Cover Page

Annual Report #3 (2016)

Crowland Mitigation through Restoration of the Tamarack Bog, Bath Nature Preserve. Summit County Ohio.

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Summary:

Monitoring of Tamarack bog at the Bath Nature Preserve from 2013-2016 has focused on Hydrology and Vegetation. Hydrological study primarily focused on classifying this peatland as a bog or a fen, to guide restoration targets. Water chemistry, water movement, and water levels indicate that this area is a "Poor Fen", with substantial contributions of groundwater and near-neutral pH. Ground water levels indicate a strong annual cycle, with rising groundwater October-April, and drawdown during the remainder of the year. However, the depth to water on the peat/muck mat in the wetland holds almost constant just below the surface. Consistent with the depth to water measures mentioned above, the absolute elevation of the mat changes with water levels by as much as 4" (100mm) indicating that the mat floats on the water in the basin. The elevation of the water outlet from the wetland was raised 5 ¾" in September 2015, but low rainfall during 2016 prevents a firm evaluation of the consequences of that action for the wetland and its hydrology. However, the fact that the mat floats suggests that raising the water level in the wetland will not result in standing water and flooding that would damage the vegetation.

Vegetation in the bog is in good shape. VIBI and FQAI scores are holding steady in the Core and Edge habitats, and are improving in the 'Enhancement' areas. High quality wetland species and Peatland indicators such as Speckled Alder, Cinnamon Fern, Blueberry, Sphagnum Moss, Fern Moss, and Tamarack are holding steady or spreading. Invasive species are generally declining. Control of Red maple through girdling was unsuccessful in the first year of effort (2014), but an improved girdling technique was used in late 2016. Plant communities have been delineated, and are holding steady over the first 4 years of this study. Trial Tamarack transplants indicate that herbivory is an important source of their mortality in the bog, but that transplanted seedlings can grow well for at least one growing season in all three habitat types in the wetland. The finding that the wetland is a "Poor Fen" rather than an acidic bog brings into question the restoration goal of doubling *Sphagnum* coverage. Three publications have resulted from the monitoring work so far, including two MS theses and a presentation at a National Scientific Meeting.

Contents

1. Introduction

Preservation and enhancement of the Tamarack Bog at the Bath Nature Preserve is a goal of the mitigation agreement. A prior study of the area (Miletti et al. 2005) evaluated past changes and existing threats to this site. Drainage ditches placed in the 1960s, and consequent reduction of habitat (from 13.8 to 4.36 acres) were the primary problems for this area, along with invasion by Red Maples and European Buckthorn (crabapples were later noted as an important invader). Placement of a drainage control structure (Agridrain) and control of invasives are important elements of the restoration plan. The bog contains several state listed species (e.g., *Carex atlantica* var. *capillacea*, *Larix laricina*). This report provides monitoring information based on the first four years of the restoration effort (2013-2016). Important elements of the initial monitoring efforts include: evaluation of water chemistry and habitat type (bog or fen), and baseline vegetation information. The water budget of the system is also carefully documented. Additional issues, such as potential for *Sphagnum* and *Larix* expansion are also addressed through pilot studies. Restoration of the hydrology was initiated in late 2015, when the level of the water outlet was raised 5 ¾"; the effects of this alteration on the hydrology of the rest of the bog, and on the vegetation, are not yet known. Another commitment of the mitigation agreement is an emplacement of a boardwalk to facilitate public access and education. The boardwalk can been seen in aerial photos within this report. It was completed in 2015 and was used by visitors throughout 2016.

2. Peat/Muck Extent Survey

On August 25, 2015 two Ohio EPA officials (Bill Schumacher, a soil scientist, and Joe Loucek, Permitting Coordinator) joined us at the site to evaluate the extent of peat and muck soils in the restoration area, specifically looking for: how far out the organic soils extend, and what portion of the area might be part of a potentially floating peat mat. We evaluated a series of transects from 'in' to 'out' of the main bog mat, using a 5' coring probe to evaluate subsurface soil. Each transect was ~20m from the previous one, in a grand circle of the site. In most cases the top foot or so of the core provided a good indication of the soil situation, but occasionally it was necessary to extend down the full length of the probe. A plot of the locations on each transect where Schumacher found the edge of the muck is in Figure 1. In general he found that the very edge of the muck had 2-12" of mineral soil overlaying it, probably from erosional deposition. Upland from there he sometimes found small amounts of muck under thicker mineral soil, other times the edge was more abrupt, and occasionally more mixed ("Mineral-Muck"). The eastern ditch appears to have been laid almost right on the edge of the muck (with a minor exception at well 5b, where the muck extends east of the ditch ~15m). On the gasline cut, the soil was all jumbled, suggesting that it has been disturbed and contains fill material to allow easier access to the pipeline. Schumacher could find almost no real muck soil north of the gasline except for a loop/ streamcourse on the western half (and that was a mixture). The gasline seems to mostly lay over the northern historic edge of the bog. On the west side, the edge of the woods pretty well matches the edge of the peat and muck. These boundaries agree with the pre-1960 boundaries of the original wetland (Miletti et al. 2005).

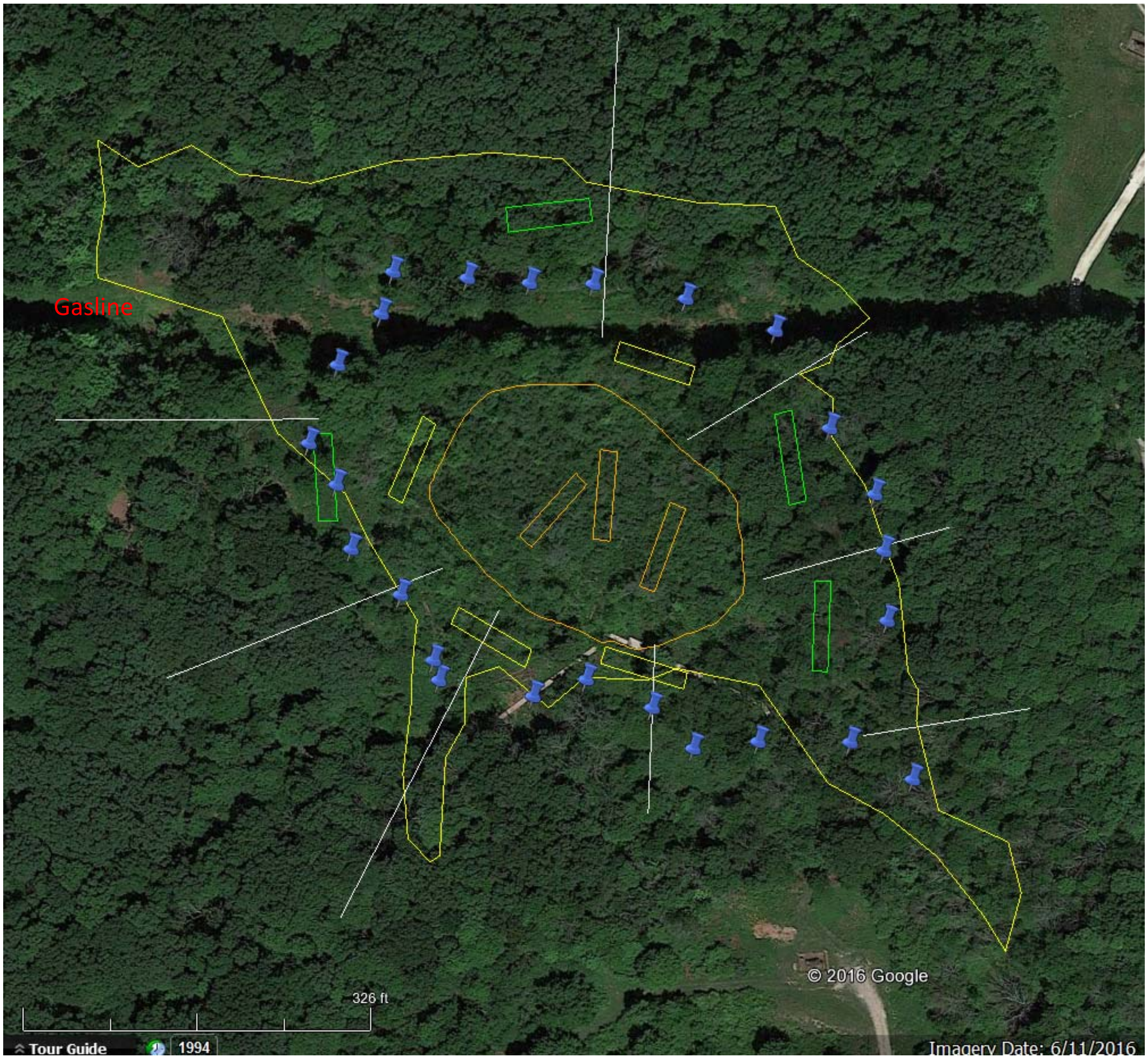


Figure 1 –Locations of major landscape and monitoring elements of the Tamarack bog restoration. The irregular yellow line surrounding the area is the wetland boundary as delineated in May 2013, and the irregular orange line indicates the approximate 2013 location of the "Core Bog" plant community. Rectangular boxes indicate the 11 VIBI modules; the orange boxes are 'core' modules, the yellow boxes are 'edge' modules, and the green boxes are 'enhancement' modules. The 8 green lines indicate the original vegetation transects (some have been elongated). The blue pushpins indicate the edge of organic soil as indicated by Bill Schumacher in August 2015. This image shows portions of the boardwalk (installed 2015) in the center- south. Note the vegetation cut for the gas pipeline along the northern edge of the bog, which is a useful landmark often referred to in this document.

3. Hydrology.

MS Thesis on Bog Hydrology and Water Chemistry.

Karyna Mezntseva completed her MS on the hydrology of this wetland during 2015**.** Her research included evaluation of borings, well installation and sampling for water chemistry and water levels, and a preliminary study of the water budget for the area. The main conclusion from her study is that the hydrology and water chemistry confirm what the plants have been telling us - this wetland is really a weak ("poor") fen. Her main reasons for this conclusion are:

- Tributary 4 (the main water source) is groundwater–fed.
- Presence of water-conducting zones in the surrounding upland areas.
- Groundwater slopes towards the Bog.
- Water is of calcium-magnesium bicarbonate type.
- Chemistry is influenced by groundwater contribution.
- pH is circumneutral (typical for fens) rather than acidic (typical for bogs).

We include below a few figures from her thesis that support her conclusions and provide context for the sampling.

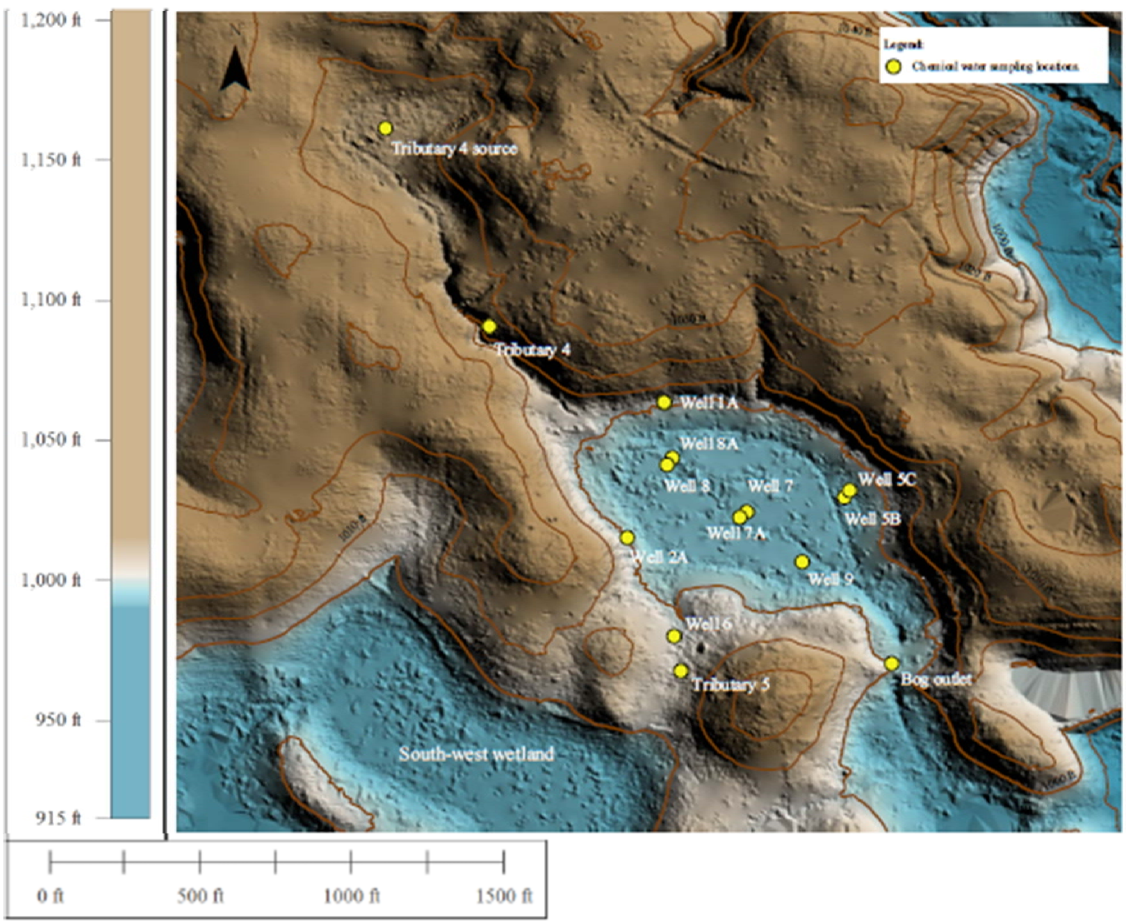


Figure 10. Map showing water sampling locations of the Tamarack Bog.

Her "Figure 10" (above) indicates locations for the water sampling.

Her “Figure H2” shows a cross-section view of the subsurface material composition from some of the borings. Based on several other cross-sections like this, she concluded that the Tamarack Bog originated as a “kettle bog” at the intersection of Hiram, Hayesville and Mogadore glacial tills. Most of the surrounding terrain is damp clay. The eastern side has some calcareous areas while the western side shows more diversity of geologic material, with several lenses of wet sand and moist sandy clay interbedded with damp clay deposits. The flat central area is mainly wet undecomposed organic matter - Carlisle muck.

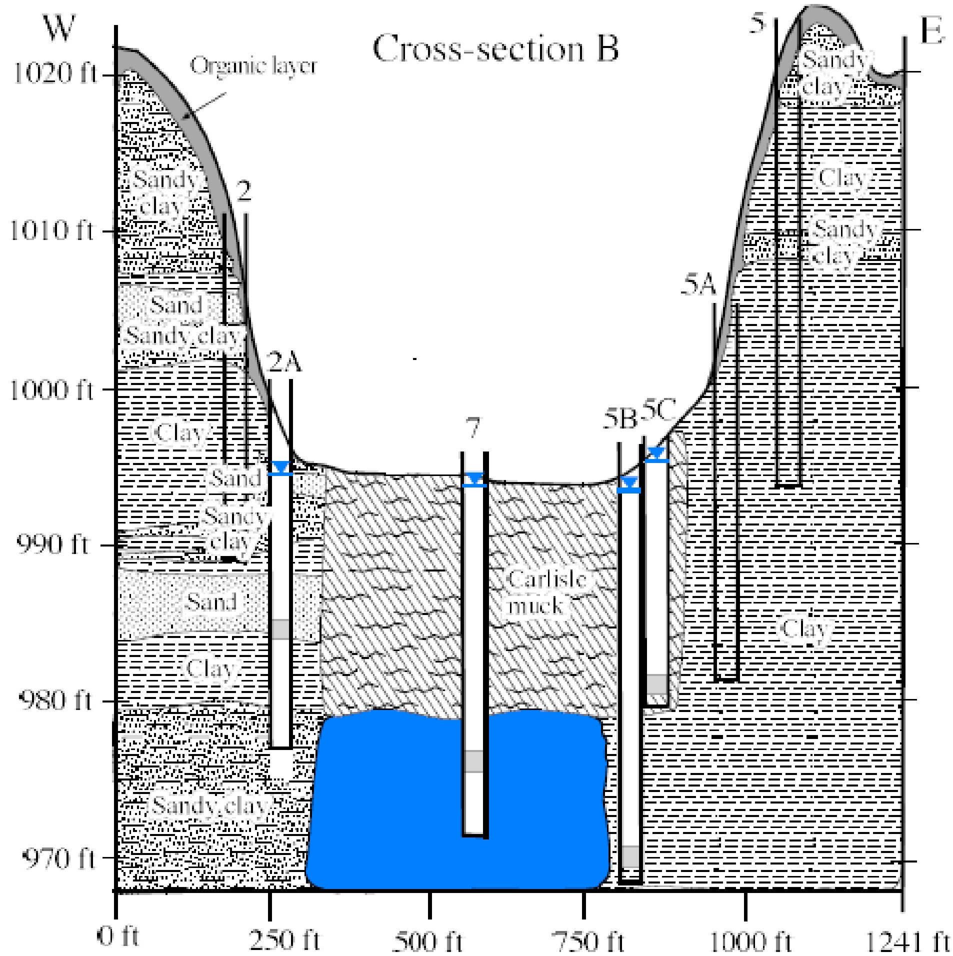


Figure H2. Cross-section B from boring 2 to 5. Vertical exaggeration is 25 times. Blue line with triangles shows groundwater level (b.g.s.) on April 26, 2014. Gray box within the well casing shows the location of the screen.

Regarding the water chemistry, a Piper plot for the June 2014 sample (“Figure 23”) compares the observed values (circles) with those expected for a bog (ellipses). All values cluster far away from the bog expectations, supporting the ‘Poor Fen’ conclusion.

Given that the hydrological studies indicate that this wetland is “Poor Fen”, it is worth a discussion about whether the restoration goals, especially with regard to the requirement to doubling *Sphagnum* coverage, should be revisited. Many fens have low sphagnum abundance, instead having a strong sedge understory.

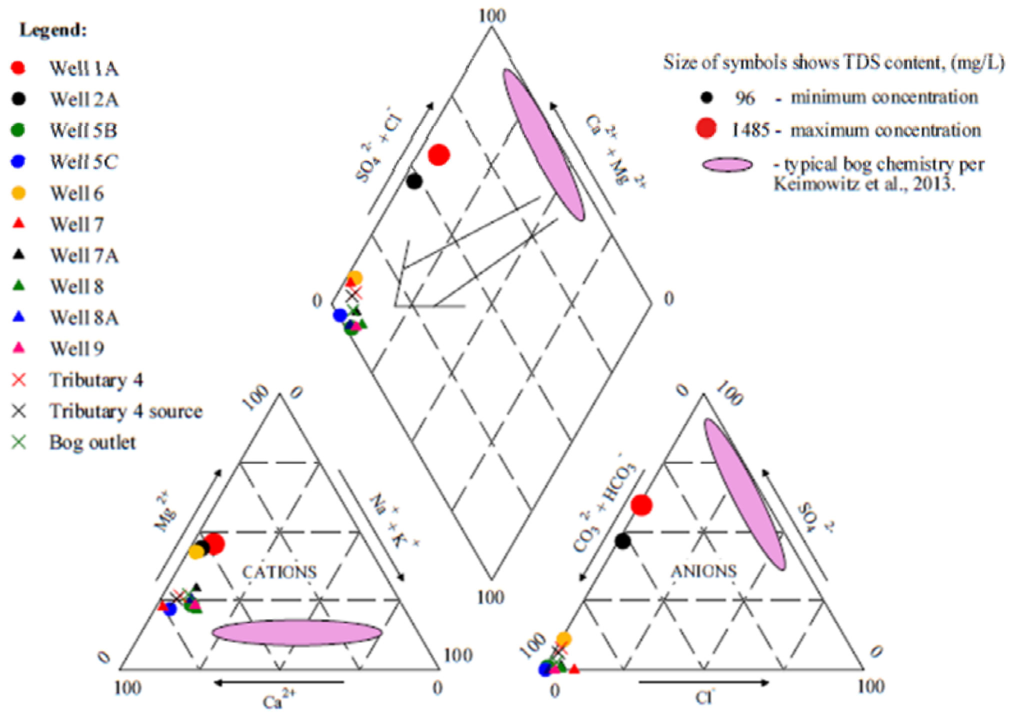


Figure 23. Piper diagram illustrating water chemistry of the Tamarack Bog June, 2014. The arrow shows transition gradient from bog to fen chemistry per Boeye et al., 1994.

Mezentseva's 263 page thesis (Mezentseva 2015) can be downloaded as a pdf at http://gradworks.umi.com/16/01/1601098.html or is available from us upon request. We have continued many of the same measurements since then, and summarize them below. In particular, we sampled water chemistry and levels: June 2014, November 2014, April 2015, October 2015, and June 2016. Chemical analyses from the first two samplings are presented in the Mezentseva Thesis (2015).

pH and Conductivity

During each of our water chemistry sampling events, we recorded field values for pH and conductivity from the wells, from the Agridrain (outlet), from the water inlet (Tributary 4), and when possible from the source of Tributary 4 (which is a spring 400 m uphill to the north). Those data are shown in the graphs below (Figure 2), with the sites identified by well number, and by the physical location of the sampling point. The sampling points that are not wells (the stream and outlet) were on occasion dry, so we had no data for those times.

pH was generally higher in the tributary stream and upland sites, lower on the edge and mat, and highly variable at the outlet. November 2014 gave fairly uniform and high (~7.4) pH readings. Conductivity, which is a proxy for total dissolved solids, showed very consistent readings at each site, with much higher levels for upland wells, and low values for the mat and outlet. These values confirm and extend those reported in the Mezentseva (2015) thesis.

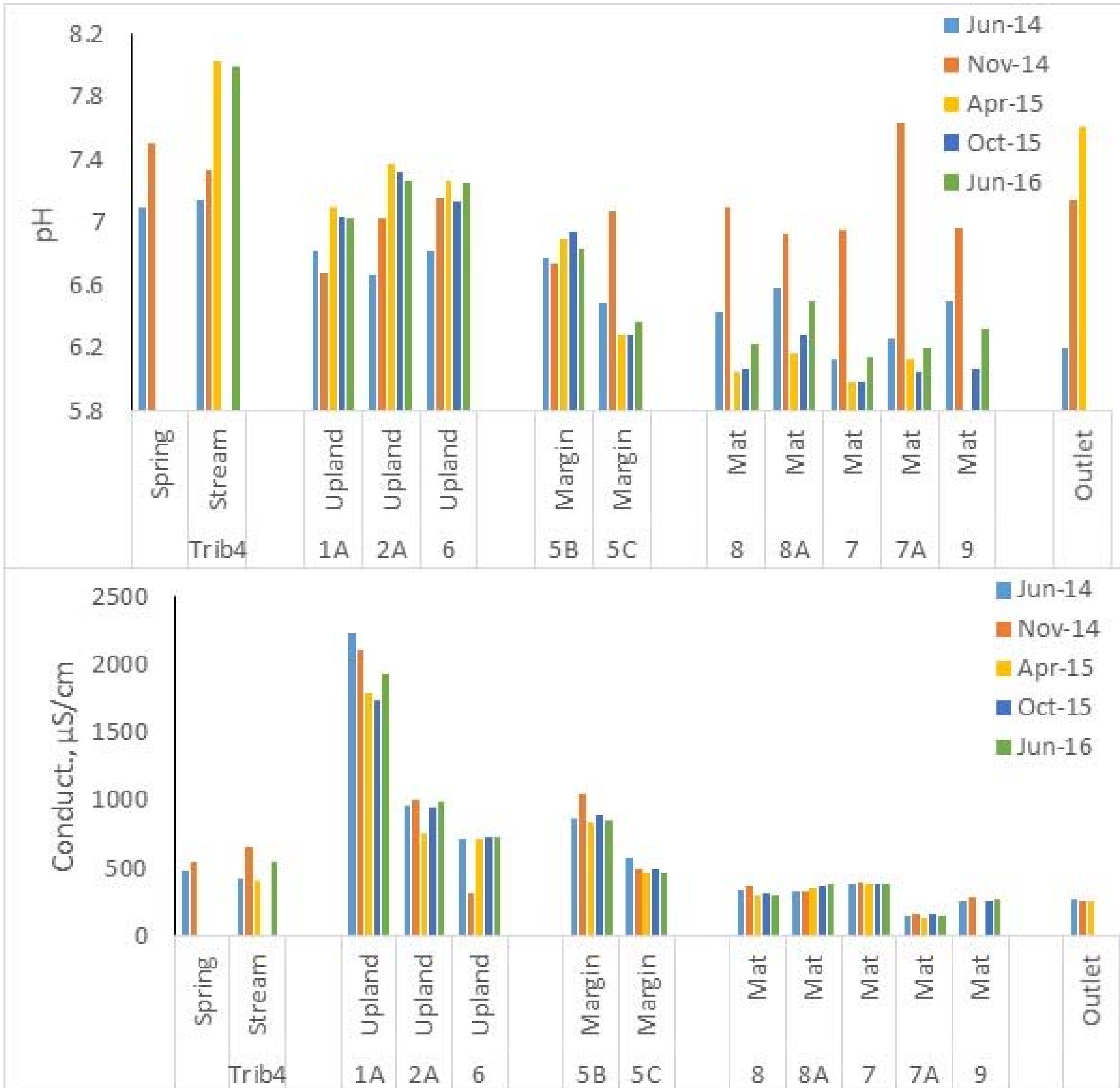


Figure 2

Water levels in the permanent wells.

Water levels in all of the wells since their establishment in 2013 are reported in Figure 3 below. As in the past, water levels in the main wetland area (Wells 5B, 5C, 7, 7A, 8, 8A, 9) hold steady just below the bog surface for most of the year except in the spring flood. Water levels in upland wells dropped on average 0.8’ in 2016, reflecting a year of low rainfall (see below). Broad patterns over the 3 year period show rising groundwater levels from October – April, with decline through the remainder of the year

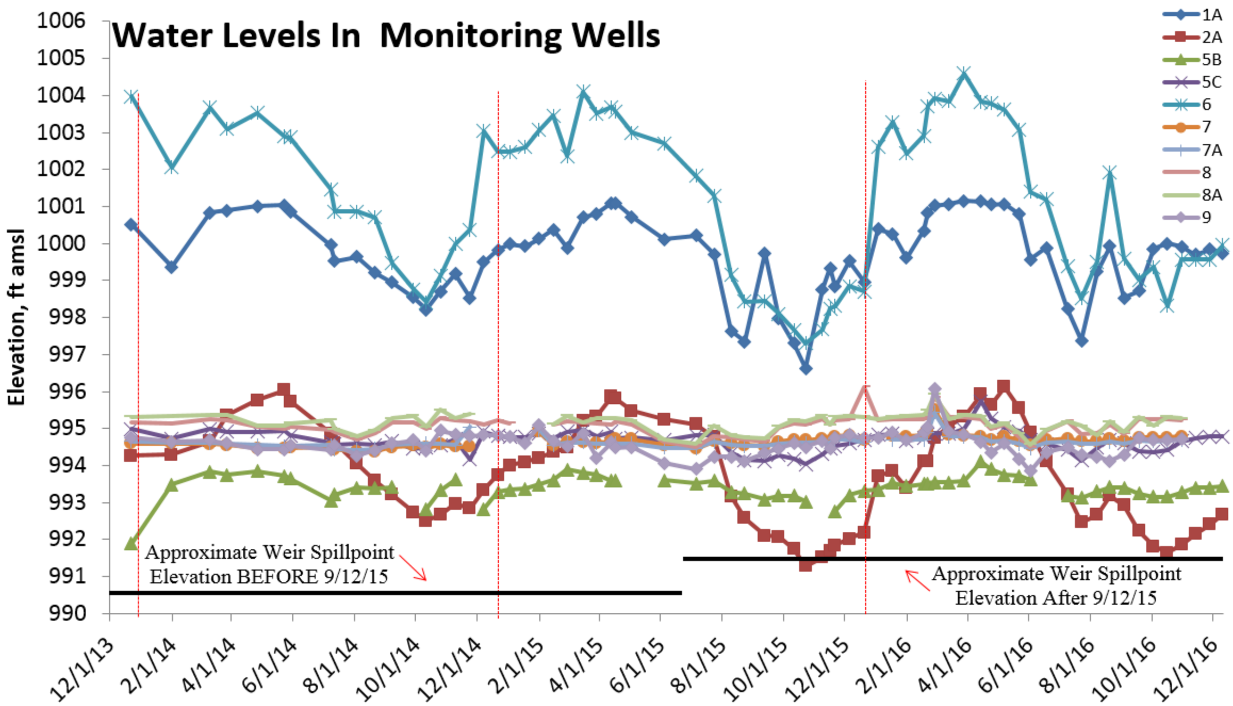


Figure 3. Water levels in monitoring wells, in feet above mean sea level, from December, 2013, to December, 2016. Note repeated cycle of rise in fall and winter and decline through summer.

Raising the Bog Water Level.

One of the most important aims in this project is to restore the hydrology to what it was before the ditches were established in the mid-1960s (Miletti *et al.* 2005). After careful initial evaluations of all data in the report and gathered in this project, and discussion among all participants, on September 12, 2015 a new v-notch stoplog was added to the Agridrain, raising the outlet height by 5 ¾", as an initial step in moving to raise the water level 6-12". This stoplog also functions, with an additional pressure-transducing datalogger, as a weir, allowing automated monitoring of discharge from the bog.

Outlet Elevation and Rainfall

We recorded water elevation daily at the bog outlet with a pressure-transducing datalogger, and tracked rainfall from our nearby weather station (Figure 4). Near September 2015 the water level at the outlet dropped distinctly. This timing coincides fairly well with the September 12, 2015 placement of the stoplog. Paradoxically, water levels at the outlet actually declined after that date (0.22m = 8.8"; means are 0.51 ± 0.18m vs. 0.28 ± 0.22m). We see no way that raising the stoplog would reduce water levels, and instead feel that this reflects the dry conditions of 2016 (the last year was widely recognized as a drought year in our area, see http://droughtmonitor.unl.edu/Home.aspx). Our rainfall data is incomplete due to equipment malfunction, so we cannot directly evaluate the reduction in water input. With so many uncertainties it is difficult to draw any firm conclusions about the effects of adding the stoplog at this time, and we are hoping that further monitoring and a return to typical rainfall patterns will clarify the issue. Rainfall does not appear to be a major driver of the water level at the outlet, since major rain events do not correspond to deeper water.

