-08	44.3708	-123.301	1.2	1.299999
12	34	29-May-08	44.36883	-123.305	2	1.399999
18	35	29-May-08	44.36908	-123.305	1.6	2.099999
19	36	29-May-08	44.36934	-123.304	1.7	2.299999
6	45	29-May-08	44.36818	-123.304	1	1
16	46	29-May-08	44.36886	-123.303	1	1
17	47	29-May-08	44.36887	-123.304	1	0
23	48	29-May-08	44.3694	-123.302	1	5
26	49	29-May-08	44.36941	-123.303	1	5
22	50	29-May-08	44.3694	-123.303	1.5	2.9
28	51	29-May-08	44.37	-123.302	1	3

VEMAData.mdb File Sample Table

1. Added To Arc-Map (Add XY Data) As a sample event;
2. Exported to shapefile;
3. Add Fields – Mindex and WIndex;
4. Populate Fields using VEMA semi-automatic MI calculator;
5. Exported as Text File;
6. Imported to MicrosoftAccess;
7. Mindex and WIndex field copied in MicrosoftAccess
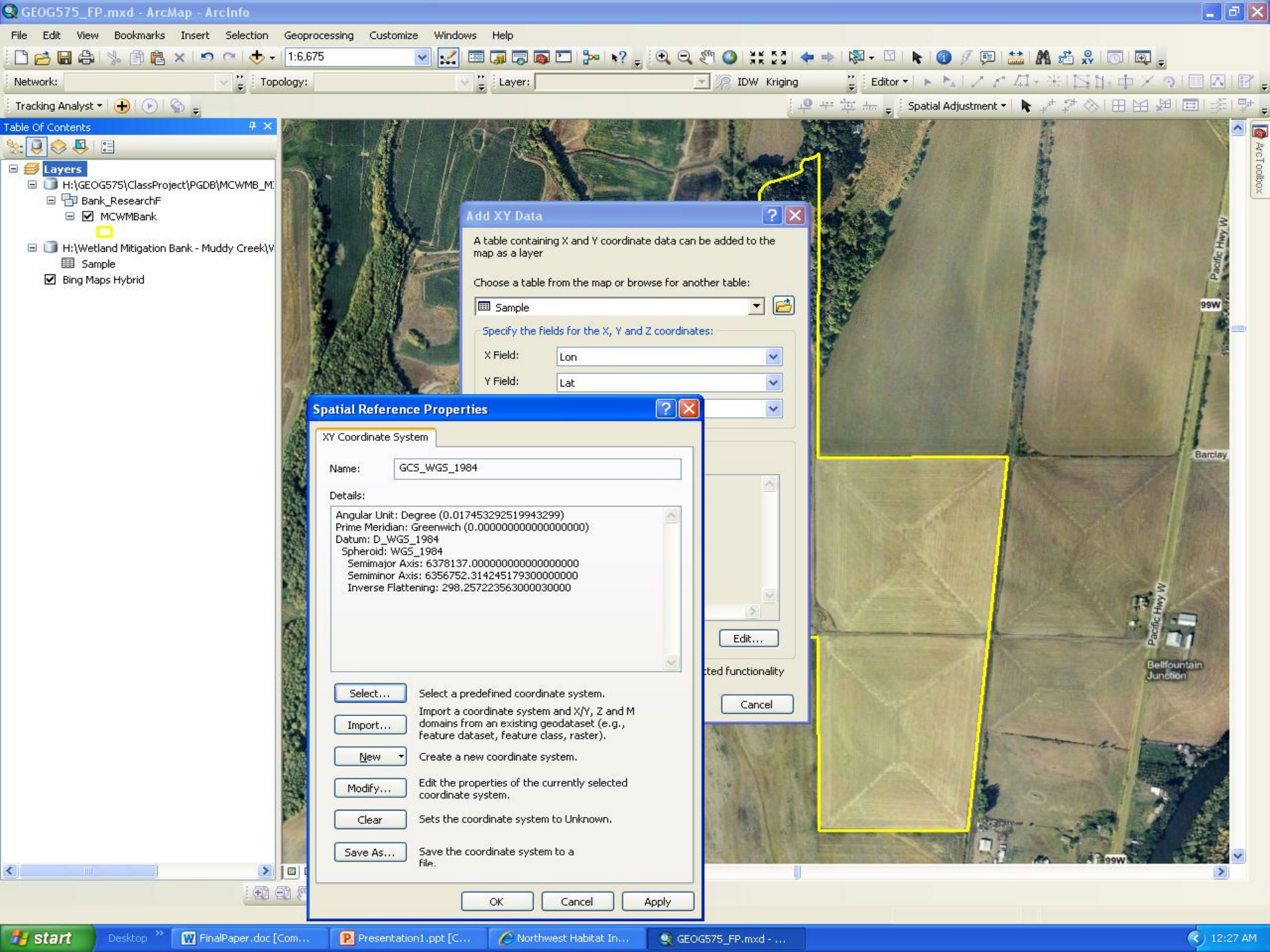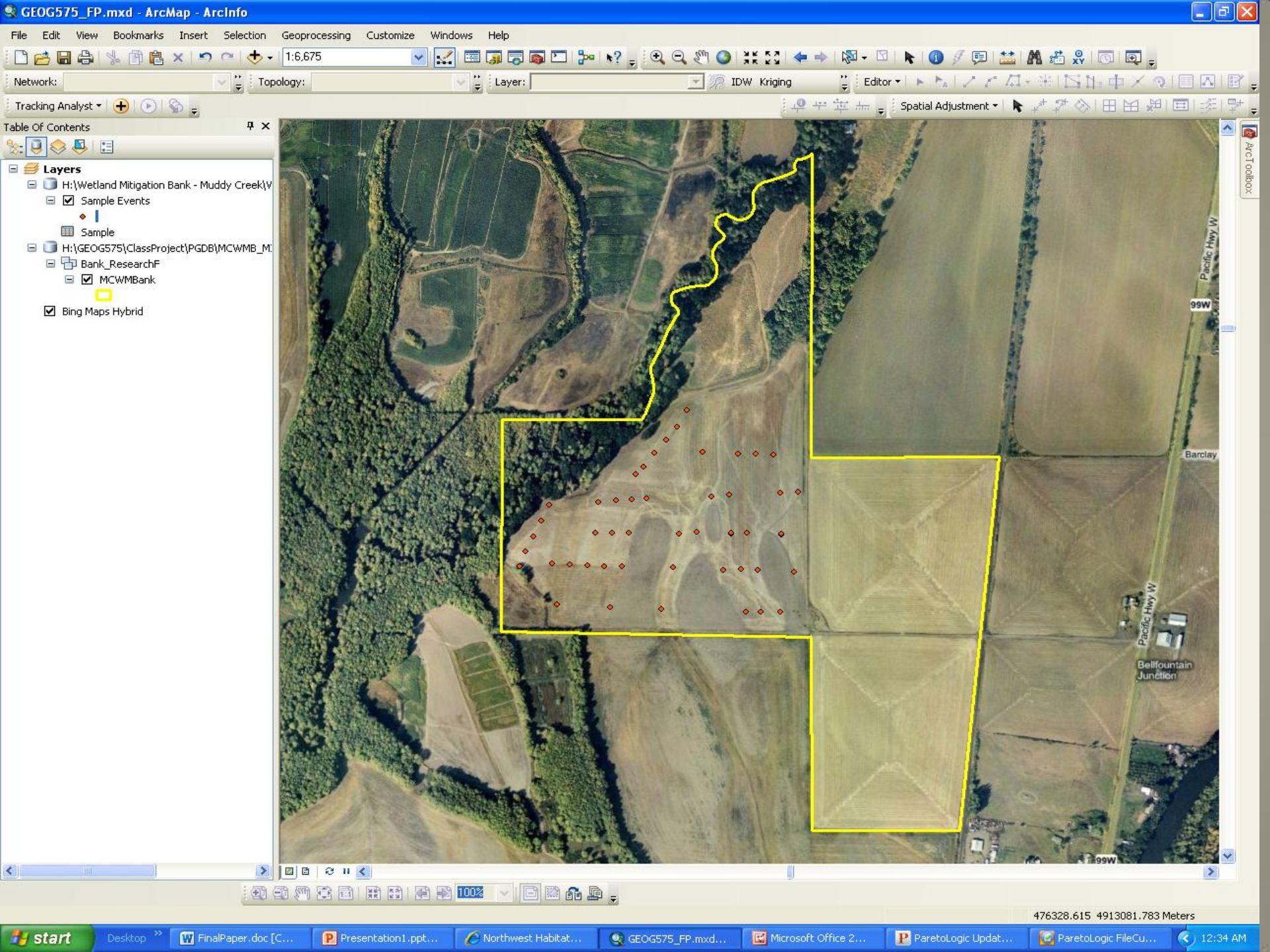
VEMA

