

Innovative Approach Using GIS to Advance Reclamation and Bond Release

June 6, 2016

Rio Franzman

Natural Resource Project Manager

SWCA[®]

ENVIRONMENTAL CONSULTANTS

Sound Science. Creative Solutions.

Presentation Overview

- Bond Release Overview
- Common Evolution of Reclamation Data
- Database Development & Capabilities
 - Why it was Developed?
 - What it Accomplishes?
- Logical Bond Release Units
- Guiding Management Decisions
- Additional Capabilities

Why?



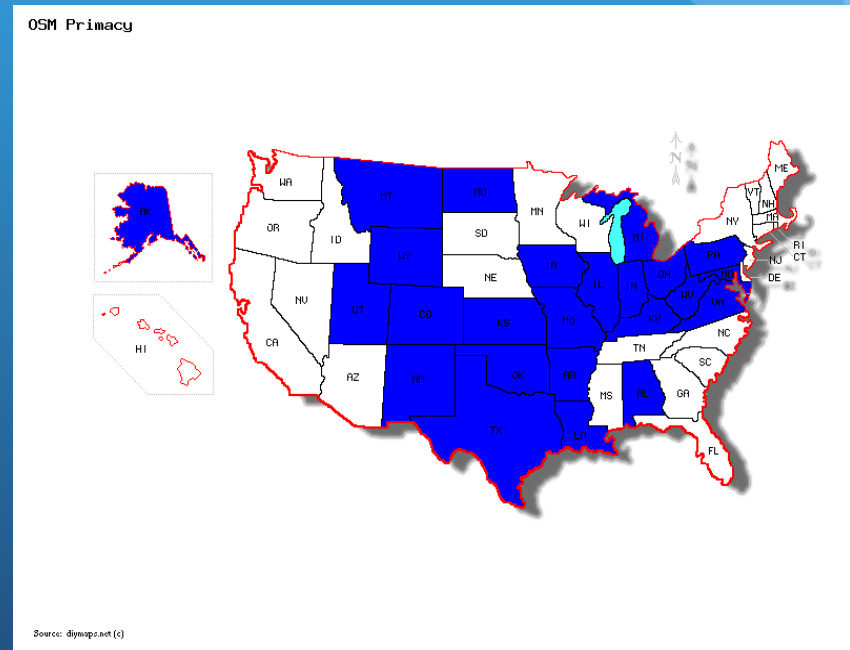
\$411,000,000 – Alpha Natural Resource
Reclamation Performance Bond

Why Cont.