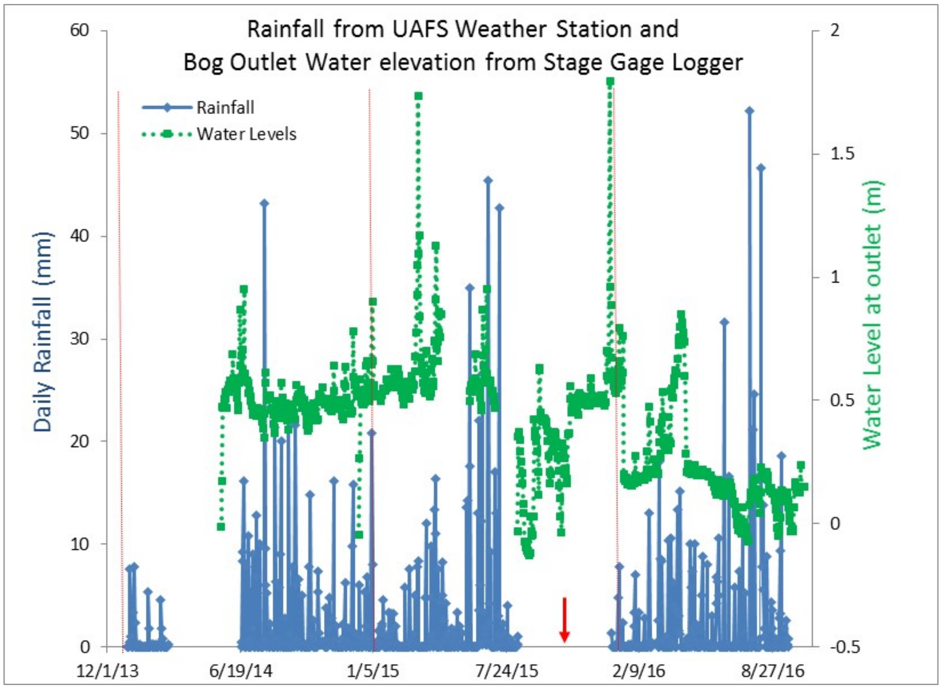


Figure 4. Rainfall and outlet water elevation. Red arrow indicates Sept 12, 2015, when the water outlet level was raised. Gaps in the traces reflect equipment malfunctions.

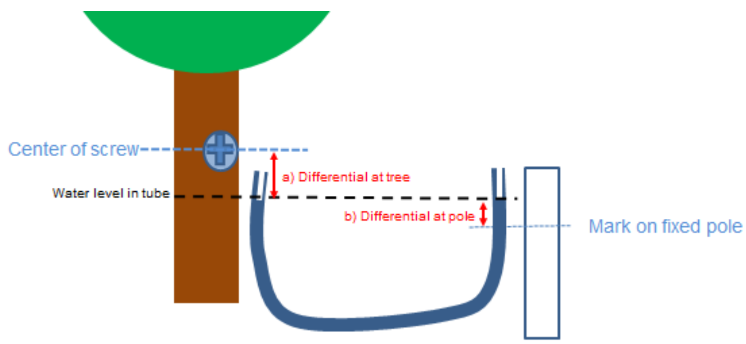
Data from the water monitoring wells provides some context for these changes. In the period following the placement of the stoplog (after Sept 12, 2015) there was a substantial DECREASE in water levels for upland wells (-0.77' = 9.2"). This presumably reflects the drought mentioned above, and the consequent decline in soil water near the bog. In contrast, the water levels in the bog wells (on the floating mat) showed almost no change (a slight increase of 0.03'= 0.36"). In other words, it has been dry lately, so it is difficult to evaluate the effect of the higher stoplog.

Does the Bog Mat Float?

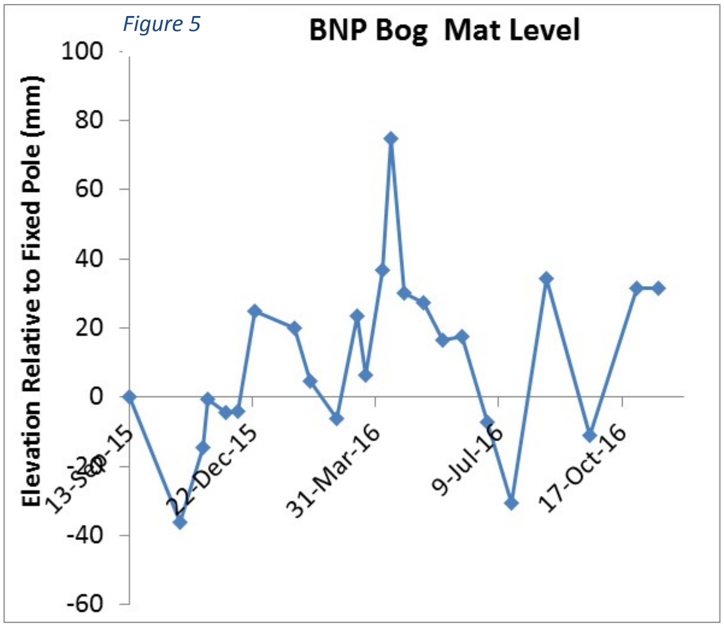
A key question about the hydrology and ecology of the tamarack bog is how changes in the height of the water outlet in the Agridrain translate into changes in the water depth (relative to the bog mat surface) in the habitat. One possibility is that the bog mat might 'float' with an increase in water level. Assessing the elevation of the mat is necessary for such a determination, but this proved difficult because the extreme thickness of the vegetation precluded most surveying methods (theodolite), and GPS does not provide sufficiently accurate elevations.

After considering and trying several methods, in 2015 we decided on the "Fixed Pole" method described below. This method relies on comparing the height of the peat/muck mat relative to a fixed pole (firmly pounded into the clay underlying the deep layer of peat). Preliminary probing of bog depth indicated that the underlying clay is, in many places, over 30' below the surface of the peat, requiring a longer pipe than initially expected. On August 23, 2015 (at two locations) we therefore pushed a pole of ¾" galvanized pipe (10' lengths, linked with threaded fittings) through the peat until we hit the underlying clay, and then used a fence-post driver to pound the pipe straight down several more feet so that it was firmly anchored and would not rise or settle with any movement of the mat. The first site is near well 7, in the middle of the bog. This station has a total of 70' of pipe – the first 56' or so went in under the force of gravity. The remainder of the distance we pushed the pipe down, at first with our own weight, and then for the last ~4' we hammered it in. This left 2' of pipe aboveground. Prior auger samples indicate that there is 14' of muck and peat at the surface here, with most of the depth below that to ~40 to 50' being open water. The second site is at Well 8 (northwestern corner of bog, just south of gas pipeline). Here we used 43' of pipe and the same combination of pushing and hammering to achieve a solid placement. The mat at Well 8 seems to be about 20' deep (at this depth we met increased resistance), and extends all the way to the underlying clay (we saw no evidence that there is any open water under the mat here). At each site, a PVC sleeve around the upper 10' of each fixed pipe was placed to reduce friction with any movement of the mat.

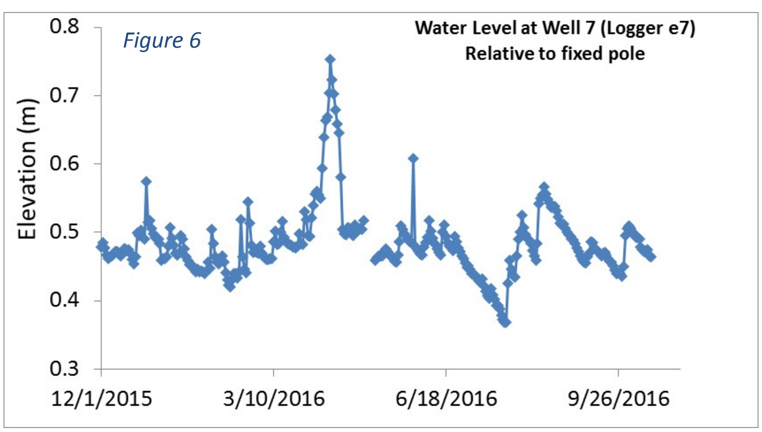
To track the relative height of the bog mat compared to the fixed poles (that is, whether the mat floats) we established permanent marks (screws) on two large (~30cm DBH) trees near each pole on September 13, 2015. We used a tube level to ensure that the marks on the trees were at the same elevation as a mark on the fixed pole on that day. Because the trees will move up and down if the mat floats, any change in the height of the screws relative to the fixed pole indicates vertical movement of the mat. We returned periodically (every 14-40 days) and measured the relative height of the marked trees. The accompanying figure (Figure 5. BNP Bog Mat Level) shows those data so far (N=4 readings per data point; the data points are the means of the relative heights of 2 permanent marks at 2 stations).



The mat height measurements using the Fixed Pole method clearly indicate that the mat is floating relatively freely. During spring floods the mat rose to as much as 75mm above our arbitrary initial height, and during summer dry spells it sinks to as much as 31mm below the initial height, for an overall amplitude of 106mm over our initial 14 months of measurement. This indicates that the mat floats at least as much as 100mm (3.9"). It therefore seems likely that our initial change to the level of the outlet stoplog in the Agridrain (raised 5 ¾" = 146 mm) will not and has not automatically drowned out the existing bog vegetation. This flexibility may therefore allow opportunities for more aggressive increases in the height of the Agridrain, to expand the wetland area. Indeed, observations during high water level periods (Spring 2016) indicated that the flooding (height of the water above the mat) was within the range seen in the past few decades (pers. obs.; see next paragraphs).

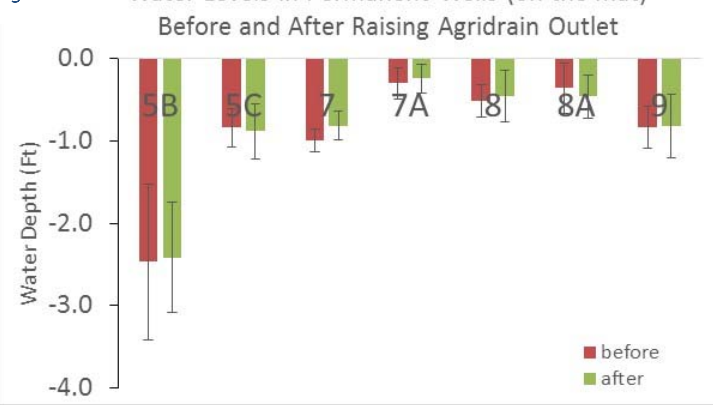


In December 2015, we placed a pressure-transducing logger at the well 7 fixed pole to record the absolute elevation of the water in the Core Bog. See photo below – the fixed galvanized pipe (shown being pushed down in the photo on the previous page) has an 'L' joint from which the logger is suspended in the white pipe below it, recording the absolute elevation of the water in the Core Bog (as opposed to elevation relative to the mat surface, which can be gained from the water sampling wells; see following paragraph). These data (Figure 6) parallel those from the mat level measurements above, documenting substantial water level variation over time (for the 17 days on which both instruments gave readings, the correlation coefficient is 0.87, signifying a very strong correlation). The logger data also have a greater range of variation than the mat elevation changes (total range of 0.4m, compared to 0.1m for the mat) , suggesting that the mat resists movement to some extent, and does not match the more extreme water level movements.



Although the addition of a 5 ¾" stoplog to the Agridrain should raise water levels, the fact that the mat floats means that we do not expect this to affect **depth to water for wells on the mat**. That is exactly the case: (see Figure 7; Before measurements N=35, from Dec 2013-Sept 2015; After measurements N=33 from Sept 2015-Nov 2016). Aside from well 5B, all wells have water typically within half a foot of the surface. Well 5B is on the NE edge of the muck and peat of the bog, and is screened at 28' deep, while 5C is screened at 16'. In other words, except in extreme flood events, the mat tracks the level of water in the bog, and there should not be extensive and extended flooding of the mat in response to changes in the elevation of the outlet (within limits).

Figure 7



Inflows and Outflows.

In September 2015 we placed a pressure datalogger in the Agridrain with the weir to provide a measure of water outflow. Findings to date are in the figure below. There is great variability in ouflow, and occasional brief high discharge events of over 500 gallons/minute.

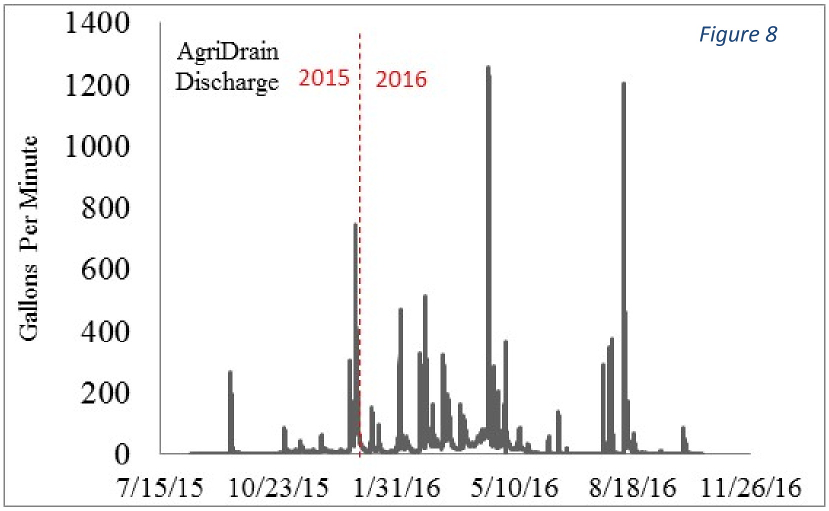
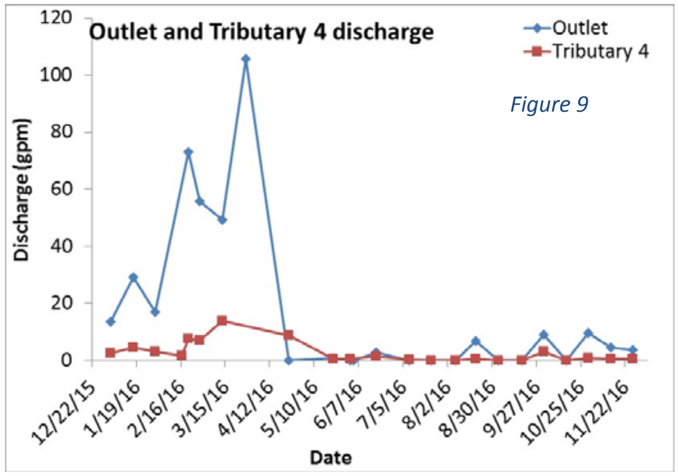


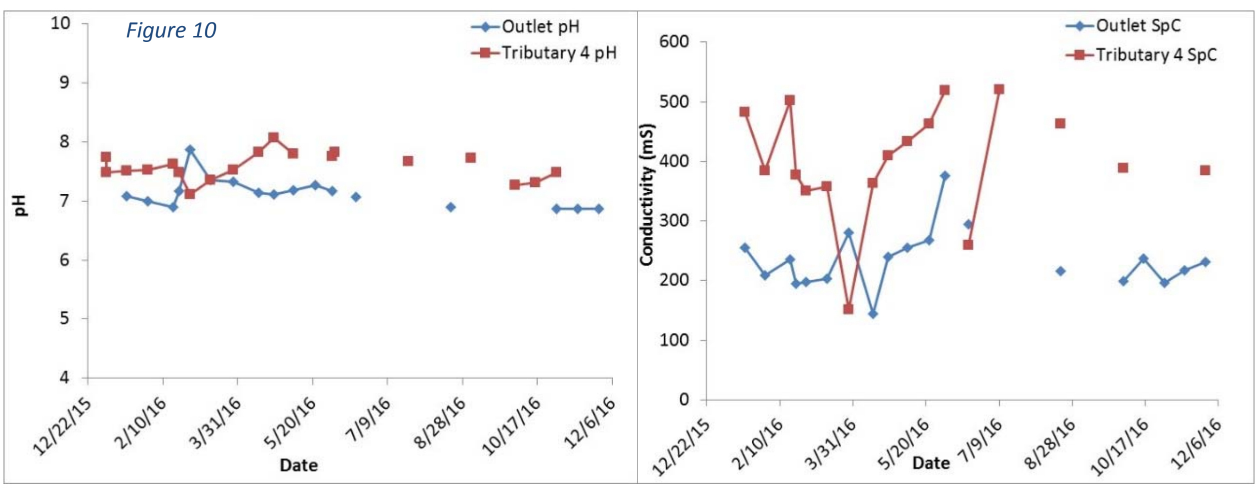
Figure 8

In 2016 we also initiated manual biweekly measures of outflow and inflow to the bog, along with pH and conductivity. To measure flow at the outlet (just downstream of the Agridrain in the Southeast of the area – a 12" diameter white pipe), we used a stop-watch and calibrated bucket. To measure inflows, we first searched the perimeter for potential inlets, and determined that the only semi-permanent inlet to the restoration area is in the northwest (we refer to this as 'Tributary 4'). Tributary 4 receives its water primarily from a spring about 400m to the NW). The entire length of Tributary 4 is low gradient, so it is difficult to make flow measurements. After trying several alternatives, we used a temporarily placed Mylar sheet as a sort of funnel to focus stream flow a few dozen meters north of the gasline. We packed sediment at the upper lip to minimize underflow, and dug out sediment at the outflow in order to be able to place a 2 L bucket to measure the time to fill it, as we did at the outlet.

Based on these manual ("bucket") measures, inflow from Tributary 4 is low (<20 gallons/minute) throughout the year, and over the past year shows only a mild peak during March and April. Outflow from the bog shows the same pattern, but has higher amplitude; outflows peak at over 100 gallons/minute) during the spring. Preliminary calculations from these biweekly measurements indicate that the outflow from the bog (mean ± SD = 17.5 ± 29.2 gallons/minute) is over 6x the inflow from Tributary 4 (mean ± SD at inlet = 2.6 ± 3.8 gallons/minute), suggesting that the large majority of the water supply for the wetland comes from precipitation, groundwater, and overland flow rather than from this tributary.



At each sampling period, we also measured pH and conductivity at the inlet and outlet of the bog, and found fairly stable values over the year (see Figure 10 below). Gaps in the lines connecting dots in these two figures indicate periods in which there was no water to sample, and this (combined with the discharge graph above) confirm that there is little to no inflow or outflow from May to October. The pH is remarkably steady overall, and slightly more basic at the inlet (mean ± SD = 7.5 ± 0.23) than at the outlet (7.10 ± 0.25). Conductivity values vary more across the season, and are usually higher at the inlet (406± 91mS) than the outlet (234±49 mS).



4. Vegetation Monitoring

VIBI Modules- Methods.

As in past years we used a modified VIBI methodology (Mack 2007) to evaluate wetland quality. Methods follow those in the 2013 report – we repeat those here for convenience (in a smaller font). Our modifications largely involve the shape of individual modules to accommodate the challenging terrain, thick shrub vegetation, and sensitive habitat (especially in the core bog area). We modified the standard 10x10m VIBI module layout to a 25m long access lane from which we sampled 2m on either side of this lane. This design minimized trampling while allowing good access to the 4x25m sampling area.

We established 11 such modules (Figure 1): 3 in the core bog area, 4 adjacent to the wetland edge (near the delineated boundary of the wetland), and 4 that are potential areas of wetland expansion. Our intent was to: 1) use the core modules to evaluate whether the existing bog maintains its status during the restoration. 2) use the wetland Edge modules to evaluate whether conditions at the edge improve (e.g., become more boglike, and experience spread of sphagnum or other bog specialists). 3) use the Expansion modules (which generally had a noticeably peaty soil with a 'bounce', and seemed likely to improve if hydrology was restored) to evaluate wetland quality and the extent of responses to the restoration. We denoted each module in the field with permanent markers, and recorded gps coordinates. We sited modules to include representative habitat of each of the areas listed above.

In each module, we used standard VIBI methods to assess presence and percent cover of herbaceous vegetation, along with both percent cover and stem abundance of different size classes of woody plants. We summarized these data using the OEPA's VIBI spreadsheet calculator available online.

VIBI Modules- Results.

In August 2016, we repeated the 2013, 2014, and 2015 sampling of all 11 100M^2 plots. We identified 216 species in these plots (and another 80 species from the area that are not in the plots), including many peatland specialists (Table 1, Appendix A, Appendix B). We also documented substantial cover by undesirable (e.g., Red Maple, Crabapple) and invasive species (e.g., Buckthorn).

The plant community in the Tamarack Bog is holding steady in the higher quality areas (core and edge), and is improving in the enhancement areas, according to VIBI scores. Below are some summaries of our findings so far.

VIBI scores for Core and Edge plots have remained high throughout the project, while the Enhancement areas are moving up after initially scoring much lower (Figure 11). ANOVA confirms that the different areas respond differently (significant interaction: $F_{6,43}$= 3.44, P <0.01), and that that habitat areas (core/ edge/ enhancement) differ ($F_{2,43}$= 88, P<0.001). Differences among years were not quite significant ($F_{3,43}$= 2.79, P=0.056).

FQAI scores were high and showed strong differences among areas that either maintained their high scores (Core), or have been trending upward over time (Edge and especially Enhancement; Figure 12). ANOVA supports those impressions: the interaction of area and year is significant ($F_{2,43}$= 2.4, P<0.05), and there were strong and significant effects of both Area ($F_{2,16}$= 18, P<0.001), and Year ($F_{3,43}$ = 5.0, P<0.006).

Figure 11.

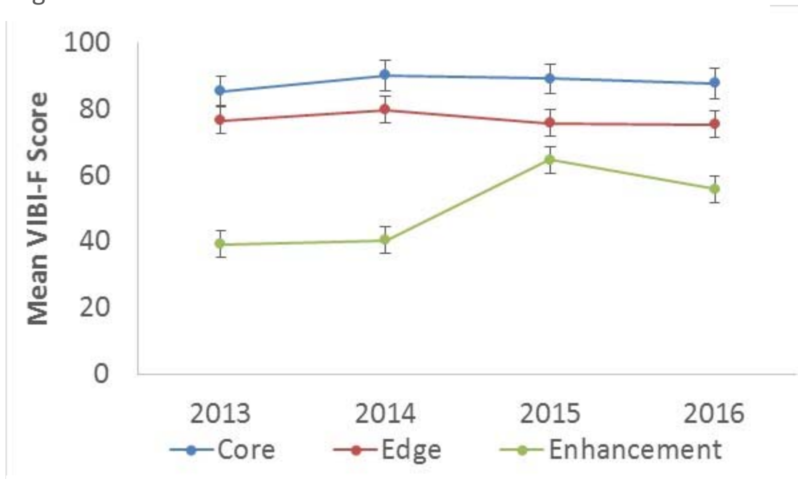


Figure 12.

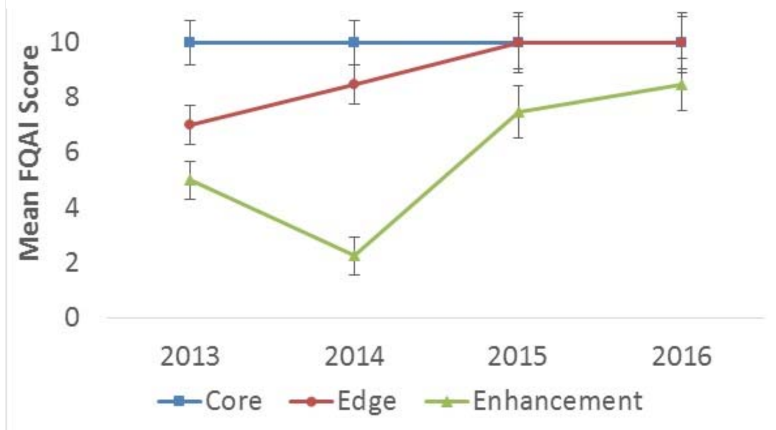
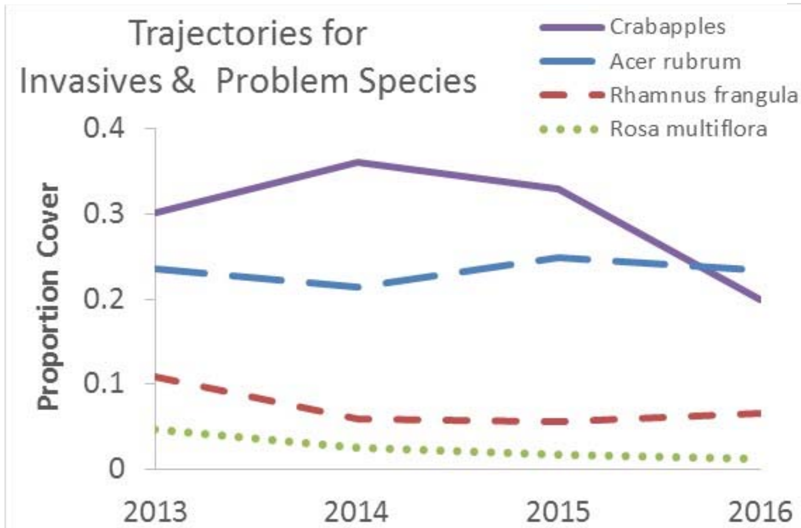


Table 1. Dominant plants (mean cover over 5%) from VIBI plots in each wetland area (mean absolute cover for each species in parentheses) during 2016.

Core **(79 taxa in 3 plots)**	**Wetland Edge** **(102 taxa in 4 plots)**	**Enhancement** **(93 taxa in 4 plots)**
Moss sp *(0.62)*	*Pyrus sp. (0.39)*	*Acer rubrum (0.41)*
Alnus incana (0.37)	*Rubus hispidus (0.23)*	*Glyceria striata (0.16)*
Osmunda cinnamomea (0.24)	*Acer rubrum (0.21)*	*Carya ovata (0.16)*
Decodon verticillatus (0.20)	*Symplocarpus foetidus (0.12)*	*Juglans nigra (0.16)*
Toxicodendron vernix (0.18)	*Fraxinus pennsylvanica (0.11)*	*Prunus serotina (0.14)*
Rhamnus frangula (0.14)	*Impatiens capensis (0.6)*	*Pyrus sp. (0.12)*
Rosa palustris (0.11)	*Ilex verticillata (0.6)*	*Ulmus americana (0.10)*
Pyrus sp. (0.10)	*Carex lacustris 0.06*	*Impatiens capensis (0.10)*
Larix laricina (0.08)	*Osmunda cinnamomea (0.06)*	*Rubus hispidus (0.09)*
Vaccinium corymbosum (0.08)	*Ulmus americana (0.05)*	*Fraxinus pennsylvanica (0.07)*
Carex atlantica subsp. *capillacea (0.07)*		*Prunus virginiana (0.06)*
Carex leptalea (0.06)		*Rubus allegheniensis (0.06)*
		Cornus amomum (0.06)

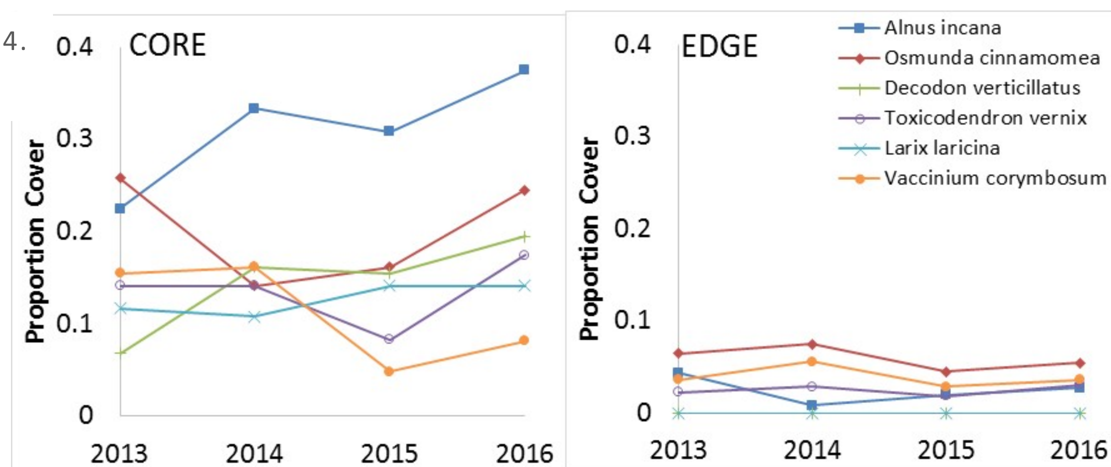
Cover for the major invasive and problem species has not increased over the last 4 years, and shows some signs of decrease, suggesting a moderate effect of invasive control activity to date (Figure 13). The strongest effect has been on crabapples, especially in the enhancement area, where the frilling and girdling of late Summer 2015 (which does not show up until the 2016 census) had a strong effect. Unfortunately, those control efforts have not had much of an effect on Red Maples to date. However, the frilling of 2015 was ineffective (no decline in *Acer rubrum* cover in 2016), and the girdling of 2016 happened after the VIBI census. We expect that the 2017 census will confirm a decrease for Red Maple cover. Buckthorn and Multiflora Rose were less abundant to start with, but have nonetheless declined since then, probably as a direct result of spraying activity. Other invasives we are aware of (*Phragmites* and Reed Canary Grass) are present, but are not common or increasing. In particular, the only *Phragmites* in the area is in the gas line (we have no monitoring plots in that area), where it is being aggressively sprayed by Davey Tree. Reed Canary is uncommon in most areas of the restoration (<1% cover there); it is only present in a few enhancement plots, and in a few areas outside of those plots.

Figure 13. Overall proportion cover (all 11 plots)



The characteristic species for the core bog are mostly maintaining themselves or increasing in the Core (see Figure 14), and show no sign of increasing in the Edge habitat so far. These species have been absent from the enhancement areas throughout the study to date.

Figure 14.



Woody stem cover in the VIBI Modules was on average well above the target of 4000 stems/acre, but varied strongly over space and has changed over time (See Figure above; "unwanted" in this context includes invasive woody species, along with species not desirable in this habitat such as *Pyrus* sp., *Acer rubrum*, and *Prunus serotina*). In the core bog the total stem count was well over 20,000 stems/acres, with native species accounting for a clear majority of that total. Among the native species, *Rosa palustris* made up over 34% of the stems, while *Alnus, Vaccinium*, and *Ilex* together accounted for another ~45%. *Rhamnus frangula* was 52% of the unwanted stems in this area. Native stems in the Core Bog declined strongly for the first three years but ticked up in 2016 (most of the variation in total native density was the result of variation in *R. palustris* density), while unwanted species declined mildly.

Total stem density in the Wetland Edge areas was well above the target level but well below the values for the Core Bog (~12,000 vs. ~24,000 on average across years; note the larger vertical axis for the Core Bog than for the other two panels). In this habitat the abundance of native and unwanted species is about equal. Here *Ilex* made up about 29% of the native stems, while *Pyrus* sp. (crabapples) accounted for over 54% of the unwanteds. Stems of both native and unwanted species were slightly declining on the edge, and standing dead was mildly rising (presumably reflecting management efforts and rapid decay of dead *R. multiflora* stems).

In the enhancement areas the total stem density is on average just above the target value, with the majority of stems being from unwanteds. 63% of the unwanted stems are *Pyrus* sp.; 19% of the native stems are *Cornus amomum*. There is some indication of a recent reduction in unwanteds and an increase in natives, but that trend is not yet clearly established; however, standing dead does seem on an upward trajectory, reflecting the more aggressive *Pyrus* sp. management activities in this area.

Vegetation Transects.

The purpose of the vegetation transects is to provide an independent method of monitoring for evidence of change in the wetland boundaries. Data are collected annually for a number of characteristics, along linear sample units, to determine if these characteristics are shifting to wetter conditions.

Eight vegetation transects were established in 2013. Each transect begins, at 0m, within the wetland and follows a compass direction (N, NE, E, SE, S, SW, W, NW) to the upland. At least 20 m of each transect is in the wetland and at least 20 m is in the upland (with the exception of transect 3). Some length of each transect is considered transition, where classification of soil or vegetation is not clearly classified. Initial transect lengths have been increased when less than 20 of the line was in wetland or upland. Vegetation, surface conditions are sampled in 10 meter long intervals along the transect. Soil is sampled at the end point of each interval.

