

Groundwater Level Monitoring in the Herring River Basin

Eight shallow groundwater monitoring wells are located at various wetland areas in the Herring River basin. Locations of the monitoring wells are shown on the attached map. The wells were installed ca. 2004-05. The wells are 1½" PVC and were slotted from x to y feet from the bottom. The wells range from x to y feet below ground surface.

In the past, water levels were measured weekly or monthly. Volunteers made the measurements until sometime in 2007. Kelly Mediros began making monthly measurements sometime in 2007. In the Fall 2010, HOBO water level dataloggers were installed in these wells to provide a period of continuous water level monitoring. Objectives of monitoring with dataloggers are;

1. Look for correlation between water levels and tidal fluctuation.
2. Observe water level changes in response to rainfall-recharge events.
3. Observe the magnitude of water level change at each site.

Water levels were recorded at ten minute intervals starting on October 25, 2010. Data were retrieved on December 22, 2010. The data were corrected for variations of barometric pressure. The resulting data are shown in the attached hydrographs. Water level data continue to be collected as of this writing (January 11, 2010). Hydrographs for each monitoring site are presented here in a generally downstream to upstream direction.

Water levels are plotted on the Y-axis as depth to water below ground surface. Ground surface is zero. Positive numbers are above ground surface, negative numbers are below ground surface. The range of the Y-axis is one foot for all sites except Nieski, which has a range of two feet. Daily precipitation data are plotted on the Y-axis on the right side of the chart to allow comparison between rainfall-recharge and water level fluctuation.

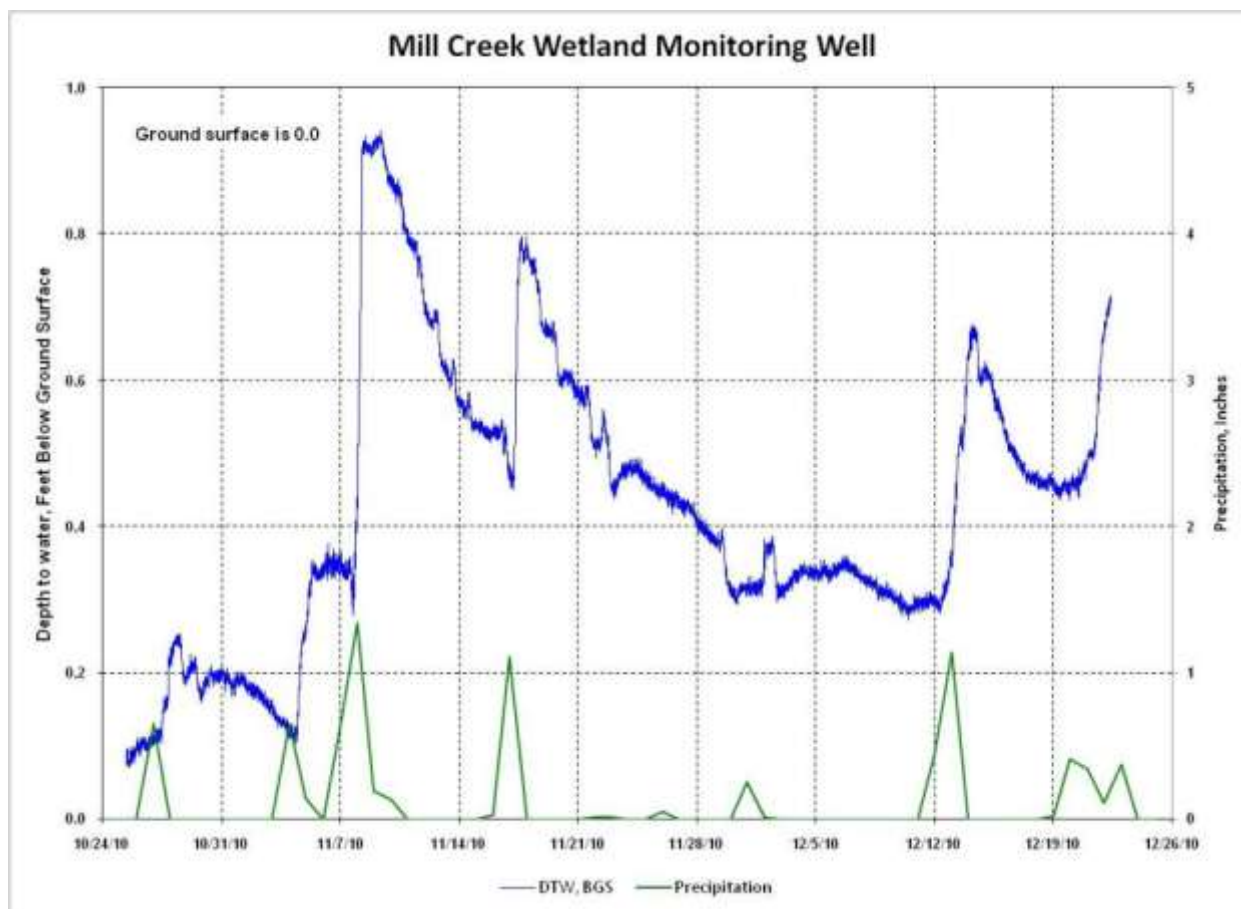
Water level is above ground surface at the Mill Creek, Merrick Island, and Ryder Beach sites. Water level is below ground surface at the Nieski, High Toss, Pole Dike, and Black Pond Road sites. Water level fluctuates from below to above ground surface at the Bound Brook Site.