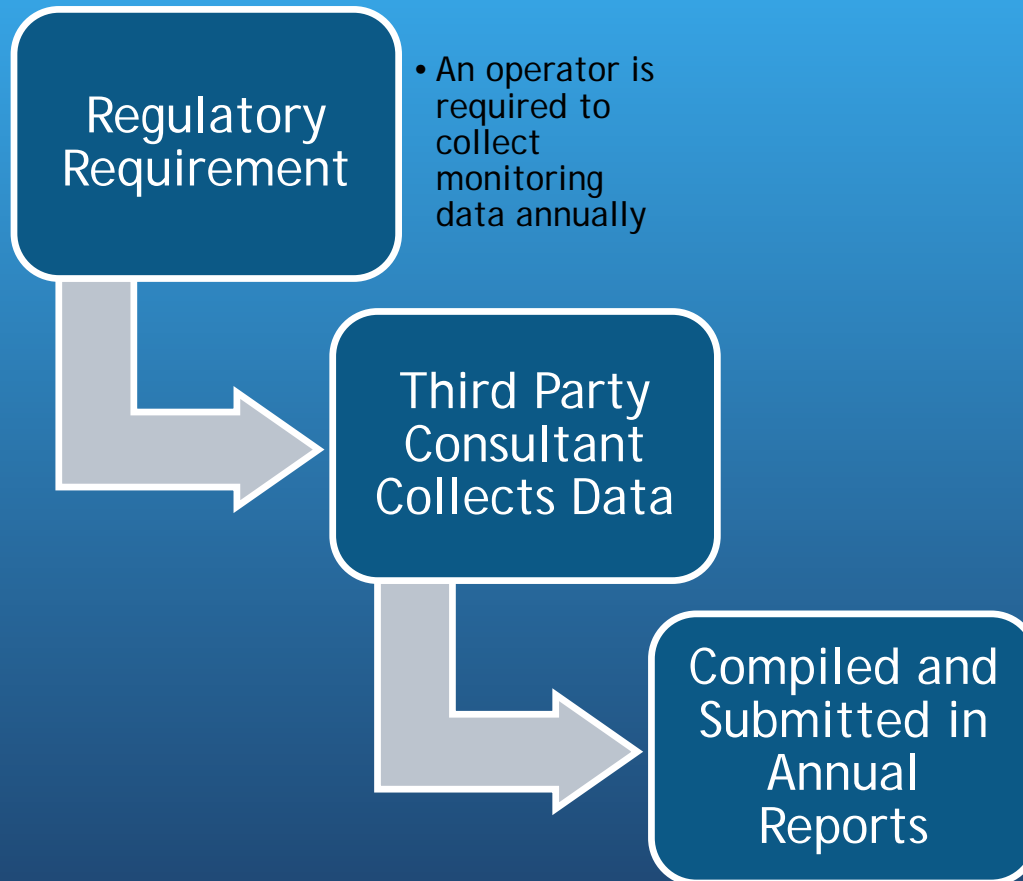
- Corporate Responsibility
- Regulatory Requirements
- Facilitate Management Decisions
 - Grazing Management
 - Weed Management
 - Normal Husbandry Practices

Understanding Bond Release

