

Determining Stable Yield Zones

Randy Taylor, Oklahoma State
University

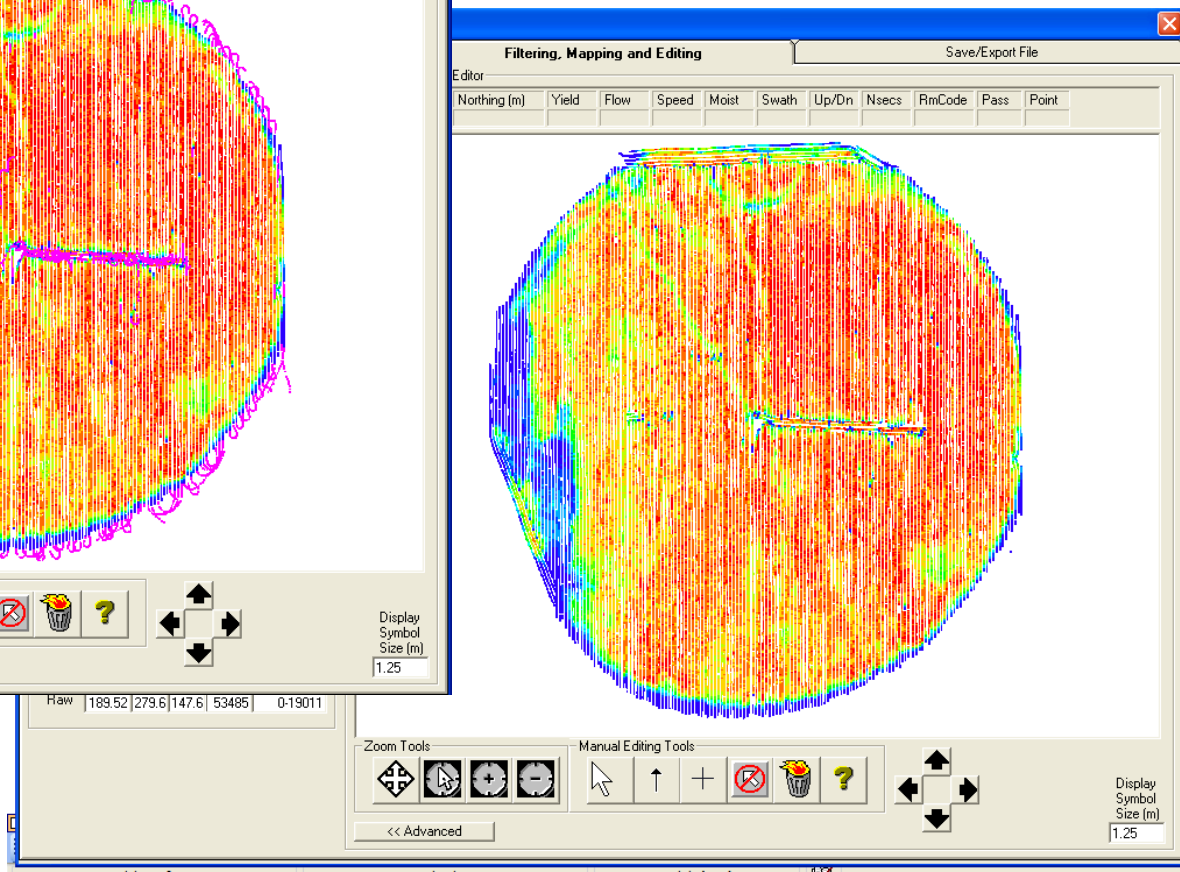
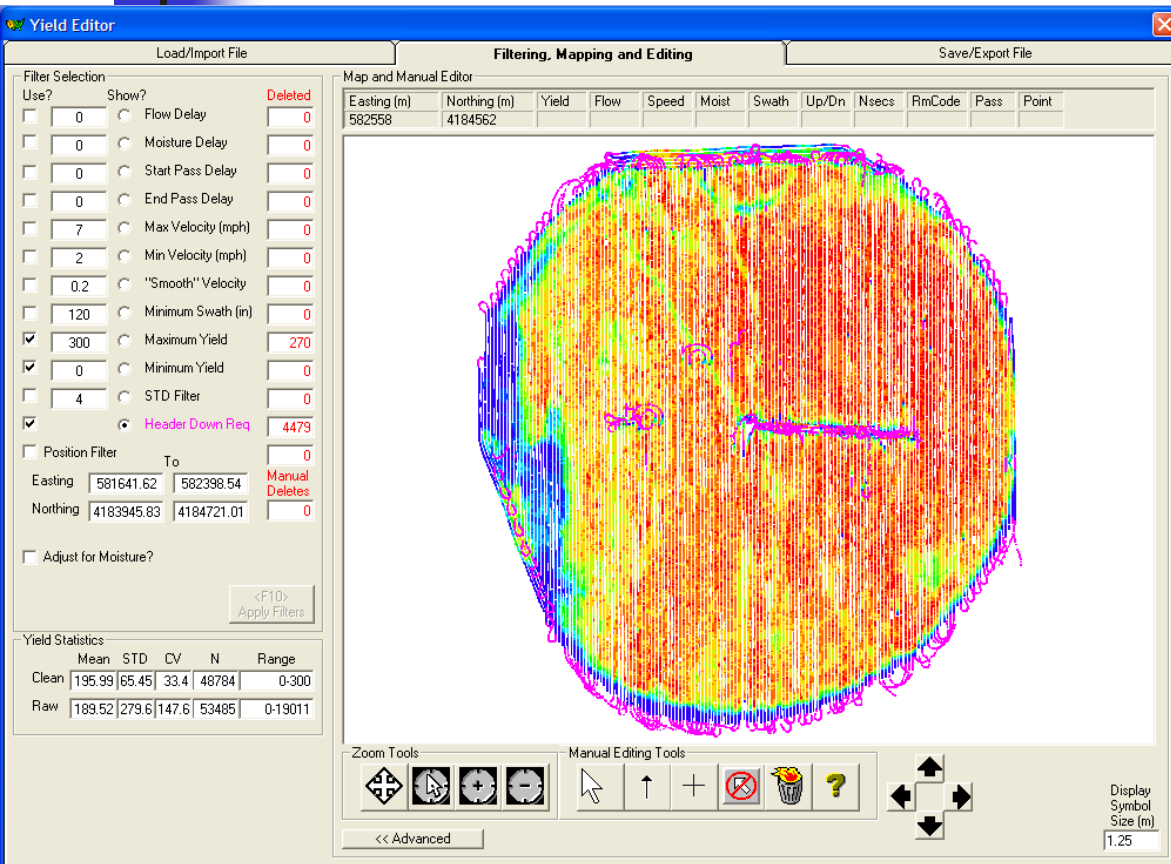
Lucas Haag, Kansas State University



