

Multi-Scale Monitoring of Potential Groundwater Withdrawal Impacts Using Delineation Methodology; Lower Platte River, Nebraska

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Burns & McDonnell

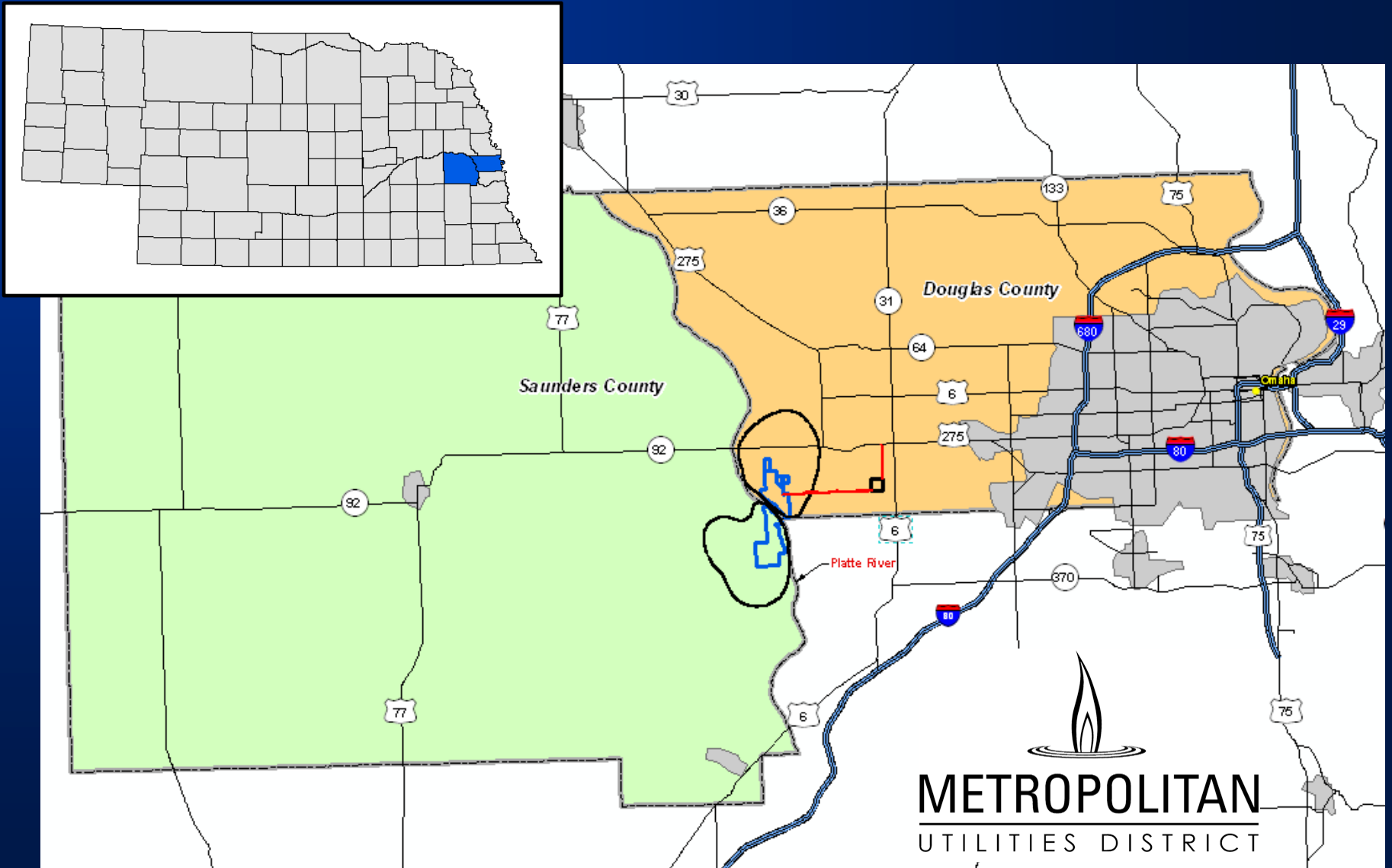
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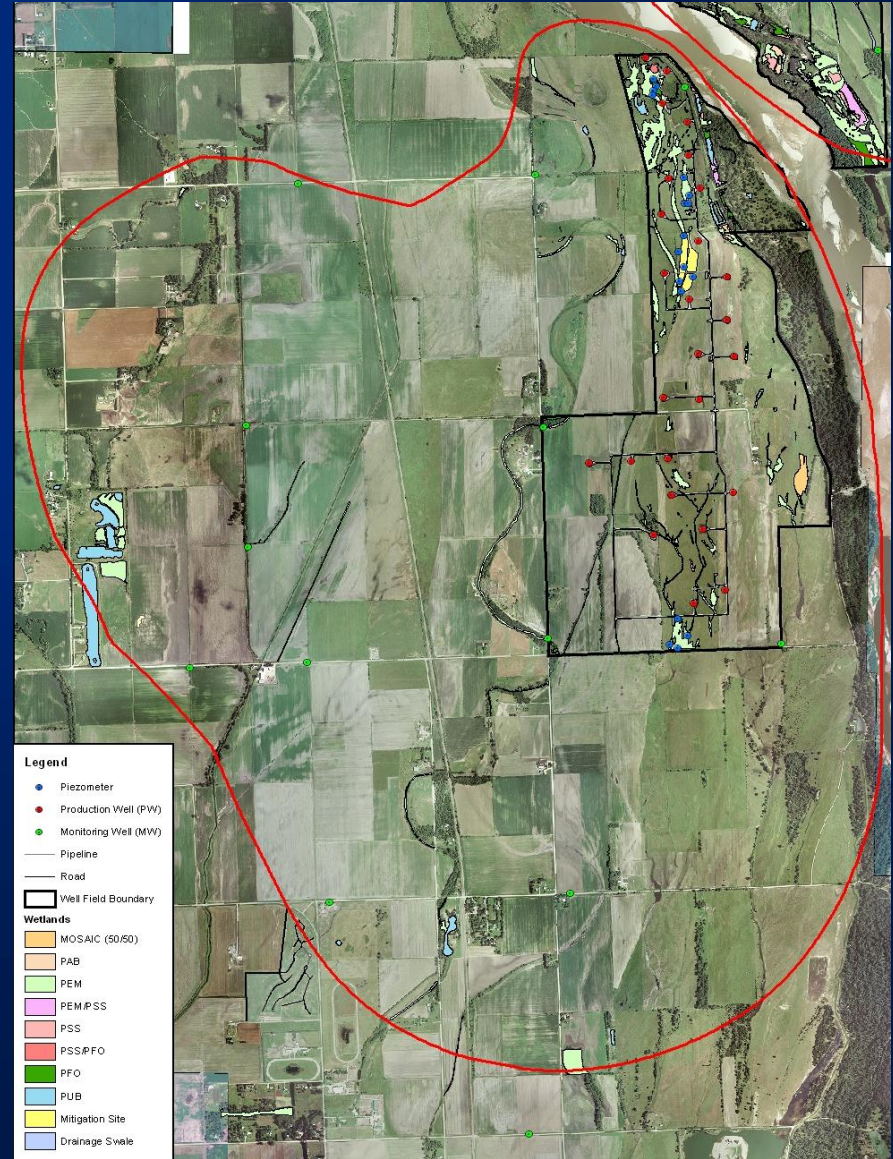
Kevin Tobin, PE
Metropolitan Utilities
District