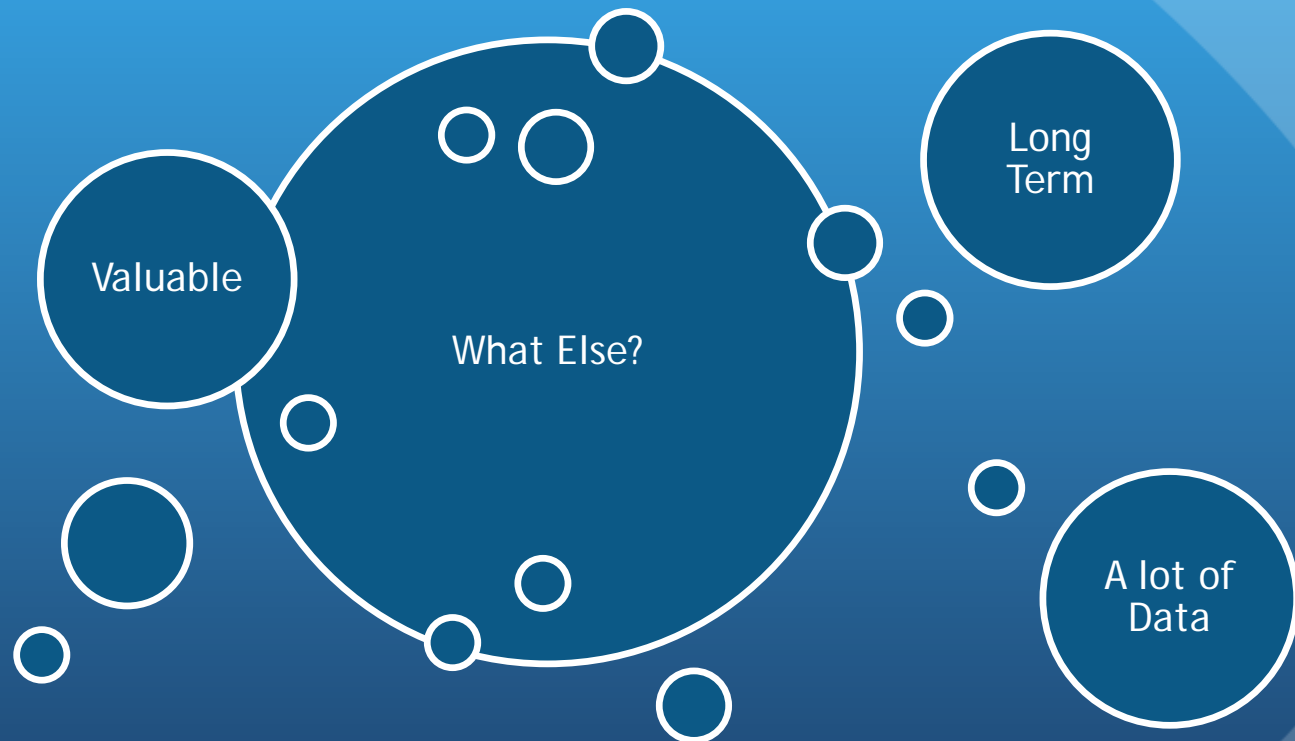
- Office of Surface Mining
 - SMCRA 1977
 - Phase I - Rough Back Fill
 - Phase II - Topsoil/Seeding
 - Phase III - Revegetation Success
- State Primacy
 - 24 States