VEMA

Site Visit Tools

Site List

Site: Muddy Creek Wetland Mitigation Bank

Site Type: Mitigation

Site Visit: 1

Start Date: 5/28/2008   **Description:** Chris Kiilsgaard
End Date: 5/29/2008

Locked: ☐

Site Layout	Performance Criteria	Field Sampling	Performance	Management

Unit Number: 1   **Unit Habitat:** Emergent

Sample Plot	Date	Transect	Baseline
1	5/28/2008	1	1
2	5/28/2008	1	1
3	5/28/2008	1	1

Sampling Summaries: Plant % Cov   Plant % Cov by Layer   Plant And Soil % Cov   Plant And Soil % Cov by Layer   Site Visit Summary

Tree	Scrub-Shrub	Herbaceous/Emergent	Floating Emergent	Surface Substrate

Herbaceous Layer

Plant Manager

Herbaceous Species
Sonchus asper

Percent Cover
1   (Values Between 0 and 100)

Moisture Index
3

Type
NN

Prairie Cohort ☐

Woody ☐

Picture

Herbaceous Species
Juncus bufonius

Percent Cover
60   (Values Between 0 and 100)

Moisture Index
1

Type
N

Prairie Cohort ☑

Woody ☐

Picture

Herbaceous Species
Lythrum portula

Percent Cover
5   (Values Between 0 and 100)

Moisture Index
5

Type
NNI

Prairie Cohort ☐

Woody ☐

Picture

Record: ◄◄ ◄ 1 ► ►► ►✳ of 13

Record: ◄◄ ◄ 1 ► ►► ►✳ of 29 (Filtered)

Plant ID number

VEMA

Site Visit Tools

Site List | Site: | Muddy Creek Wetland Mitigation Bank

Site Visit: | 1

Start Date: **5/28/2008**   Description: **Chris Kiilsgaard**
End Date: **5/29/2008**
Locked: ☐

| Site Layout | Performance Criteria | **Field Sampling** | Perfor... |

Unit Number: **3**   Unit Habitat: **Forest**

	Sample Plot	Date	Transect	Baseline
▶	34	5/29/2008	7	3
	35	5/29/2008	7	3
	36	5/29/2008	7	3

