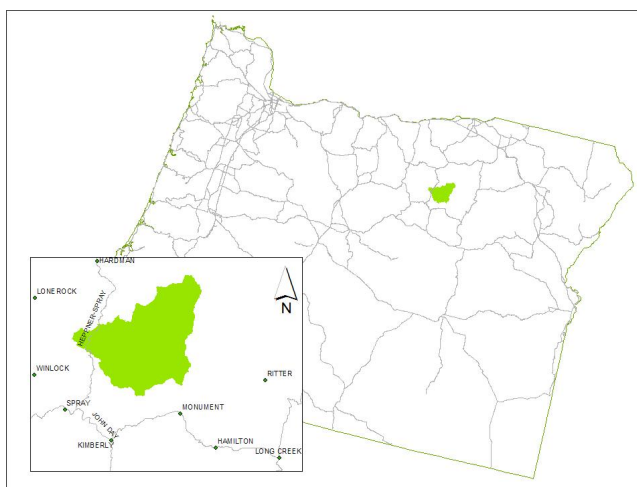


## Testing Elevation Based Predictors of Late Season Stream Flow

Bill Wessinger

## An Introduction to the Area



## About the Watershed

- ▶ The watershed begins at 2000ft in elevation and climbs to over 5000ft at its northern limits.
- ▶ Most of the area is either grassland or open ponderosa pine forests.
- ▶ Very rugged country, with multiple rock bands crossing many hillsides.
- ▶ It experiences extremes in temperature and is very dry.

## Problem

- ▶ We could not survey dry sites.
- ▶ We had to collect data for 40 sites within the watershed. We ended up visiting 63 sites. After driving to or driving and hiking in to sites, 23 were found to be dry.
- ▶ Visiting dry sites takes time, and increased the number of weeks it took to collect data. Hikes of more than 2 miles from the road to sites were not uncommon.
- ▶ If the sites could be chosen partially based on some prediction method to determine whether sites were likely to have stream flow, the project could have been completed multiple weeks earlier, saving time and money.

## Data Used

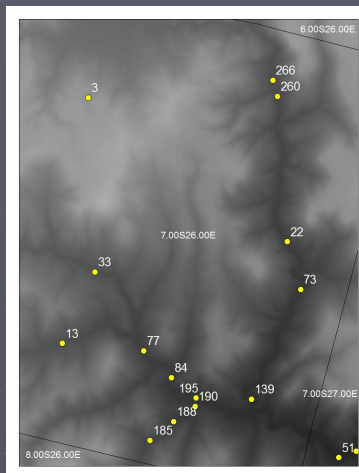
- ▶ 10 meter DEM from the I:\ drive.
- ▶ Shapefile of all potential survey sites from Demeter Design.
- ▶ Township range maps for orientation.

## Predictors

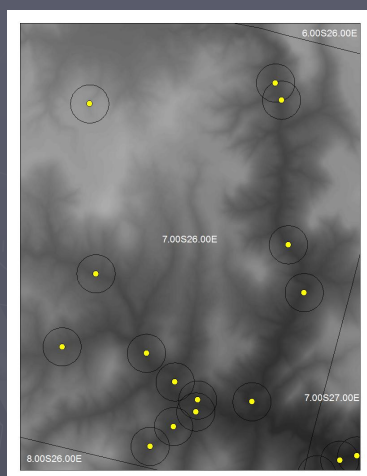
- ▶ Elevation
- ▶ Difference in elevation to lowest point within quarter mile.
- ▶ Difference in elevation to mean point within quarter mile.
- ▶ Flow accumulation
- ▶ Stream order

## Elevation

- ▶ Zonal statistics as table was used to collect elevation data for points.
- ▶ Data was returned for pixel under that point.



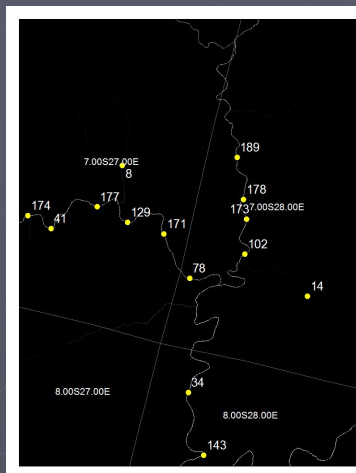
## Mean and min within quarter mile



- ▶ 1/4 mile buffer was performed on all points.
- ▶ Zonal Statistics as Table was used to gain mean elevation and minimum elevation.
- ▶ Overlapping buffers which recieved incomplete statistics were exported and statistics were calculated again. Multiple iterations performed to gain complete data.

