

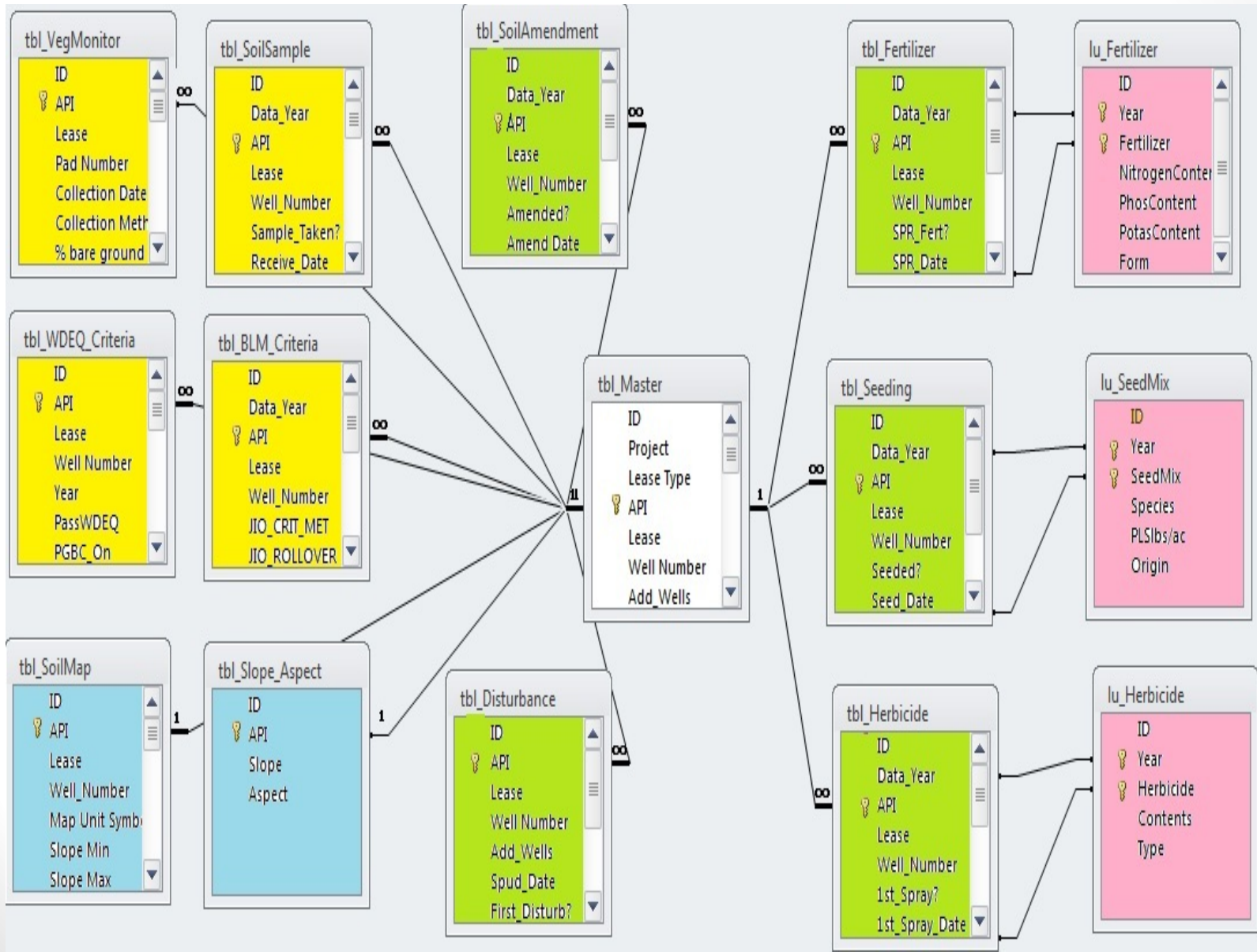
# Preliminary Results from Analyzing an Oil and Gas Reclamation Database