Methods

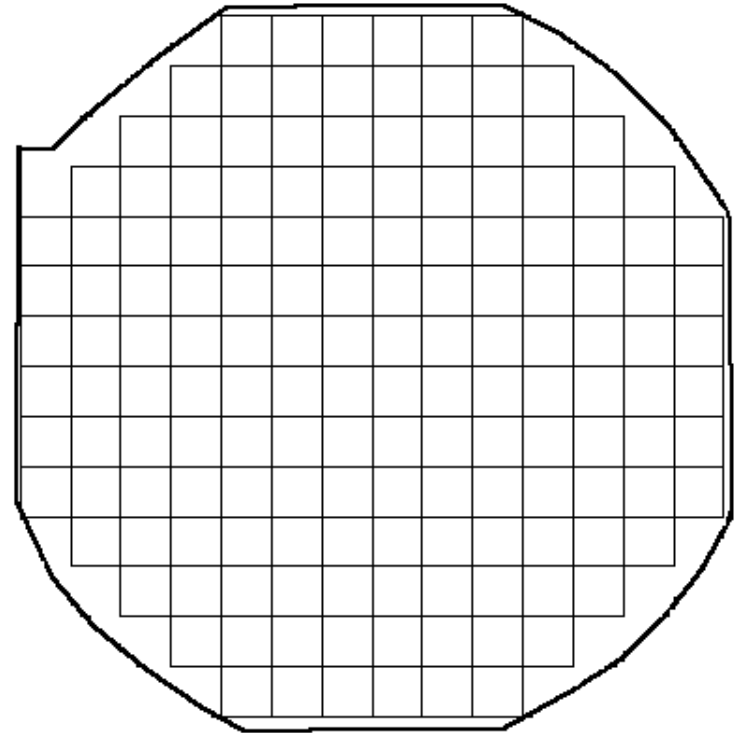
1. Clean/Filter raw yield monitor data and create grid/cell data
2. Normalize data for each individual field/year/crop
3. Average normalized data over years/time
4. Determine consistency across time
5. Aggregate cells into zones