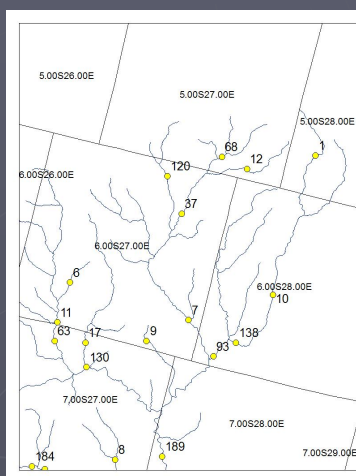
## Flow accumulation

- ▶ Stream sites were snapped to the highest value point within 150m, and point statistics were taken.
- ▶ 150m was chosen after some trial and error where shorter distances would not get all points to the streams, and more might allow them to snap down to below a convergence.



## Stream order

- ▶ Stream layer was digitalised and later converted to features from a threshold of 4500 units.
- ▶ Small first and second order tributaries not present on area map from summer were removed.
- ▶ Streams were converted back to raster and stream order was calculated.
- ▶ Data was collected manually point by point and entered into the table.



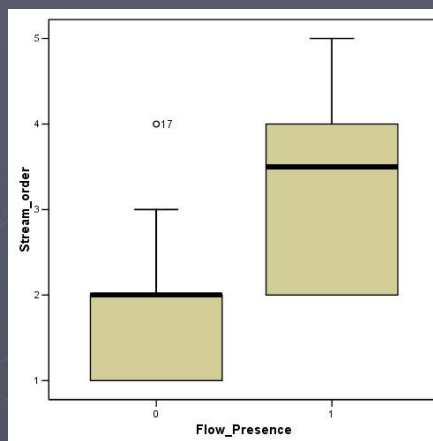
## Resulting data

Microsoft Excel - Data\_For\_Analysis

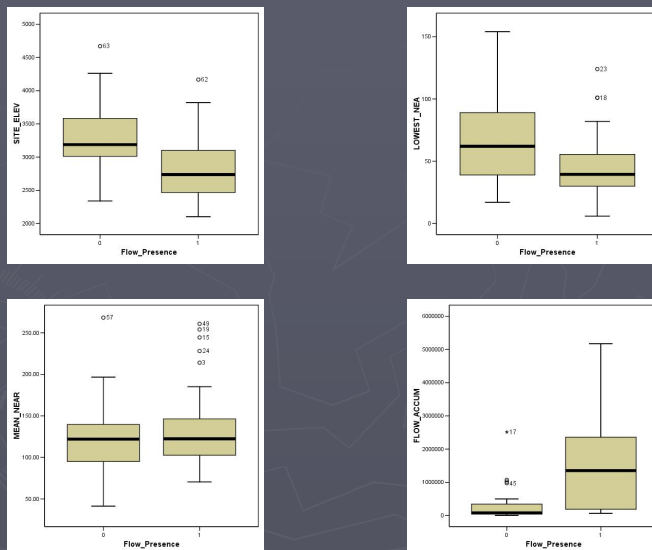
	A	B	C	D	E	F	G	H	I
	Site_ID	Flow_Prese	FLOW_PRESE	SITE_ELEV	LOWEST_NEA	MEAN_NEAR	FLOW_ACCUM	Stream_order	
2	143	1	yes	2103	33	185.19	5174010	5	
3	5	0	no	2999	154	100.52	28457	1	
4	41	1	yes	2441	6	214.04	2370600	4	
5	172	1	yes	2539	65	87.84	2329180	4	
6	145	1	yes	3412	52	70.59	81386	2	
7	147	1	yes	3291	59	102.65	99480	2	
8	34	1	yes	2159	46	98.60	5148510	5	
9	16	0	no	3320	131	114.83	14596	1	
10	150	1	yes	3192	101	85.14	115013	2	
11	157	1	yes	2996	66	139.96	141475	2	
12	14	0	no	2884	138	83.08	14282	1	
13	160	1	yes	2858	46	124.93	155903	2	
14	78	1	yes	2267	36	135.23	2525500	4	
15	165	1	yes	2782	62	153.29	209561	2	
16	168	1	yes	3117	82	244.44	74636	2	
17	102	1	yes	2307	37	98.74	2412300	4	
18	171	0	no	2339	46	138.71	2513110	4	
19	98	1	yes	2736	101	115.25	256267	2	
20	129	1	yes	2359	16	254.04	2489540	4	
21	173	1	yes	2333	23	123.79	2399100	4	
22	174	1	yes	2494	40	118.22	2345350	4	
23	85	1	yes	2556	43	107.83	2312690	4	
24	176	1	yes	2946	124	110.13	91741	2	
25	177	1	yes	2389	10	228.10	2400870	4	
26	178	1	yes	2352	29	138.06	2383850	4	

## Statistical Analysis

- ▶ A binary logistic regression was performed to see if a significant correlation between stream flow and any of the predictors could be found.
- ▶ A statistically significant correlation was only found for stream order. All other predictors seemed to display the behavior expected but not to a statistically significant level.



## Other Predictors



## Conclusions

- Stream survey sites can reasonably be eliminated late in the season if they are first order.



Questions?

