

Water Table of the Johnson Creek Watershed

Identifying Where Groundwater is Vulnerable

Brian Fletcher

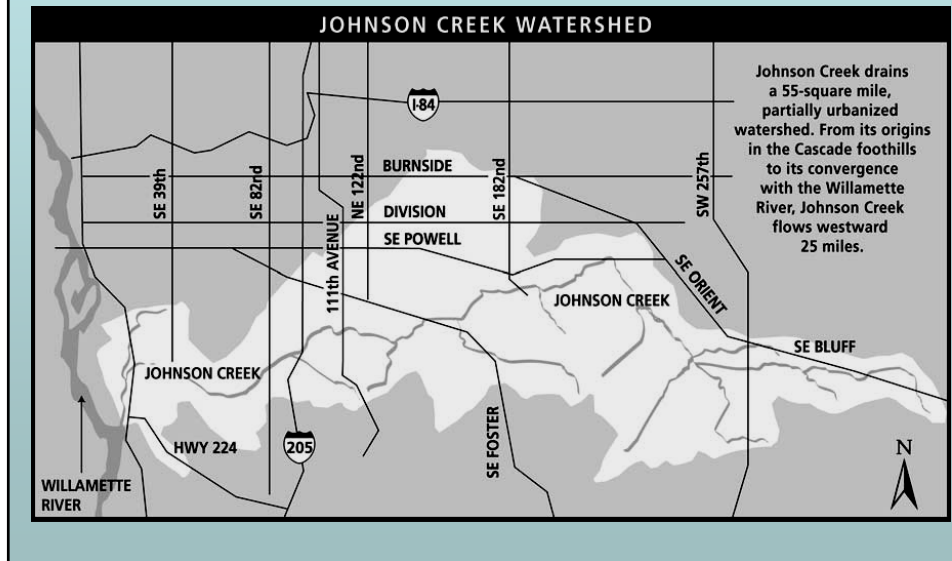
Tess Harden

David Kennedy

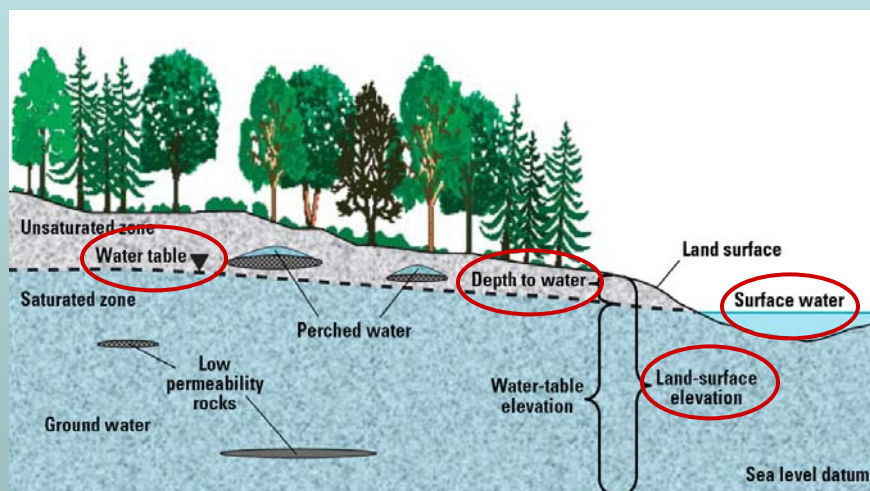
Outline

- Background
- Data
- Methods
- Analysis Results
- Limitations and Implications
- Conclusion

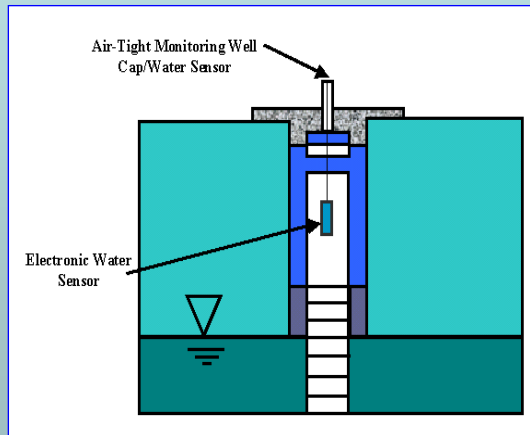
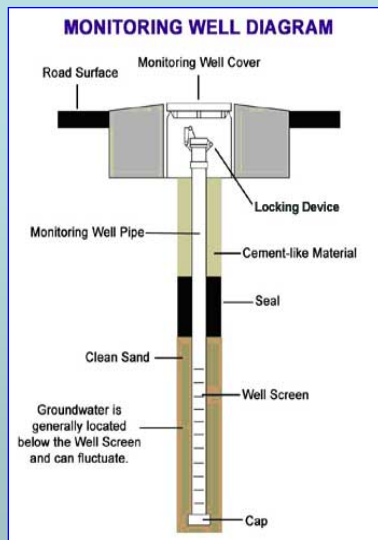
Background