Common Evolution of Reclamation Data



The Idea Behind The Database



Why Use ArcGIS?

- Visual Assessment of Collected Data
 - Color Coded
- Facilitates Landscape Level (Mine-Wide) Management
- Toggle On/Off Layers Easily

Easy Color Coded Display

Green

- Data at or Above Reference Area or Regulatory Requirement

Yellow

- Data Within 20% of Reference Area or Regulatory Requirement

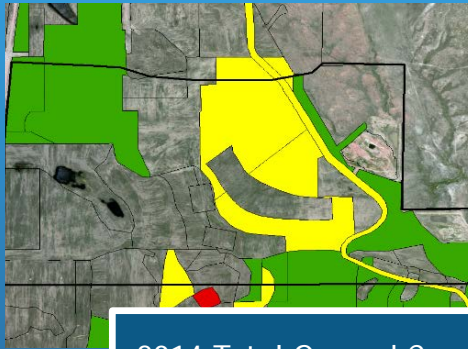
Red

- Data Below 20% of Reference Area or Regulatory Requirement

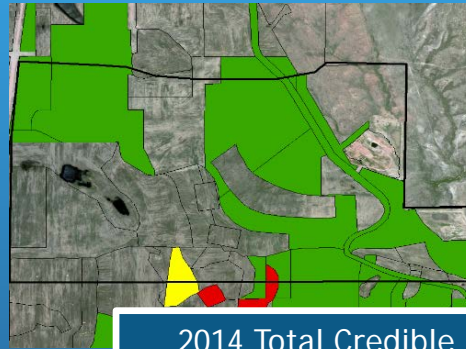
Metrics We Monitored

- Centered around WDEQ Category 5 Phase III Revegetation Success Verification
 - Cover
 - Total Credible Vegetative Cover
 - Total Ground Cover
 - Production
 - Species Diversity & Composition
 - Shrub Density

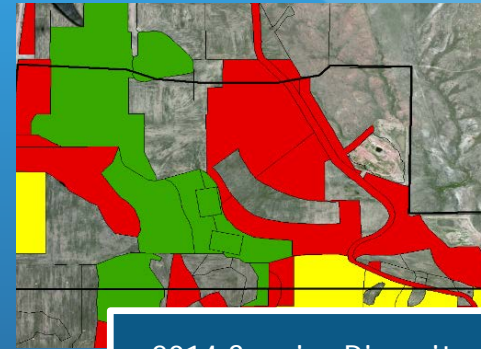
Visual Representation of Quantitative Data