Sampling Summaries: | Plant % Cov | Plant % Cov by Layer | Plant And Soil % Cov | Plant And Soil

| Tree | Scrub-Shrub | Herbaceous/Emergent | Floating |

Bare Ground Layer   [Calculate Moisture Index]

Substrate Types

Moisture Index

Percent Cover

Record: |◀ ◀ | 1 | ▶ ▶| ▶* of 1

Record: |◀ ◀ | 1 | ▶ ▶| ▶* of 11 (Filtered)

VEMA

Calculate Substrate Moisture Index

Guidelings For Establishing Moisture Index For Bare Ground

Option 1- Use plants already in the sample plot.

Assign a moisture Index to bare ground based on the moisture indexes of plants in the sample plot (weighted by percent cover).

[Use Plants]   Suggested Moisture Index = 1.4

Option 2- No plants in the sample plot.

Assign a moisture Index to bare ground based on weighted moisture tolerance index of plants near the sample plot at similar elevation.

This option can be completed in three steps:

1) Return to the sampling form and enter into the sample plot all those plants that are nearby.

2) Open this form again and use the button in Option 1 to calculate a moisture index value for the substrate.

3) Return to the sampling form and delete all of the plants you entered in step 1 from the sample plot.

Option 3- No plants in or near the sample plot.

Assign a Moisture Index to bare ground based on hydrology monitoring data or an evaluation of hydrologic indicators.

Moisture Index Value And Description:

1   Soil Moisture Regime Saturated Late Enough In the Growing Season to Exclude All But Obligate Hydrophytic Plants Or Excludes All Plants

2   Soil Moisture Regime Saturated Mid to Late Growing Season

3   Soil Moisture Regime Saturated Early to Mid Growing Season

4   Soil Moisture Regime Saturated Only Early in the Growing Season

5   Soil Moisture Regime Never Saturated For Seven or More Consecutive Days During the Growing Season

[Exit]

Form View

Species	Indicator Status	Cover Class			Weighted Cover Class		
ALGE	1	63			63		
CAUN	1.5	3			4.5		
DECE	2	15			30		
HOBR	1.5	3			4.5		
JUTE	1.5	15			22.5		
RONU	2	15			30		
		0			0		
MEPU	1	15			15		
ELPA	1	63			63		
		0			0		
		0			0		
		0			0		
BAREG	1.2109	4			4.8438		Prevalence Index
		196			237.34		**1.211**
		192			232.5		**1.211**

Table 1 Prevalence Index Calculator.

Sub-sample of Muddy Creek Wetland Mitigation Bank 2008 Vegetation Sample Plots.