Table 1. Summary of monitoring well characteristics.

Site ID	Casing Stick up from Ground Surface (ft)	Total Depth (ft)	Depth below ground surface (ft)	UTM Zone 19	
				Northing	Easting
Black Pond	1.02			4646020	414855
Bound Brook	1.09			4645240	412684
High Toss	1			4644080	412408
Merrick Island	1.07			4644801	412513
Mill Creek	1.29			4642946	412423
Nieski	0.52			4643069	412650
Pole Dike	1.5			4644530	413451
Ryder	1.6			4646253	411697



Herring River "Wetland" Monitoring Wells

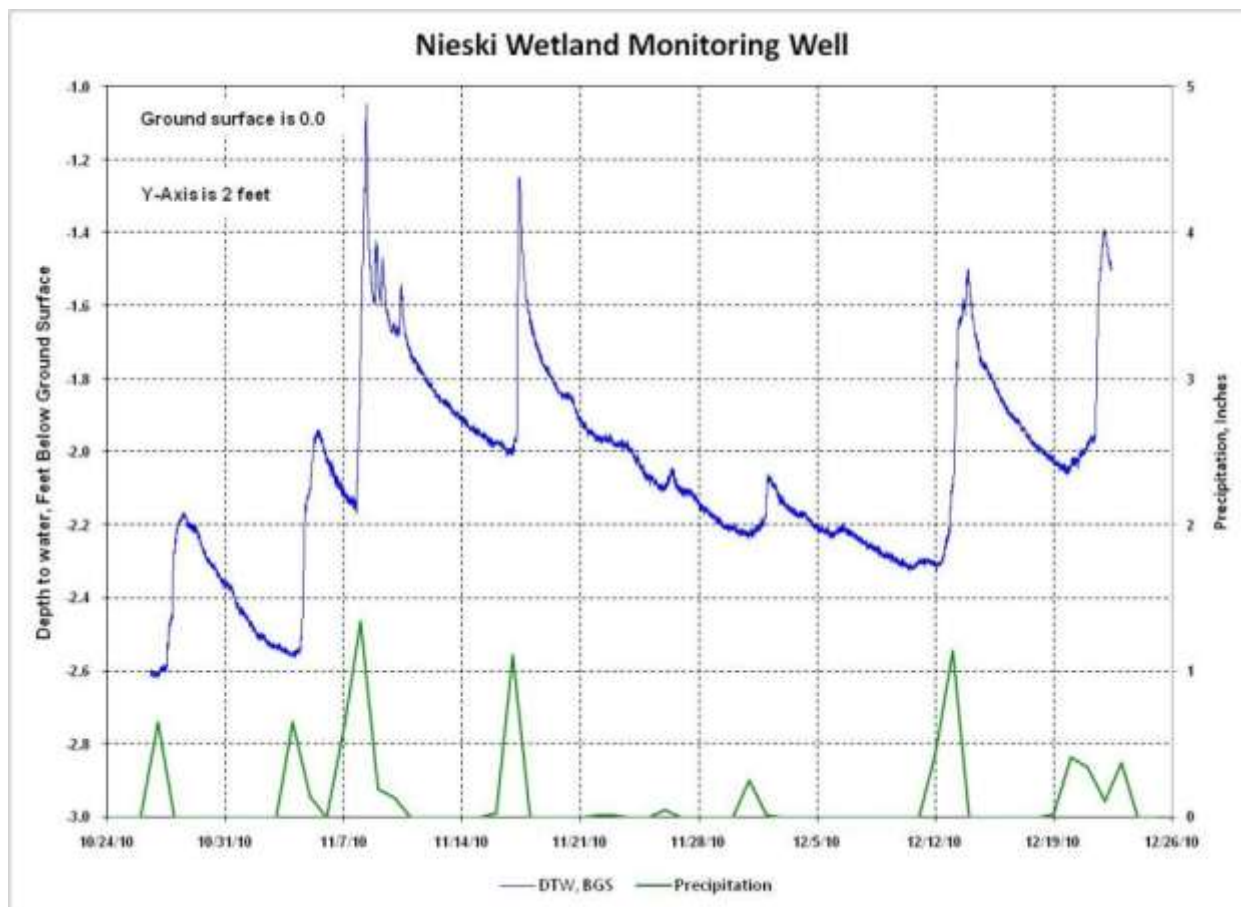


The water level in the Mill Creek wetland monitoring well is above ground surface for the entire period of record. Water level shows an immediate and dramatic response to rainfall-recharge events. For example, on November 7-8 about 2 inches of rainfall caused the water level in the well to rise more than a half foot.