After four years of sampling, the transect placements should remain consistent (Table 3) and the variability of the surface and canopy coverage should be reliable (Table 2). In future reviews of this data, we will look for trends that indicate changes from transition to wetland or from upland to transition as evidence of increasing wetland conditions. (For example, we will watch for increases in moss cover and wetland soil characteristics in transition areas.)

Table 2. Average percent coverage by category and year.

WETLAND	Litter layer	Downed woody material	Moss cover	Herb Layer Cover	Shrub Cover	Sub-canopy & pole Layer	Canopy Layer	Invasive Species Cover
2013	48.00	2.46	9.85	60.88	30.95	29.58	23.78	38.28
2014	44.02	8.32	3.29	55.44	31.50	38.90	16.54	38.02
2015	21.02	10.26	4.38	79.20	47.64	32.94	23.30	53.00
2016	30.11	16.03	4.48	72.27	63.61	27.00	29.02	52.39
Average	35.79	9.27	5.50	66.95	43.43	32.10	23.16	45.42
TRANSITION								
2013	79.50	2.75	2.25	20.17	29.33	52.67	63.17	21.42
2014	91.50	7.65	1.78	14.55	31.62	67.85	51.96	50.35
2015	82.62	9.35	1.96	37.92	28.69	67.04	85.35	40.97
2016	75.09	15.95	2.23	42.41	45.68	59.73	65.73	34.09
Average	82.18	8.93	2.05	28.76	33.83	61.82	66.55	36.71
UPLAND								
2013	68.42	1.40	3.48	31.79	23.83	48.83	62.04	25.71
2014	73.93	9.07	2.11	38.96	25.04	63.61	54.96	46.43
2015	56.07	11.07	1.61	61.39	32.75	66.89	72.93	35.96
2016	70.13	15.25	1.67	52.17	58.92	40.63	61.83	39.29
Average	67.14	9.20	2.22	46.08	35.13	54.99	62.94	36.85

Table 3. Number of 10 m units in transect categories by year, as classified by soil inspection in field.

Transect #	Year	Wetland	Transition	Upland
1	2013	6	1	1
1	2014	5	2	2
1	2015	5	2	2
1	2016	5	2	2
2	2013	3	2	0
2	2014	3	1	2
2	2015	3	1	2
2	2016	3	1	2
3	2013	2	1	1
3	2014	2	2	1
3	2015	2	2	1
3	2016	2	2	1*
4	2013	2	2	2
4	2014	3	1	2
4	2015	3	1	3
4	2016	3	1	3
5	2013	2	1	1
5	2014	3	2	2
5	2015	4	1	1
5	2016	4	1	2
6	2013	0	3	0
6	2014	3	2	2
6	2015	5	2	3
6	2016	5	2	3
7	2013	2	2	1
7	2014	2	2	2
7	2015	2	2	3
7	2016	2	2	3
8	2013	3	1	
8	2014	3	3	2
8	2015	3	3	2
8	2016	3	3	2

** An addition 10m of upland will be added to the transect in 2017.*

Plant Community Delineation

In March 2016, we scored and delineated the different plant communities in the restoration area. To do this we walked a series of transects through the area, starting in upland areas and walking a compass bearing (north) through the wetland. Whenever we noted any obvious changes in vegetation, we marked that as a boundary point between potentially different plant community “segments”. Each segment between these points along the transect therefore should represent a fairly homogenous plant community. In identifying transitions between vegetation types, we specifically aimed to be ‘splitters’, that is, to allow finer distinctions if possible. For each segment, we then recorded the major plant taxa within 5 m of the transect line that were identifiable at this time of year, and then estimated relative cover for each species, using the same categories as used in the VIBI scoring. We spent only ~5- 10 minutes in each segment, so the plant lists are partial, and focused on dominants. Because the scoring occurred before spring leaf-out, the data also emphasizes woody and perennial vegetation. Each transect was ~ 100-250m in length, and transect segments were usually 10-20m in length. After finishing a transect we returned to the southern edge of the area, moved ~20m East or West, and began another transect. There were 10 transects in total, scored between March 15 and March 26, 2016. We scored 152 segments over the restoration area, with 114 taxa.

For analysis, we followed the methods and suggestions presented in McCune and Grace (2002), and Peck (2010) to delineate and ordinate the community composition of these segments. As per their advice, we ignored species found in fewer than 5% of segments, reducing the number of species considered from 114 to 55.

We first used Cluster Analysis (PC-ORD; McCune and Grace 2002) to identify groupings of similar segments in this area. The results are shown in Figure 15 on the next page.

This analysis reveals six distinct groups of segments. These same six groups correspond to plant communities that are readily recognizable in the field. MRPP analysis (McCune and Grace 2002) indicates that this set of clusters explains a significant amount of the variation in plant community composition ($P<0.000001$). Note that the most fundamental branching in the dendrogram (Figure 15- farther right represents more “fundamental”) is between the Core Bog community and all others. This suggests that there is no other specific community that is more vegetatively similar (and therefore likely to be converted to Core Bog through restoration because of similar plant communities) than any other.

Figure 15. Cluster analysis of the wetland restoration area plant community, based on March 2016 transect samples. Each of the colored labels on the left corresponds to a particular line segment, and these are clustered together based on Sorenson distances in plant species abundance (using a flexible beta linkage =-0.25). Diagnostics suggest that 6 groupings are optimum for these data, corresponding to about 44% information remaining. The large vertically oriented text (e.g., “Upland Woods”) indicates those 6 groups (color coded), along with a verbal shorthand description based on field experience and indicator species.

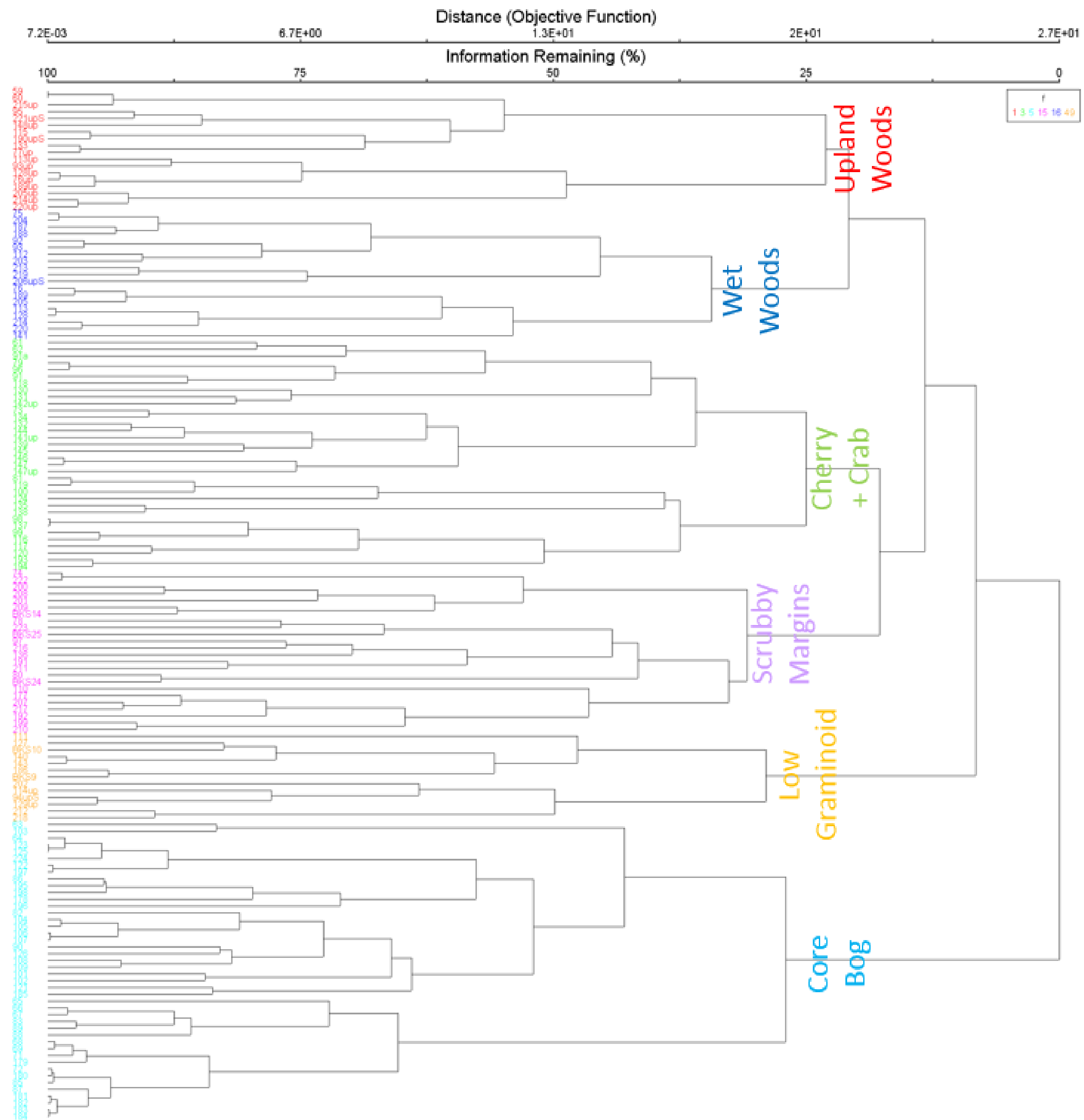
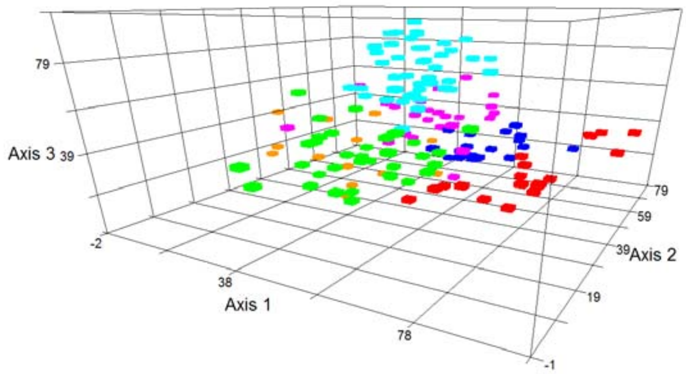


Figure 16. 3-D NMS plot showing ordination of the 6 plant communities extracted from the cluster analysis. Colors correspond to the groupings in the other figures.



Non-Metric Multidimensional Scaling analysis based on these six groupings shows good separation and clustering of the segments in 3 dimensions (Figure 16). The colors in this diagram correspond to the groupings in the dendrogram (Figure 15). The axes in an NMS analysis have no intrinsic meaning, and simply reflect overall distance and similarity. On this basis, the Core Bog (aqua color dots) segments are least similar to the Upland Woods (red) and Low Graminoid areas (Orange).

Indicator species analysis (McCune and Grace 2002; Table 4) helps to recognize any associations between particular plant species and particular clusters delineated in the analyses above. The strongest indicator species are associated with the Core Bog area; which has very

Table 4. Indicator species for each of the 6 community groups identified by cluster analysis. Within each group the species are listed from largest to smallest indicator value. All indicator species are significant except those in italics and smaller font (43 species are significant, 12 are not). Species codes are based on the first three letters of the genus and specific epithet in most cases, with a few exceptions for some groups that are not readily distinguishable in the spring ("GRA" indicates grass sp., for instance). Colors correspond to those in the other figures of cluster analyses

Species Code	Observed Indicator Value
Upland Woods	
OSTVIR	31.2
QUEALB	30.4
QUERUB	30.0
CAROVA	24.5
FAGGRA	14.1
JUGNIG	*8.0*
Cherry + Crab	
CRAB	34.6
PRUSER	30.2
FRAPEN	25.3
GEUSP	22.9
LONMOR	19.1
LIGVUL	*3.5*
Core Bog	
VACCOR	81.9
OSMCIN	80.4
CARSEO	63.2
ALNINC	61.4
THUDEL	58.9
TOXVER	54.5
SYMFOE	37.2
ROSPAL	31.9
GLYSTR	25.5
RHAFRA	25.5
ILEVER	24.6
DRYSP	24.4
CARATL	24.2
CALPAL	23.9
EPISP	18.0
RUBHIS	16.0
SOLPAT	*9.2*

Species Code	Observed Indicator Value
Scrubby Edge	
CORAMM	55.8
CARLAC	40.4
ONOSEN	25.4
SAMCAN	24.0
RUBALL	21.5
VERALT	17.6
PHAAUR	16.2
VITSP	*10.2*
POLHAS	*10.0*
CEPOCC	*8.9*
CRASP	*6.3*
Wet Woods	
EUOALA	56.8
FLOPRO	35.9
ROSMUL	33.7
CARBRO	29.4
ACERUB	27.7
ULMAME	18.9
ALLPET	*15.5*
FRANIG	*11.1*
CORRAC	*10.3*
TOXRAD	*8.3*
CLIAME	*5.7*
Low Graminoid	
GRA	34.6
JUNEFF	33.1
CARLUR	32.0
SOLALT	17.6

strong associations with *Vaccinium corymbosum*, *Osmunda cinnamomea*, *Carex seorsa*, and several other species (Aqua color in Table 2). Large indicator values designate species that are almost always in plots of that cluster, and seldom found outside of that cluster. There are some strong indicator species for other communities, but mostly those clusters have less distinct associations with particular species. Top indicators for those other clusters include *Ostrya virginica* and *Quercus alba* (Upland Woods cluster), Crabapple (*Pyrus* sp) and *Prunus serotina* (Cherry and Crab cluster), *Cornus amomum* and *Carex lacustris* (Scrubby Edge), *Euonymus alatus* and *Floerkea proserpinacoides* (Wet Woods), and Grass sp and *Juncus effusus* (Low Graminoid)

The spatial arrangement of the clusters reveals strong geographic structure that reflects subjective impressions in the field (See Figure 17 below). Here, the 152 individual transect segments are pooled according to their community type as indicated by the cluster analysis above, and are treated as distinct groups signified by the color scheme from the analysis above. The transects are not perfectly straight lines as a result of obstacles in the field.

The Core Bog is clearly recognizable (see Aqua bars in Figure 17) and clumped in space, and most of the other communities are spatially separated and grouped as well. Note that the "edge" VIBI plots (outlined in yellow in Figure 17) closely correspond to the edge between Core Bog and other community types that are very important for the restoration – the Scrubby Edge and the Cherry+Crab areas. These areas are spatially adjacent to the Core Bog, and are the most likely areas for conversion back to Bog habitat. They occupy similar soils and have good hydrological connections, so it is reasonable to expect that Core Bog species will expand into those areas as the hydrology improves and invasives are controlled.

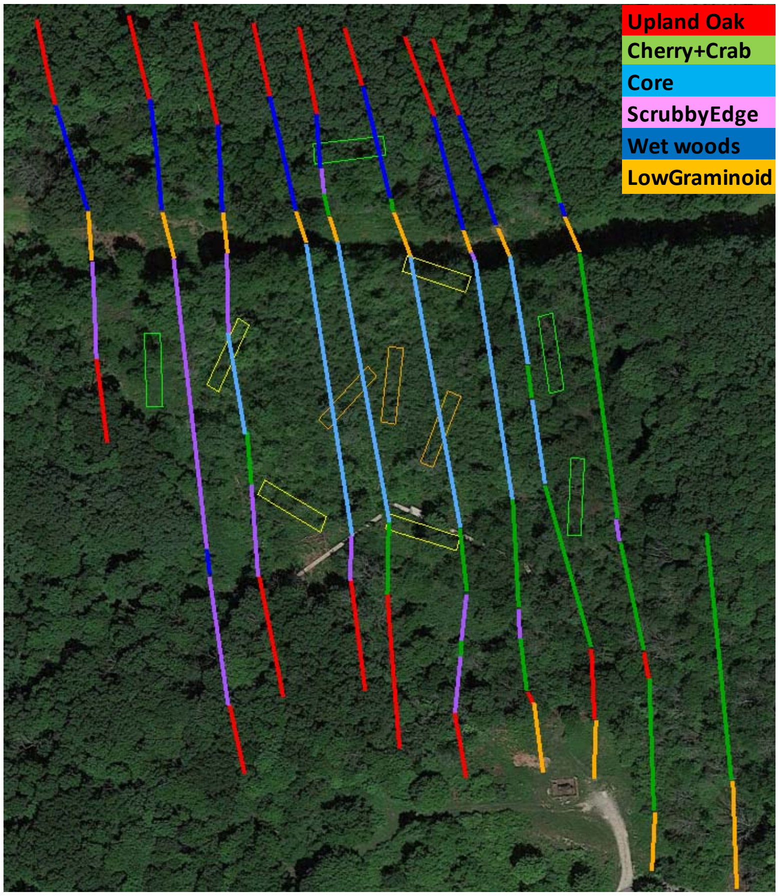


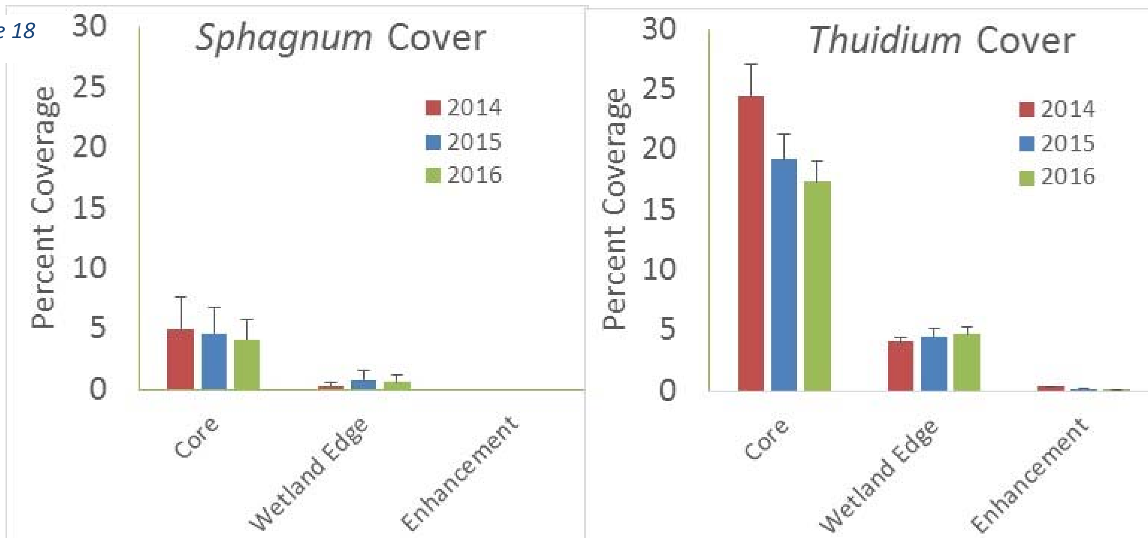
Figure 17. Community delineation map, March 2016. Colors represent different plant communities recognized by cluster analysis. VIBI plots are overlaid for reference.

Although the Low Graminoid community is adjacent to the Core Bog on the North, it has been filled with silt and clay in the course of pipeline construction and maintenance, and is regularly mowed, so it is unlikely to become more similar to the Core Bog. The Wet Woods area does not have peat or muck soils, and is well above the water level in the Core Bog, so it is unlikely to transition to that habitat type. However, since the invasive *Euonymus alatus* has the highest indicator score for that area, invasive control should be productive in that area. The main invasive species of concern in the Core Bog cluster is *Rhamnus frangula*, with an indicator score of 25.5. Invasive Control efforts by Davey Tree to date have not extended into the Core.

Sphagnum and Moss surveys

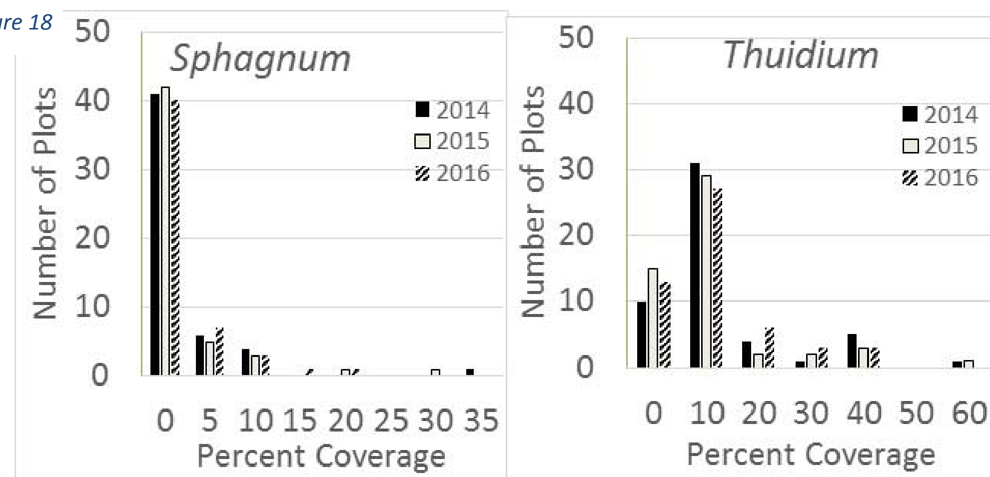
<u>Sphagnum plots.</u> To evaluate coverage and potential expansion of *Sphagnum* moss, in Spring 2014 we established 52 permanent 2x2m quadrats (Miller 2016). We placed these quadrats at the permanent markers for the 11 VIBI plot corners (N=4×11=44), and on the wetland end of each of the 8 transects (N=1×8=8). In each quadrat, we mapped the cover of *Sphagnum* moss to quantify presence and percent cover. Based on our observations during prior work we also mapped and quantified cover of the fern moss *Thuidium delicatulum*.

Figure 18



Sphagnum was not common overall, accounting for only 5% coverage in the Core areas, and almost none elsewhere. As of 2016, 12 of the 52 quadrats had any *Sphagnum* (an increase of 1 quadrat newly occupied since the last report); 11 of 12 Core quadrats, and 1 of 8 Transect quadrats (Fig. 18). *Thuidium* was much more abundant overall, and was also much more common in the core areas. Leaf litter differed dramatically among areas. Core bog areas had less than 3% leaf litter cover, while other areas have over 70% litter coverage.

Figure 18



In our three years of moss monitoring there are two noticeable trends. First, in Core areas there has been a slight temporal decline in both *Sphagnum* and *Thuidium*. This is mostly the result of reduced cover within plots, since the number of occupied plots is holding fairly constant over time. Second, in Edge areas there is a slight tendency for an increase in cover over time. The causes and implications of these countervailing trends are not yet clear.

Sphagnum extent survey. Beginning in 2013 we recorded GPS positions for the most 'exterior' (furthest toward the upland area) *Sphagnum* clumps around the perimeter of the bog. These points are shown in Figure 19 as yellow pushpins with a prefix of "SP". In 2016 we surveyed the area more systematically, in most cases walking along the transect lines used for vegetation monitoring towards the interior, and recording the first sphagnum seen along these lines. These points are shown in the aerial photo to the right as blue flags, with a prefix of ST (or in one case, S101). Note that the new boardwalk is visible in this June 2016 Google Earth image, as is the gas pipeline to the north. We found no clear expansion of the *Sphagnum* area, but also no contraction. In a few cases, we found *Sphagnum* further out than we had reported before, and in other cases there appeared to be contraction. It is not yet clear whether these differences reflect actual changes or the difficulty of finding this rather cryptic plant. We will repeat the more thorough survey method of 2016 in coming years. All of these most exterior *Sphagnum* were *S. squarrosum.* We have found several other species in the area (Appendix B), but those species seem not to do as well in the periphery.

Figure 19

Logs as moss habitat - Woody debris can be important for sphagnum and other moss establishment (e.g. Fenton et al. 2007). Past felling of invasive trees left a lot of loose woody debris in the restoration, and we felt this presented an opportunity for a trial to investigate the influence of logs in wetter areas. With permission from the Army Corps of Engineers, in March 2016 we used some of this debris to create six small log jams along the abandoned ditch near the southeastern edge of the Core Bog to evaluate methods to establish *Sphagnum* and other mosses. No appreciable moss had established as of December 2016, but these rafts may slow water flow (and perhaps loss of muck) from the site.

Tony Miller completed an MS Thesis at the University of Akron based in part on the *Sphagnum* surveys above, and in part on studies to evaluate whether *Sphagnum palustre* shows local adaptation to individual peatlands (Miller 2016). In two greenhouse experiments he found that *Sphagnum* from three different source populations (including the tamarack bog) differed in growth, but no evidence of local adaptation to individual peatlands, suggesting that any *Sphagnum* introductions might benefit from using source material from a site with especially vigorous growth (Mentor Marsh, in this study).

Tamarack monitoring

Adult Tamaracks. We have been monitoring all 8 adult tamarack trees that were noted in the bog during 2013, and all are alive and growing. In 2016 we tagged and GPS'd them so we could monitor them individually. As in the past, all trees seem to be producing at least some cones each year.

Natural Tamarack Regeneration. In July of 2016 we noted, for the first time in this study, a seedling tamarack, near hydro well 7 at the bog center (~15m north of the angle in the boardwalk), on a small flat mat of *Sphagnum girgensohnii*. We placed a pinflag near this seedling to allow monitoring. Three weeks later we noted that the seedling was gone, presumably a result of mammalian herbivory. We have not detected any other naturally occurring seedlings during our monitoring activity over 4 years.

Tamarack Transplants. In 2016 we set up a trial tamarack transplant study to evaluate methods for assisting regeneration. In June 2016 we planted 48 tamarack seedlings (purchased from Sheffield Seeds, NY) in the bog; 16 in each of the three regions of the restoration (Core, Edge, Enhancement). At intervals over the summer and fall we revisited these stations and recorded survival, herbivory, and height. The seedlings were not caged or screened.

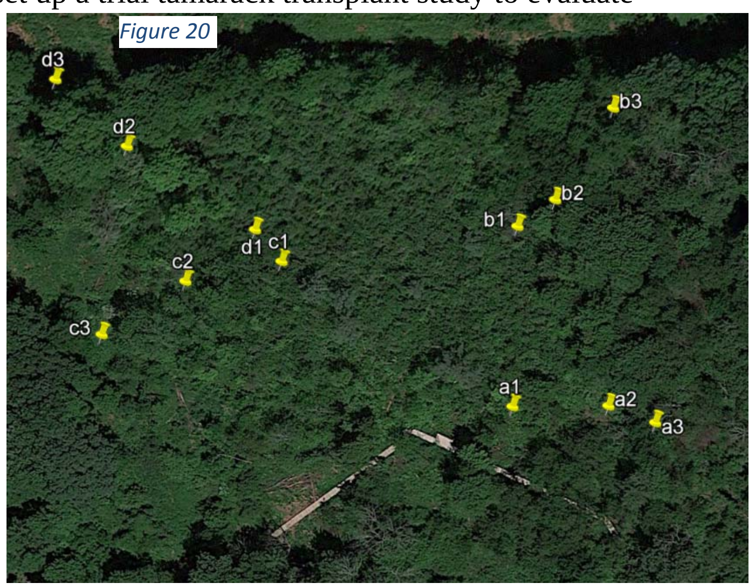


Figure 20

In their first summer these seedling Tamaracks (~50cm high at transplanting) grew on average 2.88 cm (SE= 0.58; See Table 5), with a tendency to grow faster in the enhancement and edge habitat than in the core (P<0.06). Our impression was that this tendency reflects shadier conditions in the core.

Over 75% of tamaracks survived through to October, with most deaths, apparently, the result of herbivory by deer. Indeed, nearly half of the transplants suffered at least some deer herbivory. In general, plants in the core bog had lowest survival and highest herbivory, which is mildly surprising given the very dense woody vegetation and difficult soil surface there. One aim of this trial was to evaluate whether herbivores would be an important issue for future transplants- clearly it is.

Table 5. Tamarack transplant monitoring, 2016.

Area	Mean Growth (cm) ± SE	Survival to day 136	N Suffering Deer Herbivory
Core	1.07 ± 0.73	50% = 8/16	62.2% = 10/16
Edge	3.22 ± 0.81	100% = 16/16	37.5% = 6/16
Enhancement	4.43 ± 1.33	81% = 13/16	43.8% = 7/16
Overall	2.88±0.58	77% = 37/48	47.9% = 23/48

Plot Photos Over Time.

In 2014 we established repeat photography stations at each of the 11 VIBI plots. Those photos are included in the Appendix E. We have also established photo sites at the transect endpoints. The repeat photos are presented in Appendix E. We have not yet noted any major changes in the vegetation based on those photos.

5. Invasive management

Davey Tree has been visiting twice a year to spray herbicide on invasive herbs and shrubs. In 2015, they began girdling red maples and crabapples, primarily on the east side of the restoration area. The method used then (hatchet and machete cuts to frill the base, followed by application of herbicide) was ineffective on red maples, especially larger (>20cm dbh) individuals, although this method was effective on crabapples. In 2016 they returned to many of the unaffected trees and made a 2" deep chainsaw cut encircling the base of the trunk. This treatment was late in the year (~September), and was having at least partial success before leaf fall.

6. List of Appendices

7. Publications to date resulting from this project

(PDFs available online, or hardcopies available on request)

- Mezentseva, K. (2015). Hydrology of the Tamarack Bog, Bath Nature Preserve, Bath Township, Ohio, The University of Akron. (http://gradworks.umi.com/16/01/1601098.html)
- Mezentseva, K, I Sasowsky, RJ Mitchell, J Senko, T Quick, J Rizzo, & Loucek J. (2015). Disturbed tamarack "bog" in Northern Ohio revealed as a fen. Poster, Geological Society of America meeting, Baltimore, MD. Abstract with Programs V 47, No. 7, p. 749.
- Miller, J. A. (2016). Monitoring of *Sphagnum* at a Restoration Site and Possibilities for Restorative Activities. The University of Akron. (https://etd.ohiolink.edu/pg_10?0::NO:10:P10_ETD_SUBID:115968)

8. References

Mack, John J. (2004). Integrated Wetland Assessment Program. Part 4: Vegetation Index of Biotic Integrity (VIBI) and Tiered Aquatic Life Uses (TALUs) for Ohio wetlands. Ohio EPA Technical Report WET/2004-4. Ohio Environmental Protection Agency, Wetland Ecology Group, Division of Surface Water, Columbus, Ohio

McCune, B., et al. (2002). Analysis of ecological communities, MjM software design Gleneden Beach, OR.

Mezentseva, K. (2015). Hydrology of The Tamarack Bog, Bath Nature Preserve, Bath Township, Ohio. MS Thesis, Geology, The University of Akron.

Miller, J. A. 2016. Monitoring of Sphagnum at a Restoration Site and Possibilities for Restorative Activities. MS Thesis, Biology, The University of Akron.

Miletti, T. E., C. N. Carlyle, C. R. Picard, K. M. Mulac, A. Landaw, and L. H. Fraser. 2005. Hydrology, Water Chemistry, and Vegetation Characteristics of a Tamarack Bog in Bath Township, Ohio: Towards Restoration and Enhancement. Ohio Journal of Science 105:21-30.

Peck, J. E. (2010). Multivariate analysis for community ecologists, MjM Software Design.

Fenton, N. J., C. Beland, S. De Blois, and Y. Bergeron. (2007). *Sphagnum* establishment and expansion in black spruce (*Picea mariana*) boreal forests. Canadian Journal of Botany 85:43-50.