USDA Yield Editor



Filter and Convert to Cell Data

- Filter to remove unrealistic yield values
- Determine an appropriate cell size to aggregate data
 - Averaging
 - Interpolation

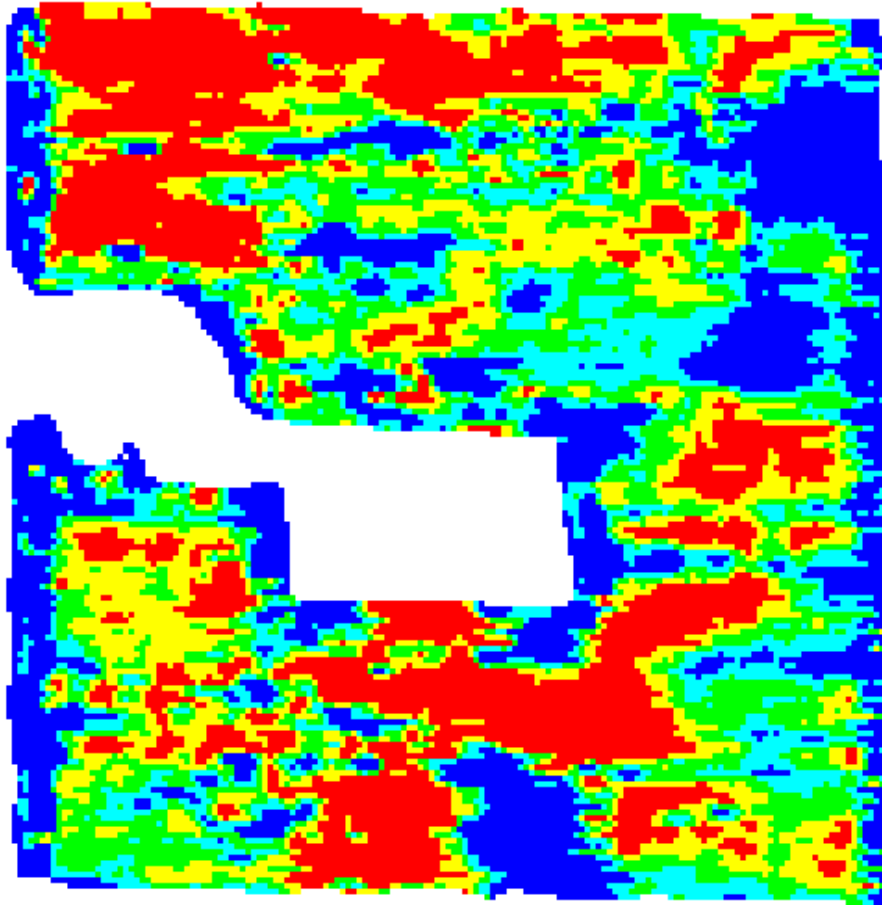


What is a normalized yield map?

- A normalized yield map is created by dividing actual yield values by the average
- Average yielding areas are 100%
- Allows comparison of different crops and different years



Normalized Yield (96-97)



■	0.00	to	0.85
■	0.85	to	0.95
■	0.95	to	1.05
■	1.05	to	1.15
■	1.15	to	2.00



Mean Relative Difference

- A relative difference ($\delta_{i,j}$) was calculated for each cell and year.