There is always surface water present at the well; generally a few inches deep. The well is in the midst of a phragmites patch in Mill Creek.

It appears that the well is probably screened in the aquifer below the peat layer of the wetland. The peat layer acts as a confining layer; allowing water level in the well to rise above ground surface. The quick and dramatic response of the water level indicates that it is the fluctuation of groundwater levels in the aquifer; not of surface water adjacent to the well.

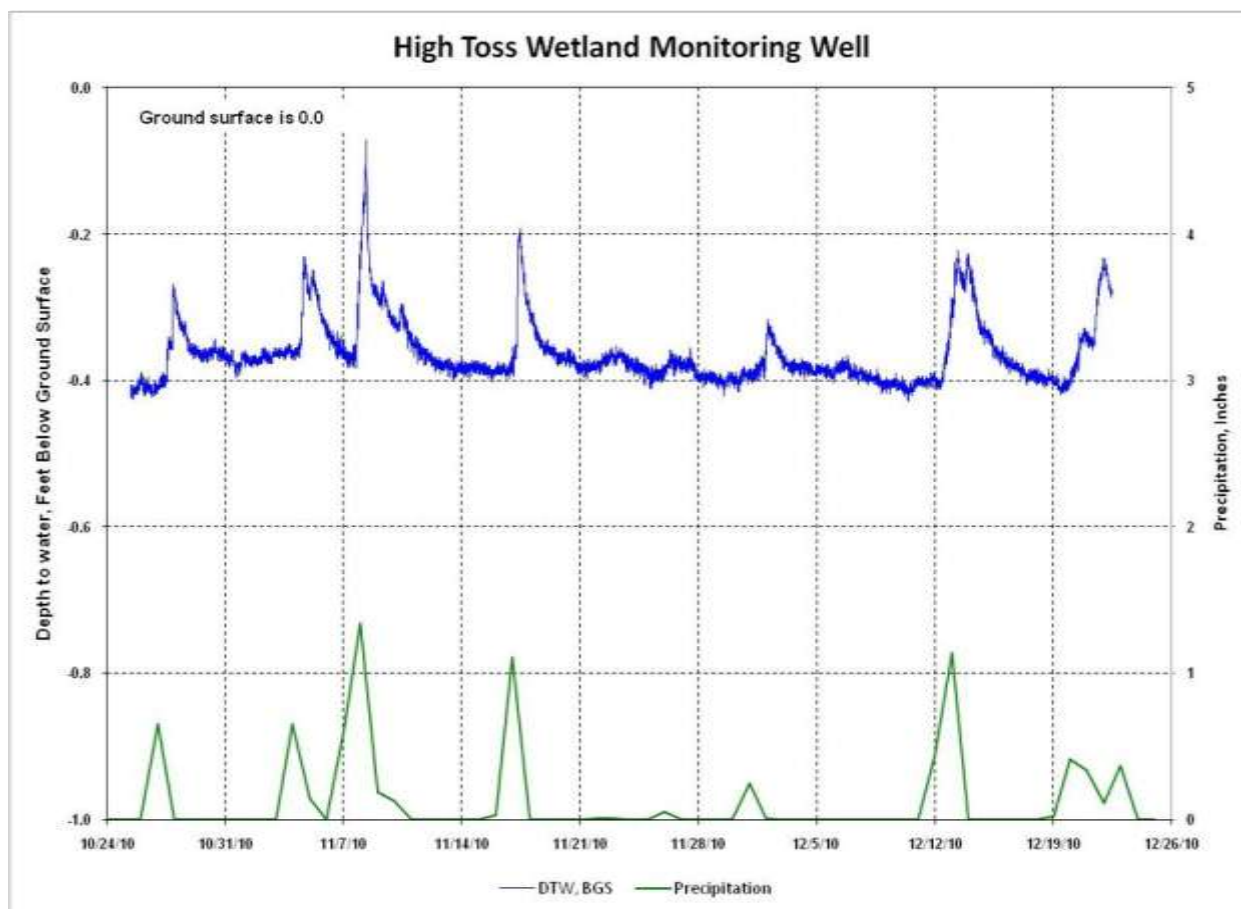
The hydrograph is typical of the response that would be expected for the water table fluctuation; quick rise from rainfall-recharge followed by a gradual recession, but yet the water level is always above ground surface.



Water level fluctuation in the Nieski well is nearly double that seen in any other wetland monitoring well. All other hydrographs are plotted with a one-foot range on the Y-axis. This hydrograph has a two-foot range on the Y-axis.

