

Hydrologic Analysis and Pilot Restoration Project, Weippe
Prairie, Nez Perce National Historical Park, Idaho

2012 Progress Report



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Scope of Work

2012 was the first summer of intensive hydrologic data collection at Weippe Prairie. Field data were collected to quantify the current water table dynamics in the prairie, which supports abundant invasive wetland and upland plants, a stark contrast to the pristine Camas fields documented by Lewis and Clark in 1806. In 2012 three stations logged soil redox potential throughout the growing season. Additionally, automated groundwater pressure transducers recorded hourly water depth in nine wells and staff gauges, providing a detailed record of water table dynamics at these sites. To broaden the spatial extent of hydrologic monitoring, NEPE staff manually measured water depth at 43 wells, 13 staff gauges, and 4 piezometers. Measurement interval was weekly from late-April through mid-July, then approximately biweekly until mid-September.

Three plywood dams were constructed across the main ditch during fall 2012 (Fig. 1). The ditch was completely dry by late-July 2012, and the dams are expected to influence the water table in subsequent growing seasons by raising the surface water elevation, flooding areas outside of the ditch, decreasing the hydrologic gradient between meadow groundwater and ditch surface water, and prolonging high water tables in the meadow.

Preliminary Conclusions

- 1) Direction of water flow was south to north in the ditch, and groundwater flow in the meadow also flowed north (Fig. 2). Changes in water level in the ditch and meadow are highly correlated. The water table declined through the summer, with surface water in the ditch disappearing in mid-late July.
- 2) Water tables, soil reducing conditions, and precipitation were closely correlated (Fig. 3). Meadow water tables responded strongly to rain inputs, and are influenced by both snowmelt and rain driven flows.
- 3) Plant species occupy distinct hydrologic niches. *Phalaris arundinacea* and *Deschampsia cespitosa* occur in the wettest locations, while upland grasses such as *Poa pratensis*, *Agrostis gigantea*, and *Bromopsis inermis* are found in the driest sites (Fig. 4, Table 1).

Goals moving forward

- 1) Monitor the effects of dam installation on the water table. The dams simulate filling of the ditch and should eliminate rapid surface drainage from the prairie. The ditch artificially drains the prairie, promoting conversion to seasonally wet or upland habitat. Water table depth will be measured in the summer of 2013, and these data will provide an initial indication of the hydrologic effects of ditch blocking on the rest of the meadow. Groundwater and surface water are closely connected between the meadow and ditch, and we will analyze the spatial extent of elevated water tables.
- 2) Identify the hydrologic niche for Camas and determine if areas experiencing this hydrologic regime increase after dam installation. Further evaluate strategies to increase the density of Camas across Weippe Prairie.
- 3) Identify vegetation change as a function of water table change. Vegetation surveys will be repeated post-dam installation in 2013. However, we would suggest that park staff repeat these measures in following years. We will compare changes in water table depth and timing of drawdown to changes in species abundance. Special attention will be paid to invasive species, such as *Phalaris arundinacea* to ensure that we are not creating habitat that could favor its expansion.