Appendices-

Appendix A: Plant Species List for the Tamarack Bog as of 2016- See attachment. Includes 295 identified species, and 30 taxa not yet confirmed to species. Voucher specimens are on file for 205 of these taxa. Total include an initial survey of mosses (32 species).

Appendix B: Fish and Wildlife Observations at the Tamarack Bog as of 2016 – See Attachment.

Appendix C: Copies of all data sheets – see attachment

Appendix D: Copies of Water Chemistry reports – see attachments

- Appendix D - June 2014 Chemistry
- Appendix D - November 2014 Chemistry
- Appendix D - April 2015 Chemistry
- Appendix D - October 2015 Chemistry
- Appendix D - June 2016 **Chemistry**

Appendix E: Plot Photos– see attachments

Appendix A: Plant Species List for the Tamarack Bog as of 2016-

Includes 295 identified species, and 30 taxa not yet confirmed to species. Voucher specimens are on file for 205 of these taxa. Total includes an initial survey of mosses (32 sp).

Name	Abbrev.	AUTHORITY	CofC	TOLERANCE	NATIVITY	FAMILY	COMMON NAME	IND	HYDRO	FORM	HABIT
Acer rubrum	ACERUB	L.	2	tolerant	native	Aceraceae	RED MAPLE	FAC	FAC	tree	
Acer saccharum	ACESAR	Marshall	5	midrange	native	Aceraceae	SUGAR MAPLE	FACU-	upland	tree	W
Actinomeris alternifolia		synonym				Asteraceae				forb	
Agrimonia pubescens	AGRPUB	Wallr.	5	midrange	native	Rosaceae	DOWNY AGRIMONY	UPL	upland	forb	
Agrimonia striata	AGRSTR	Michx.	7	sensitive	native	Rosaceae	LINED AGRIMONY	FACU-	upland	forb	PE
Alisma plantago-aquatica	ALISMA	ND	*	ND	native	Alismataceae	ND	OBL	hydrophyte	forb	PE
Alliaria petiolata	ALLPET	(M. Bieb.) Cav	0	tolerant	adventive	Brassicaceae	GARLIC MUSTARD	FACU-	upland	forb	BI
Alnus incana	ALNINC	(L.) Moench	6	sensitive	native	Betulaceae	SPECKLED ALDER	FACW+	hydrophyte	shrub	W
Amblystegium serpens						Amblystegiaceae				bryo	bryo
Amblystegium varium						Amblystegiaceae				bryo	bryo
Ambrosia artemisiifolia	AMBART	L.	0	tolerant	native	Asteraceae	COMMON RAGWEED	FACU	upland	forb	AN
Amelanchier arborea	AMEARB	(F. Michx.) Fe	5	midrange	native	Rosaceae	DOWNY SERVICEBE	FAC-	FAC	sm tree	W
Amelanchier laevis	AMELAE	Wiegand	5	midrange	native	Rosaceae	SMOOTH SERVICEBI	FAC	FAC	sm tree	W
Amphicarpaea bracteata	AMPBRA	(L.) Fernald	4	midrange	native	Fabaceae	HOG-PEANUT	FAC	FAC	forb	PE
Anomodon attenuatus						Anomodontaceae				bryo	bryo
Arctium sp.						Asteraceae				forb	
Arisaema atrorubens		synonym				Araceae				forb	
Arisaema triphyllum subsp. triphyllum	ARITRIT	(L.) Schott	3	midrange	native	Araceae	JACK-IN-THE-PULPIT	FACU-	upland	forb	PE
Aronia melanocarpa	AROMEL	(Michx.) Elliott	5	midrange	native	Rosaceae	BLACK CHOKEBERR	FAC	FAC	shrub	W
Aster (Symphyotrichum) lateriflorus	ASTLAT	(L.) Britton	2	tolerant	native	Asteraceae	CALICO ASTER	FACW-	hydrophyte	forb	PE
Aster ontarionis	ASTONT	Wiegand	7	sensitive	native	Asteraceae	BOTTOMLAND ASTE	FAC	FAC	forb	PE
Aster pilosus	ASTPIL	Willd.	1	tolerant	native	Asteraceae	AWL ASTER	UPL	upland	forb	PE
Aster puniceus	ASTPUN	L.	7	sensitive	native	Asteraceae	FEN ASTER	OBL	hydrophyte	forb	PE
Aster vimineus						Asteraceae				forb	
Atrichum crispum						Polytrichaceae				bryo	bryo
Atrichum undulatum						Polytrichaceae				bryo	bryo
Berberis thunbergii	BERTHU	DC.	0	tolerant	adventive	Berberidaceae	JAPANESE BARBERI	FACU	upland	shrub	W
Betula alleghaniensis	BETALL	Britton	7	sensitive	native	Betulaceae	YELLOW BIRCH	FAC	FAC	tree	W
Bidens cernua	BIDCER	L.	3	midrange	native	Asteraceae	NODDING BEGGAR'S	OBL	hydrophyte	forb	AN
Bidens connata	BIDCON	Muhl. ex Willd	3	midrange	native	Asteraceae	PURPLE-STEMMED E	FACW+	hydrophyte	forb	AN
Bidens frondosa	BIDFRO	L.	2	tolerant	native	Asteraceae	DEVIL'S BEGGAR'S-T	FACW	hydrophyte	forb	AN
Boehmeria cylindrica	BOECYL	(L.) Sw.	4	midrange	native	Urticaceae	FALSE NETTLE	FACW+	hydrophyte	forb	PE
Botrychium sp.	BOLFLU	(Torr.) Sojak	5	midrange	native	Cyperaceae	RIVER BULRUSH	OBL	hydrophyte	sedge	PE
Brachythecium acuminatum	BOLAST	(L.) L'Her	7	sensitive	native	Asteraceae	FALSE ASTER	FACW	hydrophyte	forb	PE
Brachythecium rivulare	BOROFF	L.	0	tolerant	adventive	Boraginaceae	TALEWORT	[UPL]	upland	forb	AN
Calamagrostis canadensis	BOTRYC	ND	*	ND	native	Ophioglossac	ND	ND	ND	fern	PE
Calamagrostis sp.	CALCAN	(Michx.) P. Be	4	midrange	native	Poaceae	CANADA BLUEJOINT	FACW+	hydrophyte	grass	PE
Callicladium haldanianum						Hypnaceae				bryo	bryo
Calliergon cordifolium						Amblystegiaceae				bryo	bryo
Calliergonella cuspidata						Amblystegiaceae				bryo	bryo
Caltha palustris	CLTPAL	L.	6	sensitive	native	Ranunculacea	MARSH-MARIGOLD	OBL	hydrophyte	forb	PE
Cardamine bulbosa						Brassicaceae				forb	AN
Carex atlantica subsp. capillacea	CXATLAC	(L.H. Bailey) F	9	sensitive	native	Cyperaceae	HOWE'S SEDGE	OBL	hydrophyte	sedge	PE
Carex bromoides	CXBROM	Schkuhr ex W	7	sensitive	native	Cyperaceae	BROME SEDGE	FACW	hydrophyte	sedge	PE
Carex comosa	CXCOMO	Boott	2	tolerant	native	Cyperaceae	BEARDED SEDGE	OBL	hydrophyte	sedge	PE

Carex crinita						Cyperaceae				sedge	PE
Carex crinita var. crinita	CXCRINC	Lam.	3	midrange	native	Cyperaceae	TASSELED SEDGE	OBL	hydrophyte	sedge	PE
Carex cristatella	CXCRIS	Britton	3	midrange	native	Cyperaceae	CRESTED SEDGE	FACW	hydrophyte	sedge	PE
Carex disperma	CXDISP	Dewey	10	sensitive	native	Cyperaceae	TWO-SEEDED SEDG	FACW+	hydrophyte	sedge	PE
Carex gracillima	CXGRCLI	Schwein.	4	midrange	native	Cyperaceae	GRACEFUL SEDGE	FACU	upland	sedge	PE
Carex hirsutella	CXHIRS	Mack.	2	tolerant	native	Cyperaceae	HIRSUTE SEDGE	FACU	upland	sedge	PE
Carex hystericina	CXHYST	Muhl. ex Willd	5	midrange	native	Cyperaceae	PORCUPINE SEDGE	OBL	hydrophyte	sedge	PE
Carex lacustris	CXLACU	Willd.	5	midrange	native	Cyperaceae	LAKE SEDGE	OBL	hydrophyte	sedge	PE
Carex leptalea	CXLEPTA	Wahlenb.	7	sensitive	native	Cyperaceae	DELICATE SEDGE	OBL	hydrophyte	sedge	PE
Carex lupulina	CXLUPL	Muhl. ex Willd	3	midrange	native	Cyperaceae	HOP SEDGE	OBL	hydrophyte	sedge	PE
Carex lurida	CXLURI	Wahlenb.	3	midrange	native	Cyperaceae	BOTTLEBRUSH SED(	OBL	hydrophyte	sedge	PE
Carex radiata/rosea	CXRADI	(Wahlenb.) Sr	6	sensitive	native	Cyperaceae	RADIATE SEDGE	FAC	FAC	sedge	PE
Carex scoparia	CXSCOP	Schkuhr ex W	3	midrange	native	Cyperaceae	POINTED BROOM SE	FACW	hydrophyte	sedge	PE
Carex seorsa	CXSEOR	Howe	7	sensitive	native	Cyperaceae	WEAK STELLATE SE	FACW	hydrophyte	sedge	PE
Carex stellulata						Cyperaceae				sedge	PE
Carex stipata	CXSTIP	Muhl. ex Willd	2	tolerant	native	Cyperaceae	CROWDED SEDGE	OBL	hydrophyte	sedge	PE
Carex trisperma	CXTRIS	Dewey	8	sensitive	native	Cyperaceae	THREE-SEEDED SED	OBL	hydrophyte	sedge	PE
Carpinus caroliniana	CRPCAR	Walter	5	midrange	native	Betulaceae	BLUE-BEECH	FAC	FAC	sm tree	W
Carya cordiformis	CARCOR	(Wangenh.) K	5	midrange	native	Juglandaceae	BITTERNUT HICKORY	FACU+	upland	tree	W
Carya glabra	CARGLA	(Mill.) Sweet	5	midrange	native	Juglandaceae	PIGNUT HICKORY	FACU-	upland	tree	W
Carya ovata	CAROVT	(Miller) K. Koc	6	sensitive	native	Juglandaceae	SHAGBARK HICKORY	FACU-	upland	tree	W
Celastrus orbiculatus	CELORB	Thunb.	0	tolerant	adventive	Celastraceae	ORIENTAL BITTERSV	FACU	upland	vine	W
Cephalanthus occidentalis	CEPOCC	L.	6	sensitive	native	Rubiaceae	BUTTONBUSH	OBL	hydrophyte	shrub	W
Chelidonium majus	CHEMAJ	L.	0	tolerant	adventive	Papaveraceae	CELANDINE	UPL	upland	forb	BI
Chelone glabra	CHEGLA	L.	6	sensitive	native	Scrophulariac	TURTLEHEAD	OBL	hydrophyte	forb	PE
Cinna arundinacea	CINARU	L.	4	midrange	native	Poaceae	COMMON WOOD-RE	FACW	hydrophyte	grass	PE
Circaea lutetiana	CIRLUT	L.	3	midrange	native	Onagraceae	ENCHANTER'S-NIGH	FACU	upland	forb	PE
Clematis virginiana	CLEVIR	L.	3	midrange	native	Ranunculacea	VIRGIN'S-BOWER	FAC	FAC	forb	PE
Climacium americanum						Climaciaceae				bryo	bryo
Coptis trifolia	COPTRI	(L.) Salisb.	7	sensitive	native	Ranunculacea	GOLDTHREAD	FACW	hydrophyte	forb	PE
Cornus amomum	CORAMO	Mill.	2	tolerant	native	Cornaceae	SILKY DOGWOOD	FACW	hydrophyte	shrub	W
Cornus florida	CORFLO	L.	5	midrange	native	Cornaceae	FLOWERING DOGW(	FACU-	upland	sm tree	W
Cornus racemosa	CORRAC	Lam.	1	tolerant	native	Cornaceae	GRAY DOGWOOD	FAC-	FAC	shrub	W
Craetaegus sp.	CRATAE	ND	*	ND	ND	Rosaceae	ND	ND	ND	sm tree	W
Craetegus coccinea	CRACOC	L.	3	midrange	native	Rosaceae	SCARLET HAWTHOR	UPL	upland	sm tree	W
Crataegus crus-gallii -	CRACRU	L.	3	midrange	native	Rosaceae	COCKSPUR	FACU	upland	sm tree	W
Cuscuta gronovii	CUSGRO	Willd. ex Schu	3	midrange	native	Cuscutaceae	COMMON DODDER	FACW+	hydrophyte	forb	AN
Cystopteris bulbifera	CYSBUL	(L.) Bernh.	7	sensitive	native	Dryopteridace	BULBLET FERN	FAC	FAC	fern	PE
Decodon verticillatus	DECVER	(L.) Elliott	6	sensitive	native	Lythraceae	SWAMP LOOSESTRI	OBL	hydrophyte	forb	PE
Desmodium sp.	DESMOD	ND	*	ND	native	Fabaceae	ND	ND	ND	forb	PE
Dryopteris carthusiana	DRYCAR	(Vill.) H.P. Fu	5	midrange	native	Dryopteridace	SPINULOSE WOOD F	FAC+	FAC	fern	PE
Dryopteris cristata	DRYCRI	(L.) A. Gray	8	sensitive	native	Dryopteridace	CRESTED WOOD FE	FACW+	hydrophyte	fern	PE
Dryopteris marginalis	DRYMAR	(L.) A. Gray	5	midrange	native	Dryopteridace	MARGINAL WOOD FE	FACU-	upland	fern	PE
Elymus hystrix?	ELYHYS	L.	4	midrange	native	Poaceae	BOTTLEBRUSH GRA	UPL	upland	grass	PE
Elymus sp.	ELYMUS	ND	*	ND	native	Poaceae	ND	ND	ND	grass	PE
Elymus virginicus	ELYVIR	L.	3	midrange	native	Poaceae	VIRGINIA WILD RYE	FACW-	hydrophyte	grass	PE
Entodon cladorrhizans						Entodontaceae				bryo	bryo
Epilobium ciliatum	EPICIL	Raf.	4	midrange	native	Onagraceae	NORTHERN WILLOW	FAC-	FAC	forb	PE

Epilobium coloratum	EPICOL	Biehler	1	tolerant	native	Onagraceae	PURPLE-LEAVED WI	OBL	hydrophyte	forb	PE
Erechtites hieracifolia	EREHIE	(L.) Raf. ex D(	2	tolerant	native	Asteraceae	PILEWORT	FACU	upland	forb	AN
Erigeron annuus	ERIANN	(L.) Pers.	0	tolerant	native	Asteraceae	DAISY FLEABANE	FACU	upland	forb	AN
Euonymous alatus	EUOALA	(Thunb.) Sieb	0	tolerant	adventive	Celastraceae	WINGED WAHOO	UPL	upland	shrub	W
Eupatorium perfoliatum	EUPPER	L.	3	midrange	native	Asteraceae	COMMON BONESET	FACW+	hydrophyte	forb	PE
Fagus grandifolia	FAGGRA	Ehrh.	7	sensitive	native	Fagaceae	AMERICAN BEECH	FACU	upland	tree	W
Fern sp.										fern	fern
Fissidens sp.						Fissidentaceae				bryo	bryo
Fraxinus americana	FRAAME	L.	6	sensitive	native	Oleaceae	WHITE ASH	FACU	upland	tree	W
Fraxinus nigra	FRANIG	Marshall	7	sensitive	native	Oleaceae	BLACK ASH	FACW	hydrophyte	tree	W
Fraxinus pennsylvanica	FRAPEN	Marshall	3	midrange	native	Oleaceae	GREEN ASH	FACW	hydrophyte	tree	W
Galium aparine	GALAPA	L.	0	tolerant	native	Rubiaceae	CLEAVERS	FACU	upland	forb	AN
Galium asprellum	GALASP	Michx.	4	midrange	native	Rubiaceae	ROUGH BEDSTRAW	OBL	hydrophyte	forb	PE
Galium labradoricum	GALLAB	(Wiegand) Wi	10	sensitive	native	Rubiaceae	BOG BEDSTRAW	OBL	hydrophyte	forb	PE
Galium sp.	GALIUM	ND	*	ND	ND	Rubiaceae	ND	ND	ND	forb	ND
Galium tinctorium	GALTIN	(L.) Scop.	4	midrange	native	Rubiaceae	SMALL THREE-LOBE	OBL	hydrophyte	forb	PE
Galium triflorum	GALTFI	L.	7	sensitive	native	Rubiaceae	NORTHERN THREE-L	FACW+	hydrophyte	forb	PE
Gaylussacia baccata	GAYBAC	(Wangenh.) K	6	sensitive	native	Ericaceae	HUCKLEBERRY	FACU	upland	shrub	W
Geranium maculatum	GERMAC	L.	4	midrange	native	Geraniaceae	WILD GERANIUM	FACU	upland	forb	PE
Geum canadense	GEUCAN	Jacq.	2	tolerant	native	Rosaceae	WHITE AVENS	FACU	upland	forb	PE
Geum laciniatum	GEULAC	Murray	2	tolerant	native	Rosaceae	ROUGH AVENS	FAC+	FAC	forb	PE
Glechoma hederacea	GLEHED	L.	0	tolerant	adventive	Lamiaceae	GROUND IVY	FACU	upland	forb	PE
Glyceria canadensis	GLYCAN	(Michx.) Trin.	7	sensitive	native	Poaceae	RATTLESNAKE MANI	OBL	hydrophyte	grass	PE
Glyceria septentrionalis	GLYSEP	Hitchc.	6	sensitive	native	Poaceae	FLOATING MANNA G	OBL	hydrophyte	grass	PE
Glyceria striata	GLYSTR	(Lam.) Hitchc.	2	tolerant	native	Poaceae	FOWL MANNA GRAS	OBL	hydrophyte	grass	PE
Hackelia virginiana	HACVIR	(L.) I. M. John	2	tolerant	native	Boraginaceae	VIRGINIA STICKSEEI	FACU	upland	forb	BI
Holcos lanatus	HOLLAN	L.	0	tolerant	adventive	Poaceae	VELVET GRASS	FACU	upland	grass	PE
Hydrophyllum virginianum	HYDVIR	L.	4	midrange	native	Hydrophyllace	VIRGINIA WATERLEA	FAC	FAC	forb	PE
Hygroamblystegium tenax var. tenax						Amblystegiaceae				bryo	bryo
Hypericum muticum	HYPMUT	L.	3	midrange	native	Clusiaceae	SLENDER ST. JOHN'S	FACW	hydrophyte	forb	AN
Hypnum sp						Hypnaceae				bryo	bryo
Ilex verticillata	ILEVER	(L.) A. Gray	6	sensitive	native	Aquifoliaceae	WINTERBERRY	FACW+	hydrophyte	shrub	W
Impatiens capensis	IMPCAP	Meerb.	2	tolerant	native	Balsaminacea	SPOTTED TOUCH-ME	FACW	hydrophyte	forb	AN
Impatiens pallida	IMPPAL	Nutt.	3	midrange	native	Balsaminacea	PALE TOUCH-ME-NO	FACW	hydrophyte	forb	AN
Juglans nigra	JUGNIG	L.	5	midrange	native	Juglandaceae	BLACK WALNUT	FACU	upland	tree	W
Juncus effusus	JUNEFF	L.	1	tolerant	native	Juncaceae	SOFT RUSH	FACW+	hydrophyte	forb	PE
Juncus tenuis	JUNTEN	Willd.	1	tolerant	native	Juncaceae	PATH RUSH	FAC-	FAC	forb	PE
Lactuca biennis	LACBIE	(Moench) Feri	1	tolerant	native	Asteraceae	TALL BLUE LETTUCE	FACU	upland	forb	BI
Lapsana communis	LAPCOM	L.	0	tolerant	adventive	Asteraceae	NIPPLEWORT	UPL	upland	forb	AN
Larix laricina	LARLAR	(Du Roi) K. Ko	9	sensitive	native	Pinaceae	TAMARACK	FACW	hydrophyte	tree	W
Leersia oryzoides	LEEORY	(L.) Sw.	1	tolerant	native	Poaceae	RICE CUT GRASS	OBL	hydrophyte	grass	PE
Leersia virginica	LEEVIR	Willd.	4	midrange	native	Poaceae	WHITE GRASS	FACW	hydrophyte	grass	PE
Lemna minor	LEMMIN	L.	3	midrange	native	Lemnaceae	COMMON DUCKWEE	OBL	hydrophyte	forb	AN
Leonuris cardiaca	LEOCAR	L.	0	tolerant	adventive	Lamiaceae	MOTHERWORT	UPL	upland	forb	PE
Leptodictyum riparium						Amblystegiaceae				bryo	bryo
Leucobyrum glaucum						Leucobryaceae				bryo	bryo
Lichen sp.										lichen	lichen
Ligustrum vulgare	LIGVUL	L.	0	tolerant	adventive	Oleaceae	COMMON PRIVET	FACU	upland	shrub	W

Lindera benzoin	LINBEN	(L.) Blume	5	midrange	native	Lauraceae	SPICEBUSH	FACW-	hydrophyte	shrub	W
Liverwort sp.										liverwort	liverwort
Lonicera japonica	LONJAP	Thunb.	0	tolerant	adventive	Caprifoliaceae	JAPANESE HONEYS	FAC-	FAC	vine	W
Lonicera maackii	LONMAA	(Rupr.) Maxim	0	tolerant	adventive	Caprifoliaceae	AMUR HONEYSUCKL	UPL	upland	shrub	W
Lonicera morrowii	LONMOR	A. Gray	0	tolerant	adventive	Caprifoliaceae	MORROW'S HONEYS	FACU	upland	shrub	W
Lotus corniculatus	LOTCOR	L.	0	tolerant	adventive	Fabaceae	BIRD'S-FOOT TREFO	FACU-	upland	forb	PE
Luzula acuminata	LUZACU	Raf.	6	sensitive	native	Juncaceae	HAIRY WOODRUSH	FAC	FAC	forb	PE
Lycopus americanus	LYCAME	Muhl. ex W.P.	3	midrange	native	Lamiaceae	AMERICAN WATER-H	OBL	hydrophyte	forb	PE
Lycopus uniflora	LYCUNI	Michx.	3	midrange	native	Lamiaceae	NORTHERN WATER-	OBL	hydrophyte	forb	PE
Lycopus virginiana	LYCVIR	L.	3	midrange	native	Lamiaceae	VIRGINIA BUGLE-WE	OBL	hydrophyte	forb	PE
Lysimachia ciliata	LYSCIL	L.	4	midrange	native	Primulaceae	FRINGED LOOSESTR	FACW	hydrophyte	forb	PE
Lysimachia nummularia	LYSNUM	L.	0	tolerant	adventive	Primulaceae	MONEYWORT	OBL	advent	forb	PE
Lysimachia thyrsiflora	LYTHYS	L.	0	tolerant	adventive	Lythraceae	HYSSOP-LEAVED LC	OBL	hydrophyte	forb	BI
Maianthemum canadense	MAICAN	Desf.	6	sensitive	native	Liliaceae	CANADA MAYFLOWE	FAC-	FAC	forb	PE
Malus baccata						Rosaceae				tree	W
Malus coronaria						Rosaceae				tree	W
Malus spp.						Rosaceae				tree	W
Marchantiophyta sp.										LIverwort	liverwort
Mentha arvensis	MENARV	L.	2	tolerant	native	Lamiaceae	FIELD MINT	FACW	hydrophyte	forb	PE
Mentha x piperata	MENPIP	L.	0	tolerant	adventive	Lamiaceae	PEPPERMINT	FACW+	advent	forb	PE
Mimulus alatus	MIMALA	Aiton	6	sensitive	native	Scrophulariac	WINGED MONKEY-FI	OBL	hydrophyte	forb	PE
Mimulus ringens	MIMRIN	L.	4	midrange	native	Scrophulariac	COMMON MONKEY-F	OBL	hydrophyte	forb	PE
Mitchella repens	MITREP	L.	5	midrange	native	Rubiaceae	PARTRIDGE-BERRY	FACU	upland	forb	PE
Mitella sp.						Saxifragaceae				forb	
bryo sp.										bryo	bryo
Nemopanthus mucronatus	NEMMUC	(L.) Loes.	10	sensitive	native	Aquifoliaceae	CATBERRY	OBL	hydrophyte	shrub	W
Nyssa sylvatica	NYSSYL	Marshall	7	sensitive	native	Cornaceae	BLACK-GUM	FAC	FAC	tree	W
Onoclea sensibilis	ONOSEN	L.	2	tolerant	native	Dryopteridace	SENSITIVE FERN	FACW	hydrophyte	fern	PE
Osmunda cinnamomea	OSMCIN	L.	6	sensitive	native	Osmundaceae	CINNAMON FERN	FACW	hydrophyte	fern	PE
Osmunda regalis	OSMREG	L.	7	sensitive	native	Osmundaceae	ROYAL FERN	OBL	hydrophyte	fern	PE
Ostrya virginiana	OSTVIR	(Miller) K. Koc	5	midrange	native	Betulaceae	HOP-HORNBEAM	FACU-	upland	tree	W
Oxalis stricta	OXASTR	L.	0	tolerant	native	Oxalidaceae	COMMON YELLOW W	UPL	upland	forb	PE
Panicum sp.	PANICU	ND	*	ND	native	Poaceae	ND	ND	ND	grass	ND
Parthenocissus quinquefolia	PARQUI	(L.) Planch.	2	tolerant	native	Vitaceae	VIRGINIA CREEPER	FACU	upland	vine	W
Penthorum sedoides	PENSED	L.	2	tolerant	native	Saxifragaceae	DITCH-STONECROP	OBL	hydrophyte	forb	PE
Persicaria sp.						Polygonaceae				forb	
Phalaris arundinacea	PHAARU	L.	0	tolerant	adventive	Poaceae	REED CANARY GRAS	FACW+	advent	grass	PE
Physocarpus opulifolius	PHYOPU	(L.) Maxim.	4	midrange	native	Rosaceae	NINEBARK	FACW-	hydrophyte	shrub	W
Phytolacca americana	PHYAME	L.	1	tolerant	native	Phytolaccacea	POKEWEED	FACU+	upland	forb	PE
Pilea pumila	PILPUM	(L.) A. Gray	2	tolerant	native	Urticaceae	CLEARWEED	FACW	hydrophyte	forb	AN
Plagiothecium latebricola						Plagiotheciaceae				bryo	bryo
Platygrium repens						Entodontaceae				bryo	bryo
Poa palustris	POAPAL	L.	5	midrange	native	Poaceae	FOWL MEADOW GRA	FACW	hydrophyte	grass	PE
Poa pratensis	POAPRA	L.	0	tolerant	adventive	Poaceae	KENTUCKY BLUEGR	FACU	upland	grass	PE
Poa Sp.	POA	ND	*	ND	ND	Poaceae	ND	ND	ND	grass	ND
Poaceae sp.						Poaceae				grass	ND
Podophyllum peltatum	PODPEL	L.	4	midrange	native	Berberidaceae	MAYAPPLE	FACU	upland	forb	PE
Polemonium reptans	POLREP	L.	5	midrange	native	Polemoniacea	SPREADING JACOB'S	FACU	upland	forb	PE

Polygonum arifolium	PLGARI	L.	4	midrange	native	Polygonaceae	HALBERD-LEAVED T	OBL	hydrophyte	forb	AN
Polygonum sagittatum	PLGSAG	L.	2	tolerant	native	Polygonaceae	ARROW-LEAVED TE	OBL	hydrophyte	forb	AN
Polygonum virginianum	PLGVIR	L.	3	midrange	native	Polygonaceae	JUMPSEED	FAC	FAC	forb	PE
Polystichum braunii						Dryopteridaceae				fern	fern
Polytrichastrum sp.						Polytrichaceae				bryo	bryo
Polytrichum sp.						Polytrichaceae				bryo	bryo
Populus deltoides	POPDEL	W. Bartram ex	3	midrange	native	Salicaceae	EASTERN COTTONW	FAC	FAC	tree	W
Populus grandidentata	POPGRA	Michx.	2	tolerant	native	Salicaceae	BIG-TOOTH ASPEN	FACU-	upland	tree	W
Populus tremuloides	POPTRE	Michx.	2	tolerant	native	Salicaceae	QUAKING ASPEN	FACU	upland	tree	W
Potentilla simplex	POTSIM	Michx.	1	tolerant	native	Rosaceae	OLD FIELD CINQUEF	FACU-	upland	forb	PE
Prunella vulgaris		L.			native	Lamiaceae	COMMON SELFHEAL			forb	AN
Prunus serotina	PRUSER	Ehrh.	3	midrange	native	Rosaceae	BLACK CHERRY	FACU	upland	tree	W
Prunus virginiana	PRUVIR	L.	2	tolerant	native	Rosaceae	CHOKE CHERRY	FACU	upland	sm tree	W
Pyrus coronaria	PYRCOR	L.	3	midrange	native	Rosaceae	WILD CRABAPPLE	UPL	upland	sm tree	W
Pyrus sieboldii		Synonym				Rosaceae				sm tree	W
Pyrus sp.	PYRUS	ND	*	ND	ND	Rosaceae	ND	UPL	upland	sm tree	W
Quercus alba	QUEALB	L.	6	sensitive	native	Fagaceae	WHITE OAK	FACU-	upland	tree	W
Quercus bicolor	QUEBIC	Willd.	7	sensitive	native	Fagaceae	SWAMP WHITE OAK	FACW+	hydrophyte	tree	W
Quercus rubra	QUERUB	L.	6	sensitive	native	Fagaceae	RED OAK	FACU-	upland	tree	W
Ranunculus abortivus	RANABO	L.	1	tolerant	native	Ranunculacea	KIDNEY-LEAVED BU	FACW-	hydrophyte	forb	PE
Ranunculus sceleratus	RANSCE	L.	1	tolerant	native	Ranunculacea	CURSED CROWFOO	OBL	hydrophyte	forb	PE
Rhamnus alnifolia	RHAALN	L'Her	8	sensitive	native	Rhamnaceae	ALDER-LEAVED BUC	OBL	hydrophyte	shrub	W
Rhamnus cathartica	RHACAT	L.	0	tolerant	adventive	Rhamnaceae	EUROPEAN BUCKTH	FACU+	upland	sm tree	W
Rhamnus frangula	RHAFRA	L.	0	tolerant	adventive	Rhamnaceae	GLOSSY BUCKTHOR	FAC	FAC	shrub	W
Rhizomnium punctatum		(Hedw.) T. Kop.				Mniaceae				bryo	bryo
Ribes americanum	RIBAME	Mill.	4	midrange	native	Grossulariace	WILD BLACK CURRA	FACW	hydrophyte	shrub	W
Ribes hirtellum	RIBHIR	Michx.	7	sensitive	native	Grossulariace	SWAMP GOOSEBER	FAC	FAC	shrub	W
Ribes sp.	RIBTRI	Pall.	8	sensitive	native	Grossulariace	SWAMP RED CURRA	OBL	hydrophyte	shrub	W
Rosa multiflora	ROSMUL	Thunb. ex Mu	0	tolerant	adventive	Rosaceae	MULTIFLORA ROSE	FACU	upland	shrub	W
Rosa palustris	ROSPAL	Marshall	5	midrange	native	Rosaceae	SWAMP ROSE	OBL	hydrophyte	shrub	W
Rubus allegheniensis	RUBALL	Porter	1	tolerant	native	Rosaceae	COMMON BLACKBEF	FACU-	upland	shrub	W
Rubus flagellaris	RUBFLA	Willd.	1	tolerant	native	Rosaceae	NORTHERN DEWBEF	FACU	upland	shrub	W
Rubus hispidus	RUBHIS	L.	5	midrange	native	Rosaceae	SWAMP DEWBERRY	FACW	hydrophyte	forb	PE
Rubus occidentalis	RUBOCC	L.	1	tolerant	native	Rosaceae	BLACK RASPBERRY	UPL	upland	shrub	W
Rubus pubescens	RUBPUB	Raf.	7	sensitive	native	Rosaceae	DWARF RASPBERRY	FACW	hydrophyte	forb	PE
Rubus setosus		Bigelow			native	Rosaceae	SETOSE BLACKBERRY			forb	PE
Rubus sp.	RUBUS	ND	*	ND	ND	Rosaceae	ND	ND	ND	ND	ND
Rumex orbicularis	RUMORB	A. Gray	5	midrange	native	Polygonaceae	GREAT WATER DOC	OBL	hydrophyte	forb	PE
Sagittaria latifolia	SAGLAT	Willd.	1	tolerant	native	Alismataceae	COMMON ARROWHE	OBL	hydrophyte	forb	PE
Salix amygdaloides	SLXAMY	Andersson	3	midrange	native	Salicaceae	PEACH-LEAVED WIL	FACW	hydrophyte	tree	W
Salix discolor	SLXDIS	Muhl.	3	midrange	native	Salicaceae	PUSSY WILLOW	FACW	hydrophyte	shrub	W
Salix eriocephala	SLXERI	Michx.	2	tolerant	native	Salicaceae	HEART-LEAVED WIL	FACW	hydrophyte	shrub	W
Salix petiolaris	SLXPET	Sm.	8	sensitive	native	Salicaceae	SLENDER WILLOW	OBL	hydrophyte	shrub	W
Salix sp	SALIX	ND	*	ND	ND	Salicaceae	ND	ND	ND	ND	W
Sambucus canadensis	SAMCAN	L.	3	midrange	native	Caprifoliaceae	COMMON ELDERBEF	FACW-	hydrophyte	shrub	W
Schoenoplectus pungens	SCHPUN	(Vahl) Palla	5	midrange	native	Cyperaceae	THREE-SQUARE	FACW+	hydrophyte	sedge	PE
Scirpus atrovirens	SCIATR	Willd.	1	tolerant	native	Cyperaceae	GREEN BULRUSH	OBL	hydrophyte	sedge	PE
Scirpus cyperinus	SCICYP	(L.) Kunth.	1	tolerant	native	Cyperaceae	WOOL-GRASS	FACW+	hydrophyte	sedge	PE