SWS Annual Meeting • June 5, 2012

Project Location



Cones of Depression



Local Landscape



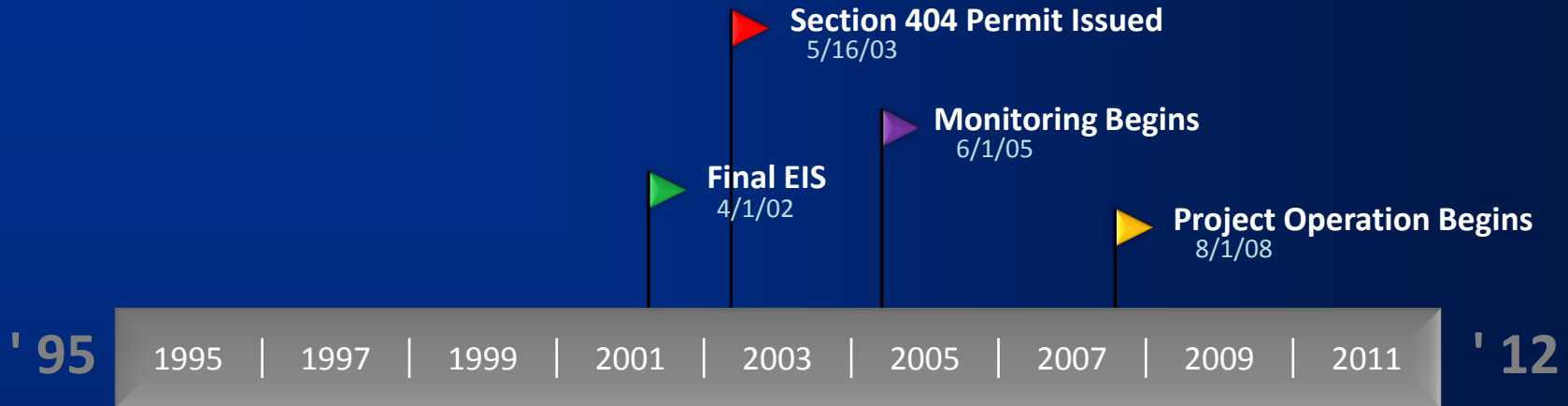
- Eastern Great Plains Wet-Meadow, Prairie, and Marsh
 - Common species found in the wet-meadow/prairie community include:
 - Prairie cordgrass (*Spartina pectinata*)
 - Switchgrass (*Panicum virgatum*)
 - Big bluestem (*Andropogon gerardii*)
 - Indiangrass (*Sorghastrum nutans*)



- Eastern Great Plains Wet-Meadow, Prairie, and Marsh
 - Common species found in the wetter areas typically include:
 - Sedges (*Carex* sp.)
 - Bulrushes (*Scirpus* sp.)
 - Cattails (*Typha* sp.)
 - Blue vervain (*Verbena hastata*)
 - Hemp dogbane (*Apocynum cannabinum*)



Project Timeline



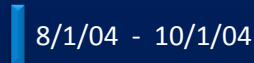
EIS Preparation



Wetland Delineation - Well Fields



Wetland Delineation - CoD



Baseline Monitoring



Operational Monitoring



Project 404 Permit

- Section 404 Individual Permit Issued May 2003
 - The Permit included over 80 conditions
- 2 types of wetland impacts
 - Direct - construction treatment plant and facilities
 - Indirect - drawdown of local water table during Project operation
 - 14.6 acres of wetland impacts estimated in the EIS (direct and indirect)