Equipment installed at Weippe Prairie, South Unit, 2012

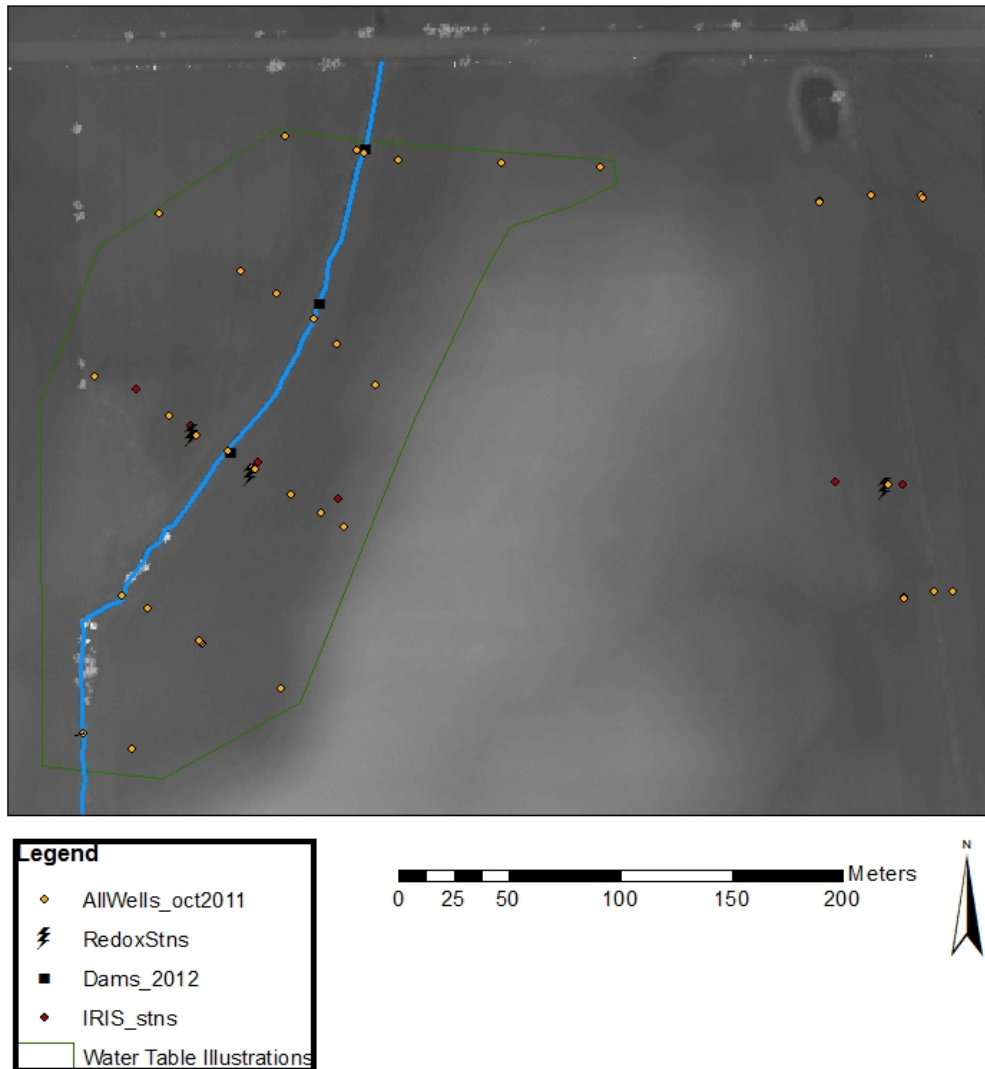
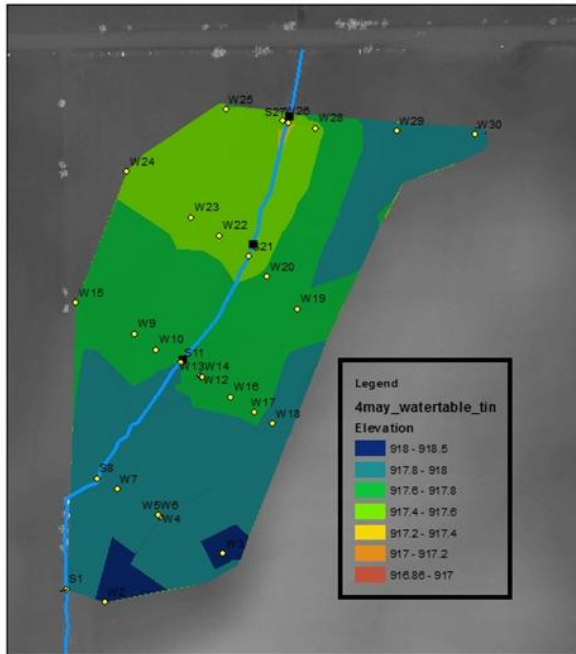


Figure 1. Southern unit of the Weippe Prairie, NEPE. All field equipment installed or used in the summer 2012 monitoring season is illustrated. The blue line is the ditch, and the green polygon outlines the area of high well density for which water tables are illustrated in subsequent figures.