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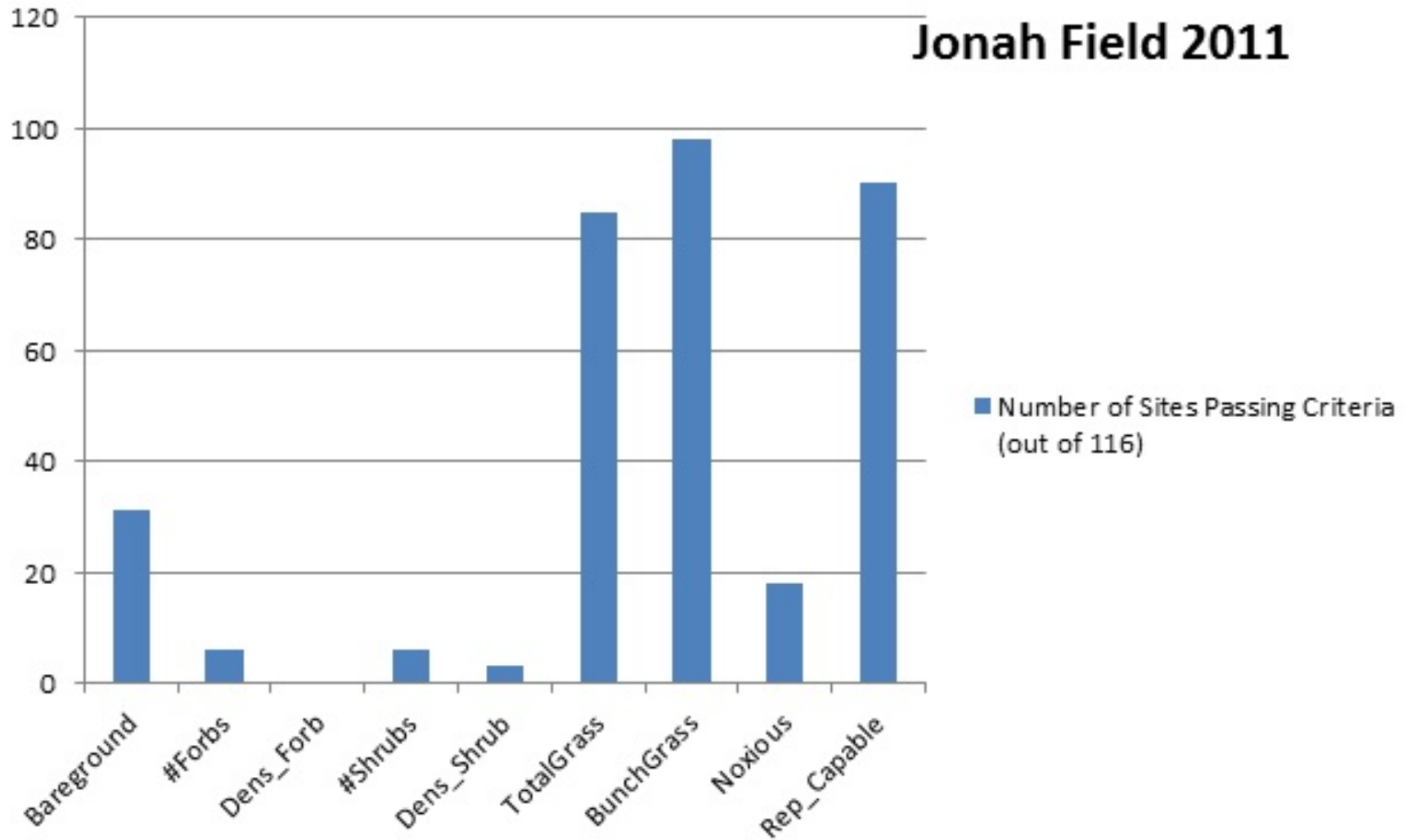
# Database Structure