Background

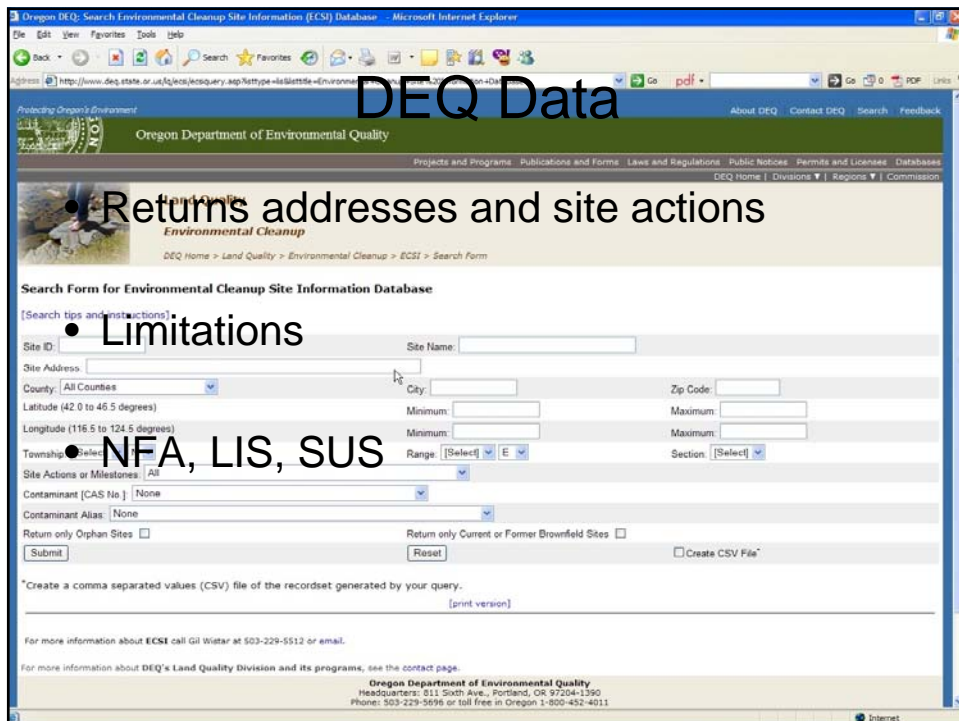
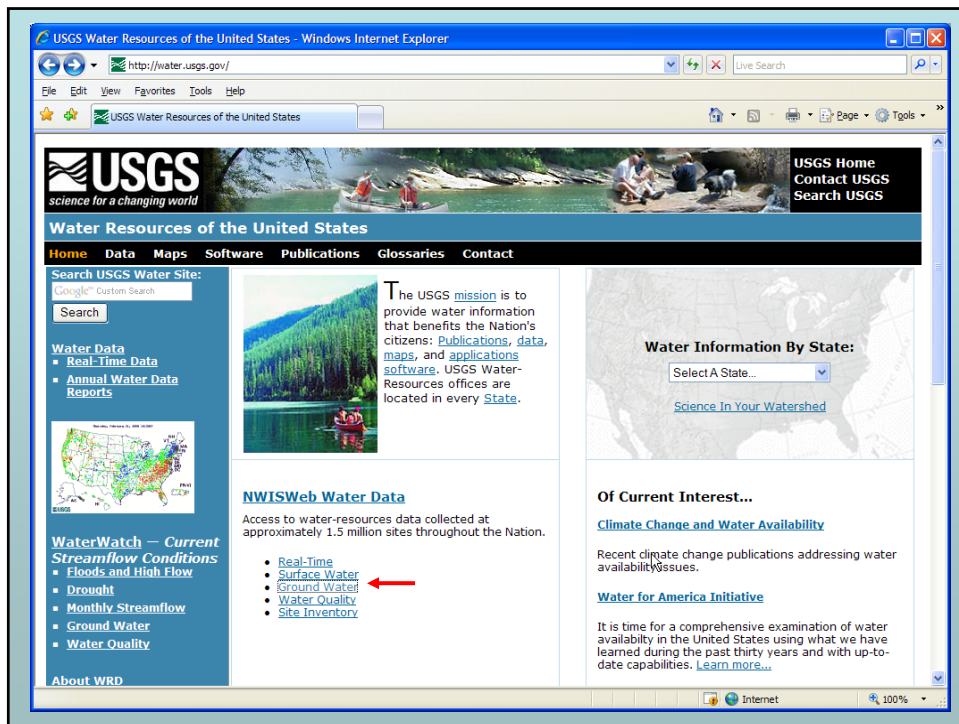