Water Table on May 4, 2012



Water Table on July 4, 2012

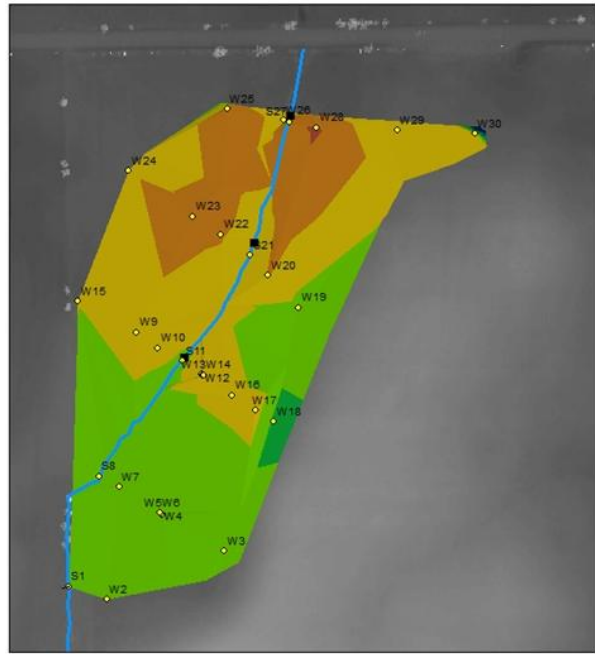


Figure 2. Water tables on a wet (May 4) and dry (July 4) date in 2012. Generally, on both dates water tables decline to the north and toward the ditch, indicating that groundwater exits the prairie through the ditch outlet. The relatively constant water tables perpendicular to the ditch indicate that increasing water level in the ditch will markedly affect water tables throughout the area. Interpolation method is triangulated irregular network. Contour interval 20 cm.