Scirpus fluviatilis		Synonym				Cyperaceae	RIVER BULRUSH		hydrophyte	sedge	PE
Scutellaria lateriflora	SCULAT	L.	3	midrange	native	Lamiaceae	MAD-DOG SKULLCAP	FACW+	hydrophyte	forb	PE
Sium suave	SIUSUA	Walter	6	sensitive	native	Apiaceae	WATER-PARSNIP	OBL	hydrophyte	forb	PE
Smilax hispida	SMXHIS	Muhl.	3	midrange	native	Smilacaceae	BRISTLY GREENBRIE	FAC	FAC	vine	W
Solanum dulcamara	SLMDUL	L.	0	tolerant	adventive	Solanaceae	BITTERSWEET NIGH	FAC-	FAC	vine	PE
Solidago altissima		L.			native	Asteraceae	CANADA GOLDENROD			forb	PE
Solidago canadensis	SOLCAN	L.	1	tolerant	native	Asteraceae	CANADA GOLDENRO	FACU	upland	forb	PE
Solidago flexicaulis	SOLFLE	L.	5	midrange	native	Asteraceae	ZIGZAG GOLDENROI	FACU	upland	forb	PE
Solidago gigantea	SOLGIG	Aiton	3	midrange	native	Asteraceae	SMOOTH GOLDENRO	FACW	hydrophyte	forb	PE
Solidago patula	SOLPAT	Muhl. ex Willd	6	sensitive	native	Asteraceae	ROUGH-LEAVED GOI	OBL	hydrophyte	forb	PE
Solidago rugosa	SOLRUG	Mill.	2	tolerant	native	Asteraceae	ROUGH GOLDENROI	FAC	FAC	forb	PE
Solidago sp.	SOLIDA	ND	*	ND	native	Asteraceae	ND	ND	ND	forb	PE
Solidago uliginosa	SOLULI	Nutt.	9	sensitive	native	Asteraceae	BOG GOLDENROD	OBL	hydrophyte	forb	PE
Spagnum capillifolium						Musci				bryo	bryo
Sphagnum centrale						Musci				bryo	bryo
Sphagnum fimbriatum						Musci				bryo	bryo
Sphagnum girgensohnii						Musci				bryo	bryo
Sphagnum palustre						Musci				bryo	bryo
Sphagnum recurvum						Musci				bryo	bryo
Sphagnum sp.	SPHAG	ND	*	ND	ND	Musci	SPHAGNUM	ND	ND	bryo	bryo
Sphagnum squarrosum						Musci				bryo	bryo
Spiraea alba	SPIALA	Du Roi	3	midrange	native	Rosaceae	MEADOW-SWEET	FACW+	hydrophyte	shrub	W
Spirogyra sp.						Zygnernataceae				Protista	Portista
Stellaria longifolia	STELON	Muhl. ex Willd	4	midrange	native	Caryophyllace	LONG-LEAVED STIT	FACW	hydrophyte	forb	PE
Symphyotrichum lateriflorum		Synonym				Asteraceae				forb	PE
Symplocarpus foetidus	SYMFOE	(L.) Salisb. ex	7	sensitive	native	Araceae	SKUNK-CABBAGE	OBL	hydrophyte	forb	PE
Tetraphis pellucida		Hedw.				Tetraphidaceae				bryo	bryo
Thelypteris palustris	THEPAL	Schott	6	sensitive	native	Thelypteridac	MARSH FERN	FACW+	hydrophyte	fern	PE
Thuidium delicatulum		(Hedw.) Schimp.				Thuidiaceae	DELICATE THUIDIUM bryo			bryo	bryo
Tiarella cordifolia	TIACOR	L.	6	sensitive	native	Saxifragaceae	FOAMFLOWER	FAC-	FAC	forb	PE
Toxicodendron radicans	TOXRAD	(L.) Kuntze	1	tolerant	native	Anacardiacea	POISON-IVY	FAC	FAC	vine	W
Toxicodendron vernix	TOXVER	(L.) Kuntze	7	sensitive	native	Anacardiacea	POISON SUMAC	OBL	hydrophyte	shrub	W
Triadenum fraseri	TRIFRA	(Spach) Gleas	6	sensitive	native	Clusiaceae	FRASER'S ST. JOHN'	OBL	hydrophyte	forb	PE
Trifolium dubium	TRFDUB	Sibth.	0	tolerant	adventive	Fabaceae	LITTLE HOP CLOVER	UPL	upland	forb	AN
Typha latifolia	TYPLAT	L.	1	tolerant	native	Typhaceae	BROAD-LEAVED CAT	OBL	hydrophyte	forb	PE
Ulmus americana	ULMAME	L.	2	tolerant	native	Ulmaceae	AMERICAN ELM	FACW-	hydrophyte	tree	W
Urnula craterium						Pezizaceae				bryo	bryo
Urtica dioica var dioica	URTDIOD	L.	0	tolerant	adventive	Urticaceae	EUROPEAN STINGIN	FACU	upland	forb	PE
Urtica dioica var. procera	URTIDIOI	(Muhl. ex Will	1	tolerant	native	Urticaceae	AMERICAN STINGIN	FAC-	FAC	forb	PE
Vaccinium corymbosum	VACCOR	L.	6	sensitive	native	Ericaceae	HIGHBUSH BLUEBEI	FACW-	hydrophyte	shrub	W
Verbena hastata	VERHAS	L.	4	midrange	native	Verbenaceae	BLUE VERVAIN	FACW+	hydrophyte	forb	PE
Verbena urticifolia	VERURT	L.	3	midrange	native	Verbenaceae	WHITE VERVAIN	FACU	upland	forb	PE
Verbesina alternifolia	VERALT	(L.) Britton ex	5	midrange	native	Asteraceae	WINGSTEM	FAC	FAC	forb	PE
Viburnum cassinoides (= V. nudum var.cassinoides)	VIBCAS	L.	5	midrange	native	Caprifoliaceae	WITHE-ROD	FACW	hydrophyte	shrub	W
Viburnum dentatum	VIBDEN	L.	2	tolerant	native	Caprifoliaceae	ARROW-WOOD	FAC	FAC	shrub	W
Viburnum pruinifolium	VIBPRU	L.	4	midrange	native	Caprifoliaceae	BLACK-HAW	FACU	upland	shrub	W
Viola blanda	VIOBLA	Willd.	7	sensitive	native	Violaceae	SWEET WHITE VIOLI	FACW	hydrophyte	forb	PE

Viola canadense	VIOCAN	L.	5	midrange	native	Violaceae	CANADA VIOLET	UPL	upland	forb	PE
Viola pubescens	VIOPUB	Aiton	4	midrange	native	Violaceae	DOWNY YELLOW VIC	FACU-	upland	forb	PE
Viola sororia	VIOSOR	Willd.	1	tolerant	native	Violaceae	COMMON BLUE VIOL	FAC-	FAC	forb	PE
Viola sp.	VIOLA	ND	*	ND	native	Violaceae	ND	ND	ND	forb	ND
Viola striata	VIOSTR	Aiton	5	midrange	native	Violaceae	STRIPED CREAMY V	FACW	hydrophyte	forb	PE
Vitis riparia	VITRIP	Michx.	3	midrange	native	Vitaceae	RIVERBANK GRAPE	FACW	hydrophyte	vine	W
Vitis sp.	VITIS	ND	*	ND	native	Vitaceae	ND	ND	ND	vine	W
Zelkova serrata											

Appendix B: Fish and Wildlife Observations at the Tamarack Bog as of 2016

Class	**Family**	***Genus species***	**Common Name**
Amphibia	Ambystomatidae	*Ambystoma maculatum*	Spotted salamander
Amphibia	Bufonidae	*Bufo americanus*	American Toad
Amphibia	Hylidae	*Hyla crucifer*	Spring Peeper
Amphibia	Hylidae	*Hyla versicolor*	Gray Tree Frog
Amphibia	Plethodontidae	*Hemidactylium scutatum*	Four-toed Salamander
Amphibia	Plethodontidae	*Plethodon cinereus*	Redback salamander
Amphibia	Ranidae	*Rana clamitans*	Green Frog
Amphibia	Salamandridae	*Notophthalmus viridescens*	Red Spotted Newt
Aves	Corvidae	*Cyanocitta cristata*	Blue Jay
Aves	Paridae	*Poecile atricapillus*	Black Capped Chickadee
Aves	Picidae	*Melanerpes erythrocephalus*	Red headed woodpecker
Aves	Scolopacidae	*Scolopx minor*	American Woodcock
Aves	Thraupidae	*Piranga olivacea*	Scarlet tanager
Aves	Turdidae	*Turdus migratorius*	American Robin
Aves	Tyrannidae	*Contopus virens*	Eastern Wood Peewee
Gastropoda	Arionidae	*Arion* sp.	Roundback Slug
Insecta	Apidae	*Bombus fervidus*	Golden Northern Bumble Bee
Insecta	Apidae	*Bombus impatiens*	Eastern Bumble bee
Insecta	Apidae	*Bombus vagans*	Half Black Bumble bee
Insecta	Buprestidae	*Agrilus planipennis*	Emerald ash borer
Insecta	Chrysomelidae	*Pyrrhalta viburni*	Viburnum leaf beetle
Insecta	Cicadadae	*Magicicada cassini*	Dwarf Cicada
Insecta	Cicadadae	*Magicicada septendecim*	Pharaoh Cicada
Insecta	Libellulidae	*Celithemis eponina*	Halloween Pennant
Insecta	Libellulidae	*Libellula pulchella*	12 spotted skimmer
Insecta	Libellulidae	*Pachydiplax longipennis*	Blue Dasher
Insecta	Libellulidae	*Plathemis lydia*	Common whitetail
Insecta	Megachilidae	*Megachile sculpturalis*	Giant Resin Bee
Insecta	Nymphalidae	*Polygnia comma*	Eastern comma
Insecta	Nymphalidae	*Vanessa atalanta*	Red Admiral Butterfly
Insecta	Ptychoteridae	*Bittacomorpha clavipes*	Phantom Crane fly
Mammalia	Cervidae	*Odoceilus virginiana*	White tailed deer
Mammalia	Procyonidae	*Procyon lotor*	Raccoon
Mammalia	Sciuridae	*Sciurus niger*	Fox squirrel
Reptilia	Colubridae	*Thamnophis sirtalis*	Eastern garter snake

VIBI Plot S1

Enhancement plot

Column F

VIBI Metric Summary														
VIBI-F Metrics			**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**
Shade			7	7	10	10								
SVP			7	10	10	10								
FQAI			7	3	10	10								
% Bryophyte			0	3	0	0								
% Hydrophyte			7	7	10	3								
% Sensitive			0	0	3	3								
% Tolerant			3	0	7	0								
Small tree			0	10	10	10								
Subcanopy IV			0	7	3	7								
Canopy IV			7	3	10	10								
Total Score			**38**	**50**	**73**	**63**								

VIBI Cover Categories														
Category (Column AP)			**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**
%open water			**0**	**0**	**0**	**0**								
%unvegetated open water			**0**	**0**	**0**	**0**								
%bare ground			**0.18**	**0**	**0.035**	**0.005**								
%litter cover			**0.18**	**4E-04**	**0.85**	**0.85**								

VIBI data- Woody Stems		Stems/H	whole	whole	whole	whole								
Plant Species		**Indicator Status**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**
Carya cordiformis					100	100								
Carya glabra		FACU-	100			100								
Carya ovata		FACU-	100	100	100									
Fraxinus pennsylvanica		FACW	400	600	900	600								
Prunus serotina		FACU	300	400	400	300								

Prunus virginiana		FACU		200	100	200								
Pyrus coronaria		UPL	1,000	100	3400	1600								
Pyrus sieboldil				2700	2700									
Rhamnus frangula		FAC	800	900										
Rosa multiflora		FACU	1,000	600		100								
Standing dead				700	2100	1000								
Ulmus americana					100	100								

VIBI Data- Areal Cover			**% Areal Cover (Raw)= totcov (column AP)**											
Plant Species	Cof C	**Indicator Status**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**
Acer rubrum	2	FAC	0.6250	0.6250	0.375	0.6250								
Agrimonia striata	7	FACU-	0.0001											
Alliaria petiolata	0	FACU-	0.0001											
Amelanchier sp.	*	ND		0.0001										
Arisaema triphyllum subsp. Tri	3	FACU-	0.0001	0.0001	0.005	0.0050								
Aster lateriflorus						0.0050								
Aster puniceus						0.0050								
Aster sp.	*	ND		0.0050	0.005	0.0001								
Aster sp.					0.0001									
Bidens sp.						0.0050								
Carex cristatella					0.005	0.0150								
Carex lacustris	5	OBL	0.0350	0.0050	0.005	0.0150								
Carex seorsa	7	FACW		0.0050	0.005	0.0050								
Carex sp.	*	ND	0.0001				see voucher s1.02							
Carex sp.	*	ND	0.0001				see vou	join these two?						
Carex rosea						0.0050	join these two?							
Carpinus caroliniana	5	FAC	0.0150	0.0001										
Carya cordiformis					0.005	0.0050								
Carya glabra	5	FACU-	0.0050			0.0350								
Carya ovata	6	FACU-	0.0001	0.0050	0.075									
Cinna arundinacea	4	FACW	0.0001	0.0050	0.005	0.0350								
Circaea lutetiana	3	FACU	0.0050	0.0050	0.005	0.0150								
Cornus amomum	2	FACW		0.0050		0.0050								

Cornus racemosa	1	FAC-	0.0001											
Crataegus sp.	*	ND	0.0001											
Dryopteris carthusiana	5	FACW+_		0.0001										
Dryopteris cristata	8	FACW+	0.0001	0.0050										
Epilobium coloratum	1	OBL	0.0001			0.0050								
Erechtites hieracifolia	2	FACU		0.0001		0.0050								
Euonymus alatus	0	UPL	0.0001			0.0001								
Eupatorium perfoliatum						0.0001								
Fraxinus pennsylvanica	3	FACW	0.1750	0.0750	0.075	0.0750								
Galium aparine	0	FACU	0.0001	0.0001										
Galium tinctorium						0.0050								
Galium triflorum	4	FACU	0.0001											
Geum canadense	2	FACU	0.0050	0.0050	0.005	0.0050								
Geum laciniatum					0.005									
Glechoma hederacea	0	FACU	0.0001											
Grass sp.					0.0001									
Ilex verticillata	6	FACW+		0.0001	0.005	0.0050								
Impatiens capensis	2	FACW	0.0050		0.015	0.0050								
Leersia oryzoides	1	OBL		0.0001	0.005	0.0050								
Ligustrum vulgare	0	FACU	0.0050	0.0050		0.0050								
Lonicera morrowii	0	FACU	0.0001											
Lycopus sp.						0.0001								
Moss sp.	*	ND	0.0001	0.0001										
Moss sp.	*	ND	0.0001	0.0050										
Moss sp.	*	ND	0.0001	0.0050										
Moss sp.	*	ND	0.0001	0.0050										
Moss sp.	*	ND	0.0050	0.0050	0.005	0.0050								
Polystichum braunii	#N/A	#N/A	0.0001											
Onoclea sensibilis	2	FACW	0.0001	0.0150	0.015	0.0350								
Panicum sp.						0.0050								
Parthenocissus quinquefolia	2	FACU	0.0050	0.0050	0.005	0.0150								
Penthorum sedoides						0.0001								
Phalaris arundinacea						0.0050								
Phytolacca americana						0.005								

Pilea pumila					0.005	0.015
Polygonum arifolium	4	OBL	0.0001		0.005	0.0150
Polygonum sagittatum	2	OBL	0.0001	0.0001	0.005	0.005
Polygonum virginianum	3	FAC	0.0050	0.0050	0.005	0.0150
Populus deltoides	3	FAC	0.0050			0.0750
Prunus serotina	3	FACU	0.0050	0.1750	0.175	0.3750
Prunus virginiana	3	FAC		0.0050	0.015	0.1750
Pyrus coronaria	3	UPL	0.6250	0.6250	0.625	0.0750
Quercus alba	6	FACU-	0.0001			
Quercus bicolor					0.0001	0.0001
Quercus rubra	6	FACU-	0.0001	0.0001	0.005	0.0750
Rhamnus frangula	0	FAC	0.0750	0.0350	0.035	0.0350
Rosa multiflora	0	FACU	0.1750	0.0150	0.015	0.0150
Rubus allegheniensis	1	FACU-	0.0150	0.0050	0.005	0.0150
Rubus flagellaris						0.0001
Rubus hispidus	5	FACW	0.6250	0.1750	0.625	0.1750
Rubus occidentalis	1	UPL	0.0001			
Scutellaria lateriflora	3	FACW+	0.0001	0.0050	0.005	0.0050
Solidago patula	6	OBL	0.0050	0.0001		
Solidago sp. -UNK narrow leave	#N/A	#N/A	0.0001			
Solidago uliginosa	9	OBL	0.0050			0.0050
Spiraea alba	3	FACW+	0.0001			
Symplocarpus foetidus	7	OBL	0.0050	0.0050	0.015	0.0150
Moss sp. - Thuidium delicatulum						0.0050
Toxicodendron radicans	1	FAC	0.0150	0.0150	0.015	0.015
Ulmus americana	2	FACW-	0.0350	0.0050	0.035	0.035
UNK tree seedling 1	#N/A	#N/A	0.0001			
Viburnum dentatum	2	FAC	0.0001	0.0050	0.005	0.005
Viola sp.						0.005
Vitis sp.					0.0001	0.005
Zelkova serrata						0.005

Summer 2013

Partial Plot Photo - Looking S. from NW corner

2014: S1 NE Corner to SW Corner

VIBI Plot S2

Wetland Edge plot

VIBI Metric Summary

VIBI-F Metrics			2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Shade			10	10	10	10								
SVP			10	10	10	10								
FQAI			7	10	10	10								
% Bryophyte			3	7	3	10								
% Hydrophyte			7	7	7	10								
% Sensitive			7	7	7	7								
% Tolerant			3	0	0	0								
Small tree			10	10	0	0								
Subcanopy IV			10	10	10	7								
Canopy IV			10	3	10	0								
Total Score			**74**	**74**	**67**	**64**								

VIBI Cover Categories

Category			2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
%open water			**0**	**0**	**0**	**0**								
%unvegetated open water			**0**	**0**	**0**	**0**								
%bare ground			**0**	**0.175**	**0.035**	**0.075**								
%litter cover			**0**	**0.075**	**0.035**	**0.175**								

VIBI data- Woody Stems		**Stems/h**	Whole?	Whole	**North**	**North**								
Plant Species		**Indicator Status**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**
Acer rubrum		FAC	700	800	200	200								
Cornus amomum		FACW		200	200	300								
Fraxinus pennsylvanica		FACW	1,400	600	1300	900								
Fraxinus nigra		FACW	100		100									
Ilex verticillata		FACW+	4,800	2900	4000	900								

Lindera benzoin						700								
Prunus serotina		FACU	300	100	100									
Pyrus coronaria					2600	800								
Pyrus sieboldii		UPL	1,500	4,700										
Rhamnus frangula		FAC	3,000	4,500	2000	1400								
Rosa multiflora		FACW		600	600									
Standing Dead		ND	800	1,500	700	1800								
Toxicodendron vernix		OBL	100											
Vaccinium corymbosum		FACW-	1,900	2,300	1100	1300								
Viburnum cassisnoides		FACU+	600	1200	700	1100								

VIBI Data- Areal Cover			**% Areal Cover (Raw)= totcov (column AP)**											
Plant SpB35:L69ecies	Cof C	**Indicator Status**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**
Acer rubrum	2	FAC	0.6250	0.85	0.9700	0.625								
Alisma sp.						0.005								
Arctium sp.	*	#N/A	0.0001											
Arisaema triphyllum subsp. Tri	3	facu-		0.0001		0.005								
Aster lateriflorus	2	FACW-	0.0001	0.005		0.015								
Aster puniceus	7	OBL		0.0050		0.0150								
Aster sp.					0.0050	0.0001								
Aster sp.					0.0050									
Bidens cernua	3	OBL		0.0001	0.0001	0.015								
Caltha palustris					0.0050	0.005								
Carex comosa						0.0150								
Carex crinita var. crinita	3	OBL	0.0050											
Carex cristatella					0.0001	0.035								
Carex gracillima	4	FACU-		0.005										
Carex lacustris	5	OBL		0.005	0.015	0.0350								
Carex leptalea	7	OBL		0.0001		0.0050								
Carex lupulina						0.0350								
Carex seorsa	7	FACW	0.1750	0.075	0.0150	0.0750								
Carex stipata						0.0050								
Cephalanthus occidentalis						0.0150								
Chelone glabra	6	OBL	0.0001	0.005	0.0001									

Cinna arundinacea	4	FACW	0.0050	0.005	0.0050	0.0150								
Clematis virginiana						0.0050								
Cornus amomum	2	FACW	0.0050	0.015	0.0150	0.0350								
Cornus florida	5	FACU-	0.0001											
Cuscuta gronovii	3	FACW+	0.0001											
Dryopteris carthusiana	5	FAC+	0.0001	0.005	0.0050	0.0050								
Dryopteris cristata	8	FACW+	0.0001	0.005	0.0050	0.0050								
Epilobium ciliatum	4	FAC-	0.0001	0.005	0.0050	0.0050								
Erechtites hieracifolia						0.0050								
Euonymus alatus					0.0001									
Fern 2	#N/A	#N/A	0.0001											
Fraxinus pennsylvanica	3	FACW	0.3750	0.175	0.0350	0.1750								
Fraxinus nigra	*	ND	0.0350											
Galium asprellum	4	OBL		0.0001		0.0050								
Galium sp.	*	ND	0.0001		0.0050									
Galium tinctorium						0.0050								
Geum canadense						0.0050								
Geum Sp.	*	ND		0.0001										
Glyceria canadensis	7	OBL		0.005										
Glyceria striata	2	OBL	0.0350	0.035	0.0350	0.0350								
Ilex verticillata	6	FACW+	0.0750	0.035	0.0750	0.0750								
Impatiens capensis	2	FACW	0.1750	0.0150	0.015	0.0750								
Leersia oryzoides	1	OBL	0.0150	0.0010	0.005	0.0050								
Lemna minor					0.0001									
Lindera benzoin	5	FACW-		0.0050		0.0050								
Marchantiophyta sp.	*	ND	0.0001	0.0001										
Moss sp.	*	ND	0.0001	0.0001										
Moss sp.	*	ND	0.0001	0.0050										
Moss sp.	*	ND	0.0001	0.0050										
Moss sp.	*	ND	0.0001	0.0750										
Moss sp.	*	ND	0.0350	0.0050	0.035	0.1750								
Moss sp.	*	ND		0.0050										
Moss sp.	*	ND		0.0050										
Moss sp.	*	ND		0.0050										

Moss sp.	*	ND		0.0050		
Moss sp. - Leucobryum glaucum						0.0050
Moss sp. - Polytrichum sp.	*	ND		0.0050		0.0050
Moss sp. - Thuidium delicatulum						0.0050
Onoclea sensibilis	2	FACW	0.0050	0.0050	0.005	0.0050
Osmunda cinnamomea	6	FACW	0.0750	0.0750	0.035	0.0350
Osmunda regalis	7	OBL	0.0350	0.0750	0.0350	0.0350
Oxalis stricta	*	ND		0.0001		
Parthenocissus quinquefolia	2	FACU	0.0050	0.0050	0.005	0.0050
Persicaria sp.						0.0050
Pilea pumila	2	FACW	0.0001	0.0050	0.005	0.0050
Polygonum arifolium	4	OBL	0.0350	0.0750	0.015	0.0350
Polygonum sagittatum	2	OBL	0.0050	0.0001	0.005	0.0050
Prunus serotina	3	FACU	0.0001	0.0150	0.0050	0.0050
Pyrus coronaria					0.3750	0.0350
Pyrus sieboldii	*	ND	0.3750	0.3750		
Quercus rubra	6	FACU-	0.0001	0.0010	0.0001	0.0001
Rhamnus frangula	0	FAC	0.0350	0.1750	0.075	0.1750
Rosa multiflora	0	FACU	0.0350	0.0150	0.0350	0.0150
Rubus flagellaris	1	FACU	0.0050	0.0050	0.0050	0.0050
Rubus hispidus	5	FACW	0.0350	0.0150	0.0150	0.0350
Rubus sp.		#N/A	0.0001			
Scutellaria lateriflora	3	FACW+	0.0001	0.0050	0.0150	0.0150
Solidago patula	6	OBL	0.0050	0.0050	0.005	0.0150
Solidago rugosa	2	FAC	0.0050	0.0050		
Solidago sp.	*	ND	0.0001			0.0050
Symplocarpus foetidus	7	OBL	0.0750	0.0350	0.1750	0.0750
Toxicodendron radicans	1	FAC	0.0050	0.0050	0.0050	0.0050
Toxicodendron vernix	7	OBL	0.0001	0.0050	0.0050	0.015
Ulmus americana	2	FACQ-		0.0010		0.005
Vaccinium corymbosum	6	FACW-	0.0750	0.1750	0.0750	0.075
Viburnum cassinoides	*	#N/A	0.0350	0.0350	0.0350	0.035
Viburnum dentatum	2	FAC	0.0001	0.0050		
Viola sp.	*	ND	0.0001	0.0050	0.005	0.005

Zelkova serrata

0.0001	

2014: S2 NE Corner to SW Corner

VIBI Plot S3

Core bog area

VIBI Metric Summary

VIBI-F Metrics			2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Shade			10	10	10	10								
SVP			10	10	10	10								
FQAI			10	10	10	10								
% Bryophyte			10	7	10	10								
% Hydrophyte			10	10	7	7								
% Sensitive			10	10	10	10								
% Tolerant			10	10	7	10								
Small tree			0	0	0	0								
Subcanopy IV			10	10	10	10								
Canopy IV			7	3	10	3								
Total Score			**84**	**80**	**84**	**80**								

VIBI Cover Categories

Category			2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
%open water			**0**	**0.075**	**0.035**	**0.075**								
%unvegetated open water			**0**	**0.005**	**0.035**	**0.035**								
%bare ground			**0**	**0.375**	**0.005**	**0.015**								
%litter cover			**0.0003**	**0.175**	**0.1753**	**0.005**								

VIBI data- Woody Stems

		Stems/H	Western	West	West	Western								
Plant Species		**Indicator Status**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**
Alnus incana		FACW+	4,600	3200	2800	2100								
Alnus serrulata		OBL	800											
Amelanchier sp.		ND		100										
Aronia melanocarpa		FAC	400	100		200								
Cornus amomum						100								

Fraxinus pennsylvanica		FACW	400	400	300	300									
Ilex verticillata		FACW+	2,800	200	1600	2100									
Larix laricina		FACW	400	200	200	200									
Pyrus coronaria		UPL	1,400	1,000	900	800									
Rhamnus frangula		FAC	3,000	700	2000	1400									
Rosa palustris		OBL	2,800	1,000	1200	2100									
Standing Dead		ND	400	700	800	1000									
Toxicodendron vernix		OBL	800	400	400	900									
Vaccinium corymbosum		FACW-	5,800	4,100	2800	2500									
Viburnum cassinoides						700									
Viburnum dentatum		FAC		200	100	100									

VIBI Data- Areal Cover			**% Areal Cover (Raw)= totcov (column AP)**												
Plant Species	Cof C	**Indicator Status**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**
Acer rubrum	2	FAC	0.0150	0.0050	0.0050	0.0050								
Alisma plantago-aquatica						0.0001								
Alnus incana	6	FACW+	0.1750	0.0350	0.3750	0.3750								
Alnus serrulata	6	OBL	0.0350	0.6250										
Amelanchier sp.	*	ND		0.0050										
Arisaema triphyllum subsp. trip	3	FACU-	0.0001	0.0050	0.0050	0.0050								
Aronia melanocarpa	5	FAC	0.0350	0.0050		0.0050								
Aster lateriflorus	2	FACW-	0.0001											
Aster puniceus	7	OBL	0.0350	0.0750		0.0350								
Aster sp.	*	ND		0.0050	0.0350	0.0050								
Aster sp.	*	ND		0.0750										
Bidens cernua	3	OBL		0.0150	0.0150									
Boehmeria cylindrica					0.0001	0.0050								
Caltha palustris	6	OBL	0.0001	0.0001	0.0050	0.005								
Carex atlantica subsp. atlantica					0.0001	0.0350								
Carex comosa	2	OBL	0.0001	0.0150		0.0050								
Carex leptalea	7	OBL	0.0050	0.0350	0.0050	0.0150								
Carex seorsa	7	FACW	0.0750	0.1750	0.0350	0.0350								