Well monitoring



Data

- 27 monitoring wells (nwis.waterdata.usgs.gov)
- DEM for Multnomah Co. ([Oregon Geospatial Clearing House](#))
- DEM for Clackamas Co. ([Oregon Geospatial Clearing House](#))
- Johnson Creek watershed boundary ([RLIS](#))
- Johnson Creek river line ([RLIS](#))
- DEQ hazardous sites (www.deq.state.or.us)

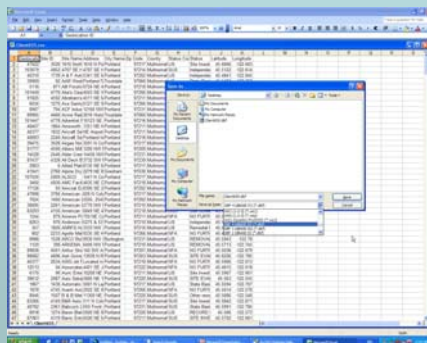


Methods

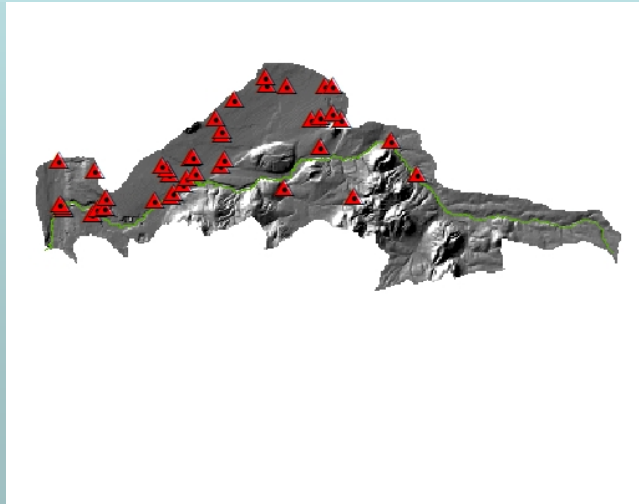
- Obtain & geocode hazardous site data from DEQ
- Create table of well points
 - Convert Lat/Long to Decimal Degrees
 - Import X-Y data
- Create surface water point data
- Determine semivariogram
- Perform data Interpolation
 - Kriging, Cokriging, Spline, IDW
- Reclassify to get 10 ft DTW
- Intersect hazardous sites where the DTW is 10 ft or less

Geocode Hazardous Sites

- Convert to d-base 4
- Add to layers window
- Rt. Click connection



Geocoded Hazardous Sites



Create X-Y table (from well logs)

Microsoft Excel - Well Data-GIS II_decimal degrees(1).xls

File Edit View Insert Format Tools Data Window Help

1 Multnomah County Well Data lat and long in degrees, minutes, seconds

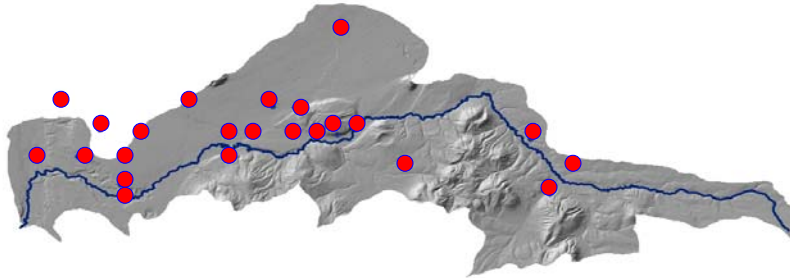
2 12/01/2007 to 12/31/2007 09/01/2007 to 09/30/2007 03/01/2008 to 03/31/08