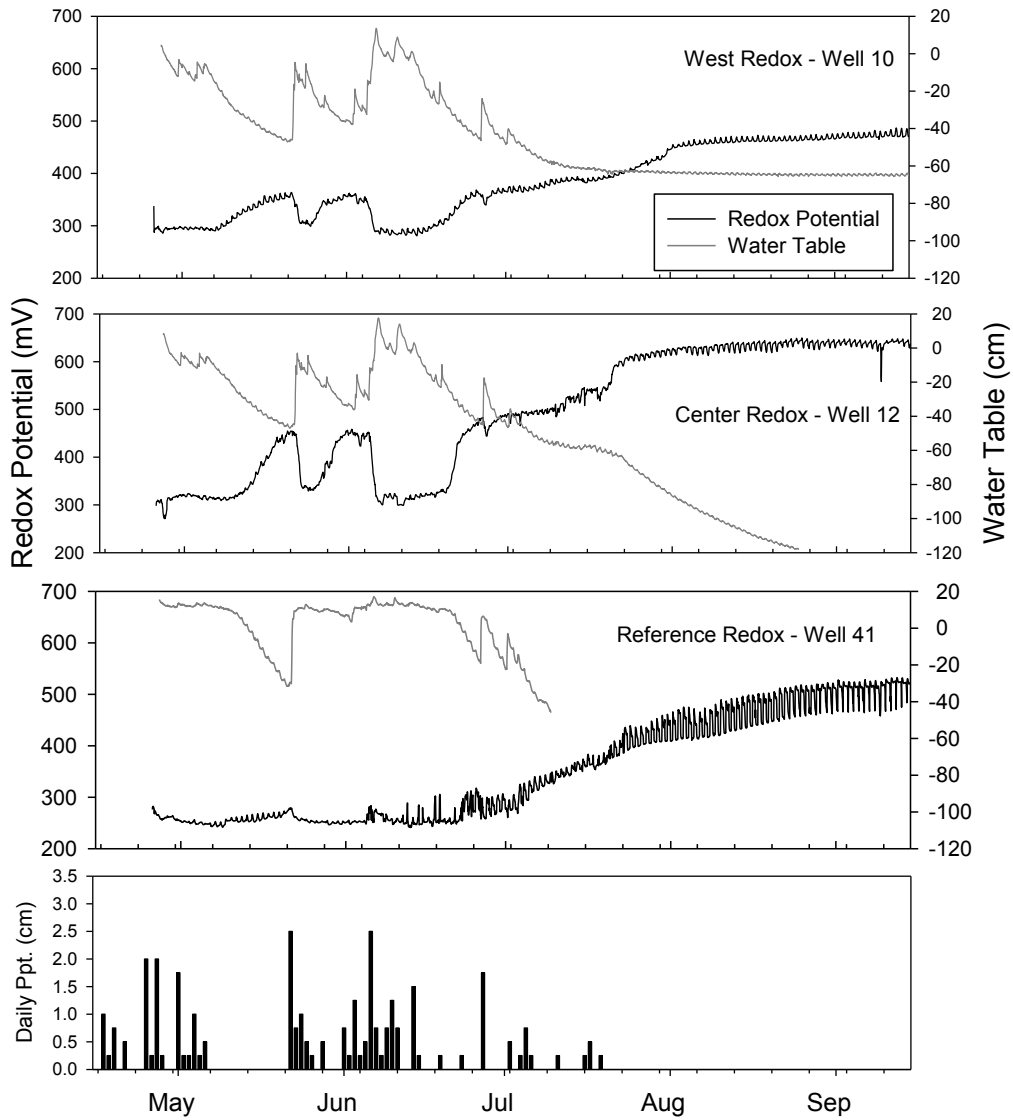


Figure 3. Water tables, redox potential, and precipitation at three locations on the south Weippe Prairie, 2012. The top two panels are from locations along either side of the main ditch in the meadow's NW corner. The Reference Redox station is on the meadow's eastern side in an area of high Camas density.