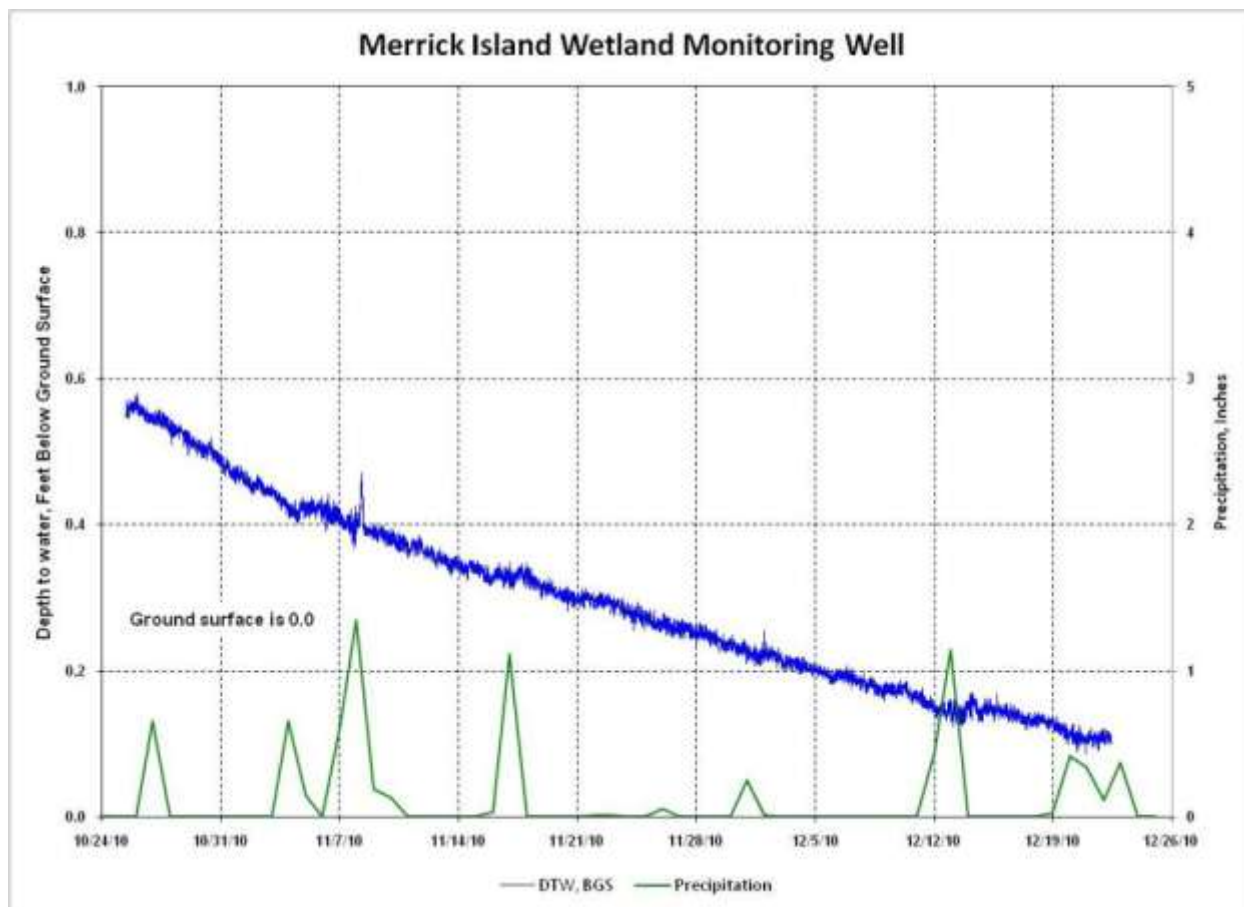
Water level at this site is always below ground surface, ranging from about 2½ feet BGS in late October to about 1 foot BGS following the 2-inch rainfall-recharge on November 7-8.

This well is located in an upland area in the back yard of the Neiski residence. Its location, in an upland area rather than in the floodplain, likely accounts for the greater range of water table fluctuation than is seen at the other wells.



Water level at the High Toss well is always below ground surface. Water level responds quickly to rainfall-recharge. Following recharge events, the water level quickly recedes to its base level of about 0.4 feet below ground surface. The “base level” for water in the well is probably controlled by the proximity to the Herring River, which probably is close to a constant water level in this area.

This well is located on the downstream (south) side of High Toss Road and about 100 feet east of the culvert where the road crosses the Herring River. The well is in an upland area of pine trees. There is probably no peat layer or other sediments to create a confining layer. It is likely an unconfined, water table well.