■ 2008 Vegetation Sample Plots

▢ Randon Sample Area

▢ Mitigation Bank Boundary
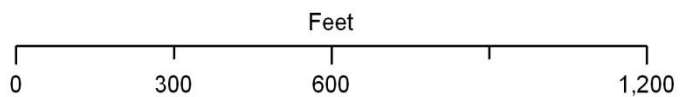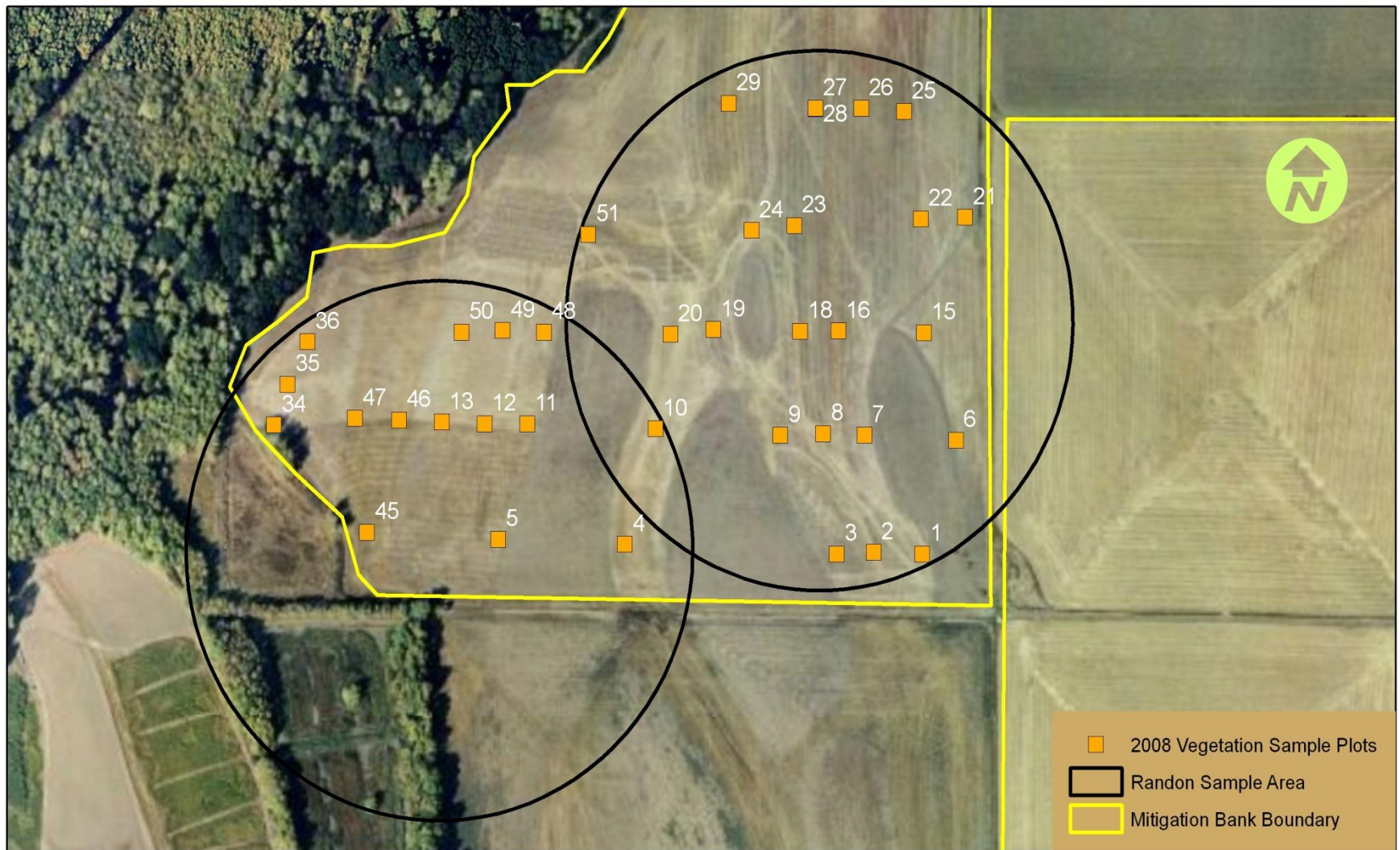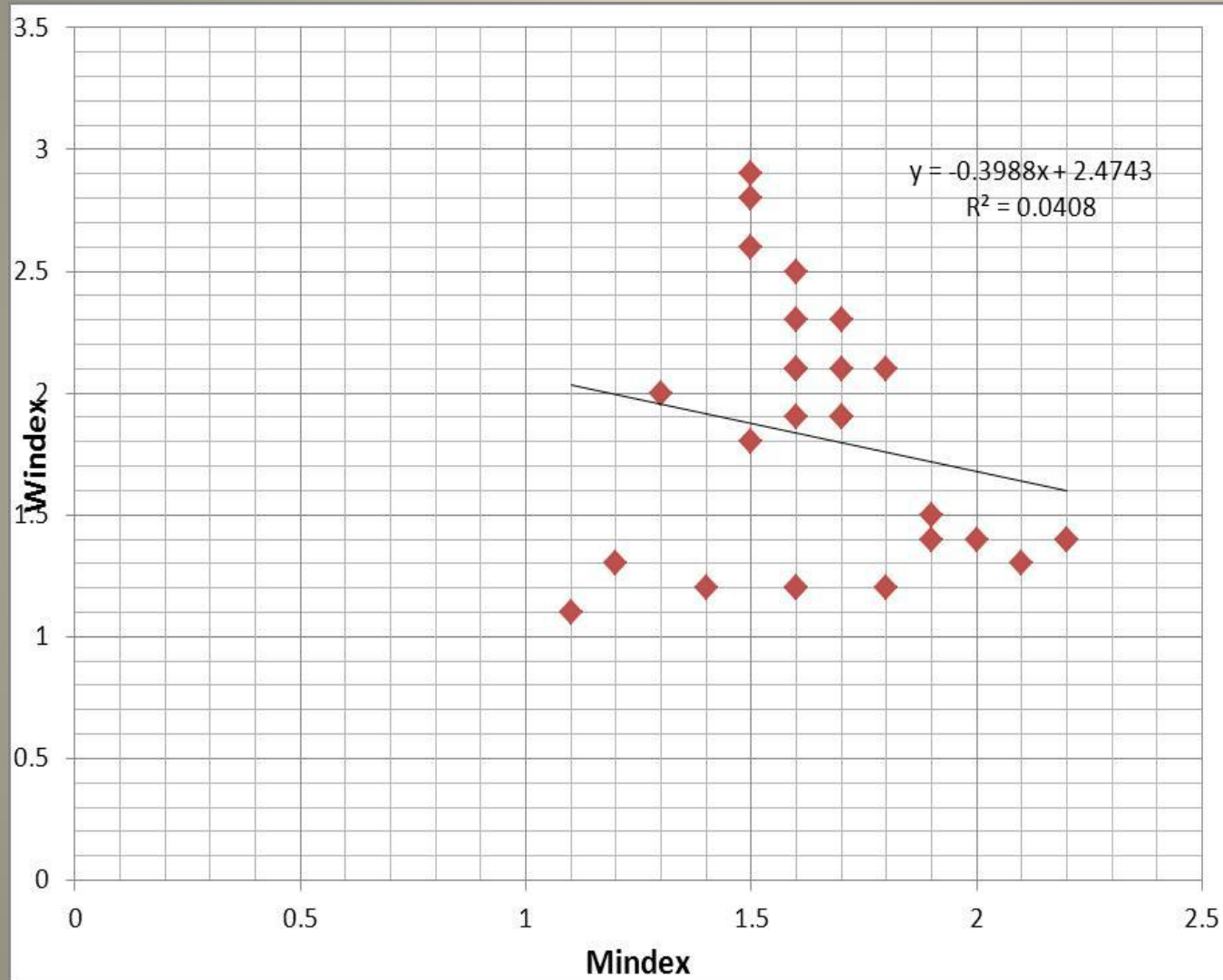
Feet