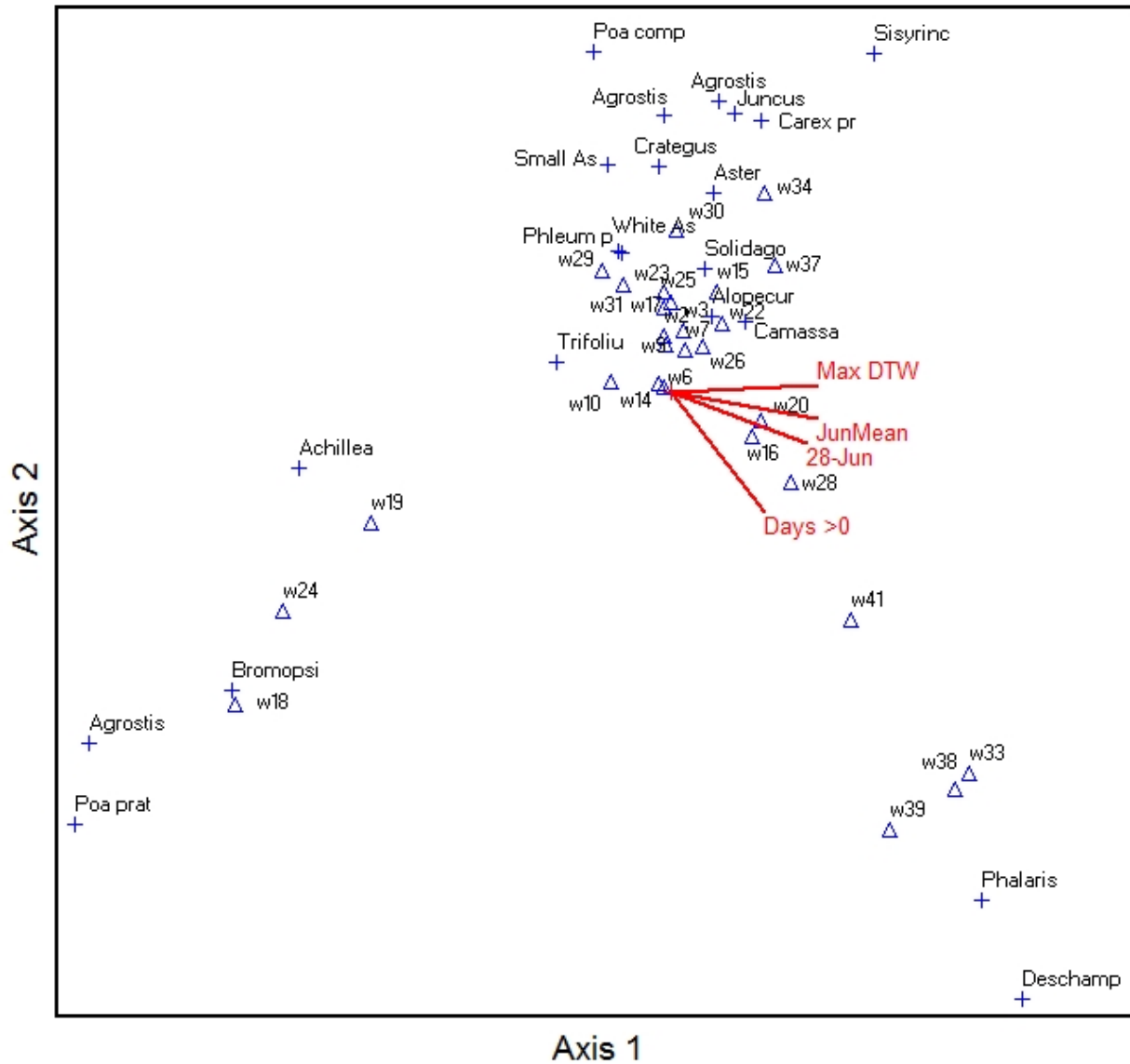


Figure 4. Canonical correspondence analysis for well and vegetation hydrologic regimes. In general, Axis 1 illustrates a gradient from dry at left to wet at right. Environmental variable abbreviations: Max DTW = highest measured water table; JunMean = mean water table from the 4 measurements in June, 2012; 28Jun = water table on June 28th; Days > 0 = estimated number of days with standing water.

Table 1. Plant species percent cover at wells on the South Weippe Prairie. Plants with "*" were not identified to species level during our late September, 2012 survey, but will be during the 2013 growing season.

Species	Well -->	29	30	31	33	34	41	37	38	39	3	2	1	8	7	6	18	17	16	14	11	10	9	15	24	23	22	21	20	19	25	26	27	28	PaulEast	PaulWest		
Alopecurus pratensis		40	40	50	0	70	60	0	0	0	80	70	0	0	40	20	2	1	70	30	0	10	3	10	0	40	30	0	70	20	50	80	0	80	10	15		
Phleum pratensis		25	15	30	0	0	0	40	0	0	10	10	0	0	30	50	0	30	0	40	0	15	5	0	0	0	0	0	0	25	0	0	0	0	5	3		
Aster *		5	0	1	0	5	0	20	0	0	0	7	0	0	7	3	0	10	0	7	0	3	5	5	0	0	25	0	1	0	1	3	0	0	0	0		
Solidago canadensis		1	1	3	0	7	5	0	0	0	0	0	0	0	3	1	0	3	0	5	0	5	3	0	0	0	0	0	0	0	1	0	0	0	3	0		
Camassa quamash		2	5	5	0	7	5	0	0	0	0	0	0	0	3	1	0	0	7	0	0	0	0	0	0	1	3	0	7	1	5	7	0	10	3	0		
Small Aster *		3	5	3	0	0	0	1	0	0	0	0	0	0	0	2	0	2	0	0	0	0	0	0	0	0	0	0	0	1	3	0	0	0	0	3	0	
Agrostis gigantea		3	25	10	0	5	0	40	0	0	0	0	0	0	0	0	0	5	0	0	0	0	5	1	0	15	40	0	0	0	30	0	0	0	30	0	0	
Poa pratensis		3	0	0	0	0	0	0	0	0	0	0	0	0	0	1	15	0	0	0	0	0	0	0	15	0	0	0	0	5	0	0	0	0	0	0	0	
Poa compressa		7	5	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	0	0	0	0	0	0	0	0	0	0	0	0	
Achillea lanulosa		0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	3	0
Agrostis scabra		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phalaris arundinacea		0	0	1	90	1	7	0	95	80	0	0	60	25	0	0	0	0	5	0	40	0	50	80	0	15	0	30	0	0	0	10	30	0	40	20	0	
White Aster *		0	0	7	0	0	0	0	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trifolium *		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Juncus *		0	0	0	0	5	0	10	0	0	0	0	0	0	0	0	0	40	0	0	0	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Deschampsia cespitosa		0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sisyrinchium idahoense		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bromopsis inermis		0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	80	0	0	0	0	60	10	0	80	15	0	0	0	5	10	0	0	0	0	40	0	
Crategus douglasii		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Vicia americana		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
Carex praegracilis		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Agrostis trachycaulon		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	0	0	0	0	0	0		