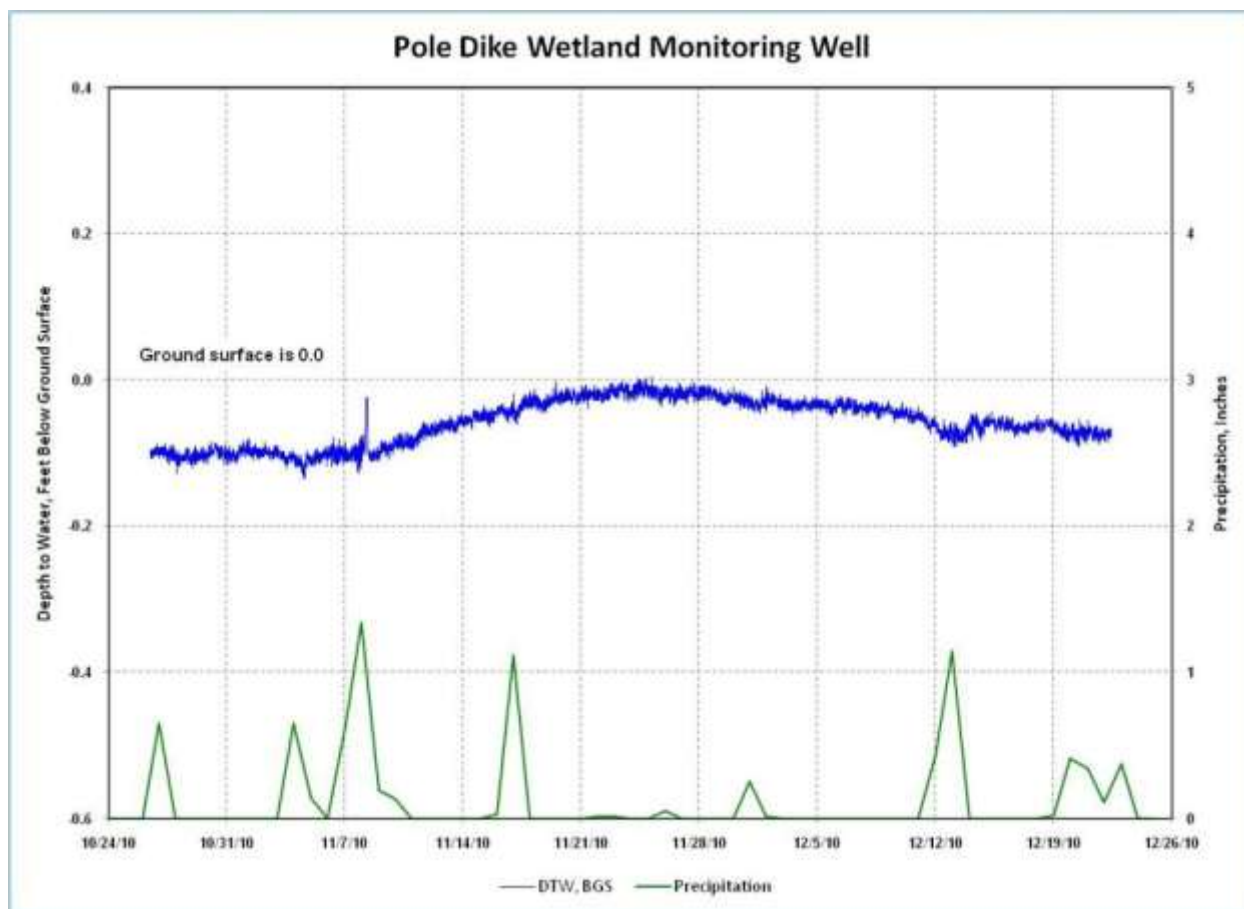
The water level at the Merrick Island shows very little response to rainfall-recharge events. The water level in the well was above ground surface for the entire two-month monitoring period, showing a gradual decline from about 0.55 feet above ground surface to about 0.1 feet above ground surface.

The well is in an open meadow of sedges and grasses. It is damp, but doesn't have standing water. The ground surface is "spongy"

We need to check this well to determine whether it is in hydraulic communication with the underlying aquifer; if the screened interval is plugged.

Is the water level really above ground surface at this site?

Might the well be completed in the peat layer? Does the long gradual decline reflect drying of the peat through the autumn? However, if it was screened in the peat layer, the water level shouldn't be above ground surface.