3 27 sites

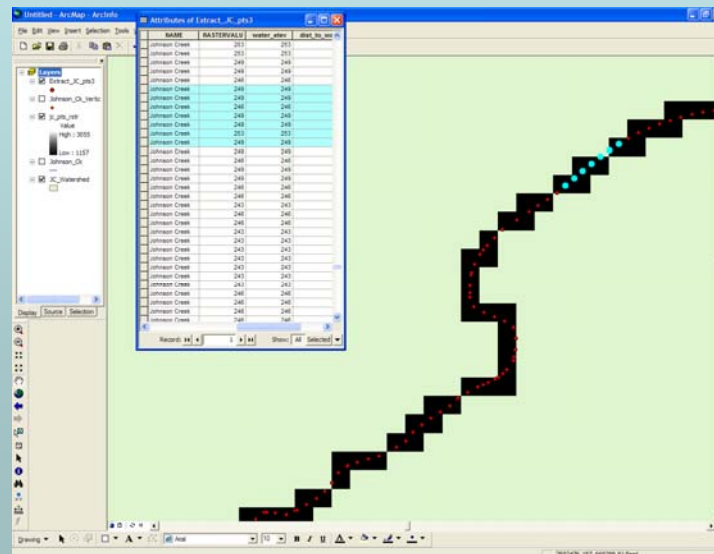
ID	y	x	ground_elev	dist_to_water	water_elev	sept_wdist	sept_wat_elev	march_wdist	march_wat_elev
1	45.456944	-122.59576	152	31.67	120.33	32.49	119.51	30.78	121.22
2	45.463	-122.39686	415	22	393	23.27	391.73	20.27	394.73
3	45.469278	-122.40919	382	107.99	274.01	115.2	266.8	109.22	272.78
4	45.472139	-122.38575	481	96.46	384.54	106.5	374.5	95.16	385.84
5	45.472794	-122.62212	198	97.05	100.95	96.84	101.16	97.2	100.8
6	45.4733	-122.54826	216	41.86	174.14	41.27	174.73	39.11	176.89
7	45.473589	-122.5986	258	117.16	140.84	115.05	142.95	115.41	142.59
8	45.474103	-122.63998	53	3.65	49.35	6.36	46.64	4.96	48.04
9	45.474078	-122.64001	53	9.16	43.84	10.87	42.13	9.41	43.59
10	45.477775	-122.5067	243	25.9	217.1	26.93	216.07	24.42	218.58
11	45.477783	-122.506717	243	7.15	235.85	11.74	231.26	10.02	232.98
12	45.478144	-122.49854	246	13.59	232.41	16.45	229.55	11.95	234.05
13	45.477936	-122.55008	206	-1.33	207.33	D	D	-0.34	206.34
14	45.478472	-122.51636	243	7.8	235.2	13.64	229.36	9.55	233.45
15	45.478667	-122.41056	339	2.67	336.33	6.17	332.83	2.63	336.37
16	45.48095	-122.58569	235	87.42	147.58	84.98	150.02	82.67	152.33
17	45.481758	-122.51641	276	41.81	234.19	46.5	229.5	42.52	233.48
18	45.482894	-122.54118	203	22.67	180.33	23.1	179.9	19.19	183.81
19	45.482986	-122.51944	273	84.13	208.87	65.34	207.66	57.11	215.89
20	45.483153	-122.61301	241	127.72	113.28	127.14	113.86	127.61	113.39
21	45.485903	-122.63061	129	61.24	67.76	61.22	67.78	61.22	67.78
22	45.486625	-122.52466	229	43.49	185.51	43.95	185.05	39.76	189.24
23	45.486789	-122.56777	252	106.76	145.24	110.85	141.15	102.96	149.04
24	45.487725	-122.51615	401	208.76	192.24	208.42	192.58	205.18	195.82
25	45.488697	-122.52688	191	7.7	183.3	9.56	181.44	4.04	186.96
26	45.489031	-122.5678	261	90.36	170.64	89.56	171.44	82.39	178.61
27	45.516233	-122.49973	247	62.34	164.66	64.23	162.77	57.5	169.5