Chelone glabra	6	OBL	0.0050	0.0050	0.0050	0.0050								
Cinna arundinacea	4	FACW		0.005	0.0050	0.0050								
Circaea lutetiana	3	FACU	0.0050											
Cornus amomum	2	FACW		0.0350	0.0350	0.0350								
Cornus racemosa	1	FAC-	0.0001											
Cuscuta gronovii	3	FACW+	0.0001	0.0050	0.0050	0.0050								
Decodon verticillatus	6	OBL	0.0150	0.0750	0.0750	0.1750								
Dryopteris carthusiana	5	FAC+	0.0001	0.0010										
Dryopteris cristata	8	FACW+	0.0001	0.0050	0.0050	0.0050								
Epilobium ciliatum	4	FAC-	0.0050	0.0050	0.0050	0.0050								
Fraxinus pennsylvanica	3	FACW	0.0350	0.0750	0.0050	0.0150								
Galium asprellum	4	OBL	0.0001	0.0050	0.0001	0.0050								
Galium sp.	*	ND	0.0001	0.0010	0.0050									
Galium tinctorium						0.0050								
Gaylussacia baccata	6	FACU	0.0001											
Geum canadense	2	FACU	0.0001	0.0050		0.0050								
Geum laciniatum					0.0001									
Glyceria striata	2	OBL	0.0050	0.0050	0.0050	0.0050								
Ilex verticillata	6	FACW+	0.0750	0.0375	0.035	0.0350								
Impatiens capensis	2	FACW	0.3750	0.0350	0.0750	0.0350								
Impatiens pallida					0.005	0.0050								
Larix laricina	9	FACW	0.1750	0.1750	0.1750	0.1750								
Leersia oryzoides	1	OBL	0.0050		0.0050	0.0050								
Lemna minor	3	OBL	0.0001	0.0050	0.0050	0.0050								
Moss sp.	*	ND	0.0001	0.0001										
Moss sp.	*	ND	0.0001	0.0150										
Moss sp.	*	ND	0.0001	0.0150										
Moss sp.	*	ND	0.0050	0.0050										
Moss sp.	*	ND	0.0050											
Moss sp.	*	ND	0.3750	0.1750	0.1750	0.3750								
Moss sp. - Climacium americanum						0.0050								
Moss sp. - Leucobryum glaucum						0.0050								
Moss sp. -Thuidium delicatulum						0.1750								
Onoclea sensibilis	2	FACW	0.0350	0.0150	0.0350	0.0150								

Osmunda cinnamomea	6	FACW	0.0750	0.1750	0.0750	0.0750								
Parthenocissus quinquefolia						0.0001								
persicaria virginiana	*	ND		0.0010										
Pilea pumila	2	FACW	0.0050	0.0350	0.0350	0.0350								
Poa palustris						0.0001								
Poaceae sp.	*	ND		0.0050										
Polygonum arifolium	4	OBL	0.0350	0.0350	0.0050	0.0050								
Polygonum sagittatum	2	OBL	0.0050	0.0050	0.0050	0.0050								
Pyrus coronaria	3	UPL	0.1750	0.1750	0.0750	0.1750								
Quercus rubra						0.0050								
Quercus sp.	*	ND		0.0050	0.0001									
Ranunculus sp.	*	ND	0.0001			0.0001								
Rhamnus frangula	0	FAC	0.1750	0.1750	0.1750	0.0750								
Rosa multiflora	0	FACU	0.0350	0.0010	0.0050	0.0001								
Rosa palustris	5	OBL	0.0150	0.0350	0.0350	0.0750								
Rubus flagellaris	1	FACU	0.0001	0.0050	0.0050	0.0050								
Rubus hispidus	5	FACW	0.1750	0.0150	0.0750	0.0050								
Salix amygdaloides						0.0050								
Salix sp.	*	ND		0.0050										
Scutellaria lateriflora	3	FACW+	0.0001	0.0150	0.0150	0.0050								
Sium suave	6	OBL	0.0050	0.0150	0.0050	0.0050								
Solanum dulcamara	0	FAC-	0.0001		0.0050									
Solidago patula	6	OBL	0.0001	0.0050	0.0050	0.0050								
Solidago rugosa	2	FAC	0.0001	0.0050	0.0050	0.0050								
Solidago uliginosa	9	OBL	0.0001											
Sphagnum girgensohnii						0.0350								
Sphagnum sp.	*	ND	0.0050	0.0050		0.0001								
Sphagnum sp.	*	ND	0.0050	0.1750	0.0750	0.0150								
Symplocarpus foetidus	7	OBL	0.0001	0.0050	0.0150	0.0050								
Thelypteris palustris					0.0050									
Toxicodendron radicans	1	FAC	0.0001	0.0050	0.0050	0.0050								
Toxicodendron vernix	7	OBL	0.0750	0.1750	0.0750	0.075								
Typha latifolia	*	OBL	0.0001	0.0050	0.0050	0.005								
Vaccinium corymbosum	6	FACW-	0.3750	0.3750	0.0750	0.175								

Viburnum cassinoides				0.0150	0.0150	0.005
Viburnum dentatum	2	FAC	0.0001	0.0050	0.0050	0.005
Viola sp.	*	ND	0.0001	0.0050	0.0050	0.005
Vitis sp.	*	ND		0.0050	0.0050	

2014: S3 NE Corner to SW Corner

VIBI Plot S4

Enhancement plot

VIBI Metric Summary

VIBI-F Metrics			2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Shade			7	3	10	10								
SVP			10	3	10	10								
FQAI			3	3	10	7								
% Bryophyte			0	0	0	0								
% Hydrophyte			7	7	10	7								
% Sensitive			0	0	3	3								
% Tolerant			3	7	7	3								
Small tree			10	10	10	7								
Subcanopy IV			7	0	3	0								
Canopy IV			3	10	7	10								
Total Score			**50**	**43**	**70**	**57**								

VIBI Cover Categories

Category			2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
%open water			**0**	**0**	**0**	**0**								
%unvegetated open water			**0**	**0**	**0**	**0**								
%bare ground			**0**	**0.075**	**0.005**	**0.015**								
%litter cover			**0.0003**	**0.375**	**0.075**	**0.85**								

VIBI data- Woody Stems

		Stems/H	Whole	whole	whole	whole								
Plant Species		**Indicator Status**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**
Acer rubrum		FAC	100											
Fraxinus pennsylvanica		FACW	1,100	500	500	700								
Prunus serotina		FACU	500	100	200	200								
Prunus virginiana		FACU	400		200									
Pyrus coronaria		ND	4,800	2,700	5000	2700								

Rhamnus frangula					100	200								
Standing dead					500	1100								
Fraxinus americana					200	200								
Ulmus americana						100								

VIBI Data- Areal Cover			**% Areal Cover (Raw)= totcov (column AP)**											
Plant Species	Cof C	**Indicator Status**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**
Acer rubrum	2	FAC	0.1750	0.0050	0.1750	0.1750								
Arisaema triphyllum subsp. Tri	3	FACU-	0.0050	0.0001	0.0050	0.0150								
Aster lateriflorus	2	FACW-	0.0001	0.0001	0.0001	0.0050								
Aster puniceus						0.0050								
Aster sp.					0.005									
Bidens cernua	3	OBL		0.0050										
Boehmeria cylindrica					0.005	0.0150								
Carex bromoides	7	FACW	0.0001	0.0050										
Carex crinita var. crinita	3	OBL	0.0050											
Carex cristatella	3	FACW	0.0001			0.0750								
Carex lacustris					0.0050	0.0050								
Carex seorsa	7	FACW		0.0051	0.0050	0.0150								
Carex sp.						0.0001								
Carya cordiformis						0.0050								
Carya ovata	6	FACU-		0.0050										
Carya sp.	*	ND	0.0001	0.0050	0.0001									
Chelone glabra					0.0001									
Cinna arundinacea					0.0050	0.0350								
Circaea lutetiana	3	FACU	0.0050	0.0050	0.0050	0.0150								
Cornus amomum	2	FACW	0.0050	0.0001	0.0001	0.0050								
Cornus racemosa	1	FAC-	0.0001											
Crataegus sp.	*	ND	0.0001											
Cuscuta gronovii	3	FACW+	0.0001	0.0050	0.0050	0.0050								
Dryopteris carthusiana					0.0050	0.0050								
Epilobium ciliatum	4	FAC-	0.0001		0.0050	0.0050								

Erechtites hieracifolia	2	FACU	0.0001		0.0001	0.0150								
Erigeron annuus	0	FACU		0.0001										
Euonymus alatus	0	UPL		0.0001		0.0050								
Eupatorium perfoliatum					0.0050	0.0050								
Fern sp.	*	ND		0.0150										
Fern sp.	*	ND		0.0150										
Fraxinus americana					0.175	0.0350								
Fraxinus pennsylvanica	3	FACW	0.1750	0.1750	0.1750	0.1750								
Geum canadense	2	FACU	0.1750	0.0350	0.0150	0.0350								
Geum laciniatum	2			0.0350										
Glyceria striata	2	OBL	0.0001	0.0150	0.0750	0.0350								
Herb sp.	*	ND		0.0001										
Impatiens capensis	2	FACW	0.3750	0.0050	0.0150	0.0150								
Impatiens pallida					0.005									
Lactuca biennis	1	FACU	0.0001		0.0001	0.0050								
Leersia oryzoides						0.0050								
Ligustrum vulgare	0	FACU	0.0050	0.0050	0.0050	0.0150								
Lonicera sp.	*	ND	0.0350											
Mimulus ringens					0.0050									
Moss sp.	*	ND	0.0001	0.0050										
Moss sp.	*	ND	0.0001	0.0050										
Moss sp.	*	ND	0.0001											
Moss sp.	*	ND	0.0001											
Moss sp.	*	ND	0.0050	0.0050	0.0050	0.0200								
Moss sp. - Thuidium delicatulum						0.0050								
Moss sp. -Climacium americanum						0.0050								
Nyssa sylvatica	7	FAC	0.0001											
Onoclea sensibilis	2	FACW	0.0001	0.0001	0.0050	0.0001								
Oxalis stricta	0	UPL	0.0001	0.0050	0.0050	0.0050								
Parthenocissus quinquefolia	2	FACU	0.0150	0.0050	0.0050	0.0050								
Phytolacca americana					0.005	0.0350								
Pilea pumila	2	FACW	0.0050	0.1750	0.0750	0.0350								
Polygonum arifolium					0.0001	0.0050								
Polygonum sagittatum	2	OBL	0.0001	0.0050	0.0050	0.0150								

Polygonum virginianum	3	FAC	0.1750	0.0350	0.0150	0.0750
Prunus serotina	3	FACU	0.3750	0.1750	0.1750	0.1750
Prunus virginiana	2	FACU	0.0350		0.0150	0.0050
Pyrus coronaria	3	UPL	0.6250	0.8500	0.8500	0.3750
Pyrus sp.	*	ND		0.8500		
Quercus rubra	6	FACU-	0.0001		0.0050	0.0050
Ranunculus abortivus					0.005	
Rhamnus frangula	0	FAC	0.0750	0.0050	0.0750	0.0750
Rosa multiflora	0	FACU	0.0750	0.0050	0.0050	0.0150
Rubus allegheniensis	1	FACU-	0.0350	0.0050	0.0150	0.1750
Rubus flagellaris	1	FACU		0.0050	0.0001	
Rubus hispidus	5	FACW	0.1750	0.0750	0.3750	0.1750
Sambucus canadensis						0.0050
Scutellaria lateriflora	3	FACW+		0.0001	0.8500	0.0350
Solidago rugosa	2	FAC	0.0050	0.0001		
Solidago uliginosa	9	OBL		0.0001		0.0050
Symplocarpus foetidus	7	OBL	0.0050	0.0050	0.0150	0.0150
Toxicodendron radicans	1	FAC	0.0050	0.0050	0.0350	0.015
Ulmus americana	2	FACW-	0.0050			0.005
Viola sp.	*	ND	0.0001	0.0001		
Vitis sp.	*	ND		0.0050		0.005
Zelkova serrata	*	ND		0.0001	0.0050	0.015

2014 Photo: S4 NE Corner to SW Corner

VIBI Plot S5

Core bog plot

VIBI Metric Summary

VIBI-F Metrics			2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Shade			10	10	10	10								
SVP			10	10	10	10								
FQAI			10	10	10	10								
% Bryophyte			10	10	10	10								
% Hydrophyte			7	7	3	3								
% Sensitive			10	10	10	10								
% Tolerant			3	10	10	10								
Small tree			10	10	10	10								
Subcanopy IV			3	7	7	7								
Canopy IV			3	10	10	7								
Total Score			**76**	**94**	**90**	**87**								
			CHECK											

VIBI Cover Categories

Category			2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
%open water			**0**	**0.375**	**0.075**	**0.175**								
%unvegetated open water			**0**	**0.175**	**0.035**	**0.175**								
%bare ground			**0**	**0.005**	**0.005**	**0.015**								
%litter cover			**0.0003**	**0.005**	**0.035**	**0.035**								

VIBI data- Woody Stems

		Stems/H	East	West	West	East								
Plant Species		**Indicator Status**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**
Alnus incana		FACW+	2,200	5,200	3900	2500								
Alnus serrulata		OBL	200	200										
Aronia melanocarpa		FAC	200	100										
Cornus amomum		FACW	2,400	900	600	400								
Ilex verticillata		FACW+		100	100	100								

Larix laricina		FACW	200	100	100	100								
Lonicera maackii					100									
Pyrus coronaria		UPL	200		1800	200								
Rhamnus frangula		FAC	9,450	3,900	5900	3100								
Rosa palustris		OBL	15,800	6,800	3800	4900								
Salix sp.		ND	800	2,900	900	600								
Standing Dead		ND	6,000	4,700	5900	2700								
Toxicodendron vernix		OBL	440	1,800	2500	1000								
Ulmus americana					100									
Vaccinium corymbosum		FACW-	400	900	1400	600								
Viburnum dentatum		FAC	200	200	100									

VIBI Data- Areal Cover			**% Areal Cover (Raw)= totcov (column AP)**											
Plant Species	Cof C	**Indicator Status**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**
Acer rubrum	2	FAC	0.0050	0.0050	0.0001									
Alisma plantago-aquatica						0.0001								
Alnus incana	6	FACW+	0.3750	0.1750	0.3750	0.375								
Alnus serrulata	6	OBL	0.0150											
Alnus sp.	*	ND		0.0150										
Arisaema triphyllum subsp. Tri	3	FACU-	0.0001	0.0150	0.0050	0.035								
Aronia melanocarpa	5	FAC	0.005	0.0050										
Aster lateriflorus	2	FACW-		0.0001		0.005								
Aster puniceus	7	OBL	0.0150			0.035								
Aster sp.	*	ND		0.0150	0.0050	0.035								
Bidens sp.	*	ND	0.0001	0.0050	0.0050	0.005								
Boehmeria cylindrica	4	FACW+	0.0001	0.0001	0.0050	0.005								
Caltha palustris	6	OBL	0.0001	0.0050	0.0050	0.005								
Carex atlantica subsp. Capillac	9	OBL	0.0150	0.0350	0.0350	0.005								
Carex comosa	2	OBL	0.0001	0.0001		0.005								
Carex lacustris						0.005								
Carex leptalea	7	OBL	0.0001	0.0350	0.0350	0.075								
Carex seorsa	7	FACW		0.0350	0.0750	0.075								

Cephalanthus occidentalis	6	OBL		0.0050		**0.015**								
Chelone glabra	6	OBL	0.0050	0.0050	0.0050	0.0050								
Cinna arundinacea	4	FACW	0.0050	0.0050	0.0050	0.0050								
Circaea lutetiana	3	FACU	0.0050											
Cornus amomum	2	FACW	0.0350	0.0050	0.0050	0.0350								
Cornus racemosa	1	FAC-	0.0001											
Cuscuta gronovii	3	FACW+		0.0001										
Decodon verticillatus	6	OBL	0.1750	0.3750	0.3750	0.3750								
Dryopteris carthusiana	5	FAC+	0.0001											
Dryopteris cristata	8	FACW+	0.0050	0.0050	0.0050	0.0050								
Dryopteris marginalis	5	FACU-	0.0150	0.0001										
Epilobium ciliatum	4	FAC-	0.0001	0.0050		0.0050								
Epilobium sp.	*	ND		0.0050										
Galium aparine	0	FACU		0.0050										
Galium asprellum	4	OBL	0.0050	0.0050	0.0050	0.0050								
Galium sp.					0.005									
Galium tinctorium						0.0001								
Geum canadense					0.0001	0.0050								
Geum laciniatum						0.0001								
Geum sp.	*	ND		0.0001										
Glyceria striata	2	OBL	0.0001	0.0001	0.0050	0.0050								
Ilex verticillata	6	FACW+	0.0001	0.0050	0.0150	0.0050								
Impatiens capensis	2	FACW	0.1750	0.0750	0.0350	0.0350								
Larix laricina	9	FACW	0.0001	0.0750	0.1750	0.0750								
Leersia oryzoides	1	OBL	0.0001	0.0150	0.0050	0.0150								
Lemna minor						0.0050								
Ligustrum sp.	0	ND	0.0001											
Lindera benzoin	5	FACW-	0.0001											
Liverwort sp.	#N/A	#N/A	0.0001											
Lonicera morrowii					0.005	0.0050								
Lycopus sp.	*	ND		0.0001	0.0050									
Moss sp.	*	ND	0.0001	0.0050										
Moss sp.	*	ND	0.0001	0.0050										
Moss sp.	*	ND	0.0001	0.0050										

Moss sp.	*	ND	0.0001	0.0050										
Moss sp.	*	ND	0.0001											
Moss sp.	*	ND	0.0050	0.0050										
Moss sp.	*	ND	0.0050	0.1750	0.1750	0.6250								
Moss sp.	*	ND	0.1750	0.0050										
Onoclea sensibilis	2	FACW	0.0150	0.0150	0.0150	0.0350								
Osmunda cinnamomea	6	FACW	0.0750	0.0750	0.0350	0.0350								
Parthenocissus quinquefolia						0.0050								
Pilea pumila	2	FACW	0.0050	0.0050	0.0150	0.0350								
Polygonum arifolium					0.0050									
Polygonum sagittatum	2	OBL	0.0001	0.0050										
Polygonum virginianum					0.0001									
Prunus sp.	*	ND	0.0001											
Pyrus coronaria	3	UPL	0.0001		0.0750	0.0750								
Quercus rubra	6	FACU-	0.0001		0.0001	0.0001								
Rhamnus alnifolia	8	OBL	0.0150	0.0150	0.0150	0.0350								
Rhamnus frangula	0	FAC	0.6250	0.0750	0.0750	0.1750								
Ribes sp.	*	ND	0.0001	0.0001										
Rosa multiflora	0	FACU		0.0150										
Rosa palustris	5	OBL	0.1750	0.0750	0.0750	0.0750								
Rubus flagellaris	1	FACU	0.0050	0.0050	0.0050	0.0050								
Rubus hispidus	5	FACW	0.0050	0.0050	0.0050	0.0350								
Rumex orbicularis	5	OBL	0.0001		0.0001	0.0050								
Salix sp.	*	ND	0.0001			0.0350								
Salix sp.	*	ND	0.0050	0.1750	0.0750	0.1750								
Scirpus cyperinus						0.0001								
Scutellaria lateriflora	3	FACW+	0.0001	0.0050	0.0050	0.0050								
Sium suave	6	OBL	0.0050	0.0150	0.0050	0.0350								
Solidago patula	6	OBL	0.0150	0.0150	0.0050	0.0150								
Solidago rugosa	2	FAC	0.0150	0.0050	0.0050									
Solidago uliginosa	9	OBL		0.0001		0.0050								
Sphagnum sp.	*	ND	0.0150		0.0350	0.0150								
Symplocarpus foetidus	7	OBL	0.0050	0.0050	0.0150	0.0150								
Thelypteris palustris					0.0050	0.0050								

Toxicodendron radicans	1	FAC	0.0001		0.1750	0.0050
Toxicodendron vernix	7	OBL	0.1750	0.1750	0.1750	0.3750
Triadenum fraseri	6	OBL	0.0001			
Ulmus americana	2	FACW-	0.0001	0.005	0.0050	0.0050
Vaccinium corymbosum	6	FACW-	0.0150	0.0350	0.0350	0.0350
Viburnum cassinoides	5	FACW	0.0001			
Viburnum dentatum	2	FAC	0.0150	0.0050	0.0150	0.0150
Viola sp.	*	ND	0.0150	0.0050	0.0050	0.0050

2015: S5 NE Corner to SW Corner

VIBI Plot S6

Wetland Edge plot

photo not available

VIBI Metric Summary

VIBI-F Metrics			2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Shade			7	7	10	10								
SVP			10	10	10	10								
FQAI			7	7	10	10								
% Bryophyte			10	10	3	10								
% Hydrophyte			7	10	10	10								
% Sensitive			10	7	7	7								
% Tolerant			7	7	3	10								
Small tree			10	10	10	10								
Subcanopy IV			10	10	7	7								
Canopy IV			10	10	10	3								
Total Score			**85**	**88**	**80**	**87**								

VIBI Cover Categories

Category			2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
%open water			**0**	**0.035**	**0.005**	**0**								
%unvegetated open water			**0**	**0.035**	**0.005**	**0**								
%bare ground			**0.08**	**0.175**	**0.035**	**0.075**								
%litter cover			**0.02**	**0.075**	**0.035**	**0.035**								

VIBI data- Woody Stems	**Stems/Ha (colu**		Whole	whole	**East**	whole								
Plant Species		**Indicator Status**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**
Acer rubrum		FAC	100	100		100								
Alnus incana		UPL	100	300	500									
Aronia melanocarpa		FAC		200										
Cephalanthus occidentalis		OBL	200	100	100									
Cornus amomum		FACW	2,000	1,400	1300	2300								

Fraxinus pennsylvanica		FACW	100												
Ilex verticillata		FACW+	2,900	2,100	1500	700									
Ligustrum vulgare						100									
Prunus serotina		FACU	200	100	200										
Prunus virginiana					100										
Pyrus coronaria		UPL	3,900	4,300	1400	2800									
Rhamnus frangula		FAC	200												
Ribes americana					100										
Rosa multiflora		FACU	100			200									
Rosa palustris		OBL	2,300	1,000	800	1100									
Sambucus canadensis		FACW+		100											
Standing dead		ND		300	500	1100									
Ulmus americana		FACW-	100	300	100										
Viburnum cassinoides		FACW	300	200	700	900									
Vitis sp.		ND	100			100									

VIBI Data- Areal Cover			**% Areal Cover (Raw)= totcov (column AP)**												
Plant Species	Cof C	**Indicator Status**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**
Acer rubrum	2	FAC	0.0750		0.3750	0.0350									
Alnus incana	6	FACW+	0.1750	0.0350	0.075	0.0750									
Amphicarpaea bracteata	4	FAC	0.0050	0.0050	0.0050	0.0050									
Arisaema triphyllum subsp. Tri	3	FACU-	0.0050	0.0150	0.0150	0.0150									
Aronia melanocarpa	5	FAC		0.0050		0.0050									
Aster lateriflorus	2	FACW-	0.0001	0.0050		0.0050									
Aster puniceus						0.0050	line up with sp?								
Aster sp.	*	ND		0.0001											
Aster sp.	*	ND		0.0050	0.0050										
Calamagrostis sp.	*	ND	0.0001												
Caltha palustris	6	OBL		0.0050	0.0001	0.0050									
Cardamine sp.						0.0001									
Carex bromoides					0.0150	0.0050									
Carex cristatella						0.0050									
Carex lacustris					0.0050	0.0050									
Carex leptalea	7	OBL	0.0050	0.0050	0.0050	0.0050									

Carex lurida						0.005								
Carex seorsa	7	FACW	0.0050	0.0001	0.0050	0.035								
Carex sp.	*	ND		0.005	0.0001									
Carex stipata						0.005								
Cephalanthus occidentalis	6	OBL	0.0050	0.0150	0.0350	0.005								
Chelone glabra					0.005	0.005								
Cinna arundinacea						0.005								
Circaea lutetiana	3	FACU	0.0050											
Cornus amomum	2	FACW	0.0750	0.0350	0.0350	0.0750								
Cornus racemosa	1	FAC-	0.0001											
Crataegus sp.	*	ND		0.0050										
Cuscuta gronovii	3	FACW+		0.0050	0.0050									
Dryopteris cristata	8	FACW+		0.0050	0.015	0.0150								
Epilobium sp.	*	ND		0.0001	0.005	0.0050								
Erechtites hieracifolia	2	FACU		0.0001		0.0001								
Euonymus alatus					0.0050	0.0001								
Eupatorium perfoliatum						0.0001								
Fraxinus pennsylvanica	3	FACW	0.0050	0.0150	0.015	0.0150								
Galium labradoricum	10	OBL		0.0050		0.0050								
Galium sp.					0.0001									
Geum canadense	2	FACU	0.0050	0.0050	0.0050	0.0050								
Geum laciniatum						0.0050								
Geum sp.	*	ND		0.0001										
Geum sp.	*	ND		0.0050										
Glechoma hederacea					0.0001									
Glyceria canadensis						0.0150								
Glyceria striata	2	OBL	0.0350	0.0050	0.0350	0.0050								
Grass sp.					0.0001									
Hackelia virginiana						0.0050								
Ilex verticillata	6	FACW+	0.0350	0.1750	0.0750	0.0750								
Impatiens capensis	2	FACW	0.3750	0.0350	0.3750	0.0750								
Impatiens pallida	3	FACW		0.0350		0.0001								
Leersia oryzoides	1	OBL	0.0050	0.0050		0.0050								
Ligustrum vulgare					0.0050	0.0050								

Lysimachia ciliata					0.0050	0.0050
Mitella sp.					0.0050	
Moss sp.	*	ND	0.0050	0.0001		
Moss sp.	*	ND	0.0050	0.0001		
Moss sp.	*	ND	0.0050	0.0050		
Moss sp.	*	ND	0.6250	0.1750	0.0750	0.1750
Moss sp.	*	ND	0.0001			
Moss sp.	*	ND	0.0001			
Onoclea sensibilis	2	FACW	0.0350	0.0350	0.0350	0.0350
Osmunda cinnamomea	6	FACW	0.0750	0.0750	0.0750	0.0750
Parthenocissus quinquefolia	2	FACU	0.0050	0.0050	0.0050	0.0050
Penthorum sedoides						0.0050
Pilea pumila	2	FACW	0.0050	0.0350	0.0050	0.0150
Polygonum sagittatum	2	OBL		0.0001		
Polygonum virginianum	3	FAC	0.0150	0.0050	0.0050	0.0050
Prunus serotina	3	FACU	0.1750	0.0150	0.0050	
Prunus virginiana					0.0050	0.0050
Pyrus coronaria	3	UPL	0.6250	0.6250	0.8500	0.8500
Quercus rubra					0.0001	
Ranunculus sp.	*	ND		0.0050		0.0050
Rhamnus frangula	0	FAC	0.0050	0.0050	0.0050	0.0050
Ribes americanum	4	FACW	0.0050		0.0001	0.0050
Rosa multiflora	0	FACU	0.0050	0.0050	0.0050	0.0050
Rosa palustris	5	OBL	0.0750	0.0750	0.0350	0.075
Rubus flagellaris	1	FACU	0.0001	0.0150	0.0050	
Rubus hispidus						0.005
Sambucus canadensis	3	FACW-	0.0350		0.005	
Scutellaria lateriflora	3	FACW+	0.0050	0.005		0.0150
Solanum dulcamara	0	FAC-		0.0001	0.0001	
Solidago patula	6	OBL	0.0350	0.015	0.0050	0.0150
Solidago rugosa						0.0050
Symplocarpus foetidus	7	OBL	0.0350	0.1750	0.3750	0.1750
Tiarella cordifolia	6	FAC-		0.0001		
Toxicodendron radicans	1	FAC	0.0001	0.0150	0.0050	0.0050

Ulmus americana	2	FACW-	0.0750	0.0350	0.0150	0.0150
Viburnum cassinoides	5	FACW	0.0350	0.0350	0.0350	0.1750
Viola sp.	*	ND		0.0001		
Viola sp.	*	ND	0.0050	0.0050	0.0050	0.0350
Vitis sp.	*	ND	0.0001	0.0001	0.0050	0.0050
Zelkova serrata	*	ND		0.0050		

VIBI Plot S7

Enhancement

VIBI Metric Summary

photo not available

VIBI-F Metrics			2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Shade			10	10	10	10								
SVP			3	3	10	10								
FQAI			7	3	10	10								
% Bryophyte			0	0	0	0								
% Hydrophyte			10	10	10	10								
% Sensitive			3	0	0	0								
% Tolerant			0	0	0	0								
Small tree			0	10	10	10								
Subcanopy IV			0	3	0	0								
Canopy IV			0	0	3	3								
Total Score			**33**	**39**	**53**	**53**								

VIBI Cover Categories

Category			2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
%open water			**0**	**0**	**0**	**0**								
%unvegetated open water			**0**	**0**	**0**	**0**								
%bare ground			**0.04**	**0.015**	**0.035**	**0.015**								
%litter cover			**0.01**	**0.053**	**0.375**	**0.015**								

VIBI data- Woody Stems	Stems/Ha (colu		whole	Whole	Whole	whole								
Plant Species		**Indicator Status**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**
Cornus amomum		FACW	1,900	2,200	800	800								
Cornus florida		FACU-		100										
Juglans nigra		FACU	100	100	100	100								
Rosa multiflora		FACU	2,000	400	200	200								
Standing Dead					100	100								

VIBI Data- Areal Cover			**% Areal Cover (Raw)= totcov (column AP)**											
Plant Species	Cof C	**Indicator Status**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**
Acer rubrum	2	FAC		0.0350										
Alnus incana	6	FACW+	0.0001											
Amphicarpaea bracteata	4	FAC	0.0150	0.0050	0.0050	0.0050								
Aster lateriflorus	2	FACW-	0.0001	0.0150										
Boehmeria cylindrica					0.0001	0.0001								
Carex bromoides	7	FACW		0.0050	0.0150	0.0150								
Carex cristatella	3	FACW	0.0350	0.0150	0.0150	0.0150								
Carex lacustris	5	OBL	0.0350	0.1750	0.1750	0.1750								
Carex leptalea	7	OBL	0.0350											
Carex seorsa	7	FACW	0.0001											
Carex sp.					0.0001	0.0001								
Cinna arundinacea	4	FACW	0.0001	0.0050	0.0050	0.0050								
Circaea lutetiana	3	FACU	0.0050	0.0050	0.0050	0.0050								
Clematis virginiana	3	FAC	0.0001	0.0050	0.0150	0.0150								
Cornus amomum	2	FACW	0.3750	0.1750	0.1750	0.1750								
Cornus racemosa	1	FAC-	0.0001											
Crataegus sp.					0.0050	0.0050								
Cuscuta gronovii	3	FACW+	0.0150	0.0150	0.0150	0.0150								
Desmodium sp.	*	ND		0.0050										
Dryopteris carthusiana	5	FAC+		0.0050	0.0050	0.0050								
Epilobium coloratum	1	OBL		0.0050	0.0050	0.0050								
Euonymus alatus	0	UPL		0.0001	0.0050	0.0050								
Eupatorium perfoliatum					0.0001	0.0001								
Galium asprellum	4	OBL		0.0350	0.0050	0.0050								