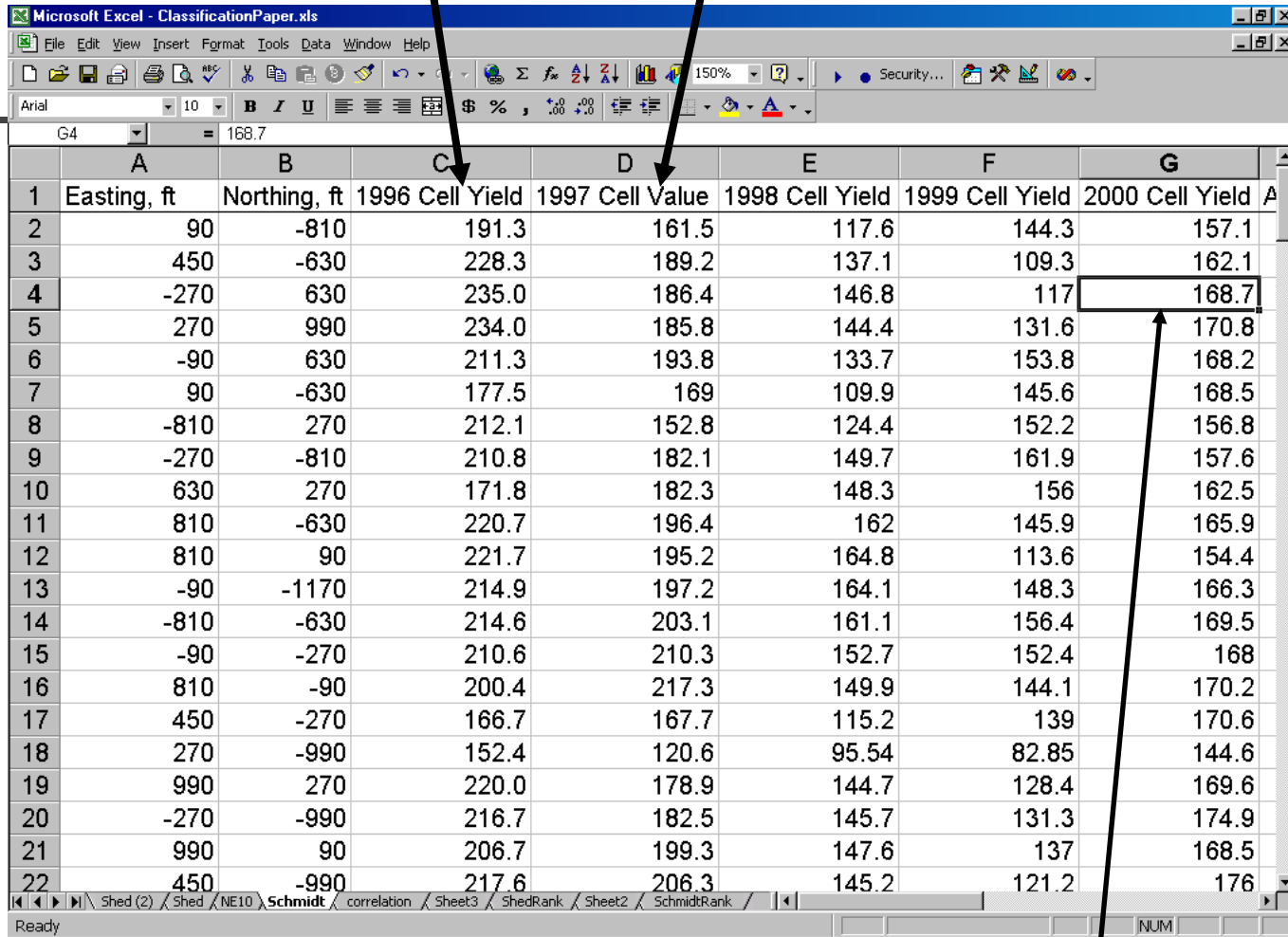
$$\delta_{i,j} = \frac{Y_{i,j} - \bar{Y}_j}{\bar{Y}_j}$$

- The mean relative difference
- calculated across years

Now average cells are zero

$$\delta_i = \frac{1}{n} \sum_{j=1}^n \delta_{i,j}$$

$\bar{Y}_j$ is average yield for year j



Microsoft Excel - ClassificationPaper.xls

File Edit View Insert Format Tools Data Window Help

100% 150%

Security...