# Queries

- Queries allow for data from multiple tables to be viewed together dynamically
- Examples of simple queries:
  - Combine seed information from 2005 with vegetation monitoring data from 2006
  - Isolate sites in a given soil map unit and couple them with soil sample data to compare pH
  - Combine seed information with seed look-up table to provide a quantitative report of how much lbs. of specific species' seeds were used in a given production field
- Example of a more complex query:
  - Combine slope, aspect, soil map unit, and precipitation data with seed information, soil amendment and herbicide application information over multiple years along with multiple years of veg data in effort to isolate trends

# General Findings



# Comparing Vegetation Across Field after initial seeding of “Early Seral Mix”

- In 2005, initial seeds from “Early Seral Mix” were applied to 58 sites in the Jonah field that were subsequently monitored in 2006.
- Mix composed primarily of grasses, with no shrubs and one forb
- A query combined sites receiving this seed mix, vegetation monitoring in 2006 (% Veg Cover), and soil map units was performed
- A one-way ANOVA was run to detect differences in veg cover based on soil map unit

Comparisons significant at the 0.05 level are indicated by \*\*\*.

soilunit Comparison	Difference Between Means	95% Confidence Limits		
5402 - 5203	2.523	-5.631	10.677	
5402 - 5504	11.130	1.037	21.223	***
5402 - 5332	11.495	0.496	22.494	***
5402 - 2205	12.398	0.756	24.039	***
5203 - 5402	-2.523	-10.677	5.631	
5203 - 5504	8.607	-0.159	17.374	
5203 - 5332	8.972	-0.824	18.768	
5203 - 2205	9.875	-0.637	20.387	
5504 - 5402	-11.130	-21.223	-1.037	***
5504 - 5203	-8.607	-17.374	0.159	
5504 - 5332	0.365	-11.096	11.826	
5504 - 2205	1.268	-10.811	13.346	
5332 - 5402	-11.495	-22.494	-0.496	***
5332 - 5203	-8.972	-18.768	0.824	
5332 - 5504	-0.365	-11.826	11.096	
5332 - 2205	0.903	-11.942	13.748	
2205 - 5402	-12.398	-24.039	-0.756	***
2205 - 5203	-9.875	-20.387	0.637	
2205 - 5504	-1.268	-13.346	10.811	
2205 - 5332	-0.903	-13.748	11.942	

# Comparing 3 years of seed mix treatments in same map unit

- Treatment A
  - Seeded initially in 2005 with “Early Seral Mix” and in 2006 with a different “Early Seral Mix”, not seeded in 2007
- Treatment B
  - Seeded initially in 2005 with “Early Seral Mix”, seeded in 2006 with “Late Seral Mix”, not seeded in 2007
- Treatment C
  - Seeded initially in 2005 with “Early Seral Mix”, not seeded in 2006, seeded in 2007 with “Late Seral Mix”
- A one-way ANOVA was performed to see if 2008 vegetation monitoring showed difference in %bareground

Comparisons significant at the 0.05 level  
are indicated by \*\*\*.

treatment Comparison	Difference Between Means	95% Confidence Limits		
A - C	11.339	-3.149	25.827	
A - B	14.469	0.405	28.533	***
C - A	-11.339	-25.827	3.149	
C - B	3.129	-10.348	16.607	
B - A	-14.469	-28.533	-0.405	***
B - C	-3.129	-16.607	10.348	