Ready

Well Locations



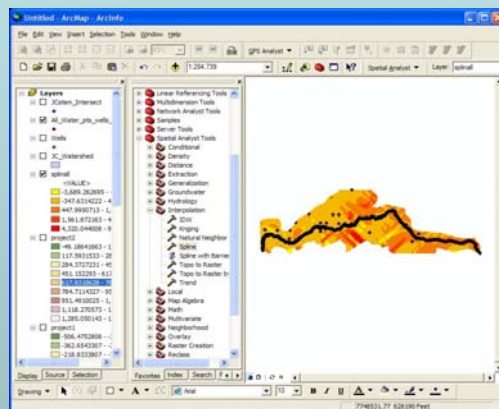
Extract raster values

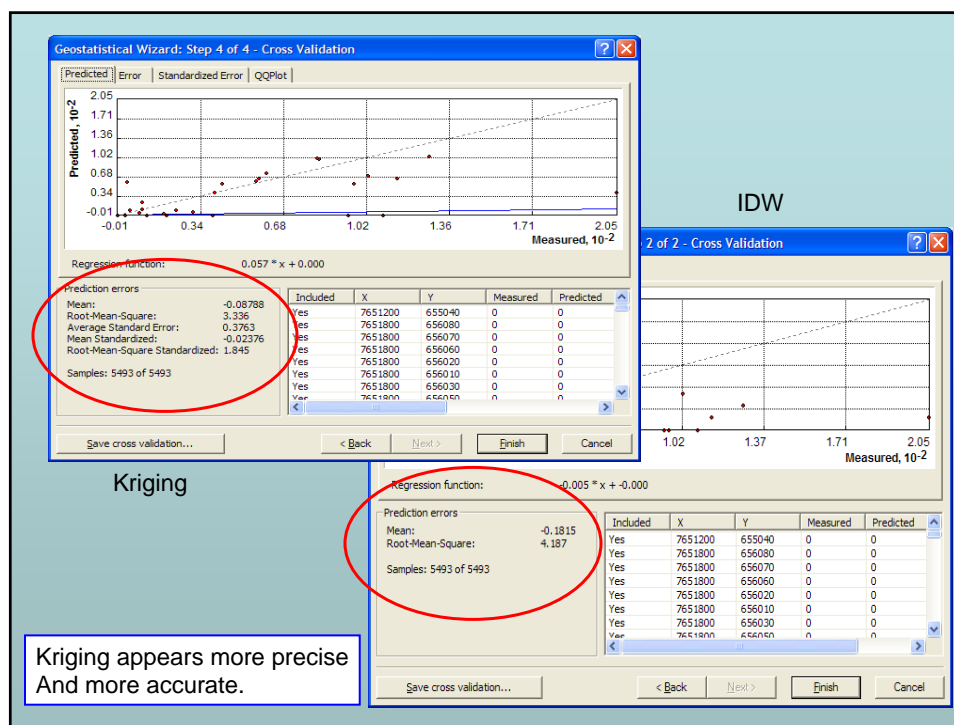
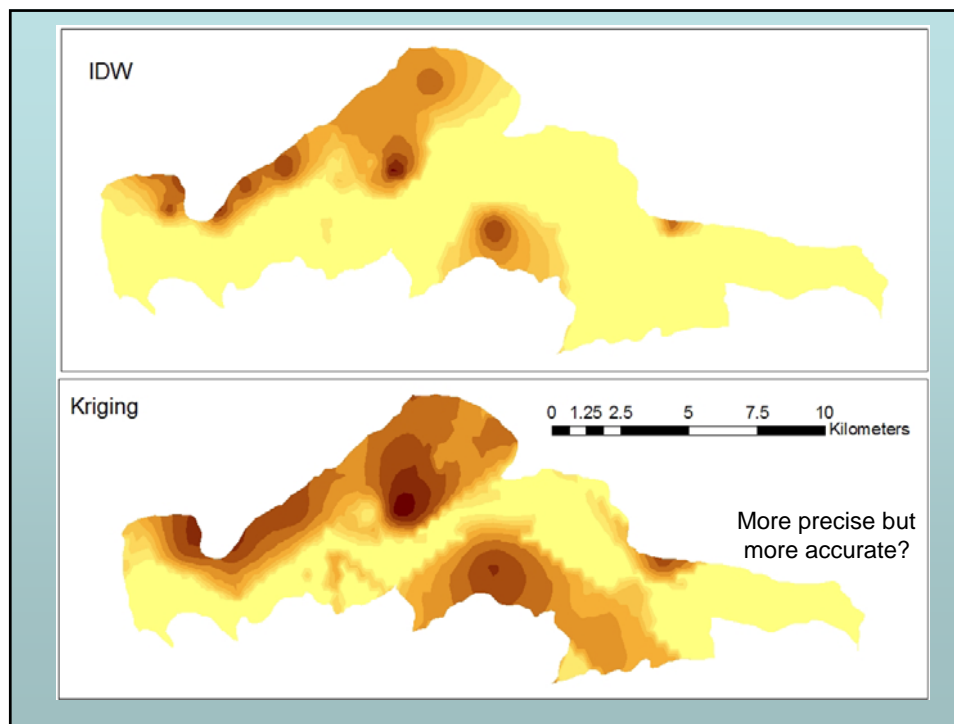