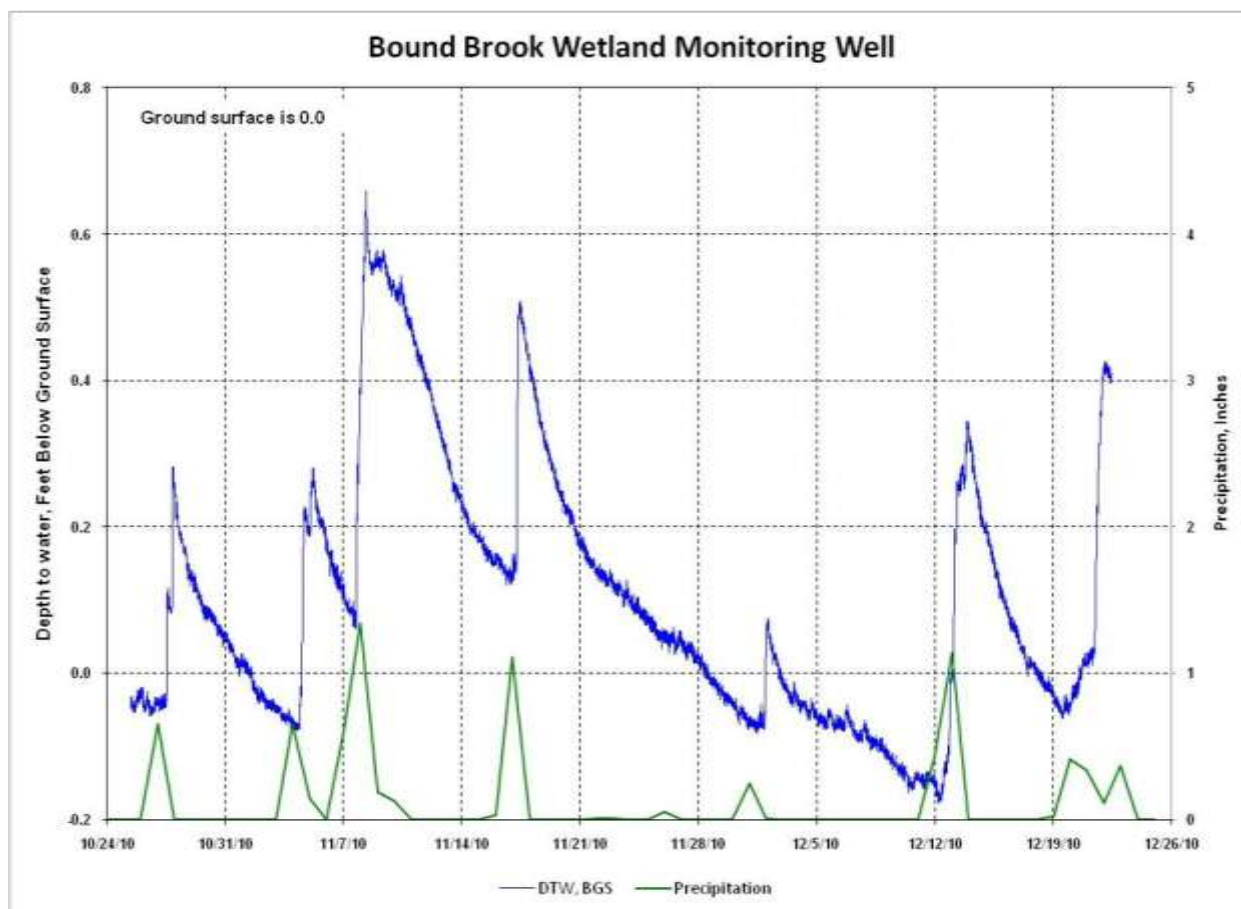
The water level in the monitoring well at Pole Dike shows little correlation with rainfall-recharge events. The water level is always just slightly below ground surface, ranging from about ground surface to 0.1 foot below ground surface.

Check this well for communication with the aquifer. Is it plugged?

This is actually a very believable hydrograph for this wetland area adjacent to Pole Dike Creek. The water level gradually rises as ET is reduced at the end of the growing season. There is a gradual decline in December, possibly because there a long period without a significant rainfall-recharge event.

This well might be completed in the peat layer. That might be the cause for the muted response to rainfall-recharge.

The well is located on the upstream (east) side of the road, adjacent to the creek. Water levels might be affecting by the road immediately downstream and the restriction of flow through the culvert under the road.