Permit Conditions

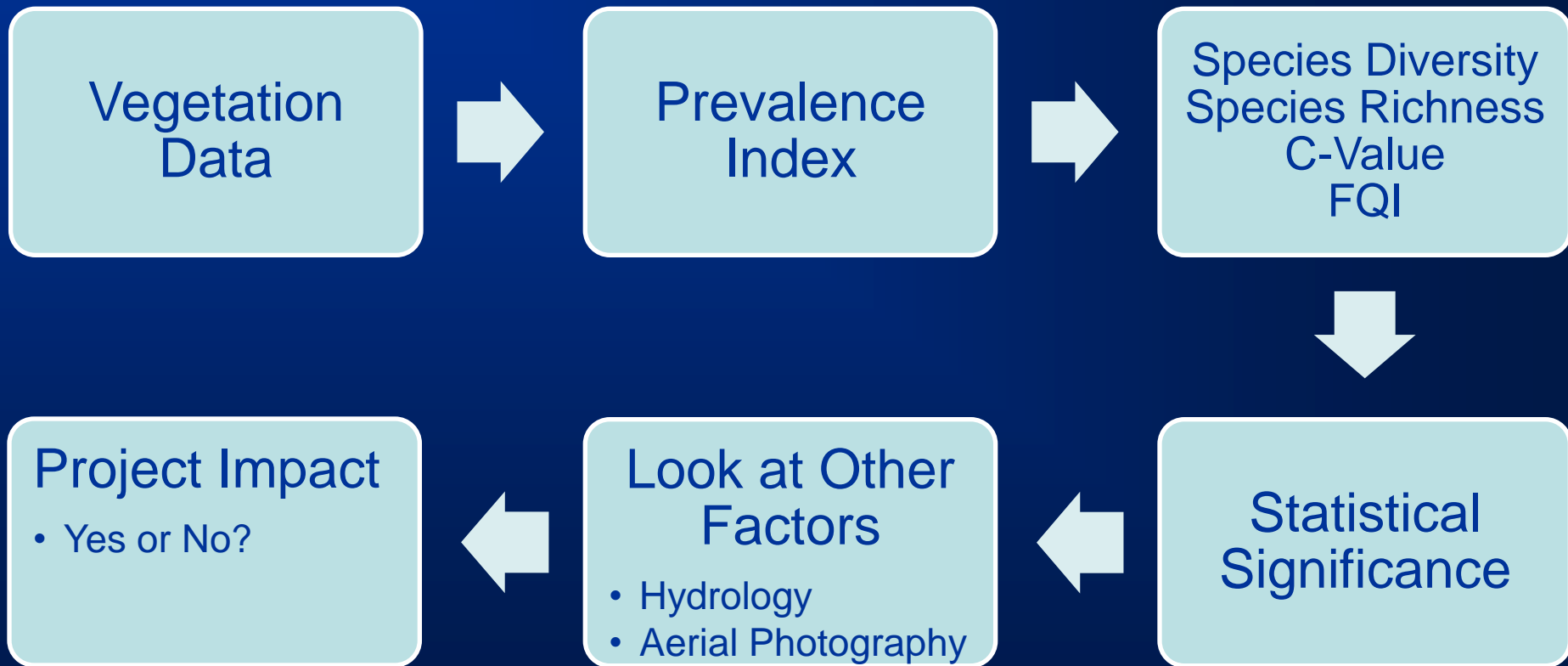
- Permit Condition 37 states:
 - *The purpose of the monitoring is to identify any changes in the existing or future wetlands or aquatic sites impacted as the result of project development and operation.*
- Impacts due to Groundwater Withdrawal



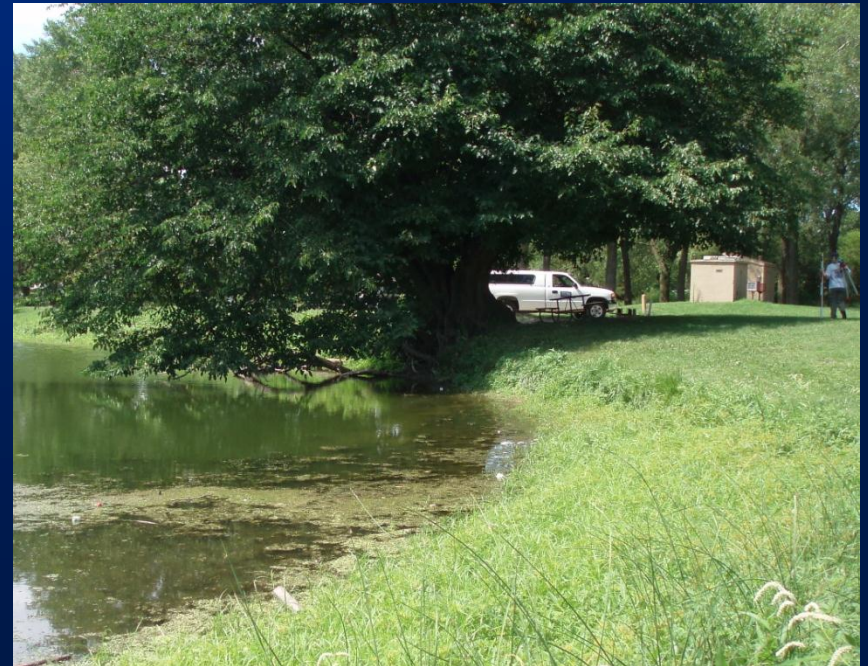
Monitoring Goals

- The monitoring plan states that monitoring is to occur two times per year until:
 - “the Corps determines that any impacts to wetlands as a result of Project operation are not likely to occur or that long-term wetland monitoring should be either decreased, increased, or stopped.”*
- Impact detection through multi-scale, multi-temporal monitoring plan