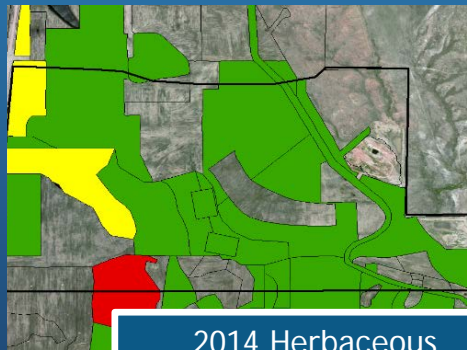
2014 Total Ground Cover



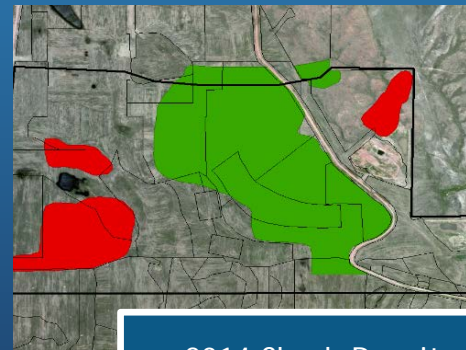
2014 Total Credible Vegetation



2014 Species Diversity



2014 Herbaceous Production



2014 Shrub Density

Quantitative Data

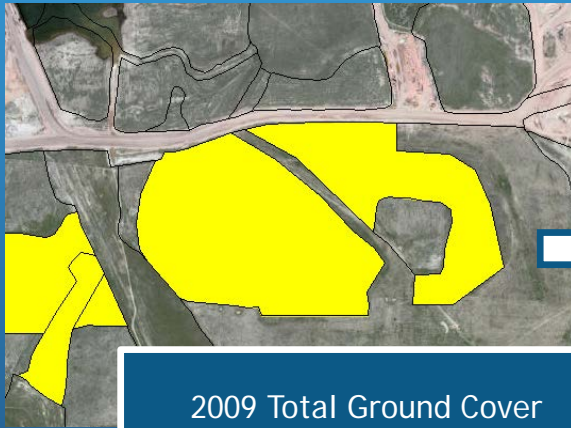
TGC_Multi_Year_Samples

Monitoring	FID	Shape *	LAYER	Acres	Rec_Block	2009TGC	2010TGC	2011TGC	2012TGC	2013TGC	2014TGC	2015_TGC_1	Change
MU-6	0	Polygon	Perm Grassland Prior	15.180542	RPR-S04-011	95		94.6					-0.4
MU-1	1	Polygon	Perm Shrublands Prior	48.84187	PR-S00-2	86.7		94					7.3
MU-6	2	Polygon	Perm Shrublands Prior	43.691366	RPR-S04-001	89.2		93.6		87			4.4
MU-6	3	Polygon	Perm Shrublands Prior	12.905326	PR-S06-4	86				91			5
MU-5	4	Polygon	Perm Grassland Prior	34.594611	PR-S07-16		90.4		83.5				-6.9
MU-3	9	Polygon	Perm Grassland Prior	21.213651	PR-F95-1		90		90				0
MU-3	11	Polygon	Perm Shrublands Prior	46.677947	PR-S91-2		82.4		89.3				6.9
MU-3	12	Polygon	Perm Shrublands Prior	74.396229	PR-S95-2	85.25			98.5				13.25
MU-1	13	Polygon	Perm Grassland Prior	84.290345	PR-S96-5		94.8	91					-3.8
MU-4	15	Polygon	Perm Shrublands Prior	10.592021	PR-S00-4		99		87				-12
MU-1	17	Polygon	Perm Grassland Prior	7.128981	PR-F99-8	86		100					14
MU-12	23	Polygon	Perm Grassland Prior	91.839157	PR-F09-2				54.6	84			29.4
MU-7	27	Polygon	Perm Shrub Mosaic Prior	17.725286	PR-S96-6		95	100					5
MU-5	28	Polygon	Perm Shrublands Prior	20.304314	PR-F99-1	96			89				-7
MU-7	29	Polygon	Perm Shrublands Prior	6.701958	PR-F99-2	99.3		82.5					-16.8
MU-7	30	Polygon	Perm Shrublands Prior	16.808375	PR-F99-2	99.3		82.5					-16.8
MU-7	31	Polygon	Perm Shrublands Prior	37.384128	PR-S00-3	98.5		96.7					-1.8
MU-7	32	Polygon	Perm Grassland Prior	48.912073	PR-F05-4		79	80					1
MU-7	33	Polygon	Perm Grassland Prior	29.580536	PR-F05-5		94.6	94					-0.6
MU-7	34	Polygon	Perm Grassland Prior	23.949268	PR-S06-2		93	100					7
MU-7	35	Polygon	Perm Grassland Prior	31.372784	PR-S06-3		85.3	91					5.7
MU-7	36	Polygon	Perm Shrublands Prior	60.283248	PR-S08-1		79.6	84					4.4
MU-7	37	Polygon	Perm Grassland Prior	1.89414	PR-S08-9		82	90					8
MU-7	38	Polygon	Perm Grassland Prior	38.678738	PR-S01-1		96.5	98					1.5
MU-7	39	Polygon	Perm Grassland Prior	10.203309	PR-S05-6	90		93					3
No MU assigne	40	Polygon	Perm Shrublands Prior	1.901258	RPR-F03-014	100	98						-2
No MU assigne	41	Polygon	Perm Grassland Prior	3.853044	RPR-F03-015	82	72						-10
No MU assigne	42	Polygon	Perm Shrublands Prior	14.779271	RPR-F03-013	94	77.4						-16.6
No MU assigne	43	Polygon	Perm Grassland Prior	1.447941	RPR-S06-002	90	90						0
MU-6	44	Polygon	Perm Grassland Prior	1.862862	RPR-S06-001	78	84						6
MU-3	46	Polygon	Perm Shrublands Prior	15.358861	PR-S95-1	85			90				5