Arial 10 B I U

G4 = 168.7

	A	B	C	D	E	F	G
1	Easting, ft	Northing, ft	1996 Cell Yield	1997 Cell Value	1998 Cell Yield	1999 Cell Yield	2000 Cell Yield
2	90	-810	191.3	161.5	117.6	144.3	157.1
3	450	-630	228.3	189.2	137.1	109.3	162.1
4	-270	630	235.0	186.4	146.8	117	168.7
5	270	990	234.0	185.8	144.4	131.6	170.8
6	-90	630	211.3	193.8	133.7	153.8	168.2
7	90	-630	177.5	169	109.9	145.6	168.5
8	-810	270	212.1	152.8	124.4	152.2	156.8
9	-270	-810	210.8	182.1	149.7	161.9	157.6
10	630	270	171.8	182.3	148.3	156	162.5
11	810	-630	220.7	196.4	162	145.9	165.9
12	810	90	221.7	195.2	164.8	113.6	154.4
13	-90	-1170	214.9	197.2	164.1	148.3	166.3
14	-810	-630	214.6	203.1	161.1	156.4	169.5
15	-90	-270	210.6	210.3	152.7	152.4	168
16	810	-90	200.4	217.3	149.9	144.1	170.2
17	450	-270	166.7	167.7	115.2	139	170.6
18	270	-990	152.4	120.6	95.54	82.85	144.6
19	990	270	220.0	178.9	144.7	128.4	169.6
20	-270	-990	216.7	182.5	145.7	131.3	174.9
21	990	90	206.7	199.3	147.6	137	168.5
22	450	-990	217.6	206.3	145.2	121.2	176

Shed (2) Shed NE10 Schmidt correlation Sheet3 ShedRank Sheet2 SchmidtRank

Ready NUM

$Y_{i,j}$ is the yield for cell i in year j

Mean Relative Difference

Microsoft Excel - ClassificationPaper.xls

File Edit View Insert Format Tools Data Window Help

150%

Security...