0   300   600   1,200

IDW Interpolated Vegetation Moisture Index Surface at Muddy Creek Wetland Mitigation Bank Based on 2008 Vegetation Sample Plots

Legend

■ 2008 Vegetation Sample Plots

▭ Randon Sample Area

▭ Mitigation Bank Boundary

Moisture Index Surface

- 1 - 1.25
- 1.26 - 1.47
- 1.48 - 1.65
- 1.66 - 1.83
- 1.84 - 2.2
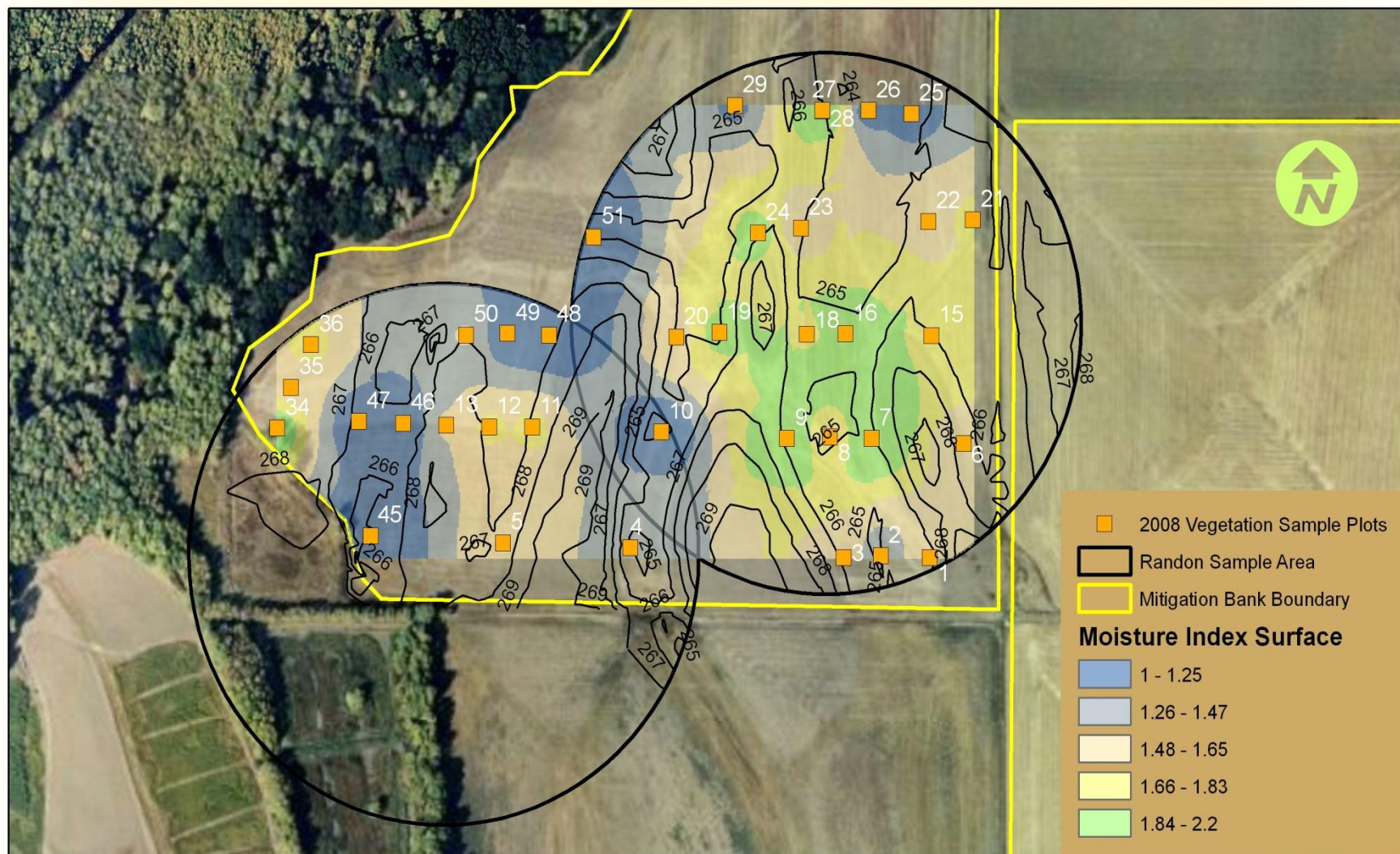
Feet

0   300   600   1,200

IDW Interpolated Weed Surface at Muddy Creek Wetland Mitigation Bank Based on 2008 Vegetation Sample Plots.

Legend:

- 2008 Vegetation Sample Plots
- Randon Sample Area
- Mitigation Bank Boundary

Weed Surface

- 0 - 1.1
- 1.11 - 1.67
- 1.68 - 2.41
- 2.42 - 3.57
- 3.58 - 5
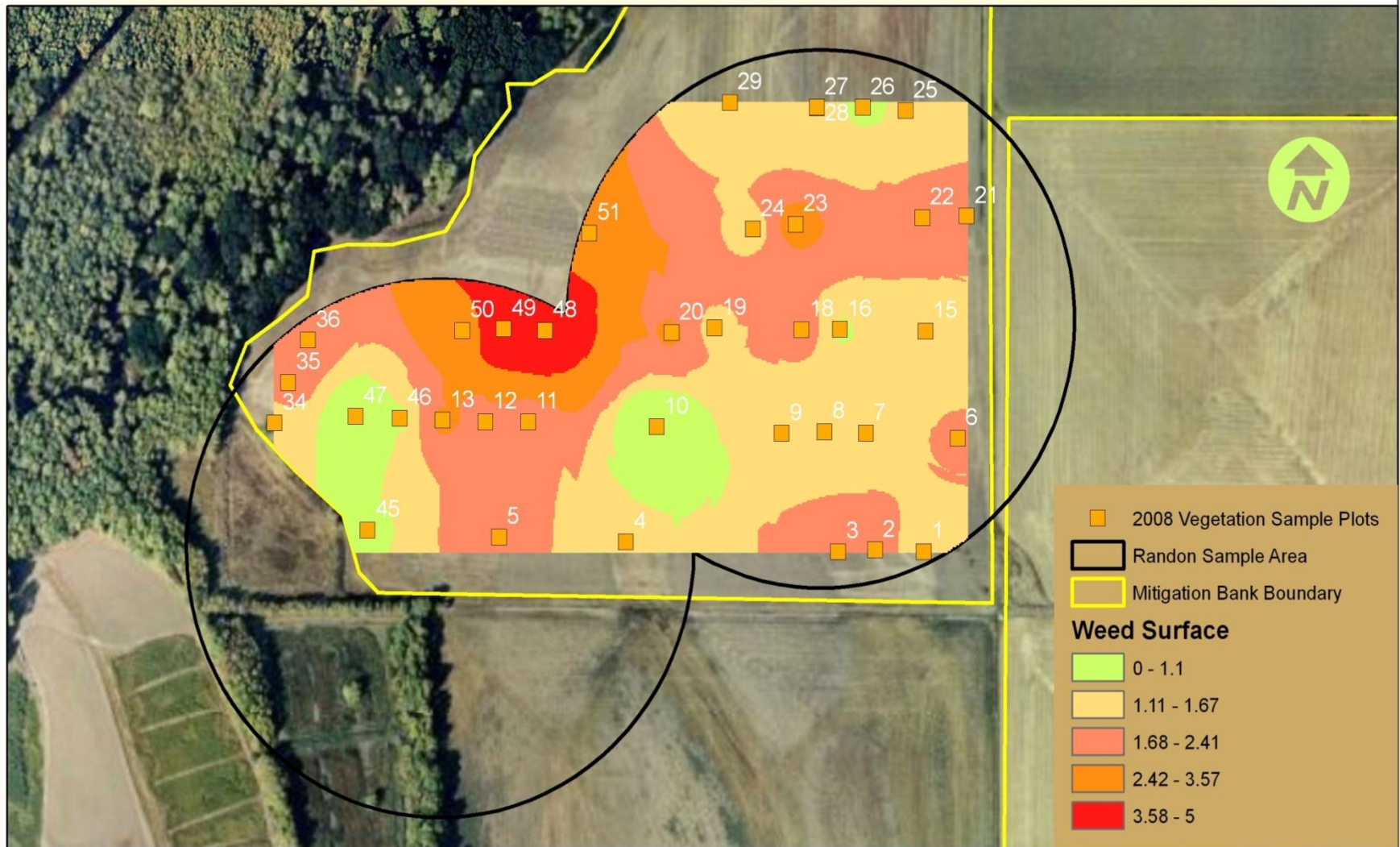
Feet