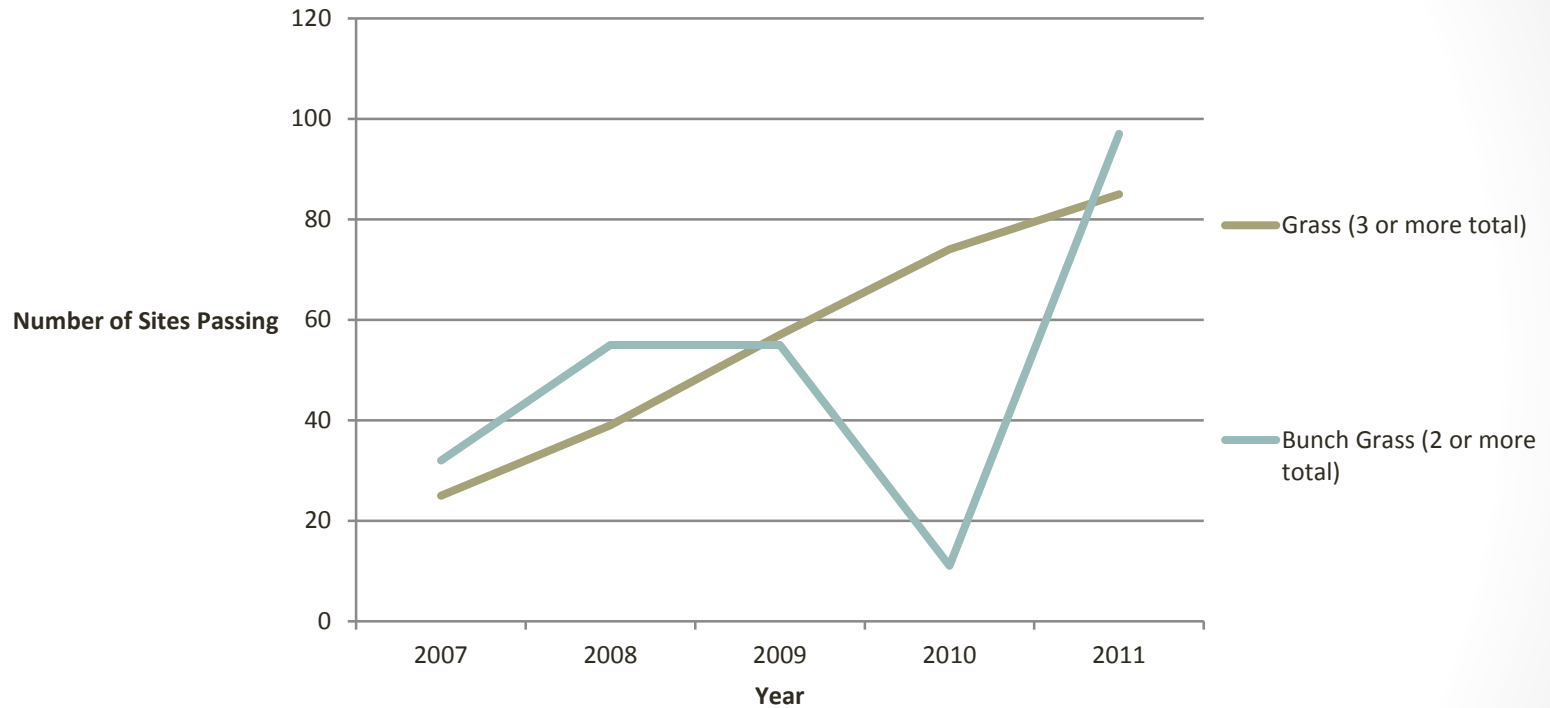
# Problems Encountered

- Data analysis
  - Lack of controls, treatments, and replicates
  - Monitoring protocol/procedures vary over years and across agencies and locations
  - Monitoring timing changes from year to year
  - Regulatory Standards vary across and amongst agencies
  - Reference sites – can be moving targets and can vary greatly in a small area
  - Qualitative vs. quantitative data – Binary vs. Gradient
  - Climate and precipitation data accuracy

Pad	Treatment	Year	PercentBG	Method
Cab5-29	A	2006	48	Ocular
Cab5-29	A	2007	74	Ocular
Cab5-29	A	2008	26.5	Modified daubenmire
Cor11-30	A	2006	57	Ocular
Cor11-30	A	2007	.	
Cor11-30	A	2008	50.5	Modified daubenmire
Cor11-31	A	2006	55	Ocular
Cor11-31	A	2007	74.5	Ocular
Cor11-31	A	2008	41.5	Modified daubenmire
Cor14-30	A	2006	57	Ocular
Cor14-30	A	2007	86	Ocular
Cor14-30	A	2008	58.75	Modified daubenmire
Shb15-15	A	2006	54	Ocular
Shb15-15	A	2007	84	Ocular
Shb15-15	A	2008	31.25	Modified daubenmire
Shb15-17	A	2006	54	Ocular
Shb15-17	A	2007	.	
Shb15-17	A	2008	44.25	Modified daubenmire
Cab13-13	B	2006	65	Ocular
Cab13-13	B	2007	89	Ocular
Cab13-13	B	2008	21.5	Modified daubenmire