Galium sp.	*	ND	0.0001	0.0050										
Galium sp.	*	ND	0.0150	0.0050										
Galium sp.	*	ND		0.0050										
Geum canadense	2	FACU	0.0050	0.0750	0.0150	0.0150								
Glechoma hederacea	0	FACU		0.0150	0.0050	0.0050								
Glyceria striata	2	OBL	0.0050	0.1750	0.6250	0.6250								
grass sp.	*	ND		0.0001										
Impatiens capensis	2	FACW	0.6250	0.6250	0.3750	0.3750								
Impatiens pallida	3	FACW		0.1750										
Juglans nigra	5	FACU	0.3750	0.3750	0.6250	0.6250								
Juncus effusus	1	FACW+		0.0001										
Leersia oryzoides	1	OBL	0.0001											
Mentha sp.					0.005	0.005								
Mimulus ringens					0.0001	0.0001								
Moss sp.	*	ND	0.0050	0.0001										
Moss sp.	*	ND	0.0150	0.0001	0.0150	0.0150								
Onoclea sensibilis					0.0050	0.0050								
Parthenocissus quinquefolia	2	FACU	0.0001	0.0050	0.0050	0.0050								
Penthorum sedoides	2	OBL		0.0001										
Phalaris arundinacea	0	FACW+	0.0150	0.0750	0.0350	0.0350								
Pilea pumila	2	FACW	0.0750	0.6250	0.0050	0.0050								
Polygonum arifolium	4	OBL	0.0150	0.0350	0.0050	0.0050								
Polygonum sagittatum	2	OBL	0.0350		0.0350	0.0350								
Polygonum virginianum	3	FAC	0.0750		0.0050	0.0050								
Pyrus coronaria	3	UPL	0.1750	0.0750	0.0150	0.0150								
Ribes americanum	4	FACW		0.0001	0.005	0.005								
Rosa multiflora	0	FACU	0.0350	0.0750	0.0150	0.0150								
Rubus allegheniensis	1	FACU-		0.0350	0.0350	0.0350								
Rubus flagellaris	1	FACU		0.0050										
Rubus hispidus	5	FACW	0.0350											
Solidago patula	6	OBL	0.0350	0.0150	0.0150	0.0150								
Solidago sp.	*	ND		0.0050	0.015	0.015								
Solidago uliginosa	9	OBL		0.0050										
Stellaria longifolia	0	FACU-		0.0350	0.0001	0.0001								

Symplocarpus foetidus	7	OBL	0.0150	0.0350	0.0150	0.0150								
Toxicodendron radicans	1	FAC	0.0150	0.0050	0.0001	0.0001								
Urtica dioica var dioica	0	FACU	0.0050	0.0150	0.0050	0.0050								
Verbena urticifolia	3	FACU	0.0150											
Verbesina alternifolia	5	FAC	0.1750	0.0050	0.0050	0.0050								
Viola sp.	*	ND		0.0001	0.0050	0.0050								

VIBI Plot S8

Core bog plot

VIBI Metric Summary

VIBI-F Metrics			2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Shade			10	10	10	10								
SVP			10	10	10	10								
FQAI			10	10	10	10								
% Bryophyte			10	10	7	10								
% Hydrophyte			10	10	10	10								
% Sensitive			10	10	10	10								
% Tolerant			10	7	7	10								
Small tree			10	10	10	10								
Subcanopy IV			10	10	10	10								
Canopy IV			7	10	10	7								
Total Score			**97**	**97**	**94**	**97**								

VIBI Cover Categories

Category			2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
%open water			**0**	**0.075**	**0**	**0.005**								
%unvegetated open water			**0**	**0.075**	**0**	**0.005**								
%bare ground			**0**	**0.005**	**0**	**0.075**								
%litter cover			**0**	**0.005**	**0.0003**	**0.005**								

VIBI data- Woody Stems	Stems/Ha (colu		East	West	West	East								
Plant Species		**Indicator Status**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**
Acer rubrum		FAC		300	100	100								
Alnus incana		FACW+	3,000	2,700	2000	2400								
Alnus serrulata		ND		800										
Amelanchier laevis		FAC	200	200										
Aronia melanocarpa		FAC	1,400	200		300								

Cornus amomum		FACW		100	500	200								
Fraxinus pennsylvanica		FACW	200	100		200								
Ilex verticillata		FACW+	12,200		3300	5500								
Larix laricina		FACW	200	100		200								
Pyrus coronaria		UPL	200			100								
Pyrus sieboldii		UPL		100										
Rhamnus frangula		FAC	4,800	5,000	3300	5800								
Rosa multiflora		FACU		200										
Rosa palustris		OBL	10,000	1,800	800	17000								
Salix sp.		ND	200											
Standing Dead		ND	5,800	2,400	2000	4600								
Toxicodendron vernix		OBL	1,400	300	300	800								
Vaccinium corymbosum		FACW-	4,000	3,500	900	2500								
Viburnum dentatum		FAC		100										
Viburnum cassinoides		UPL		100										

VIBI Data- Areal Cover			**% Areal Cover (Raw)= totcov (column AP)**											
Plant Species	Cof C	**Indicator Status**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**
Acer rubrum	2	FAC	0.0750	0.0350	0.075	0.0750								
Alnus incana	6	FACW+	0.0750	0.0750	0.1750	0.3750								
Alnus serrulata	6	OBL		0.0750										
Amelanchier laevis	5	FAC	0.0050	0.0050		0.0050								
Arisaema triphyllum subsp. trip	3	FACU-	0.0001	0.0050	0.005	0.0050								
Aronia melanocarpa	5	FAC	0.0350	0.0150	0.015	0.0050								
Aster puniceus	7	OBL		0.0001		0.0750								
Aster sp.					0.0150	0.0050								
Bidens sp.						0.0050								
Boehmeria cylindrica	4	FACW		0.0001	0.0001	0.0050								
Caltha palustris	6	OBL	0.0050	0.0050	0.005	0.0050								
Cardamine sp.	*	ND	0.0001											
Carex atlantica subsp. capillace	9	OBL	0.0001	0.0150	0.0150	0.1750								
Carex lacustris					0.075									
Carex leptalea	7	OBL	0.0350	0.0750	0.005	0.0750								
Carex lurida						0.0050								

Carex seorsa	7	FACW	0.0750	0.0750		0.0350	
Carex trisperma	8	OBL	0.0050	0.0150	0.005	0.0050	
Cephalanthus occidentalis					0.005		
Chelone glabra	6	OBL		0.0050	0.0150	0.0050	
Cinna arundinacea	4	FACW	0.0001	0.0050	0.005	0.0050	
Circaea lutetiana	3	FACU	0.0050				
Cornus amomum	2	FACW	0.0150	0.0150	0.015	0.0350	
Cornus racemosa	1	FAC-	0.0001				
Cuscuta gronovii	3	FACW+	0.0050	0.0050			
Decodon verticillatus	6	OBL	0.0150	0.0350	0.0150	0.0350	
Dryopteris cristata	8	FACW+	0.0001	0.0050	0.0001	0.0050	
Epilobium ciliatum	4	FAC-	0.0050	0.0050	0.005	0.0150	
Fraxinus pennsylvanica	3	FACW	0.0150	0.0050	0.035	0.0050	
Fungus sp.	#N/A	#N/A	0.0001				
Galium aparine	0	FACU		0.0050			
Galium sp.					**0.015**	0.0050	
Galium sp.						0.0050	CHECK - could this be triflorum?
Galium triflorum	4	FACU	0.0350				
Geum canadense						0.0050	CHECK - canadense?
Geum sp.	*	ND	0.0050	0.0050	0.0050		CHECK - canadense?
Glyceria striata	2	OBL	0.0001		0.0001	0.0050	
Grass sp.					0.0001		
Ilex verticillata	6	FACW+	0.3750	0.1750	0.1750	0.0350	
Impatiens capensis	2	FACW	0.1750	0.1750	0.0750	0.0350	
Larix laricina	9	FACW	0.1750	0.0750	0.0750	0.1750	
Leersia oryzoides	1	OBL	0.0150	0.0150	0.0050	0.0150	
Lemna minor	3	OBL	0.0050	0.0150		0.0050	
Ligustrum vulgare					0.0750		
Lycopus sp.					0.0001		
Mitchella repens	5	FACU		0.0001	0.0001	0.0050	
moss sp.	*	ND	0.0001	0.0050			
Moss sp.	*	ND	0.0050	0.0050			
Moss sp.	*	ND	0.0050	0.0350			
Moss sp.	*	ND	0.0050				

Moss sp.	*	ND	0.0050					
Moss sp.	*	ND	0.0350	0.0050				
Moss sp.	*	ND	0.6250	0.1750	0.075	0.6250		
Onoclea sensibilis	2	FACW	0.0001	0.0050	0.0050	0.0350		
Osmunda cinnamomea	6	FACW	0.6250	0.1750	0.3750	0.6250		
Parthenocissus quinquefolia	2	FACU	0.0001	0.0001	0.0050	0.0050		
Persicaria virginiana	*	ND		0.0001				
Pilea pumila	2	FACW	0.0150	0.0050	0.0050	0.0150		
Polygonum sagittatum	2	OBL	0.0001	0.0050	0.0050	0.0050		
Polygonum virginianum						0.0001		
Pyrus coronaria	3	UPL	0.0150	0.0150	0.0050	0.0350		
Rhamnus alnifolia					0.0050			
Rhamnus frangula	0	FAC	0.1750	0.1750	0.1750	0.1750		
Rosa multiflora	0	FACU		0.0150				
Rosa palustris	5	OBL	0.0350	0.0750	0.0750	0.1750		
Rubus allegheniensis	1	FACU-	0.0001					
Rubus flagellaris	1	FACU	0.0050	0.0050	0.0001	0.0050		
Rubus hispidus	5	FACW	0.1750	0.0350	0.0750	0.0350		
Rubus setosus	*	ND		0.0001				
Salix sp.	*	ND	0.0001					
Sambucus canadensis					0.0001			
Scutellaria lateriflora	3	FACW+		0.0050	0.0150	0.0050		
Sium suave	6	OBL	0.0150	0.0050	0.0050	0.0150		
Solidago patula	6	OBL	0.0350	0.0050	0.0050	0.0150		
Solidago rugosa						0.0050		
Solidago sp.	*	ND	0.0001					Check if more species info?
Solidago uliginosa						0.0050		
Sphagnum sp.	*	ND	0.0150		0.0750	0.0350		
Symplocarpus foetidus	7	OBL	0.0750	0.0050	0.0750	0.075		
Toxicodendron radicans	1	FAC	0.0001	0.0050	0.0050	0.005		
Toxicodendron vernix	7	OBL	0.1750	0.0750		0.075		
Typha latifolia	1	OBL	0.0001	0.0001				
Ulmus sp.	*	ND		0.0001		0.005		
Vaccinium corymbosum	6	FACW-	0.0750	0.0750	0.0350	0.035		

Viburnum cassinoides	5	FACW	0.0050	0.0050	0.0050	0.005
viburnum dentatum	2	FAC		0.0050	0.0001	
Viola sp.						0.005
Vitis sp.	*	ND	0.0001	0.0001		0.0001
Zelkova serrata	*	ND	0.0001		0.0001	

2014: S8 NE Corner to SW Corner

VIBI Plot S9

Wetland Edge

photo not available

VIBI Metric Summary														
VIBI-F Metrics			2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Shade			10	10	10	10								
SVP			10	10	10	10								
FQAI			7	10	10	10								
% Bryophyte			7	3	7	0								
% Hydrophyte			10	10	10	10								
% Sensitive			7	7	7	7								
% Tolerant			0	7	3	7								
Small tree			10	10	0	10								
Subcanopy IV			7	10	7	3								
Canopy IV			7	7	10	3								
Total Score			**75**	**84**	**74**	**70**								

VIBI Cover Categories														
Category			2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
%open water			**0**	**0**	**0**	**0**								
%unvegetated open water			**0**	**0**	**0**	**0**								
%bare ground			**0**	**0.035**	**0.015**	**0.015**								
%litter cover			**0**	**0.075**	**0.375**	**0.375**								

VIBI data- Woody Stems		Stems/H	whole	whole	Whole	whole								
Plant Species		Indicator Status	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Alnus incana		FACW+	100			400								
Aronia melanocarpa		FAC		300	100									
Cephalanthus occidentalis		OBL		600	300									
Cornus amomum		UPL	600	100	200	100								
Fraxinus pennsylvanica		FACW	400	300	100	700								

Ilex verticillata		FACU+	800	2,300	1000	2100								
Lonicera maackii		UPL	300	800	100	700								
Physocarpus opulifolius		FACW-	6,300	1,400	2900									
Populus deltoides		FAC	1,000	1,100	500	1900								
Pyrus coronaria		UPL	9,200		6900	5300								
Pyrus sp.		UPL	400											
Rhamnus frangula		FAC	100		800									
Rosa multiflora		FACU	1,900	3,300	4200	1600								
Sambucus canadensis		FACW-	200	100	300	100								
Standing Dead		ND	800	600	600	1400								
Toxicodendron vernix		OBL	200	300	200	300								
Ulmus americana		FACW-	200	200	200	200								
Vaccinium corymbosum		FACW-	1,000		100	600								

VIBI Data- Areal Cover					**% Areal Cover (Raw)= totcov (column AP)**									
Plant Species	Cof C	**Indicator Status**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**
Acer rubrum	2	FAC	0.0001											
Alliaria petiolata	0	FACU-	0.0001											
Alnus incana					0.0050	0.0350								
Amphicarpaea bracteata					0.0001									
Arisaema triphyllum subsp. trip	3	FACU-	0.0050	0.0050	0.0150	0.0150								
Aronia melanocarpa	5	FAC		0.0050	0.0001	0.0050								
Aster lateriflorus	2	FACW-	0.0001	0.0050		0.0150								
Aster puniceus						0.0050								
Aster sp.	*	ND	0.0050	0.0050	0.0050									
Aster sp.	*	ND		0.0050										
Bidens sp.					0.0050		is this cernua or frondosa?							
Bidens cernua	*	ND	0.0001	0.0050										
Bidens frondosa						0.0001								
Boehmeria cylindrica	4	FACW+		0.0050	0.0050	0.0050								
Botrychium sp.	*	ND		0.0001										
Caltha palustris	6	OBL		0.0050										
Carex bromoides	7	FACW	0.0150	0.0050										

Carex cristatella					0.0001	0.0350		
Carex lacustris	5	OBL		0.1750	0.1750	0.1750		
Carex leptalea					0.0001	0.0350		
Carex seorsa						0.0350	bromoides?	
Carex stipata					0.0001	0.0150		
Carya sp.						0.0001		
Cephalanthus occidentalis	6	OBL		0.0150	0.0050	0.0050		
Chelone glabra	6	OBL	0.0001	0.0050	0.0001			
Cinna arundinacea					0.0050			
Circaea lutetiana	3	FACU	0.0050		0.0001	0.0050		
Cornus amomum	2	FACW	0.0350	0.0050	0.0050	0.0050		
Cornus racemosa	1	FAC-	0.0001					
Cuscuta gronovii	3	FACW+	0.0150	0.0050	0.0050	0.0050		
Dryopteris carthusiana	5	FAC+	0.0001	0.0001	0.015	0.0050		
Dryopteris cristata	8	FACW+	0.0150	0.0150	0.0350	0.0350		
Epilobium ciliatum	4	FAC-	0.0001	0.0050	0.0050	0.0050		
Euonymus alatus					0.0050			
eupatorium perfoliatum	3	FACW+		0.0001	0.0050	0.0050		
Fraxinus pennsylvanica	3	FACW	0.1750	0.0750	0.0750	0.1750		
Galium asprellum	4	OBL		0.0050				
Galium sp.	*	ND	0.0150			0.0050	asprellum?	
Geum canadense	2	FACU	0.0350	0.0050		0.0050		
Glyceria canadensis	7	OBL		0.0050		0.0150		
Glyceria striata	2	OBL	0.0150	0.0350		0.0750		
Ilex verticillata	6	FACW+	0.0350	0.0350		0.0750		
Impatiens capensis	2	FACW	0.3750	0.0150		0.0350		
Juncus effusus						0.0050		
Leersia oryzoides	1	OBL	0.0050	0.0050	0.0050	0.0150		
Ligustrum vulgare	0	FACU	0.0001	0.0050		0.0050		
Lonicera japonica					0.0001			
Loniciera maackii	0	UPL	0.0150	0.0150	0.0050	0.0350		
Mentha arvensis	2	FACW	0.0001					
Mimulus ringens						0.0050		
Moss sp.	*	ND	0.0001	0.0050				

Moss sp.	*	ND	0.0001	0.0050		
Moss sp.	*	ND	0.0001			
Moss sp.	*	ND	0.0150	0.0050		
Moss sp.	*	ND	0.0750	0.0001	0.0750	0.0050
Onoclea sensibilis	2	FACW	0.0001			
Osmunda cinnamomea	6	FACW	0.0350	0.0750	0.0350	0.0350
Parthenocissus quinquefolia	2	FACU	0.0050	0.0050	0.0050	0.0050
Persicaria virginiana	*	ND		0.0050		
Physocarpus opulifolius	4	FACW-	0.0350	0.0350	0.0750	0.0750
Pilea pumila	2	FACW	0.3750	0.0350	0.3750	0.0150
Poa pratensis	0	FACU		0.0050		
Polygonum sagittatum	2	OBL	0.1750	0.0050	0.0050	0.0050
Polygonum virginianum	3	FAC		0.0050		0.0050
Populus deltoides	3	FAC	0.0150	0.0350	0.0350	0.1750
Prunella vulgaris					0.0001	
Prunus serotina	3	FACU	0.0001			
Pyrus coronaria	3	UPL	0.1750	0.0150		0.1750
Pyrus sp.	*	UPL	0.0350	0.1750	0.3750	
Quercus rubra	6	FACU-	0.0750	0.0050	0.0001	0.0050
Rhamnus frangula	0	FAC	0.0050	0.0050	0.0050	0.0050
Ribes americanum	4	FACW	0.0001	0.0050		
Rosa multiflora	0	FACU	0.0750	0.0750	0.0750	0.0350
Rubus allegheniensis	1	FACU-	0.0050			
Rubus flagellaris						0.0001
Rubus hispidus	5	FACW	0.0150	0.0050	0.0050	0.0150
Rubus occidentalis	1	UPL		0.0001	0.0001	
Sambucus canadensis	3	FACW-	0.0150	0.0150	0.0050	0.0150
Scutellaria lateriflora	3	FACW+	0.0350	0.0050	0.0050	0.0050
Solidago canadensis	3	FACU		0.0050		
Solidago patula	6	OBL	0.0750	0.0050	0.0050	0.0050
Solidago rugosa	2	FAC	0.0001			0.0150
Solidago sp.					0.0050	
Spiraea alba	3	FACW+	0.0001	0.0001	0.0050	0.0050
Symplocarpus foetidus	7	OBL	0.0150	0.0150	0.1750	0.1750

Thelypteris palustris	6	FACW+	0.0050	0.0150	0.0350	0.0350
Toxicodendron radicans	1	FAC	0.0001	0.0050		0.0050
Toxicodendron vernix	7	OBL	0.0750	0.0750	0.0350	0.0750
Ulmus americana			0.0750	0.0750	0.0750	0.1750
Urtica dioica var. procera	1	FAC-	0.0001			
Vaccinium corymbosum	6	FACW-	0.0350	0.0350	0.0050	0.0350
Verbena hastata					0.0001	
Verbesina alternifolia					0.0001	
Viburnum dentatum	2	FAC	0.0001	0.0050	0.0001	0.0001
Viola sp.	*	ND	0.0001	0.0150	0.0350	0.0350
Viola sp .	*	ND		0.005		
Vitis sp.					0.0001	
Zelkova serrata	*	ND	0.0001		0.0050	0.005

VIBI Plot S10

Wetland Edge

VIBI Metric Summary

VIBI-F Metrics			2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Shade			7	7	10	10								
SVP			10	10	10	10								
FQAI			7	7	10	10								
% Bryophyte			3	3	3	10								
% Hydrophyte			10	10	10	10								
% Sensitive			3	7	3	7								
% Tolerant			3	3	7	7								
Small tree			10	10	10	7								
Subcanopy IV			10	10	10	10								
Canopy IV			7	7	10	0								
Total Score			**70**	**74**	**83**	**81**								

VIBI Cover Categories

Category			2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
%open water			**0**	**0**	**0**	**0**								
%unvegetated open water			**0**	**0**	**0**	**0**								
%bare ground			**0**	**0.035**	**0.015**	**0.015**								
%litter cover			**0**	**0.075**	**0.075**	**0.375**								

VIBI data- Woody Stems	**Stems/Ha (colu**		Whole	whole	whole	Whole								
Plant Species		**Indicator Status**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**
Acer rubrum		FAC	1,300	100	400	400								
Aronia melanocarpa						100								
Fraxinus pennsylvanica		FACU	400	500	200	400								
Ilex verticillata		FACW+	400	1,100	1000	700								
Ligustrum vulgare				100										

Lindera benzoin						100										
Prunus serotina		FACU	500	500	400	400										
Prunus virginiana				200	400	300										
Pyrus coronaria		UPL	2,400	2,300	5000	680										
Pyrus sp.		UPL	800													
Quercus rubra					100	10										
Rhamnus frangula		FAC	200		200	20										
Rosa multiflora		FACU	1,300	400		30										
Standing Dead		ND	700	400	1100	30										
Toxicodendron vernix		OBL	400	300	500	40										
Ulmus americana		FACW-	100		100	10										
Vaccinium corymbosum		FACW-	300	700	3600	240										
Viburnum dentatum		FAC	100	100												

VIBI Data- Areal Cover			**% Areal Cover (Raw)= totcov (column AP)**													
Plant Species	Cof C	**Indicator Status**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**
Acer rubrum	2	FAC	0.3750	0.1750	0.3750	0.1750								
Arisaema triphyllum subsp. Tri	3	FACU-		0.0050	0.0050	0.0050								
Aronia melanocarpa	5	FAC	0.0350		0.0050	0.0150								
Aster lateriflorus						0.0050								
Aster puniceus					0.0050	0.0050								
Aster sp.	*	ND	0.0001		0.0050		Check if this is lateriflorus							
Berberis thunbergii	0	FACU	0.0050											
Bidens sp.					0.0001									
Boehmeria cylindrica					0.0001	0.0150								
Carex cristatella					0.0150	0.0050								
Carex lacustris	5	OBL	0.0001	0.0150	0.0150	0.0150								
Carex seorsa	7	FACW	0.0150	0.0050	0.0050	0.0350								
Carex stipata						0.0001								
Carya sp.	*	ND	0.0001	0.0050		0.0001								
Chelone glabra	6	OBL	0.0001		0.0001									
Cinna arundinacea	4	FACW		0.0050	0.0001	0.0050								
Circaea lutetiana	3	FACU	0.0050											

Cornus amomum	2	FACW		0.0050	0.0001	0.0050								
Crataegus sp.	*	ND		0.0001										
Cuscuta gronovii	3	FACW+		0.0050	0.0050	0.0050								
Dryopteris carthusiana	5	FAC+	0.0050	0.0150	0.0150	0.0150								
Dryopteris cristata						0.0001								
Epilobium ciliatum	4	FAC-	0.0001	0.0050										
Epilobium coloratum						0.0150								
Epilobium sp.					0.0150									
Erechtites hieracifolia	2	FACU		0.0050		0.0050								
Eupatorium perfoliatum	3	FACW+		0.0050	0.0050	0.0050								
Fraxinus pennsylvanica	3	FACW		0.0350	0.0050	0.0750								
Galium triflorum						0.0050								
Geum canadense	2	FACU	0.0050	0.0050	0.0050	0.0050								
Glyceria striata	2	OBL	0.0050	0.0050	0.0150	0.0750								
Grass sp.						0.005	Check for voucher?							
Ilex verticillata	6	FACW+	0.0350	0.0350	0.0150	0.0350								
Impatiens capensis	2	FACW	0.0750	0.0350	0.0750	0.0750								
Impatiens pallida					0.0050	0.0350								
Lactuca biennis	1	FACU	0.0001											
Leersia oryzoides	1	OBL	0.0050	0.0050	0.0050	0.0050								
Lichen sp.	#N/A	#N/A	0.0050	0.0050										
Lichen sp.	*	ND		0.0001										
Ligustrum vulgare	0	FACU	0.0050	0.0050										
Lindera benzoin						0.0050								
Liverwort sp.	#N/A	#N/A	0.0001											
Lycopus sp.					0.0050		Check for voucher?							
Mimulus ringens	4	OBL		0.0050	0.0050	0.0001								
Moss sp.	*	ND	0.0001	0.0050										
Moss sp.	*	ND	0.0001											
Moss sp.	*	ND	0.0050	0.0050										
Moss sp.	*	ND	0.0050	0.0150										
Moss sp.	*	ND	0.0150	0.0050	0.0350	0.1750								
Moss sp. - Thuidium delicatulum						0.0050								
Nyssa sylvatica	7	FAC	0.0001	0.0050	0.0001	0.0050								

Onoclea sensibilis	2	FACW	0.0001	0.0001	0.0050	0.0050	
Osmunda cinnamomea	6	FACW	0.0750	0.0750	0.0350	0.0750	
Parthenocissus quinquefolia	2	FACU	0.0001	0.0050	0.0050	0.0050	
Pilea pumila	2	FACW	0.0001	0.0050	0.0050	0.0050	
Polygonum arifolium	4	OBL	0.0001	0.0001	0.0050	0.0050	
Polygonum sagittatum	2	OBL	0.1750	0.1750	0.0350	0.0050	
Polygonum virginianum	3	FAC	0.0001				
Prunus serotina	3	FACU	0.1750	0.0350	0.0350	0.0750	
Prunus virginiana	2	FACU		0.0150	0.0150	0.0050	
Pyrus coronaria	3	UPL	0.3750	0.1750	0.3750	0.3750	
Pyrus sp.	*	UPL	0.0750				
Quercus rubra	6	FACU-	0.0050	0.0150	0.0350	0.0350	
Rhamnus frangula	0	FAC	0.0350	0.0150	0.0050	0.0050	
Rosa multiflora	0	FACU	0.0750	0.0350	0.0150	0.0150	
Rubus allegheniensis					0.0050	0.0050	
Rubus flagellaris	1	FACU	0.0050	0.0050	0.0050	0.0001	
Rubus hispidus	5	FACW	0.6250	0.3750	0.8500	0.8500	
Sagittaria latifolia					0.0001	0.0050	
Sambucus canadensis	3	FACW-	0.0050			0.0050	
Scirpus cyperinus						0.0050	
Scutellaria lateriflora	3	FACW+	0.0001	0.0050	0.0150	0.0050	
Solidago patula	6	OBL	0.0150		0.0050	0.0050	
Solidago rugosa	2	FAC	0.0050			0.0050	
Solidago sp.	*	ND		0.0050			check voucher
Solidago uliginosa					0.0050		
Symplocarpus foetidus	7	OBL	0.0050	0.0050	0.0350	0.0350	
Thelypteris palustris	6	FACW+		0.0050	0.0001		
Toxicodendron radicans	1	FAC		0.0050	0.0050	0.0050	
Toxicodendron vernix	7	OBL	0.0150	0.0350	0.0350	0.0350	
Ulmus americana	2	FACW-	0.0350	0.0750	0.0150	0.0050	
Vaccinium corymbosum	6	FACW-	0.0350	0.0150	0.0350	0.0350	
Verbesina alternifolia					0.0050		
Viburnum dentatum	2	FAC	0.0001	0.0050	0.0001	0.0050	
Viola sp.	*	ND	0.0150	0.0050	0.0050		

Vitis sp.	*	ND		0.0050	0.0050	0.0001

2014: S10 NE Corner to SW Corner

VIBI Plot S11

Enhancement

VIBI Metric Summary

photo not available

VIBI-F Metrics			2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Shade			3	7	10	10								
SVP			3	3	10	7								
FQAI			3	0	0	7								
% Bryophyte			0	0	0	0								
% Hydrophyte			0	0	10	0								
% Sensitive			7	0	10	7								
% Tolerant			3	0	3	0								
Small tree			10	10	10	10								
Subcanopy IV			0	0	0	3								
Canopy IV			7	10	10	7								
Total Score			**36**	**30**	**63**	**51**								

VIBI Cover Categories

Category			2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
%open water			**0**	**0**	**0**	**0**								
%unvegetated open water			**0**	**0**	**0**	**0**								
%bare ground			**0**	**0**	**0.035**	**0.005**								
%litter cover			**0**	**4E-04**	**0.375**	**0.85**								

VIBI data- Woody Stems	Stems/Ha (colu		Whole	Whole	Whole	whole								
Plant Species		**Indicator Status**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**
Acer rubrum		FAC	300	200	300	200								
Acer saccharum		FACU-	100	400	300	500								
Carya ovata		FACU-		100	100	100								
Crataegus sp.		ND	1,000	1,200	1100	2100								
Euonymus alatus		UPL	1,000	400										

Fraxinus pennsylvanica					100									
Prunus serotina		FACU	200	200	200	100								
Pyrus coronaria		UPL	100		100	100								
Standing Dead		ND	300	300	300	500								
Ulmus americana		FACW-	1,300	200	300	200								

VIBI Data- Areal Cover			**% Areal Cover (Raw)= totcov (column AP)**											
Plant Species	Cof C	**Indicator Status**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**
Acer rubrum	2	FAC	0.6250	0.6250	0.3750	0.8500								
Acer saccharum	5	FACU-	0.3750	0.0050	0.3750	0.1750								
Agrimonia pubescens	5	UPL		0.0050	0.0050	0.0150								
Alliaria petiolata	0	FACU-	0.0150	0.0050	0.0050	0.0050								
Amphicarpaea bracteata	4	FAC	0.0001											
Arisaema triphyllum subsp. Triphyllum					0.0050									
Aster lateriflorus						0.0050								
Aster sp.	*	ND		0.0001		0.0001								
Carex bromoides					0.0750	0.0150								
Carex crinita var. crinita	3	OBL	0.0150			0.0150								
Carex hirsutella						0.0050								
Carex seorsa	7	FACW	0.0750			0.0750	bromoides?							
Carex sp.	*	ND	0.0050	0.0150	0.0050									
Carex sp.	*	ND		0.0050	0.0050									
Carex sp.	*	ND		0.0150										
Carex sp.	*	ND		0.0750										
Carya cordiformis						0.0001								
Carya ovata	8	FACU-	0.6250	0.0050	0.6250	0.6250								
Cinna arundinacea	4	FACW		0.0150		0.0050								
Circaea lutetiana	3	FACU	0.0050	0.0050	0.0050	0.0150								
Cornus amomum	2	FACW		0.0050	0.0050	0.0150								
Crataegus sp.	*	ND	0.0750	0.0750	0.0750	0.0750								
Dryopteris carthusiana			0.0001	0.0050	0.0050	0.0050								

Elymus sp.					0.0001	0.0150	check vouchers.			
Euonymus alatus	0	UPL	0.0350	0.0750	0.0050	0.0150				
Fraxinus americana					0.005	0.0001				
Fraxinus pennsylvanica	*	ND		0.1750	0.0050	0.0350				
Galium aparine	0	FACU		0.0050	0.0050	0.0050				
Geranium maculatum	4	FACU		0.0050	0.0050	0.0050				
Geum canadense	2	FACU	0.0750		0.0150	0.0350				
Geum laciniatum	2	FAC+		0.0350						
Glyceria sp.					0.0001		voucher?			
Grass sp.	#N/A	#N/A	0.0001				Elymus??			
Hackelia virginiana	2	FAC+		0.0001	0.0001	0.0001				
Holcos lanatus	0	FACU	0.0001							
Hydrophyllum virginianum	4	FAC	0.0050							
Impatiens capensis	2	FACQ		0.0150	0.0050	0.0050				
Leersia virginica	4	FACW	0.0050							
Ligustrum vulgare	0	FACU		0.0050	0.0050	0.0050				
Lonicera morrowii						0.0001				
Loniciera maackii	0	UPL	0.0050	0.0050	0.0001	0.0050				
Moss sp.	*	ND	0.0001							
Moss sp.	*	ND	0.0001							
Moss sp.	*	ND	0.0001							
Moss sp.	*	ND	0.0050							
Moss sp.	*	ND	0.0050	0.0050						
Moss sp.	*	ND	0.0050	0.0150	0.0050	0.0050				
Moss sp.	*	ND	0.0050							
Ostrya virginiana	5	FACU-		0.0001	0.0050	0.0050				
Parthenocissus quinquefolia	2	FACU	0.1750	0.1750	0.0350	0.0750				
Poa sp.	*	ND	0.0050			0.0150				
Polygonum virginianum	3	FAC	0.0750	0.0750	0.1750	0.1750				
Prunus serotina	3	FACU	0.0150	0.0350	0.0050					
Prunus virginiana	2	FACU		0.0001		0.0750				
Pyrus coronaria	3	UPL	0.0350	0.0050	0.0050	0.0150				
Quercus sp.	*	ND		0.0001	0.0001					
Ribes hirtellum					0.0050	0.0150	check vouchers			

Ribes americanum			0.0050	0.0150			check vouchers
Rosa multiflora	0	FACU	0.0150	0.0350	0.0350	0.0350	
Rubus allegheniensis	1	FACU-		0.0150	0.0050	0.0050	
Rubus flagellaris	1	FACU		0.0050	0.0001	0.0050	
Solidago patula	6	OBL	0.0050	0.0050	0.0050	0.0050	
Solidago sp.	*	ND		0.0050			
Toxicodendron radicans	1	FAC	0.0050	0.0050	0.0050	0.0050	
Ulmus americana	2	FACW-	0.0750	0.0750	0.1750	0.3750	
Viola canadensis	5	UPL		0.0150	0.005	0.0150	
Viola sp.	*	ND	0.0150		0.0050	0.0001	

Summit Environmental Technologies, Inc.
3310 Win St.
Cuyahoga Falls, Ohio 44223
TEL: (330) 253-8211 FAX: (330) 253-4489
Website: http://www.settek.com

June 17, 2014

Dr. Ira Sasowsky
University of Akron
Department of Geosciences- MS4101
Akron, OH 44325-4101
TEL: (330) 972-5389
FAX:

RE: Bath Bog

Order No.: 14061016

Dear Dr. Ira Sasowsky:

Summit Environmental Technologies, Inc. received 13 sample(s) on 6/9/2014 for the analyses presented in the following report.