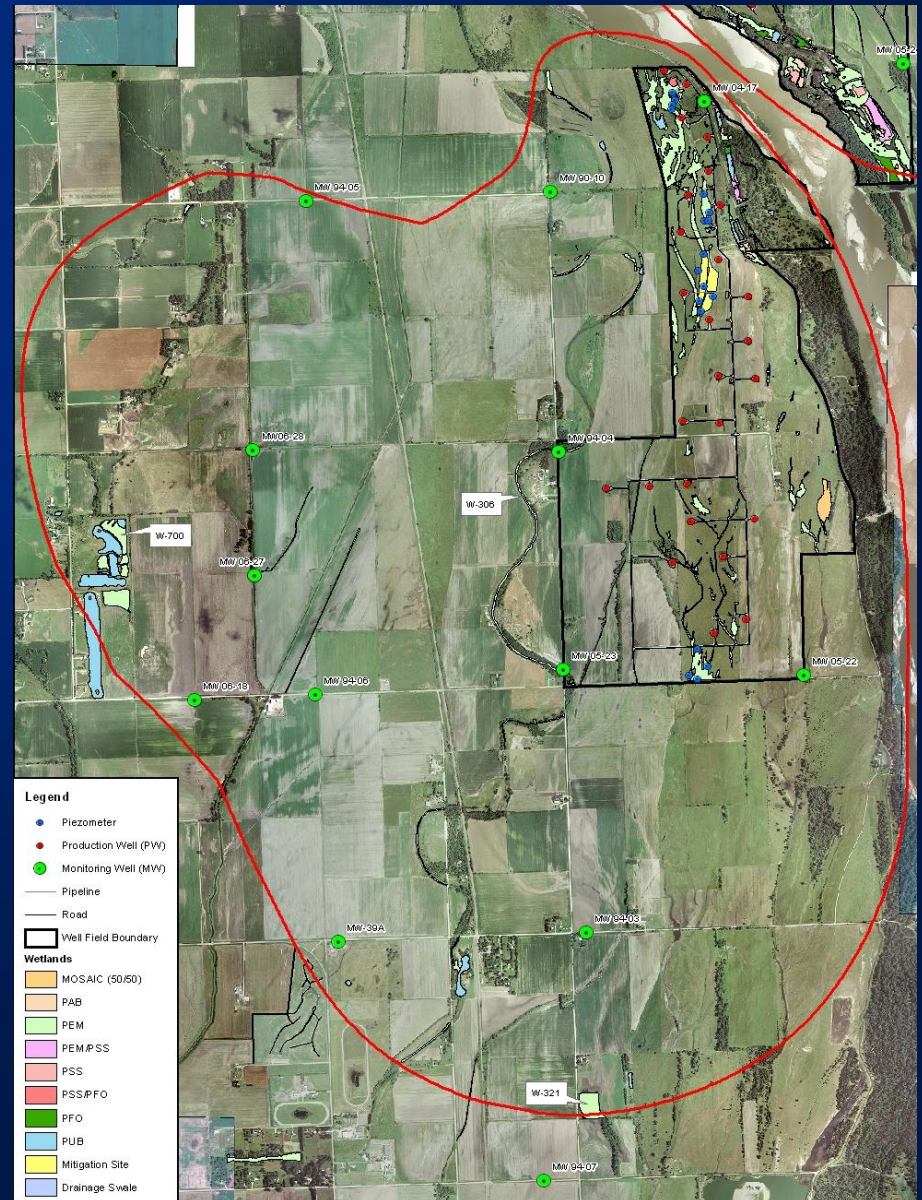
Interrelationships



- Initiated in June 2005
 - Baseline Monitoring
 - June 2005 through June 2008
 - Operational Monitoring
 - August 2008 to Present

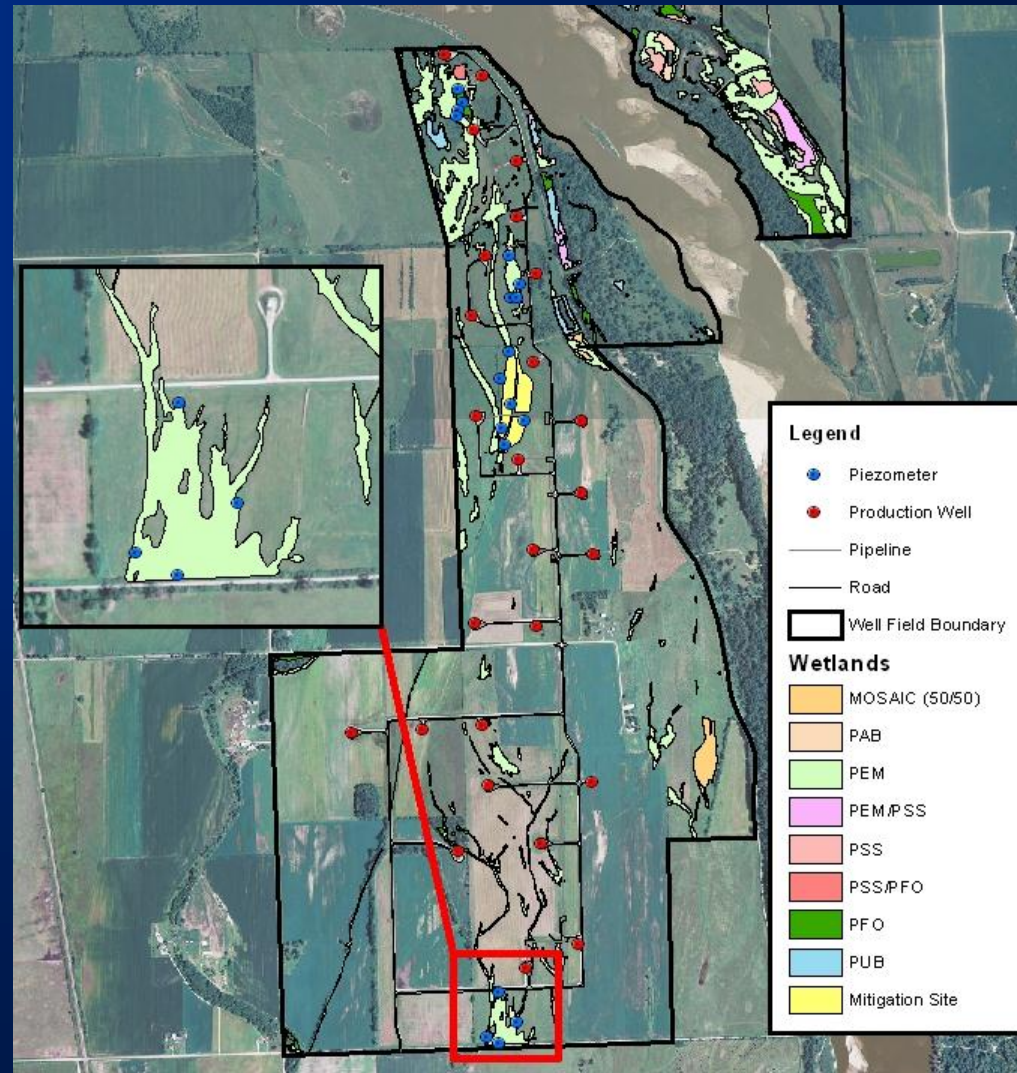


- Groundwater Monitoring in the CoD:
 - Monitoring Well Data
- Surface Water Monitoring in the CoD:
 - Pond Water Level
 - Local Precipitation and Temperature Data
 - Stream Gauge
- Aerial Photography
- Vegetation (potential)



Monitoring in the Well Fields

- Groundwater Monitoring in the Well Fields:
 - Production Well Data
 - Shallow Groundwater Piezometers
- Aerial Photography
- Vegetation