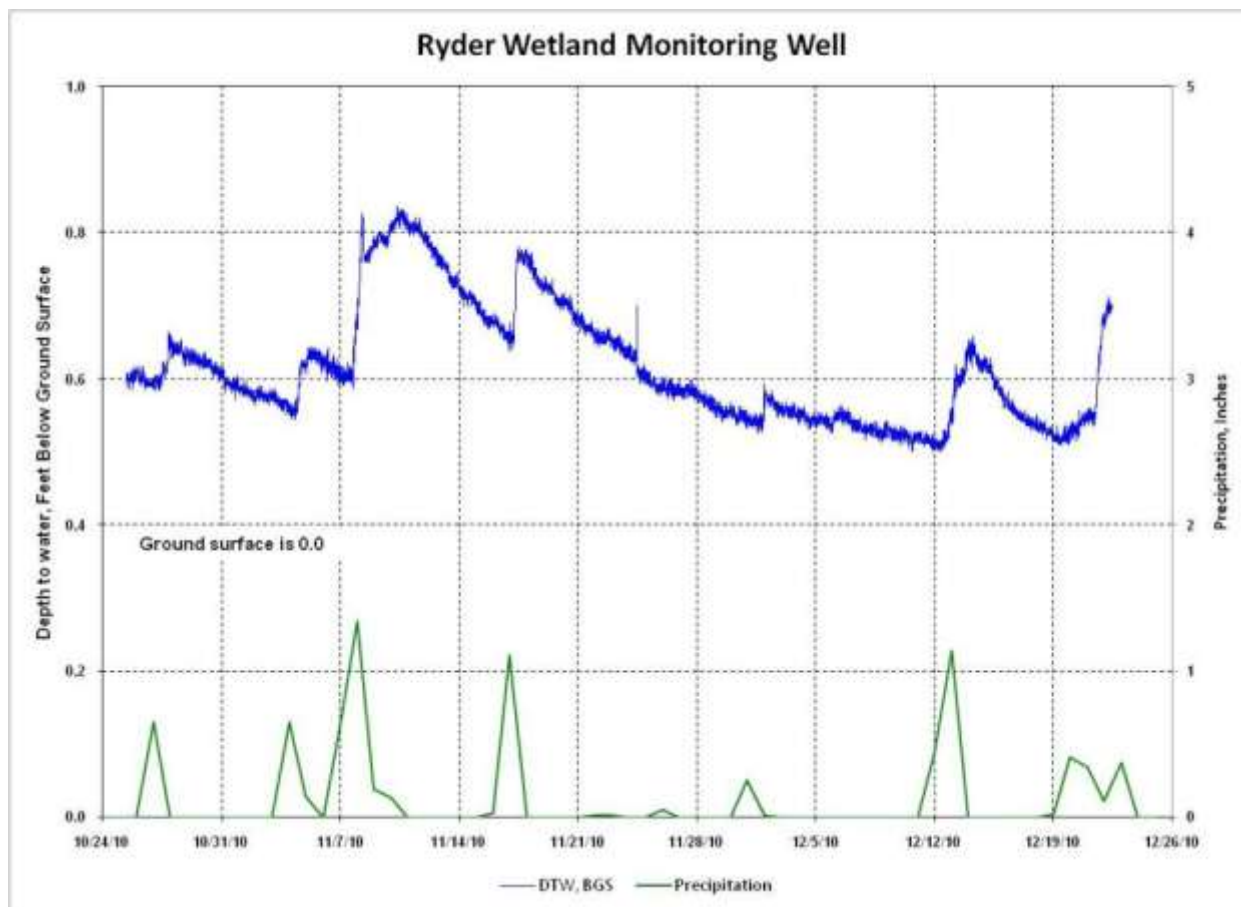


The water level at the Bound Brook monitoring well is above ground surface (greater than zero) for much of the time. During dry periods it does drop below ground surface.

The water level shows an immediate and dramatic response to rainfall-recharge events.

Perhaps this well is screened below a peat layer that might act as a confining layer, creating artesian pressures in the well.

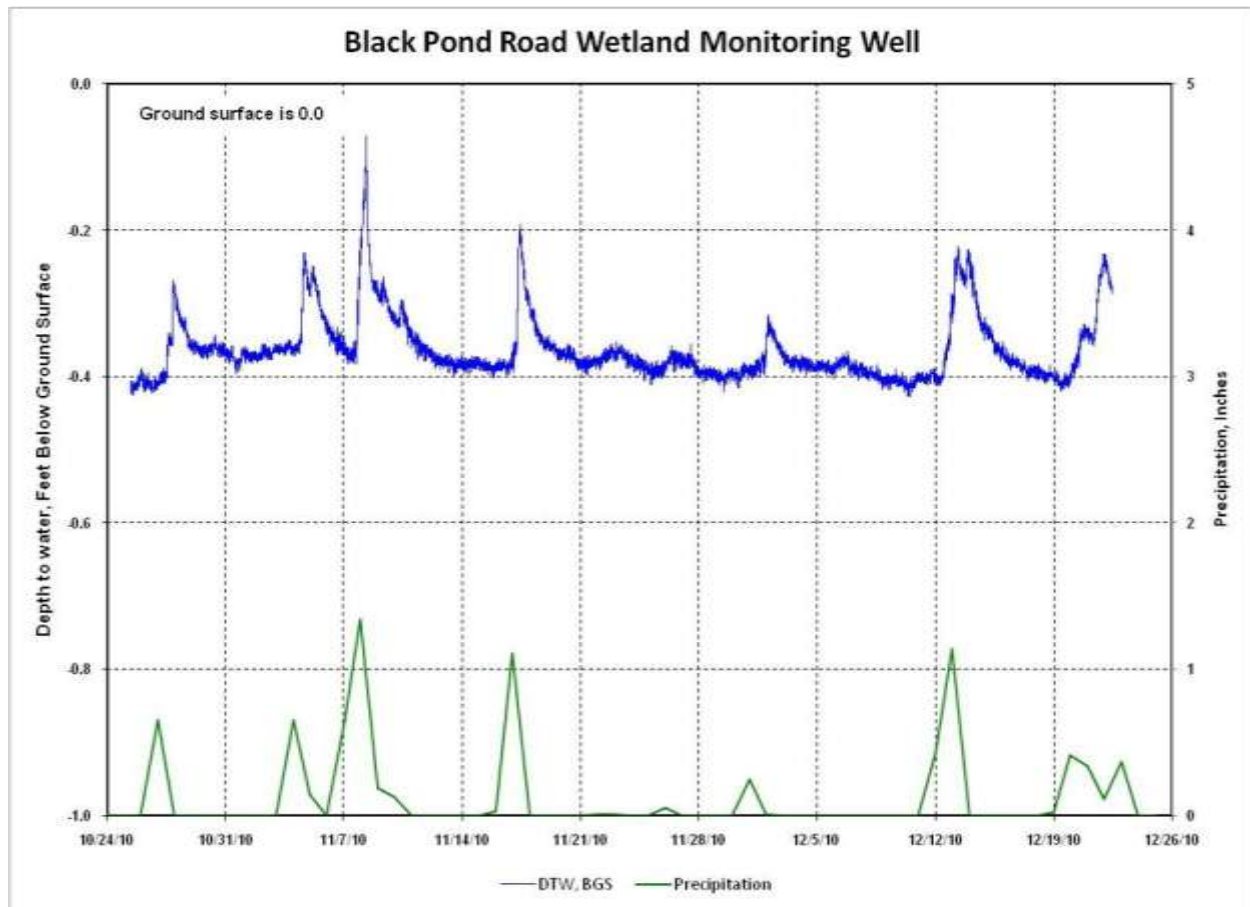
The site is at the edge of an upland area, on the east side of a fire road. Land surface at the site is always dry. Therefore, there must be a peat layer underlying to act as a confining layer to allow the artesian pressures necessary for water level in the well to be above ground surface.