UID	Designated	Data collecti	NumberFort	NumberFort	NumberShru	NumberShru	NumberGra	NumberGra	PG_Percent	PG_Percent	PF_Percent	PF_Percent
49-023-20328	Shute Creek 05	7/7/2009	1	3	2	5	4	3	22	3	0	2
49-023-22020	Shute Creek 05	7/11/2009	2	2	0	6	1	3	3		0	
49-023-21966	Shute Creek 05	7/7/2009	0	0	0	7	0	3	0		0	
49-023-20363	Shute Creek 06	7/7/2009	1	2	2	3	1	2	5	1	0	1
49-023-20424	Shute Creek 08	7/7/2009	3	3	2	5	3	3	17	17	1	2
49-023-20413	Shute Creek 09	7/11/2009	3	3	5	7	2	3	33	18	1	1
49-023-20440	Shute Creek 10	7/11/2009	2	0	1	4	1	1	2	1	0	0
49-023-20529	Shute Creek 12	7/11/2009	1	3	3	6	3	3	13	5	0	2
49-023-21797	Shute Creek 13	7/7/2009	0	2	0	4	0	3	0		0	
49-023-20781	Shute Creek 14	7/7/2009	4	2	4	5	3	3	11	15	0	1
49-023-20826	Shute Creek 15	6/11/2009	4	4	1	4	3	2	1		2	
49-023-21943	Shute Creek 15	7/11/2009	1	0	2	3	2	1	1		0	
49-023-20829	Shute Creek 16	7/7/2009	1	2	1	4	2	2	14	2	0	0
49-023-20584	Amoco Miller 1	8/9/2010							14	18	1	1
49-041-20245	Berkley Fed #1	7/29/2010							23	7	2	2
49-041-21279	Blacks Fork 1-3	7/26/2010							10	11	1	1
49-041-21297	Blacks Fork 2-3	7/27/2010							10	12	2	2
49-041-21328	Bruff 614	7/25/2010							6	10	1	1
49-023-20714	Champlin 122 A	8/12/2010							19	7	0	0
49-023-20736	Champlin 122 C	8/5/2010							20	4	1	1
49-023-21148	Champlin 122 C	9/13/2010							40	24	1	1
49-041-20141	Champlin 149 A	7/25/2010							18	10	1	1
49-041-20978	Champlin 149 A	7/25/2010							1	1	0	0
49-041-20980	Champlin 149 A	7/25/2010							4	2	2	2
49-023-21167	Champlin 149 A	8/2/2010							25	6	1	1