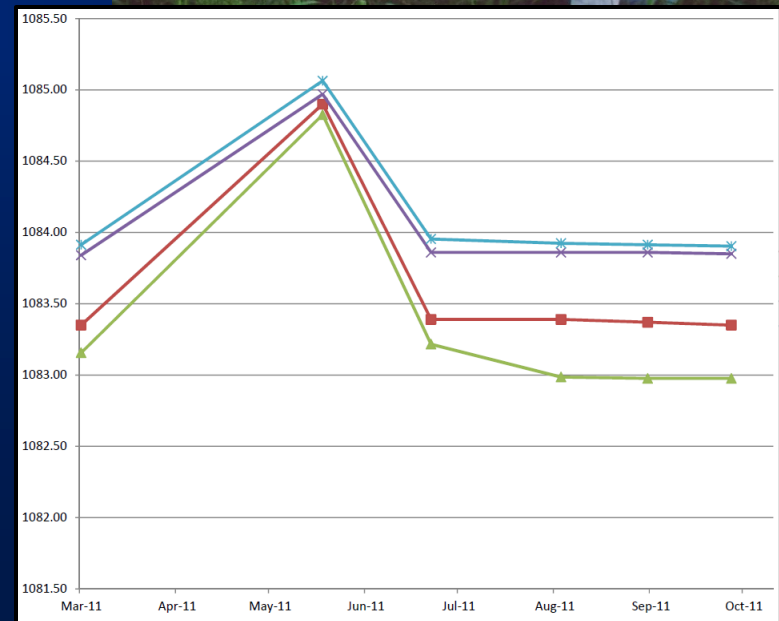
Production & Monitoring Well Data

Table 1 2011 Production Well Pumping Rates, Total Million Gallons Per Day (MGD) - Douglas County Wellfield

WELL # (PW)	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	YEARLY WELL DATA
94-2	11.67	37.57	66.80	79.39	95.62	40.92	64.87	79.65	61.43	15.93	553.85
91-3	0.00	0.00	0.00	0.00	0.00	10.20	7.73	0.00	0.07	0.01	18.01
04-4	0.00	0.00	0.00	0.00	1.07	0.00	0.61	0.51	0.52	1.24	3.95
04-5	0.00	0.00	0.00	0.00	0.56	1.83	0.74	0.59	0.88	0.00	4.60
04-6	19.38	5.12	0.00	0.00	0.00	25.30	65.89	84.27	32.84	34.04	266.84
04-7	1.90	0.00	0.00	0.00	0.37	24.67	0.00	0.00	0.00	0.00	26.94
04-8	0.00	0.00	0.00	0.00	4.18	0.00	0.06	3.54	38.55	0.12	46.45
04-9	0.00	0.00	0.00	0.00	14.91	2.26	3.04	1.74	0.04	0.00	21.99
04-10	103.00	5.21	0.04	52.11	80.03	33.91	43.03	9.73	56.42	73.12	456.60
04-11	0.00	68.94	104.58	43.54	0.19	42.96	62.66	88.83	84.51	45.66	541.87
04-12	0.79	35.50	0.00	0.00	10.83	55.95	120.37	34.34	66.83	28.01	352.62
04-13	0.65	5.46	0.00	0.00	0.00	2.26	60.07	34.33	24.99	0.00	127.76
04-14	65.54	58.99	0.00	9.80	11.18	30.47	44.69	18.41	32.03	30.10	301.21
04-15	87.50	4.38	34.93	28.46	31.17	60.34	27.23	72.72	71.16	8.10	425.99
04-16	0.64	5.59	0.00	0.00	11.14	39.67	8.10	19.12	69.80	37.76	191.82
04-17	4.82	5.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	10.07
Monthly Totals, MG	295.89	231.92	206.35	213.30	261.25	370.74	509.09	447.78	540.07	274.18	
Daily Averages, MGD	9.54	8.28	6.66	7.11	8.43	12.36	16.42	14.44	18.00	8.84	

Shallow Groundwater Piezometer

- 18 Piezometers Installed
- 7 foot, sand-point wells
- Levels measured
~monthly during the
growing season
- Data graphed over time
- Included in Annual
Reports