0   300   600   1,200

Weed Index Surface Hot Spots
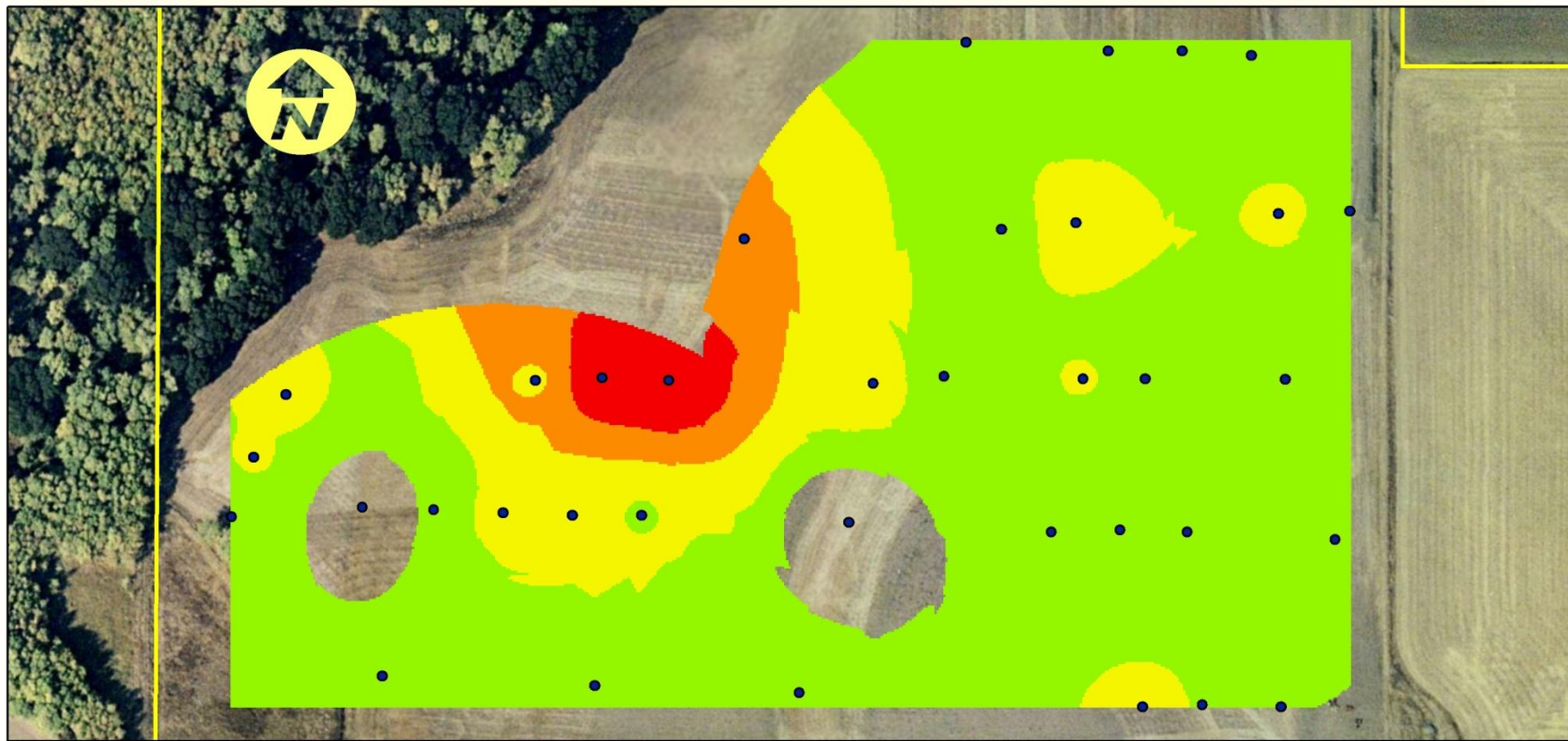
Feet

0   125   250   500

Weed Index Based Credit Release Formula

Threshold for Weed Related Credit Suspension Equals > 3.0

Weed Index

	0 - 1
	1.01 - 2
	2.01 - 3
	3.01 - 4
	4.01 - 5

Weed Index Surface Hot Spots
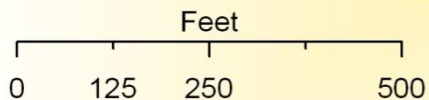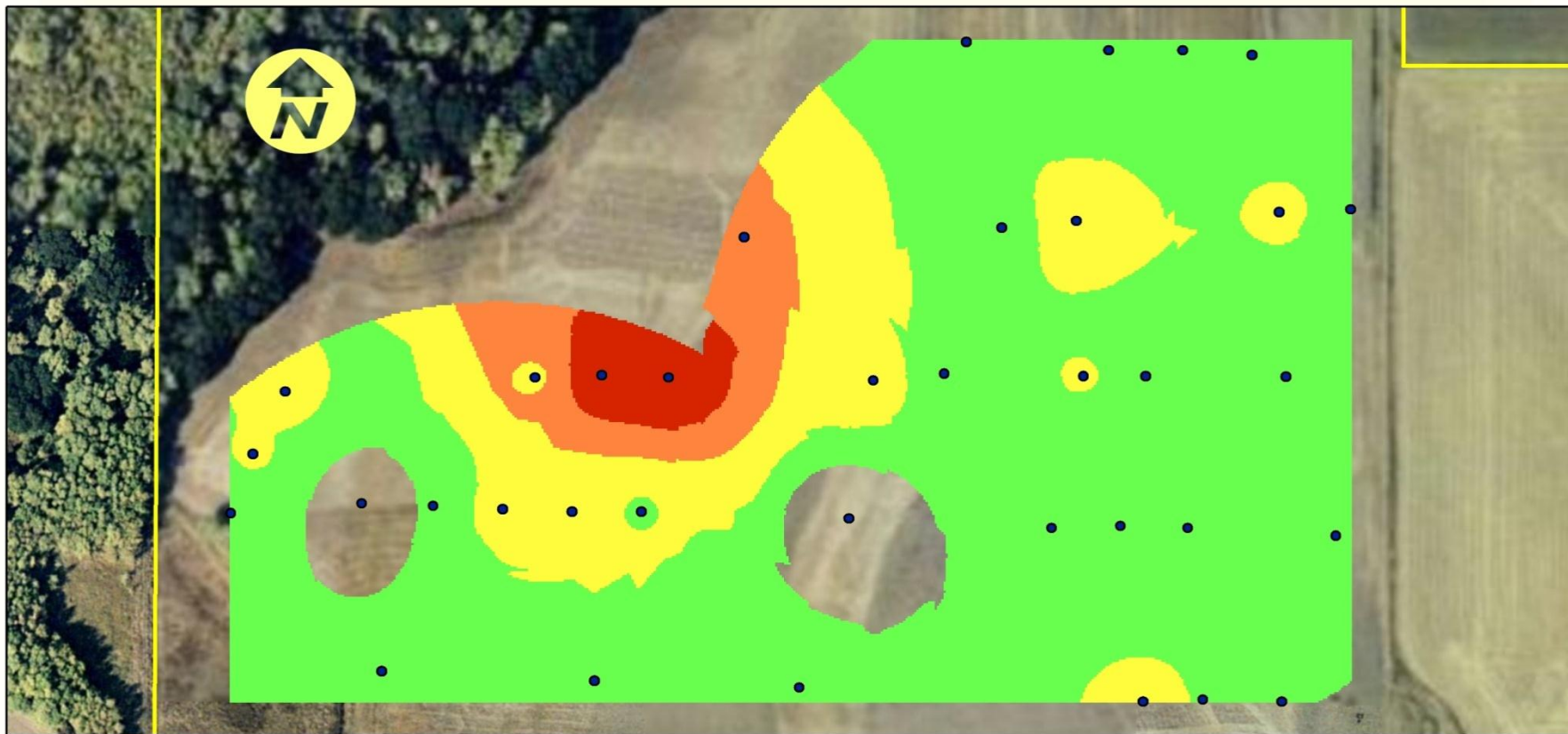
Feet

| 0 | 125 | 250 | 500 |

Weed Index Based Credit Release Formula

$$(1.61 + 0.75)/(20.49 + 5.52 + 1.61 + 0.75)$$
$$= 0.083$$

0.083 x 10 potential credits = 0.83 credits suspended
10 - 0.83 = 9.17 credits released