Arial 10

N1

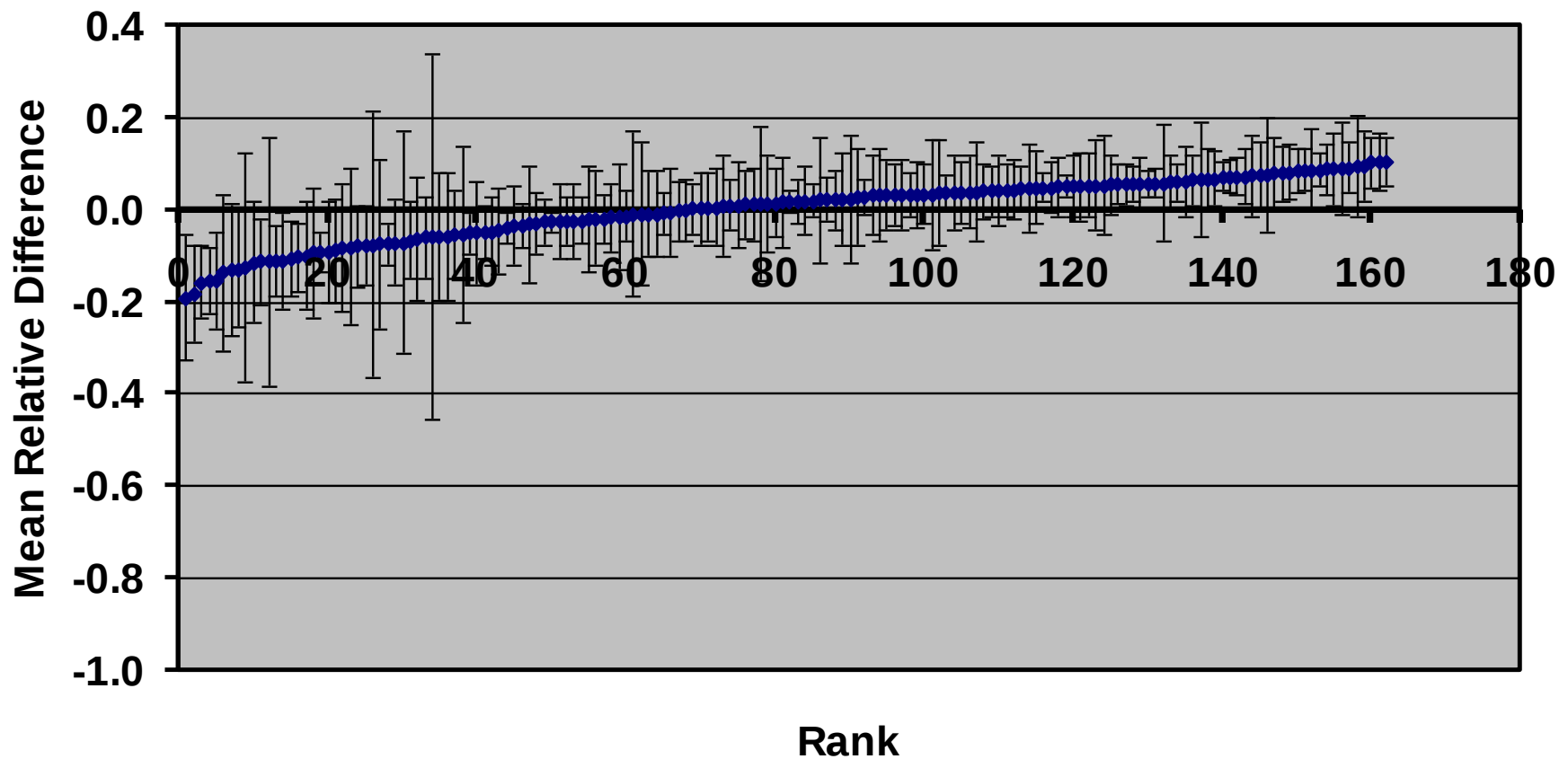
	N	O	P	Q	R	S	T	U	V	W	X	Y
1		delta96	delta97	delta98	delta99	delta00	rank	meande	deltaSD	CV	RankSD	Class
2	1	-0.0796	-0.1480	-0.1970	-0.0021	-0.0932	75	-0.1040	0.0847	0.9826	1	1
3	2	0.0984	-0.0018	-0.0638	-0.2441	-0.0644	163	-0.0552	0.144	1.0191	2	0
4	3	0.1306	-0.0166	0.0024	-0.1909	-0.0263	92	-0.0201	0.1321	1.0123	3	0
5	4	0.1258	-0.0198	-0.0140	-0.0899	-0.0141	157	-0.0024	0.0904	1.0148	4	0
6	5	0.0166	0.0224	-0.0871	0.0636	-0.0291	130	-0.0027	0.0641	1.0235	5	0
7	6	-0.1460	-0.1084	-0.2496	0.0069	-0.0274	111	-0.1049	0.1059	0.9145	6	0
8	7	0.0204	-0.1939	-0.1506	0.0526	-0.0949	103	-0.0733	0.1225	1.0182	7	0
9	8	0.0142	-0.0393	0.0222	0.1196	-0.0903	127	0.0053	0.0662	1.094	8	0
10	9	-0.1734	-0.0382	0.0126	0.0788	-0.0620	35	-0.0365	0.1069	1.0103	9	0
11	10	0.0618	0.0361	0.1062	0.0090	-0.0424	160	0.0341	0.0413	1.074	10	0
12	11	0.0666	0.0298	0.1253	-0.2144	-0.1088	124	-0.0203	0.1494	1.1006	11	0
13	12	0.0339	0.0404	0.1205	0.0256	-0.0401	79	0.0361	0.044	1.0713	12	0
14	13	0.0325	0.0715	0.1000	0.0816	-0.0216	137	0.0528	0.0285	1.0675	13	2
15	14	0.0132	0.1095	0.0427	0.0539	-0.0303	58	0.0378	0.0403	1.0643	14	0
16	15	-0.0358	0.1464	0.0236	-0.0035	-0.0176	59	0.0226	0.0796	1.0363	15	0
17	16	-0.1980	-0.1153	-0.2134	-0.0387	-0.0153	134	-0.1161	0.0808	0.89	16	1
18	17	-0.2668	-0.3638	-0.3476	-0.4270	-0.1654	89	-0.3141	0.066	0.8243	17	1
19	18	0.0585	-0.0562	-0.0119	-0.1120	-0.0211	141	-0.0286	0.072	0.9925	18	0
20	19	0.0426	-0.0372	-0.0051	-0.0920	0.0095	80	-0.0164	0.0565	0.9732	19	0
21	20	-0.0055	0.0514	0.0079	-0.0526	-0.0274	108	-0.0052	0.0428	1.0197	20	0
22	21	0.0469	0.0884	-0.0085	-0.1618	0.0159	135	-0.0038	0.1095	0.9844	21	0