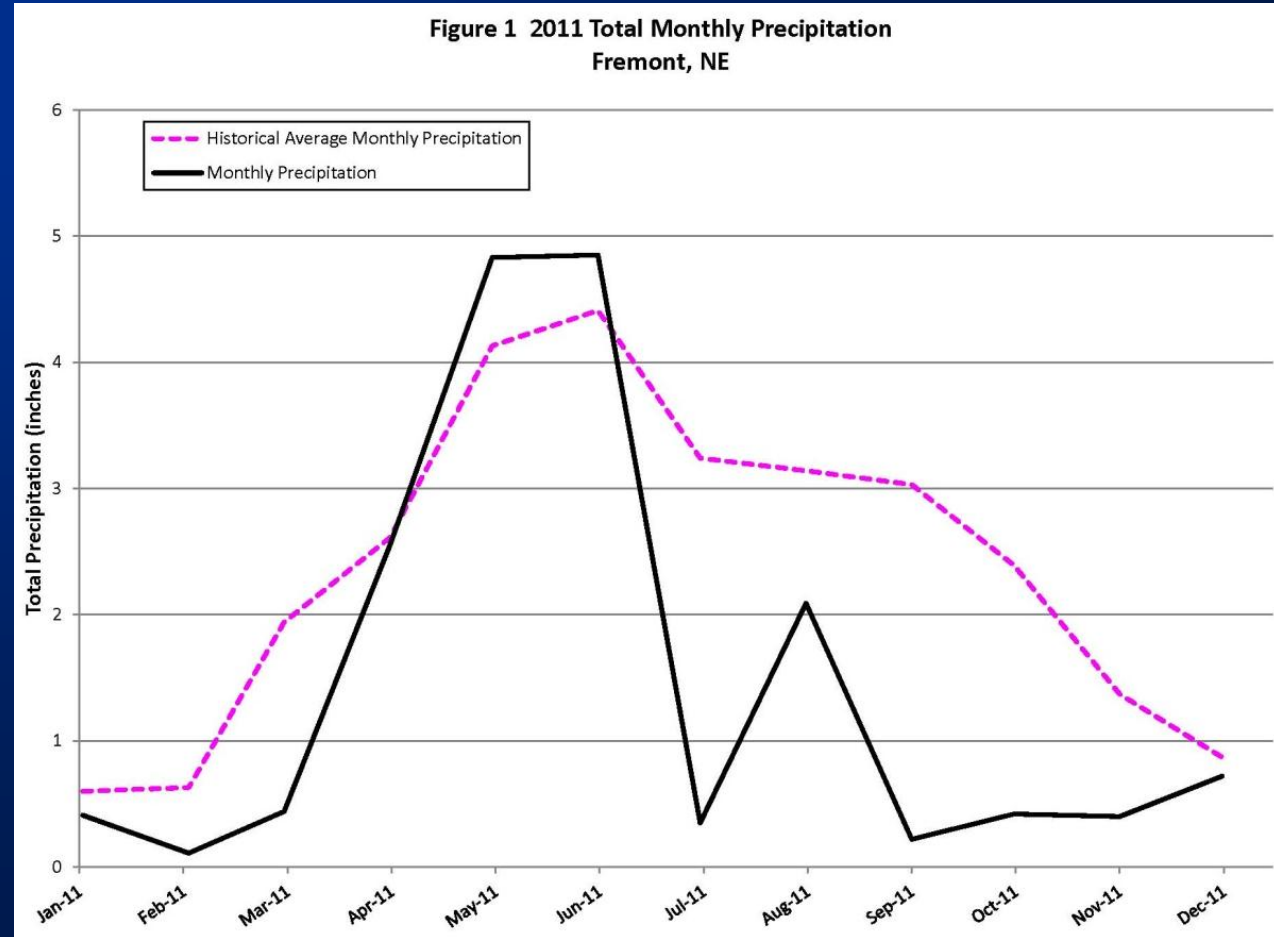


Pond Water Levels

- Annual Monitoring (Baseline and Operational)
 - 47 ponds monitored
 - 4 times yearly (March, August, September, October)
 - Annual Report



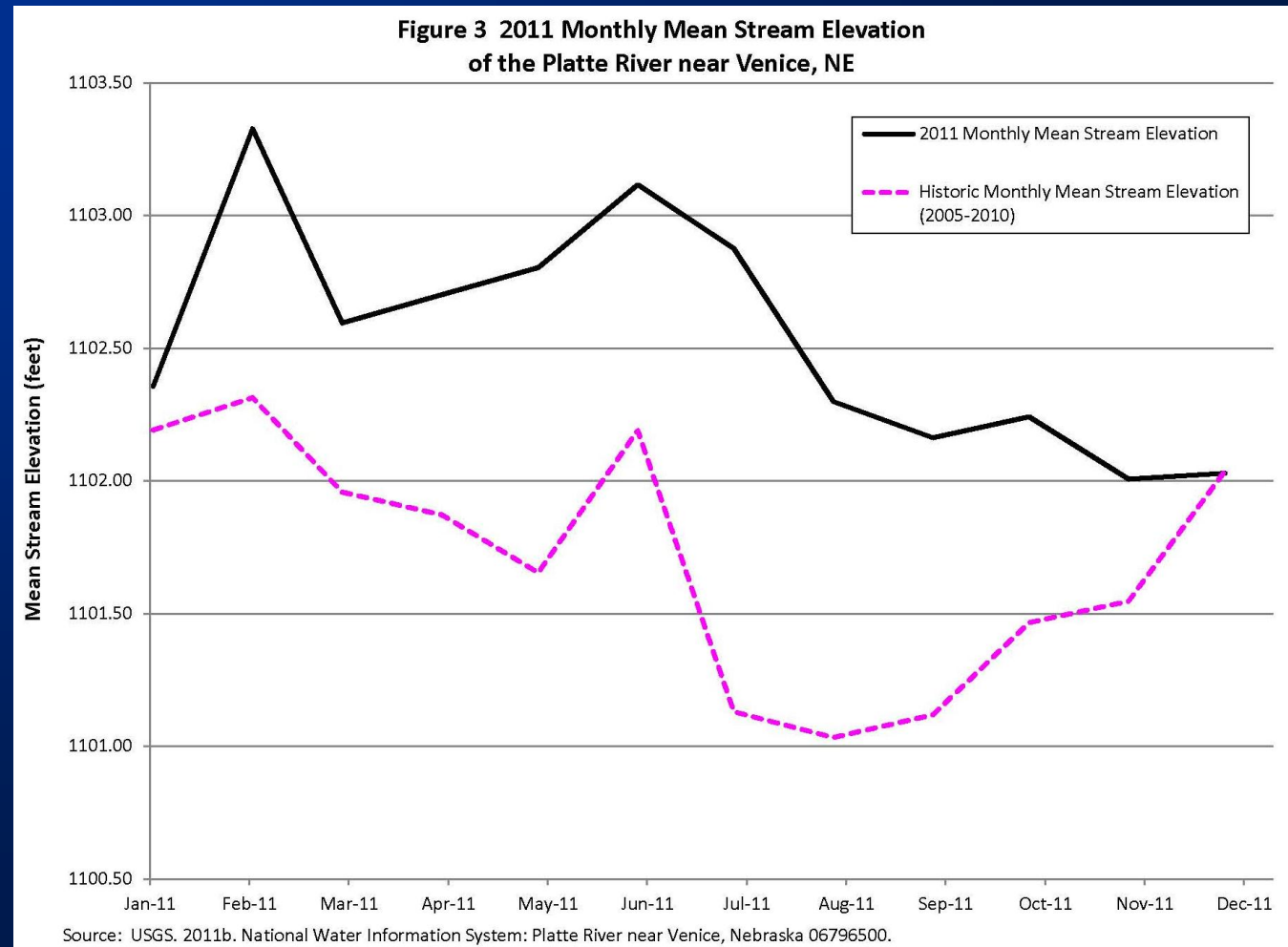
- Taken at Fremont, NE
- Monthly Averages compared to historical data



Stream Gauge Data

Taken at:
Platte River,
Venice, NE
(USGS Gauge
#06796500)

Elkhorn River,
Ashland, NE
(USGS Gauge
#06801000)