Spatial Interpolation

- Tried Kriging, Spline, IDW, Cokriging

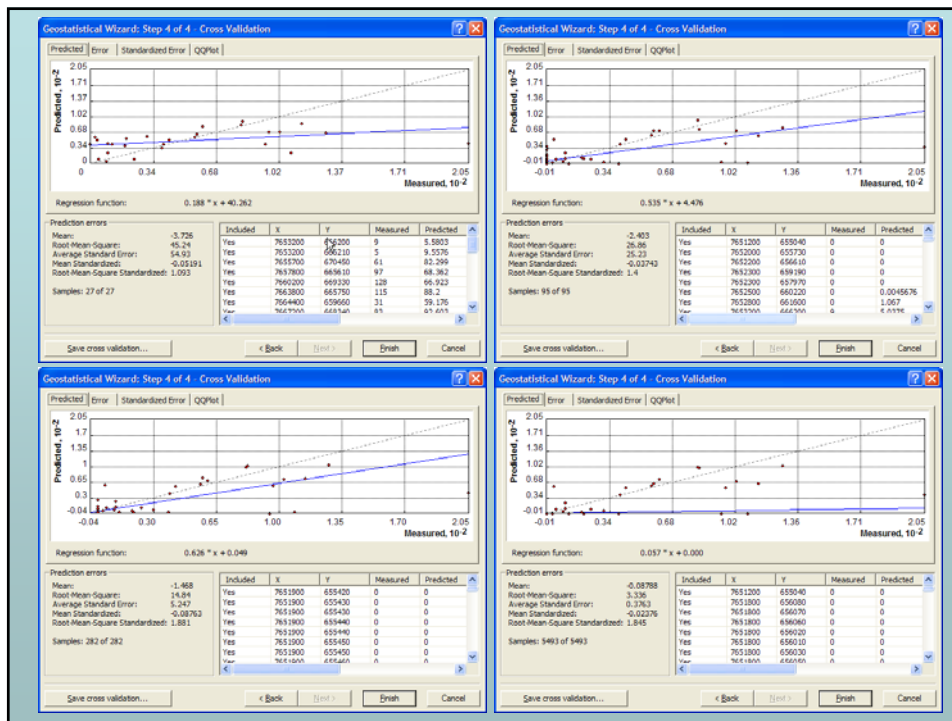
Spline



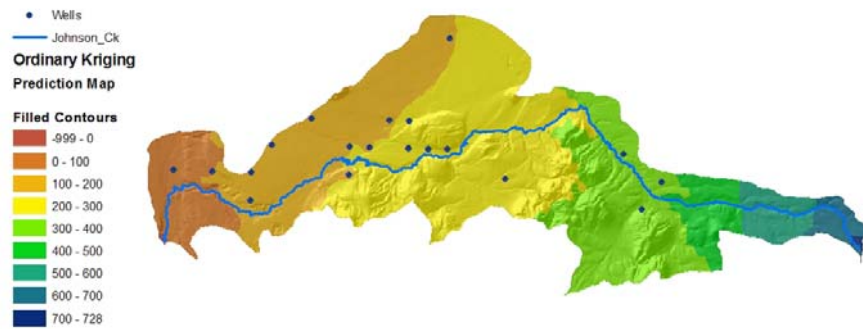


Determine semivariogram for Kriging

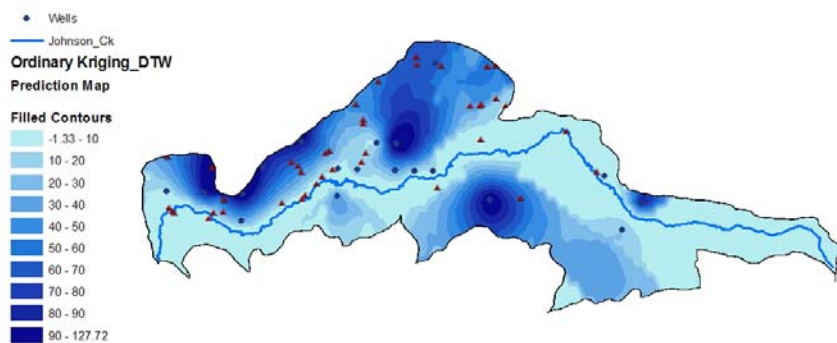
- Lag distance
- # of lags
- Anisotropy
- De-trend
- Model types
- # of known points



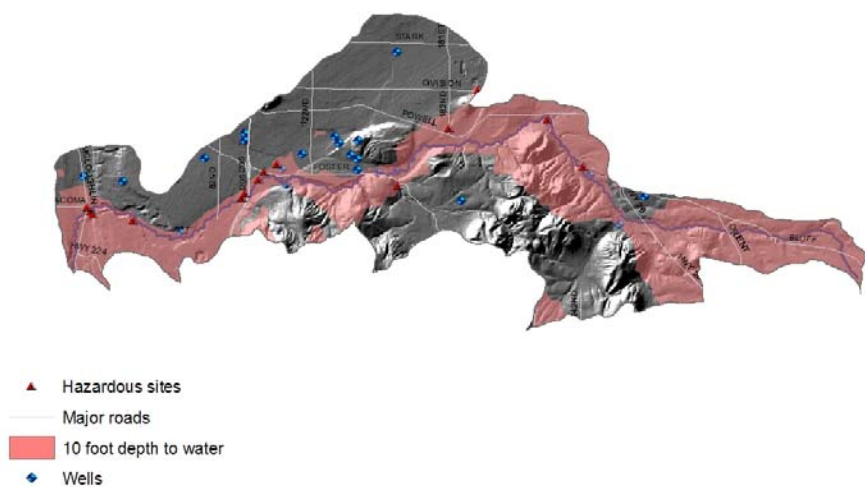
Results: Water Table Elevation



Results: Depth to Groundwater



Results: Vulnerable Areas



Implications

- Groundwater levels fluctuate