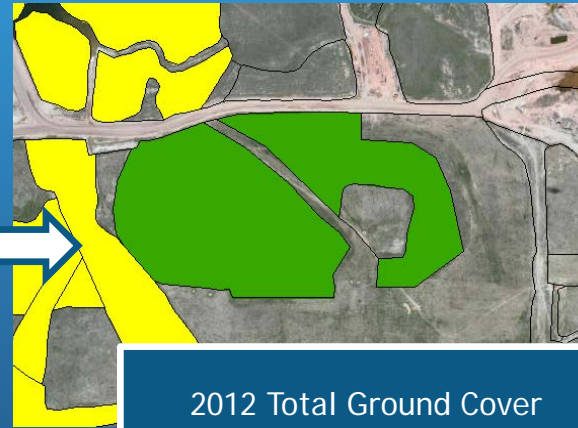
1 (0 out of 47 Selected)

TGC_Multi_Year_Samples

Tracking Trends



2009 Total Ground Cover



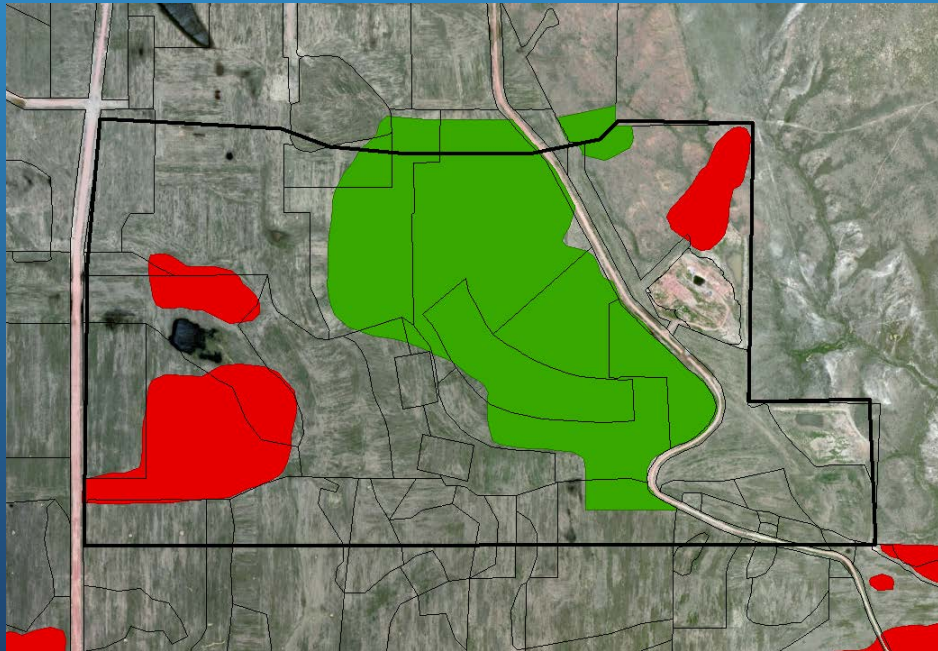
2012 Total Ground Cover

Development of Logical Bond Release Units

- What is a Logical Bond Release Unit?
- Expansion of Logical Bond Release Units
- Start with the Limiting Factor
 - Shrub Density

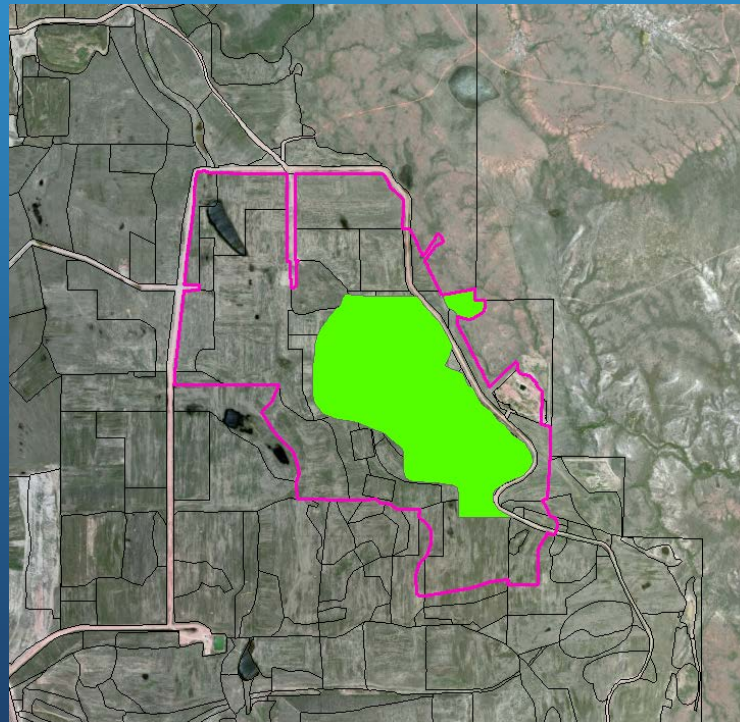
Step 1 – Identify a Shrub Patch that Meets or Exceeds Phase III Requirements

- Shrub Patch is 179 acres with a Density of 2.75 Shrubs per meter squared.

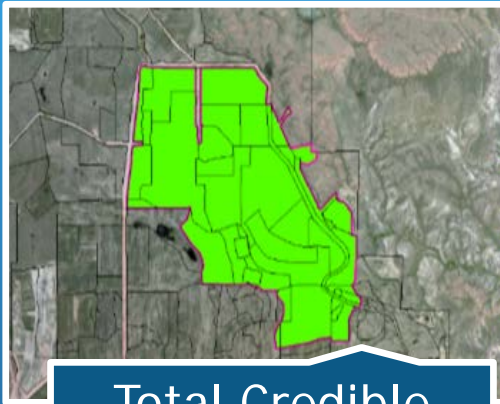


Step 2 - Extrapolate the Acreage to Meet the 1 Shrub per Meter Squared Standard.