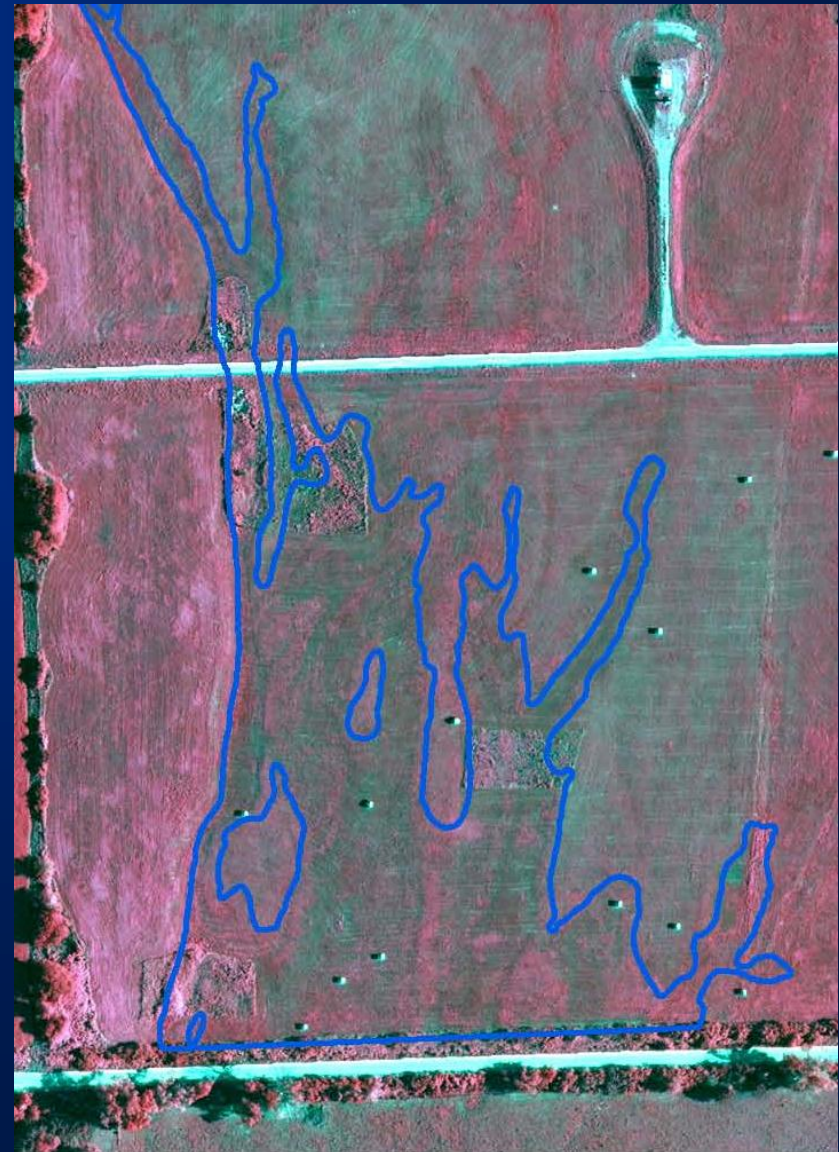
– Natural Color

- Multi-Temporal data
- Obtained annually 2005-2009
- Obtained every-other-year after 2009



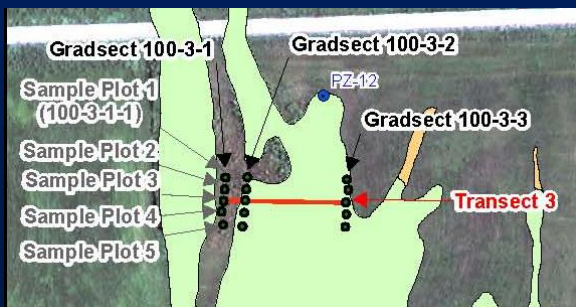
– Color Infrared (CIR)

- Multi-Temporal data
- Obtained annually 2005-2009
- Obtained every-other-year after 2009



Wetland Vegetation

- Sample plot monitoring along transects using wetland delineation methodology
- 7 monitored wetlands (primary wetlands)
 - 3 PEM, 3 PFO, 1 PSS
 - Data entered and stored in a Microsoft Access Database
 - Annual Report



Wetland Monitoring

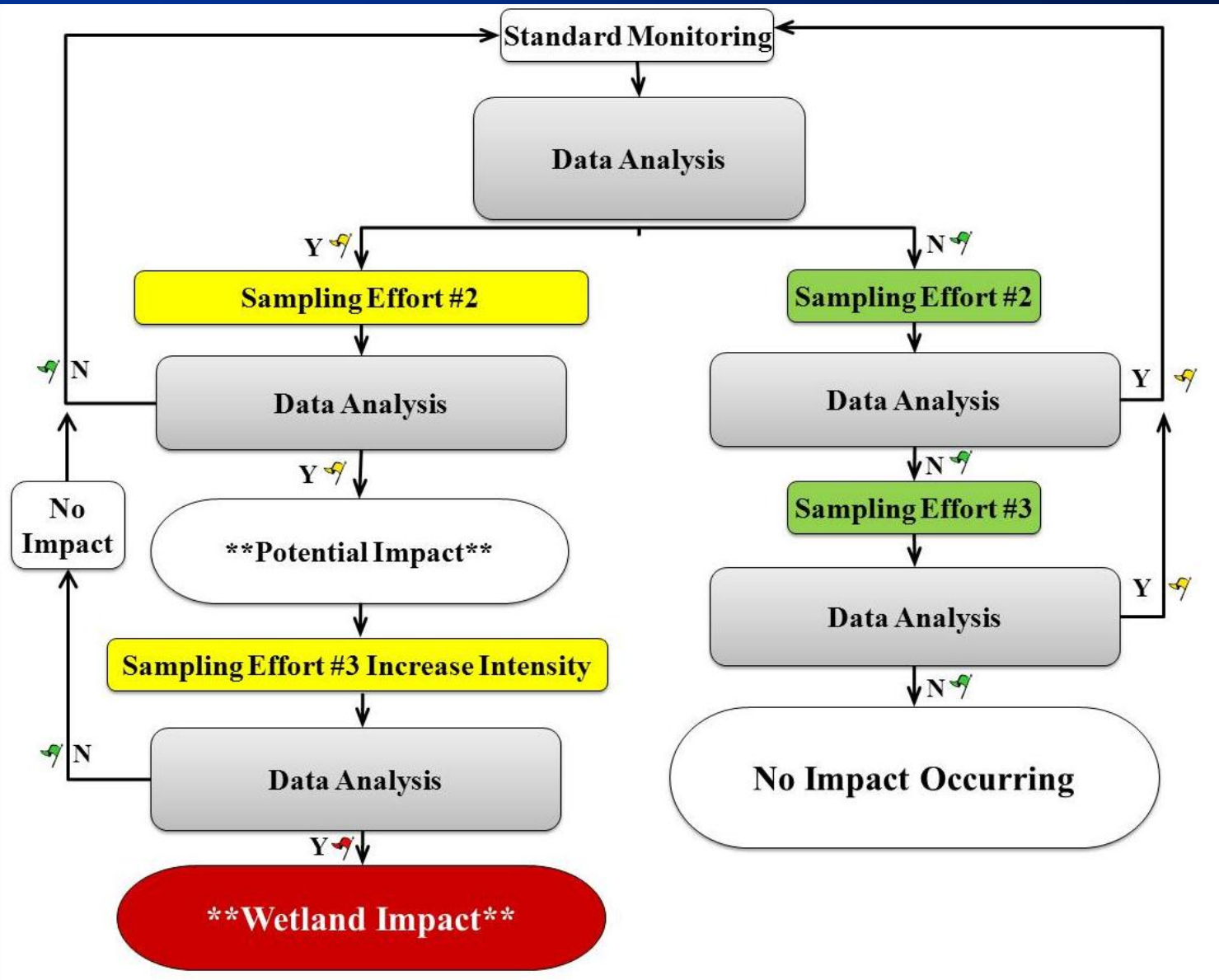
- Standard Annual Wetland Monitoring:
 - Vegetation monitoring in all primary wetlands twice per year
 - Remote monitoring in secondary wetlands using aerial photography
 - CIR Aerial photography obtained every year
 - Piezometer readings at least 5 times per year
- Data Analysis