Ready

NUM

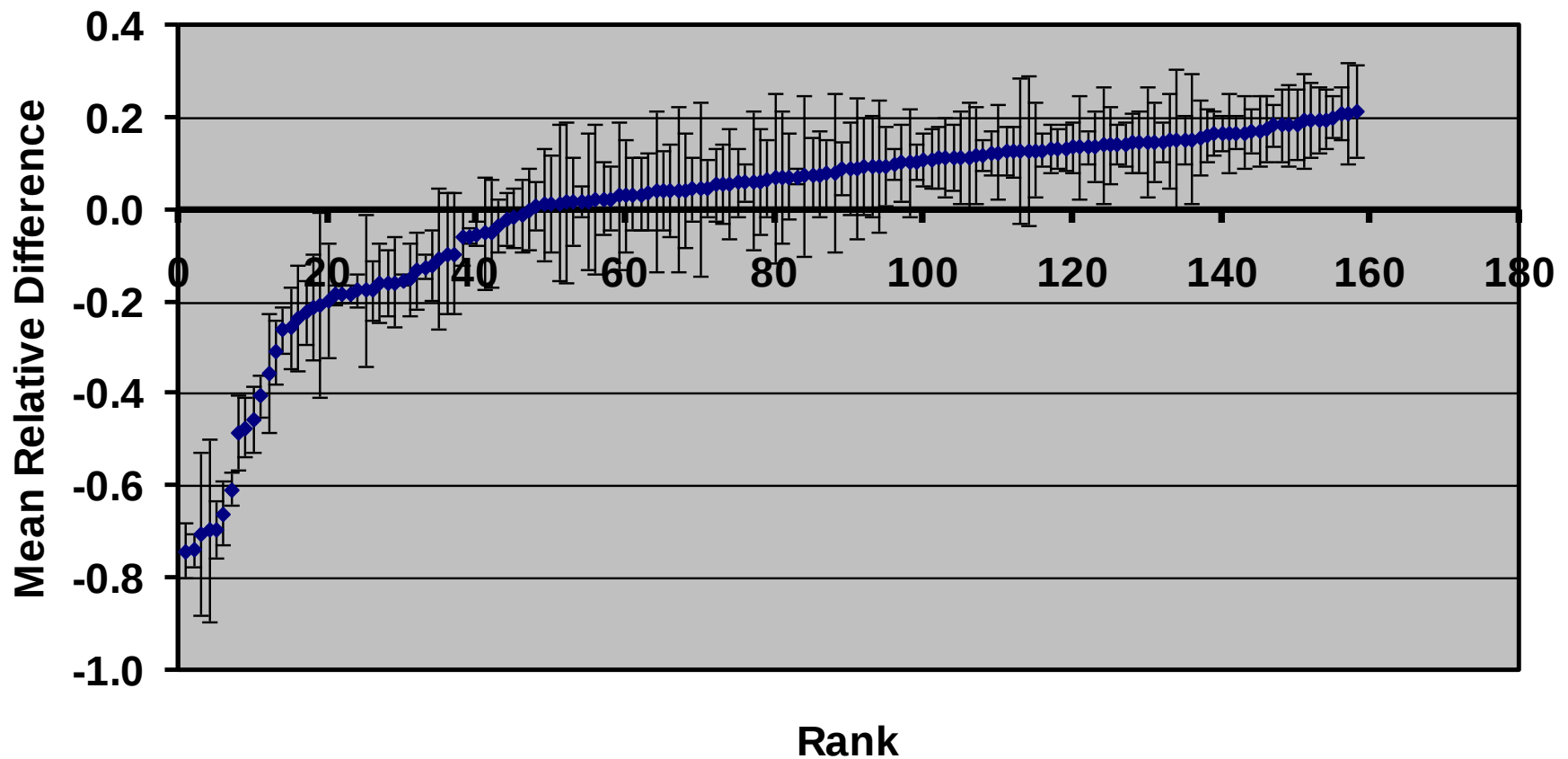


Seven Years of YM Data – Field B





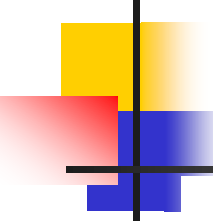
Fours Years of YM Data - Field A



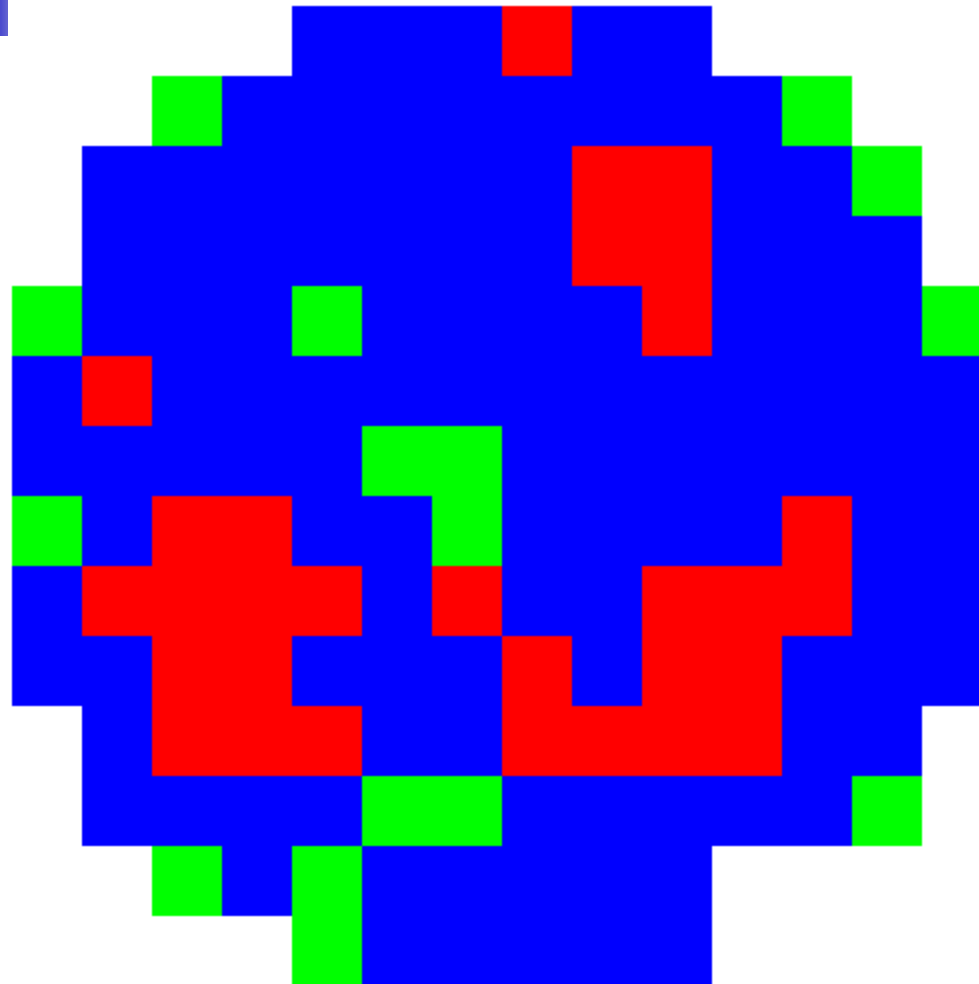


Data Classification

- If the mean relative difference was greater than the temporal standard deviation, the cell yield was deemed consistently different than the mean. These cells were then classified as high or low if they were greater or less than the mean.
- Cells with a standard deviation greater than the mean relative difference were classified as average or unstable.



Classification Map - Field B



**I grouped
Unstable cells
with average
because that is
how I would
treat them.**