- Prioritize DEQ sites
- Planning tool for future development

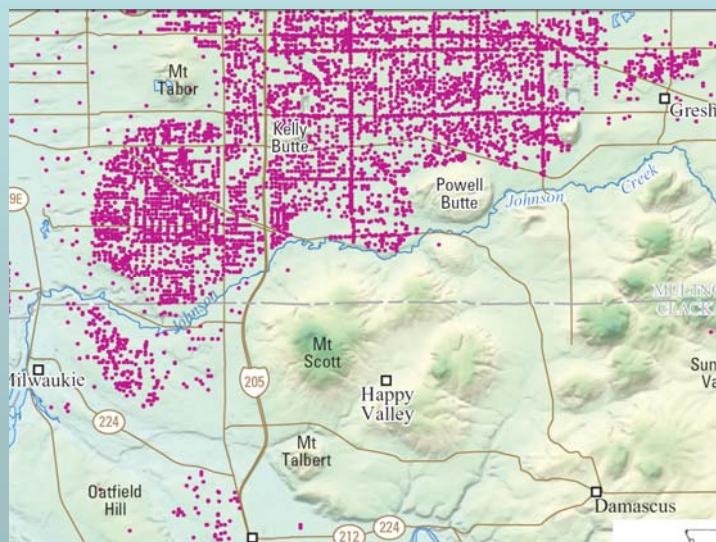


www.fws.gov

Limitations and possible sources of error

- Number and location of wells
- Soil type / permeability
- Semivariogram issues
- Toxicity unknown at DEQ sites

UIC Locations



Conclusions

- 14 hazardous sites where the groundwater is vulnerable
- GIS is a valuable tool for evaluating potential groundwater contamination hazards.

Questions?



Modified from ci.grasham.or.us