Monitoring Goals

- What are we doing with all the data?
 - Reminder: the permit states that monitoring is to occur two times per year until:
 - *“the Corps determines that any impacts to wetlands as a result of Project operation are not likely to occur or that long-term wetland monitoring should be either decreased, increased, or stopped.”*
- Criteria needed to measure indirect impacts
- Triggers or “Thresholds” were developed

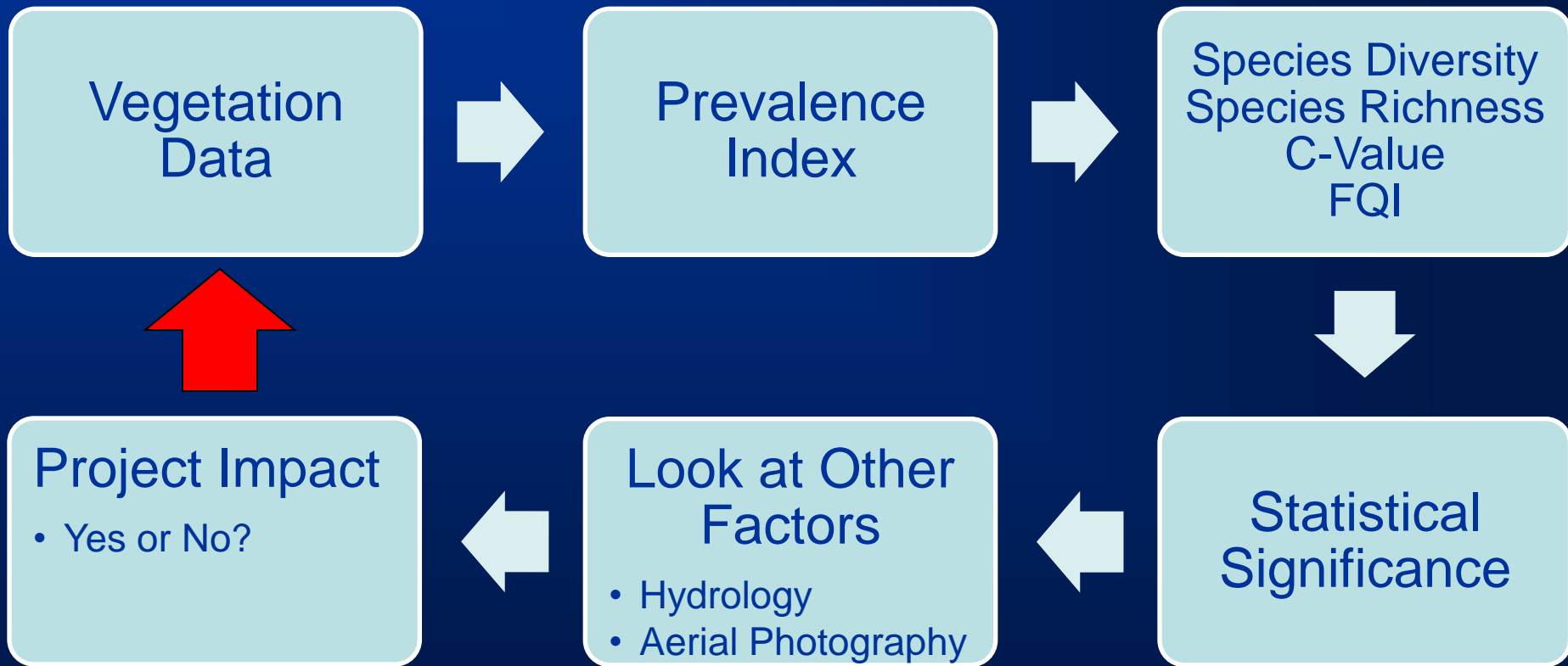
Project Thresholds



Monitoring Intensity

- Begin at Standard Annual Wetland Monitoring
- If 3 consecutive monitoring efforts show no impact (🚩), reduce level of effort
 - 3 levels of reduced monitoring established
- If 3 consecutive monitoring efforts show possible impact (🚩), increase level of effort
- At reduced levels of monitoring, fewer “flags” are needed to move from one level to the next

Interrelationships





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