0.83 x $65,000 = $53,950

1 - 20.49-acres
2 - 5.52-acres
3 - 1.61-acres
4 - 0.75-acres

Moisture Index Surface in Relation to Land Surface Elevations

Feet

0   125   250   500

Elevation Mean Sea Level

Plant Community Moisture Index

1 - 1.25
1.26 - 1.47
1.48 - 1.66
1.67 - 1.84
1.85 - 2.2
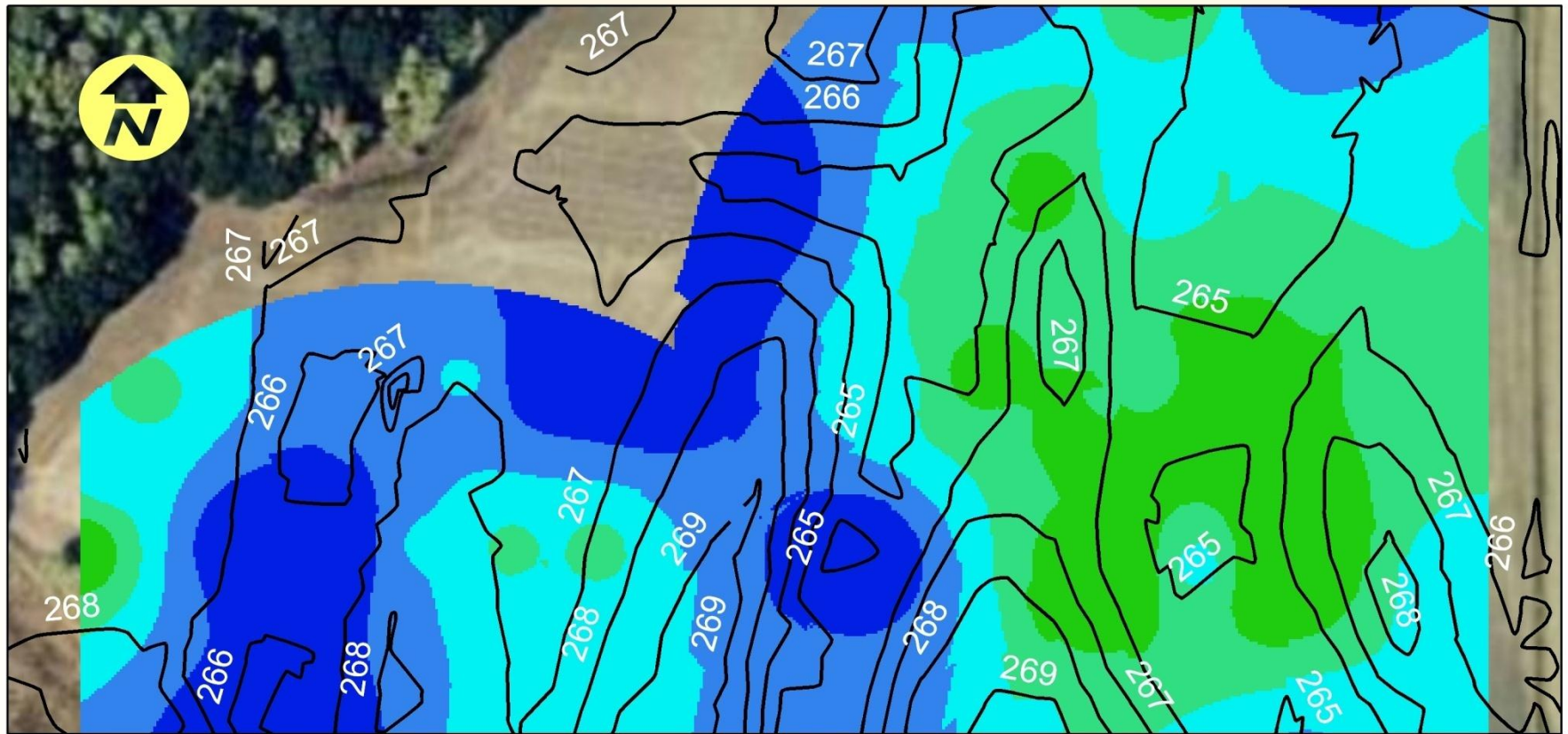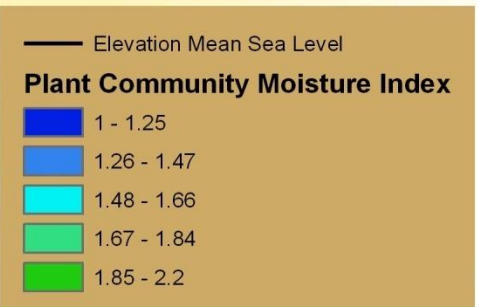
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