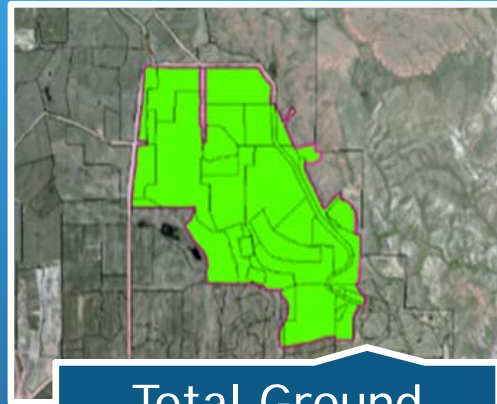
- 179 Acres multiplied by 20% (Shrub Standard)



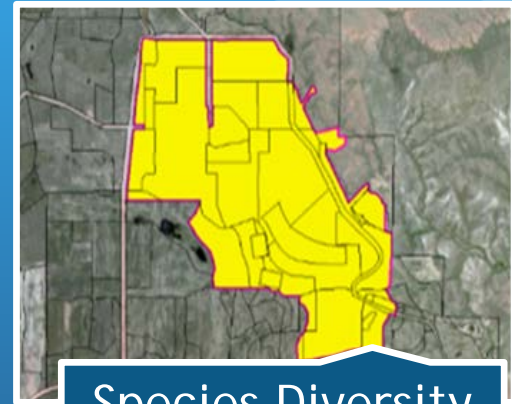
Step 3 - Verify Remaining Phase III Bond Release Requirements for the Bond Release Unit



Total Credible
Vegetation Cover



Total Ground
Cover



Species Diversity
& Composition

We Can See the Only Key
Metric Below Reference is
Species Diversity &
Composition

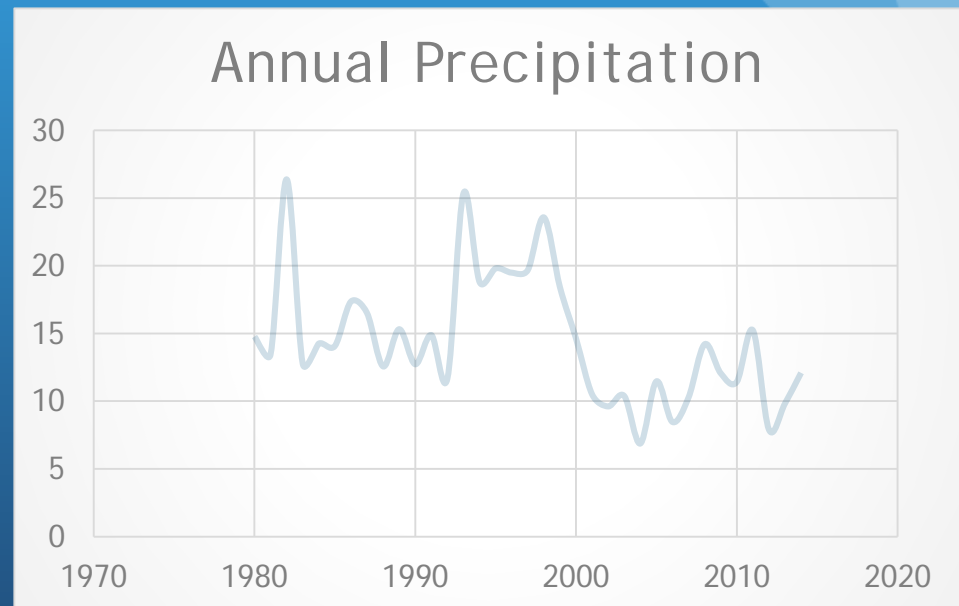
Management Decisions

- When the Mine is Ready for Bond Release
- Normal Husbandry
 - Interseeding
 - Livestock Grazing
 - Mowing
 - Haying
 - Fertilizing
 - Weed Control
 - Fencing
- Reseeding



Ancillary Data

- Weather and Precipitation
- Seed Mixture
- Problem Areas
 - Weed Infestations
 - Bare Ground Areas
- Soil Attributes & Depth
- Tree Replacement
- Permanent Transect Locations



Notes on How Database Was Prepared

- Data Compared to Same Year's Reference Area.
- Data Attached to Individual Reclamation Polygons
 - Allows Units to be Compared and Combined
- More than Individual Verifications
- Additional Layers Added
 - Seed Mixture
 - Precipitation
 - Monthly
 - Quarterly
 - Yearly

Questions?

Rio Franzman
rfranzman@swca.com
832-998-7376