Water level at the Ryder monitoring well is always well above ground surface. Water level in the well correlates with rainfall-recharge events.

Might this be another well screened below the peat layer to create artesian pressures in the well, allowing the water level to rise above ground surface?

There is always standing water at the site, about knee deep. The well is in a lowland area west of the old RR grade. It is probably a confined (artesian) well completed in the aquifer underlying the peat layer. The water level response to rainfall-recharge is typical of a groundwater monitoring well, rather than a surface-water influenced well.



Water levels in the Black Pond Road monitoring well respond to rainfall-recharge events. The water level is always below ground surface.

The well is at the base of the slope, at the edge of the wetland area. It is probably too close to the edge of the wetland to be influenced by the confining properties of the peat layer.

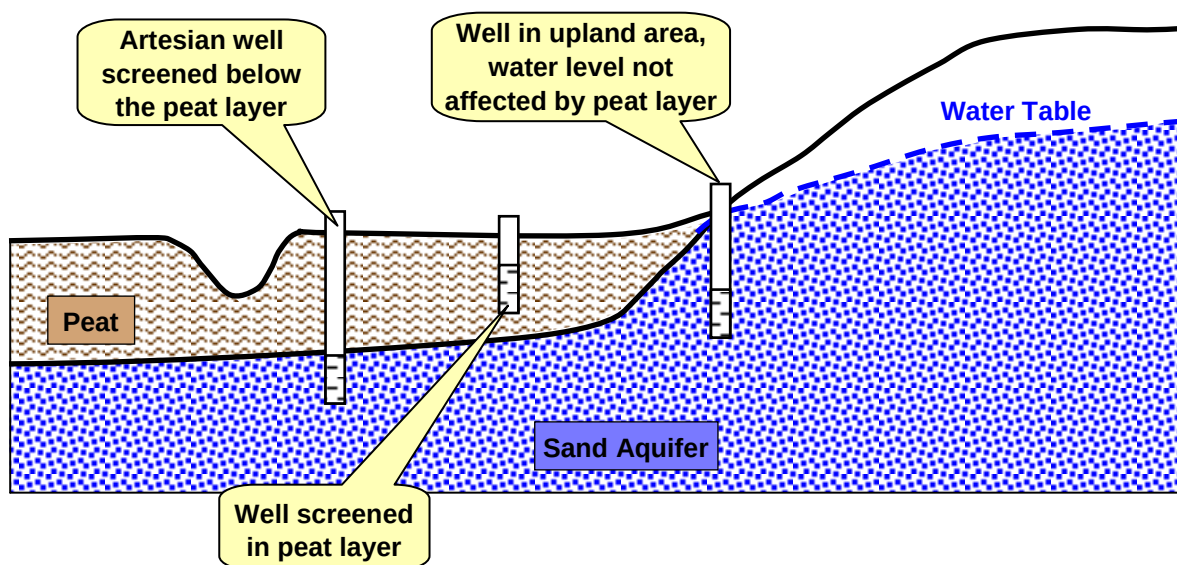
Discussion

Some of the wells seem to be under artesian pressure. The water level fluctuation correlates very well with the rainfall-recharge events, but the water level is above ground surface. This could occur if the peat layer forms a local confining layer and the well is screened in the sand aquifer below the peat. Water levels in the well might then be affected by recharge on the adjacent upland areas.

Water level fluctuations in the monitoring wells seem to fall into 3 categories;

1. Little or no response to rainfall-recharge events; Merrick Island & Pole Dike.
2. Correlate with rainfall-recharge events; water level above ground surface (artesian); Mill Creek, Bound Brook, Ryder.
3. Correlate with rainfall-recharge events; water level below ground surface; Nieski, High Toss, Black Pond.

The attached sketch illustrates the probable hydrogeologic setting of the monitoring wells.



Sketch of possible well completions for shallow, wetland monitoring wells in the Herring River Basin