# Sites Passing Grass and Bunch Grass Requirements in Jonah



## Mean Collection Dates:

2007 – July 14

2008 -- June 14

2009 – July 16

2010 – June 4

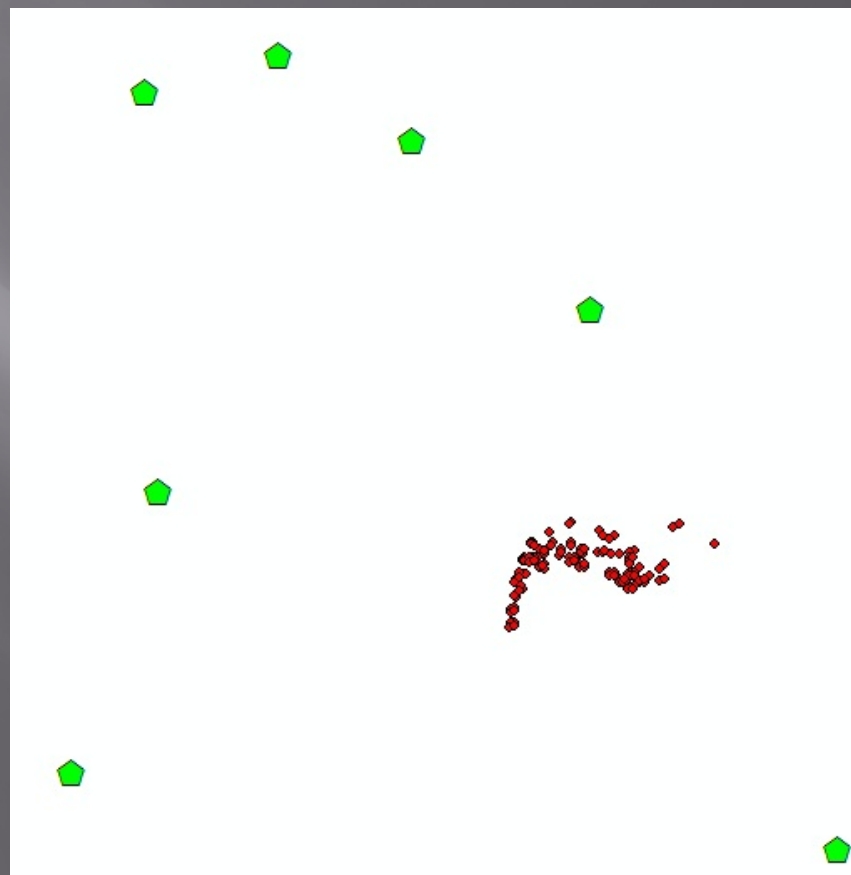
2011 – July 7

# Kemmerer BLM vs. JIO

- Jonah 2011:
  - 51 Sites pass WDEQ SWPPP Criteria (43.9%)
  - 0 Sites pass every JIO Interim Criteria (0%)
- Moxa 2011:
  - 338 Sites pass WDEQ SWPPP Criteria (54.6%)
  - 312 Sites pass Moxa ROD Interim Reclamation Criteria (50.4%)
- Cross-Query Results 2011:
  - 91 Jonah Sites pass Moxa ROD Interim Criteria (78.4%)
  - 0 Moxa Sites pass every JIO Interim Criteria

# Binary Criteria and Reference Sites

Map Unit Symbol	API	No forbs present undisturbed	No forbs present disturbed
5203	49-035-21391	1	2
5203	49-035-21425	1	0
5203	49-035-21509	7	2
5203	49-035-21548	1	0
5203	49-035-21556	4	0
5203	49-035-21557	2	0
5203	49-035-21558	5	2
5203	49-035-21585	4	1
5203	49-035-21643	3	0
5203	49-035-21667	3	0
5203	49-035-21751	3	0
5203	49-035-21764	2	0
5203	49-035-21844	7	2
5203	49-035-21856	1	0
5203	49-035-21867	3	1
5203	49-035-21899	5	4
5203	49-035-21907	6	2
5203	49-035-21918	2	3
5203	49-035-21923	3	2
5203	49-035-21942	3	0
5203	49-035-21991	4	3
5203	49-035-22066	7	5
5203	49-035-22232	2	0
5203	49-035-22233	2	0
5203	49-035-22234	1	2



# Solutions

- Increase weather stations in oil and gas field areas
- Monitoring
  - Consistent Timing – Currently working with degree day models
  - Consistent Methods
  - Consistent measurements (i.e., collect same type of data from year to year)
- More data will increase our treatment size
- More time will allow for ability to look at longer-term trends
- Select sites to be experimental controls
  - Allow us to determine if certain reclamation practices are working better than natural recruitment
- Select sites to be experimental replicates
  - Allow us to determine if certain reclamation practices are working better than other practices over given amount of time
- Unify our definition of Reclamation Success and Reclamation Success Criteria
  - Incorporate trend analysis
  - Careful selection of reference sites, allow for multiple reference sites



# Acknowledgements

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- BLM
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- WyGIS
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# Questions?

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