There were no problems with the analytical events associated with this report unless noted in the Case Narrative.

Quality control data is within laboratory defined or method specified acceptance limits except where noted.

If you have any questions regarding these tests results, please feel free to call the laboratory.

Sincerely,

Dr. Mo Osman

Project Manager

3310 Win St.
Cuyahoga Falls, Ohio 44223

A2LA 0724.01, Alabama 41600, Arkansas 88-0735, California 07256CA, Colorado, Connecticut PH-0105, Delaware, Florida NELAC E87688, Georgia E87688 and 943, Idaho OH00923, Illinois 200061 and Reg.5, Indiana C-OH-13, Kansas E-10347, Kentucky (underground Storage Tank) 3, Kentucky 90146, Louisiana 04061 and LA12004, Maine 2012015, Maryland 339, Massachusetts M-OPH923, Minnesota 409711, Montana CERT0099, New Hampshire 2996, New Jersey OH006, New York 11777, North Carolina 39705 and 631, Ohio 4170, Ohio VAP CL0052, Oklahoma 9940, Oregon OH200001, Pennsylvania 68-01335, Rhode Island LA000317, South Carolina 92016001, Tennessee TN04018, Texas T104704466-11-5, Region 8 8TMS-L, USDA/APHIS P330-11-00244, Utah OH009232011-1, Vermont VT-87688, Virginia 00440 and 1581, Washington C891, West Virginia 248 and 9957C and E87688, Wisconsin 399013010

Summit Environmental Technologies, Inc.
3310 Win St.
Cuyahoga Falls, Ohio 44223
TEL: (330) 253-8211 FAX: (330) 253-4489
Website: http://www.settek.com

Workorder Sample Summary

WO#: **14061016**
17-Jun-14

CLIENT: University of Akron
Project: Bath Bog

Lab SampleID	Client Sample ID	Tag No	Date Collected	Date Received	Matrix
14061016-001	BNP-Bog Outlet		6/7/2014 12:35:00 PM	6/9/2014 11:15:00 AM	Non-Potable Water
14061016-002	BNP-6		6/7/2014 1:24:00 PM	6/9/2014 11:15:00 AM	Non-Potable Water
14061016-003	BNP-7		6/7/2014 2:13:00 PM	6/9/2014 11:15:00 AM	Non-Potable Water
14061016-004	BNP-7A		6/7/2014 2:33:00 PM	6/9/2014 11:15:00 AM	Non-Potable Water
14061016-005	BNP-2A		6/7/2014 3:15:00 PM	6/9/2014 11:15:00 AM	Non-Potable Water
14061016-006	Tributary 4 BNP		6/7/2014 3:36:00 PM	6/9/2014 11:15:00 AM	Non-Potable Water
14061016-007	Tributary 4 Source BNP		6/7/2014 4:00:00 PM	6/9/2014 11:15:00 AM	Non-Potable Water
14061016-008	BNP-1A		6/7/2014 4:33:00 PM	6/9/2014 11:15:00 AM	Non-Potable Water
14061016-009	BNP-8		6/7/2014 5:14:00 PM	6/9/2014 11:15:00 AM	Non-Potable Water
14061016-010	BNP-8A		6/7/2014 5:02:00 PM	6/9/2014 11:15:00 AM	Non-Potable Water
14061016-011	BNP-5C		6/7/2014 6:00:00 PM	6/9/2014 11:15:00 AM	Non-Potable Water
14061016-012	BNP-5B		6/7/2014 6:25:00 PM	6/9/2014 11:15:00 AM	Non-Potable Water
14061016-013	BNP-9		6/7/2014 7:10:00 PM	6/9/2014 11:15:00 AM	Non-Potable Water

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Case Narrative

WO#:	**14061016**
Date:	**6/17/2014**

CLIENT: University of Akron
Project: Bath Bog

This report in its entirety consists of the documents listed below. All documents contain the Summit Environmental Technologies, Inc. Work Order Number assigned to this report.

Paginated Report including: Cover Letter, Case Narrative, Analytical Results, Applicable Quality Control Summary Reports and copies of the Chain of Custody Documents supplied with this sample set.

Concentrations reported with a J flag in the Qual field are values below the Limit of Quantitation (LOQ) but greater than the established Limit of Detection (LOD). There is greater uncertainty associated with these results and data should be considered as estimated.

Method numbers, unless specified as SM (Standard Methods) or ASTM, are EPA methods.

Estimated uncertainty values are available upon request.

Any comments or problems with the analytical events associated with this report are noted below.

Summit Environmental Technologies, Inc.
3310 Win St.
Cuyahoga Falls, Ohio 44223
TEL: (330) 253-8211 FAX: (330) 253-4489
Website: http://www.settek.com

WO#:	**14061016**
Date Reported:	**6/17/2014**
Company:	University of Akron
Address:	Department of Geosciences- MS4101 Akron OH 44325-4101
Received:	6/9/2014
Project#:	Bath Bog

Client ID#	Lab ID#	Collected	Analyte	Result	Units	Matrix	Method	DF	RL	Run	Analyst
BNP-Bog Outlet	001	6/7/2014	Calcium(Ca)	29	mg/L	Non-Potable Water	EPA 200.7	1	0.10	6/11/2014	VVK
BNP-Bog Outlet	001	6/7/2014	Magnesium(Mg)	7.4	mg/L	Non-Potable Water	EPA 200.7	1	0.030	6/11/2014	VVK
BNP-Bog Outlet	001	6/7/2014	Potassium(K)	1.4	mg/L	Non-Potable Water	EPA 200.7	1	0.20	6/11/2014	VVK
BNP-Bog Outlet	001	6/7/2014	Sodium(Na)	3.2	mg/L	Non-Potable Water	EPA 200.7	1	0.20	6/11/2014	VVK
BNP-Bog Outlet	001	6/7/2014	Alkalinity, Total (As CaCO3)	120	mg/L	Non-Potable Water	SM 2320 B	1	10	6/14/2014	AYS
BNP-Bog Outlet	001	6/7/2014	Ammonia-N	ND	mg/L	Non-Potable Water	SM 4500-NH3-E	1	1.0	6/12/2014	AMG
BNP-Bog Outlet	001	6/7/2014	Chloride	2.4	mg/L	Non-Potable Water	EPA 300.0	1	0.50	6/12/2014	SG
BNP-Bog Outlet	001	6/7/2014	Nitrate-N	ND	mg/L	Non-Potable Water	EPA 300.0	1	0.50	6/12/2014	SG
BNP-Bog Outlet	001	6/7/2014	Nitrite-N	ND	mg/L	Non-Potable Water	EPA 300.0	1	0.50	6/12/2014	SG
BNP-Bog Outlet	001	6/7/2014	Orthophosphate-P	ND	mg/L	Non-Potable Water	EPA 300.0	1	0.33	6/12/2014	SG
BNP-Bog Outlet	001	6/7/2014	Sulfate	3.4	mg/L	Non-Potable Water	EPA 300.0	1	0.50	6/12/2014	SG

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WO#: **14061016**
Date Reported: **6/17/2014**
Company: University of Akron
Address: Department of Geosciences- MS4101
Akron OH 44325-4101
Received: 6/9/2014
Project#: Bath Bog

Client ID#	Lab ID#	Collected	Analyte	Result	Units	Matrix	Method	DF	RL	Run	Analyst
BNP-6	002	6/7/2014	Calcium(Ca)	74	mg/L	Non-Potable Water	EPA 200.7	1	0.10	6/11/2014	VVK
BNP-6	002	6/7/2014	Magnesium(Mg)	35	mg/L	Non-Potable Water	EPA 200.7	1	0.030	6/11/2014	VVK
BNP-6	002	6/7/2014	Potassium(K)	1.3	mg/L	Non-Potable Water	EPA 200.7	1	0.20	6/11/2014	VVK
BNP-6	002	6/7/2014	Sodium(Na)	3.4	mg/L	Non-Potable Water	EPA 200.7	1	0.20	6/11/2014	VVK
BNP-6	002	6/7/2014	Alkalinity, Total (As CaCO3)	340	mg/L	Non-Potable Water	SM 2320 B	1	10	6/14/2014	AYS
BNP-6	002	6/7/2014	Ammonia-N	ND	mg/L	Non-Potable Water	SM 4500-NH3-E	1	1.0	6/12/2014	AMG
BNP-6	002	6/7/2014	Chloride	2.3	mg/L	Non-Potable Water	EPA 300.0	1	0.50	6/12/2014	SG
BNP-6	002	6/7/2014	Nitrate-N	ND	mg/L	Non-Potable Water	EPA 300.0	1	0.50	6/12/2014	SG
BNP-6	002	6/7/2014	Nitrite-N	ND	mg/L	Non-Potable Water	EPA 300.0	1	0.50	6/12/2014	SG
BNP-6	002	6/7/2014	Orthophosphate-P	ND	mg/L	Non-Potable Water	EPA 300.0	1	0.33	6/12/2014	SG
BNP-6	002	6/7/2014	Sulfate	41	mg/L	Non-Potable Water	EPA 300.0	1	0.50	6/12/2014	SG

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Akron OH 44325-4101
Received: 6/9/2014
Project#: Bath Bog

Client ID#	Lab ID#	Collected	Analyte	Result	Units	Matrix	Method	DF	RL	Run	Analyst
BNP-7	003	6/7/2014	Calcium(Ca)	18	mg/L	Non-Potable Water	EPA 200.7	1	0.10	6/11/2014	VVK
BNP-7	003	6/7/2014	Magnesium(Mg)	3.3	mg/L	Non-Potable Water	EPA 200.7	1	0.030	6/11/2014	VVK
BNP-7	003	6/7/2014	Potassium(K)	1.0	mg/L	Non-Potable Water	EPA 200.7	1	0.20	6/11/2014	VVK
BNP-7	003	6/7/2014	Sodium(Na)	ND	mg/L	Non-Potable Water	EPA 200.7	1	0.20	6/11/2014	VVK
BNP-7	003	6/7/2014	Alkalinity, Total (As CaCO3)	160	mg/L	Non-Potable Water	SM 2320 B	1	10	6/14/2014	AYS
BNP-7	003	6/7/2014	Ammonia-N	3.2	mg/L	Non-Potable Water	SM 4500-NH3-E	1	1.0	6/12/2014	AMG
BNP-7	003	6/7/2014	Chloride	12	mg/L	Non-Potable Water	EPA 300.0	1	0.50	6/13/2014	SG
BNP-7	003	6/7/2014	Nitrate-N	ND	mg/L	Non-Potable Water	EPA 300.0	1	0.50	6/13/2014	SG
BNP-7	003	6/7/2014	Nitrite-N	ND	mg/L	Non-Potable Water	EPA 300.0	1	0.50	6/16/2014	SG
BNP-7	003	6/7/2014	Orthophosphate-P	ND	mg/L	Non-Potable Water	EPA 300.0	1	0.33	6/13/2014	SG
BNP-7	003	6/7/2014	Sulfate	ND	mg/L	Non-Potable Water	EPA 300.0	1	0.50	6/13/2014	SG

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BNP-7A	004	6/7/2014	Calcium(Ca)	13	mg/L	Non-Potable Water	EPA 200.7	1	0.10	6/11/2014	VVK
BNP-7A	004	6/7/2014	Magnesium(Mg)	3.8	mg/L	Non-Potable Water	EPA 200.7	1	0.030	6/11/2014	VVK
BNP-7A	004	6/7/2014	Potassium(K)	1.1	mg/L	Non-Potable Water	EPA 200.7	1	0.20	6/11/2014	VVK
BNP-7A	004	6/7/2014	Sodium(Na)	1.6	mg/L	Non-Potable Water	EPA 200.7	1	0.20	6/11/2014	VVK
BNP-7A	004	6/7/2014	Alkalinity, Total (As CaCO3)	60	mg/L	Non-Potable Water	SM 2320 B	1	10	6/14/2014	AYS
BNP-7A	004	6/7/2014	Ammonia-N	ND	mg/L	Non-Potable Water	SM 4500-NH3-E	1	1.0	6/12/2014	AMG
BNP-7A	004	6/7/2014	Chloride	2.1	mg/L	Non-Potable Water	EPA 300.0	1	0.50	6/13/2014	SG
BNP-7A	004	6/7/2014	Nitrate-N	ND	mg/L	Non-Potable Water	EPA 300.0	1	0.50	6/13/2014	SG
BNP-7A	004	6/7/2014	Nitrite-N	ND	mg/L	Non-Potable Water	EPA 300.0	1	0.50	6/13/2014	SG
BNP-7A	004	6/7/2014	Orthophosphate-P	0.37	mg/L	Non-Potable Water	EPA 300.0	1	0.33	6/13/2014	SG
BNP-7A	004	6/7/2014	Sulfate	0.94	mg/L	Non-Potable Water	EPA 300.0	1	0.50	6/13/2014	SG

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Client ID#	Lab ID#	Collected	Analyte	Result	Units	Matrix	Method	DF	RL	Run	Analyst
BNP-2A	005	6/7/2014	Calcium(Ca)	98	mg/L	Non-Potable Water	EPA 200.7	1	0.10	6/11/2014	VVK
BNP-2A	005	6/7/2014	Magnesium(Mg)	50	mg/L	Non-Potable Water	EPA 200.7	1	0.030	6/11/2014	VVK
BNP-2A	005	6/7/2014	Potassium(K)	2.5	mg/L	Non-Potable Water	EPA 200.7	1	0.20	6/11/2014	VVK
BNP-2A	005	6/7/2014	Sodium(Na)	6.5	mg/L	Non-Potable Water	EPA 200.7	1	0.20	6/11/2014	VVK
BNP-2A	005	6/7/2014	Alkalinity, Total (As CaCO3)	280	mg/L	Non-Potable Water	SM 2320 B	1	10	6/14/2014	AYS
BNP-2A	005	6/7/2014	Ammonia-N	ND	mg/L	Non-Potable Water	SM 4500-NH3-E	1	1.0	6/12/2014	AMG
BNP-2A	005	6/7/2014	Chloride	5.5	mg/L	Non-Potable Water	EPA 300.0	1	0.50	6/13/2014	SG
BNP-2A	005	6/7/2014	Nitrate-N	ND	mg/L	Non-Potable Water	EPA 300.0	1	0.50	6/13/2014	SG
BNP-2A	005	6/7/2014	Nitrite-N	ND	mg/L	Non-Potable Water	EPA 300.0	1	0.50	6/13/2014	SG
BNP-2A	005	6/7/2014	Orthophosphate-P	ND	mg/L	Non-Potable Water	EPA 300.0	1	0.33	6/13/2014	SG
BNP-2A	005	6/7/2014	Sulfate	240	mg/L	Non-Potable Water	EPA 300.0	10	5.0	6/16/2014	SG

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Tributary 4 BNP	006	6/7/2014	Calcium(Ca)	50	mg/L	Non-Potable Water	EPA 200.7	1	0.10	6/11/2014	VVK
Tributary 4 BNP	006	6/7/2014	Magnesium(Mg)	12	mg/L	Non-Potable Water	EPA 200.7	1	0.030	6/11/2014	VVK
Tributary 4 BNP	006	6/7/2014	Potassium(K)	1.4	mg/L	Non-Potable Water	EPA 200.7	1	0.20	6/11/2014	VVK
Tributary 4 BNP	006	6/7/2014	Sodium(Na)	3.8	mg/L	Non-Potable Water	EPA 200.7	1	0.20	6/11/2014	VVK
Tributary 4 BNP	006	6/7/2014	Alkalinity, Total (As CaCO3)	200	mg/L	Non-Potable Water	SM 2320 B	1	10	6/14/2014	AYS
Tributary 4 BNP	006	6/7/2014	Ammonia-N	ND	mg/L	Non-Potable Water	SM 4500-NH3-E	1	1.0	6/12/2014	AMG
Tributary 4 BNP	006	6/7/2014	Chloride	2.3	mg/L	Non-Potable Water	EPA 300.0	1	0.50	6/13/2014	SG
Tributary 4 BNP	006	6/7/2014	Nitrate-N	ND	mg/L	Non-Potable Water	EPA 300.0	1	0.50	6/13/2014	SG
Tributary 4 BNP	006	6/7/2014	Nitrite-N	ND	mg/L	Non-Potable Water	EPA 300.0	1	0.50	6/13/2014	SG
Tributary 4 BNP	006	6/7/2014	Orthophosphate-P	ND	mg/L	Non-Potable Water	EPA 300.0	1	0.33	6/13/2014	SG
Tributary 4 BNP	006	6/7/2014	Sulfate	17	mg/L	Non-Potable Water	EPA 300.0	1	0.50	6/13/2014	SG

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Client ID#	Lab ID#	Collected	Analyte	Result	Units	Matrix	Method	DF	RL	Run	Analyst
Tributary 4 Source BNP	007	6/7/2014	Calcium(Ca)	58	mg/L	Non-Potable Water	EPA 200.7	1	0.10	6/11/2014	VVK
Tributary 4 Source BNP	007	6/7/2014	Magnesium(Mg)	13	mg/L	Non-Potable Water	EPA 200.7	1	0.030	6/11/2014	VVK
Tributary 4 Source BNP	007	6/7/2014	Potassium(K)	1.1	mg/L	Non-Potable Water	EPA 200.7	1	0.20	6/11/2014	VVK
Tributary 4 Source BNP	007	6/7/2014	Sodium(Na)	4.1	mg/L	Non-Potable Water	EPA 200.7	1	0.20	6/11/2014	VVK
Tributary 4 Source BNP	007	6/7/2014	Alkalinity, Total (As CaCO3)	200	mg/L	Non-Potable Water	SM 2320 B	1	10	6/14/2014	AYS
Tributary 4 Source BNP	007	6/7/2014	Ammonia-N	ND	mg/L	Non-Potable Water	SM 4500-NH3-E	1	1.0	6/12/2014	AMG
Tributary 4 Source BNP	007	6/7/2014	Chloride	2.3	mg/L	Non-Potable Water	EPA 300.0	1	0.50	6/13/2014	SG
Tributary 4 Source BNP	007	6/7/2014	Nitrate-N	ND	mg/L	Non-Potable Water	EPA 300.0	1	0.50	6/13/2014	SG
Tributary 4 Source BNP	007	6/7/2014	Nitrite-N	ND	mg/L	Non-Potable Water	EPA 300.0	1	0.50	6/13/2014	SG
Tributary 4 Source BNP	007	6/7/2014	Orthophosphate-P	ND	mg/L	Non-Potable Water	EPA 300.0	1	0.33	6/13/2014	SG
Tributary 4 Source BNP	007	6/7/2014	Sulfate	13	mg/L	Non-Potable Water	EPA 300.0	1	0.50	6/13/2014	SG

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Client ID#	Lab ID#	Collected	Analyte	Result	Units	Matrix	Method	DF	RL	Run	Analyst
BNP-1A	008	6/7/2014	Calcium(Ca)	190	mg/L	Non-Potable Water	EPA 200.7	1	0.10	6/11/2014	VVK
BNP-1A	008	6/7/2014	Magnesium(Mg)	110	mg/L	Non-Potable Water	EPA 200.7	1	0.030	6/11/2014	VVK
BNP-1A	008	6/7/2014	Potassium(K)	7.8	mg/L	Non-Potable Water	EPA 200.7	1	0.20	6/11/2014	VVK
BNP-1A	008	6/7/2014	Sodium(Na)	26	mg/L	Non-Potable Water	EPA 200.7	1	0.20	6/11/2014	VVK
BNP-1A	008	6/7/2014	Alkalinity, Total (As CaCO3)	430	mg/L	Non-Potable Water	SM 2320 B	1	10	6/14/2014	AYS
BNP-1A	008	6/7/2014	Ammonia-N	ND	mg/L	Non-Potable Water	SM 4500-NH3-E	1	1.0	6/12/2014	AMG
BNP-1A	008	6/7/2014	Chloride	6.1	mg/L	Non-Potable Water	EPA 300.0	1	0.50	6/13/2014	SG
BNP-1A	008	6/7/2014	Nitrate-N	ND	mg/L	Non-Potable Water	EPA 300.0	1	0.50	6/13/2014	SG
BNP-1A	008	6/7/2014	Nitrite-N	ND	mg/L	Non-Potable Water	EPA 300.0	1	0.50	6/13/2014	SG
BNP-1A	008	6/7/2014	Orthophosphate-P	ND	mg/L	Non-Potable Water	EPA 300.0	1	0.33	6/13/2014	SG
BNP-1A	008	6/7/2014	Sulfate	620	mg/L	Non-Potable Water	EPA 300.0	25	12	6/16/2014	SG

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Client ID#	Lab ID#	Collected	Analyte	Result	Units	Matrix	Method	DF	RL	Run	Analyst
BNP-8	009	6/7/2014	Calcium(Ca)	30	mg/L	Non-Potable Water	EPA 200.7	1	0.10	6/11/2014	VVK
BNP-8	009	6/7/2014	Magnesium(Mg)	6.1	mg/L	Non-Potable Water	EPA 200.7	1	0.030	6/11/2014	VVK
BNP-8	009	6/7/2014	Potassium(K)	1.1	mg/L	Non-Potable Water	EPA 200.7	1	0.20	6/11/2014	VVK
BNP-8	009	6/7/2014	Sodium(Na)	6.4	mg/L	Non-Potable Water	EPA 200.7	1	0.20	6/11/2014	VVK
BNP-8	009	6/7/2014	Alkalinity, Total (As CaCO3)	160	mg/L	Non-Potable Water	SM 2320 B	1	10	6/14/2014	AYS
BNP-8	009	6/7/2014	Ammonia-N	1.2	mg/L	Non-Potable Water	SM 4500-NH3-E	1	1.0	6/12/2014	AMG
BNP-8	009	6/7/2014	Chloride	6.3	mg/L	Non-Potable Water	EPA 300.0	1	0.50	6/13/2014	SG
BNP-8	009	6/7/2014	Nitrate-N	ND	mg/L	Non-Potable Water	EPA 300.0	1	0.50	6/13/2014	SG
BNP-8	009	6/7/2014	Nitrite-N	ND	mg/L	Non-Potable Water	EPA 300.0	1	0.50	6/13/2014	SG
BNP-8	009	6/7/2014	Orthophosphate-P	ND	mg/L	Non-Potable Water	EPA 300.0	1	0.33	6/13/2014	SG
BNP-8	009	6/7/2014	Sulfate	0.63	mg/L	Non-Potable Water	EPA 300.0	1	0.50	6/13/2014	SG

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Client ID#	Lab ID#	Collected	Analyte	Result	Units	Matrix	Method	DF	RL	Run	Analyst
BNP-8A	010	6/7/2014	Calcium(Ca)	31	mg/L	Non-Potable Water	EPA 200.7	1	0.10	6/11/2014	VVK
BNP-8A	010	6/7/2014	Magnesium(Mg)	7.4	mg/L	Non-Potable Water	EPA 200.7	1	0.030	6/11/2014	VVK
BNP-8A	010	6/7/2014	Potassium(K)	0.88	mg/L	Non-Potable Water	EPA 200.7	1	0.20	6/11/2014	VVK
BNP-8A	010	6/7/2014	Sodium(Na)	4.8	mg/L	Non-Potable Water	EPA 200.7	1	0.20	6/11/2014	VVK
BNP-8A	010	6/7/2014	Alkalinity, Total (As CaCO3)	160	mg/L	Non-Potable Water	SM 2320 B	1	10	6/14/2014	AYS
BNP-8A	010	6/7/2014	Ammonia-N	ND	mg/L	Non-Potable Water	SM 4500-NH3-E	1	1.0	6/12/2014	AMG
BNP-8A	010	6/7/2014	Chloride	2.1	mg/L	Non-Potable Water	EPA 300.0	1	0.50	6/13/2014	SG
BNP-8A	010	6/7/2014	Nitrate-N	ND	mg/L	Non-Potable Water	EPA 300.0	1	0.50	6/13/2014	SG
BNP-8A	010	6/7/2014	Nitrite-N	ND	mg/L	Non-Potable Water	EPA 300.0	1	0.50	6/13/2014	SG
BNP-8A	010	6/7/2014	Orthophosphate-P	ND	mg/L	Non-Potable Water	EPA 300.0	1	0.33	6/13/2014	SG
BNP-8A	010	6/7/2014	Sulfate	ND	mg/L	Non-Potable Water	EPA 300.0	1	0.50	6/13/2014	SG

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Client ID#	Lab ID#	Collected	Analyte	Result	Units	Matrix	Method	DF	RL	Run	Analyst
BNP-5C	011	6/7/2014	Calcium(Ca)	51	mg/L	Non-Potable Water	EPA 200.7	1	0.10	6/11/2014	VVK
BNP-5C	011	6/7/2014	Magnesium(Mg)	9.3	mg/L	Non-Potable Water	EPA 200.7	1	0.030	6/11/2014	VVK
BNP-5C	011	6/7/2014	Potassium(K)	1.5	mg/L	Non-Potable Water	EPA 200.7	1	0.20	6/11/2014	VVK
BNP-5C	011	6/7/2014	Sodium(Na)	2.9	mg/L	Non-Potable Water	EPA 200.7	1	0.20	6/11/2014	VVK
BNP-5C	011	6/7/2014	Alkalinity, Total (As CaCO3)	290	mg/L	Non-Potable Water	SM 2320 B	1	10	6/14/2014	AYS
BNP-5C	011	6/7/2014	Ammonia-N	1.9	mg/L	Non-Potable Water	SM 4500-NH3-E	1	1.0	6/12/2014	AMG
BNP-5C	011	6/7/2014	Chloride	1.2	mg/L	Non-Potable Water	EPA 300.0	1	0.50	6/13/2014	SG
BNP-5C	011	6/7/2014	Nitrate-N	ND	mg/L	Non-Potable Water	EPA 300.0	1	0.50	6/13/2014	SG
BNP-5C	011	6/7/2014	Nitrite-N	ND	mg/L	Non-Potable Water	EPA 300.0	1	0.50	6/13/2014	SG
BNP-5C	011	6/7/2014	Orthophosphate-P	ND	mg/L	Non-Potable Water	EPA 300.0	1	0.33	6/13/2014	SG
BNP-5C	011	6/7/2014	Sulfate	ND	mg/L	Non-Potable Water	EPA 300.0	1	0.50	6/13/2014	SG

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BNP-5B	012	6/7/2014	Calcium(Ca)	22	mg/L	Non-Potable Water	EPA 200.7	1	0.10	6/11/2014	VVK
BNP-5B	012	6/7/2014	Magnesium(Mg)	4.8	mg/L	Non-Potable Water	EPA 200.7	1	0.030	6/11/2014	VVK
BNP-5B	012	6/7/2014	Potassium(K)	1.5	mg/L	Non-Potable Water	EPA 200.7	1	0.20	6/11/2014	VVK
BNP-5B	012	6/7/2014	Sodium(Na)	3.2	mg/L	Non-Potable Water	EPA 200.7	1	0.20	6/11/2014	VVK
BNP-5B	012	6/7/2014	Alkalinity, Total (As CaCO3)	480	mg/L	Non-Potable Water	SM 2320 B	1	10	6/14/2014	AYS
BNP-5B	012	6/7/2014	Ammonia-N	3.8	mg/L	Non-Potable Water	SM 4500-NH3-E	1	1.0	6/12/2014	AMG
BNP-5B	012	6/7/2014	Chloride	2.8	mg/L	Non-Potable Water	EPA 300.0	1	0.50	6/13/2014	SG
BNP-5B	012	6/7/2014	Nitrate-N	ND	mg/L	Non-Potable Water	EPA 300.0	1	0.50	6/13/2014	SG
BNP-5B	012	6/7/2014	Nitrite-N	ND	mg/L	Non-Potable Water	EPA 300.0	1	0.50	6/13/2014	SG
BNP-5B	012	6/7/2014	Orthophosphate-P	ND	mg/L	Non-Potable Water	EPA 300.0	1	0.33	6/13/2014	SG
BNP-5B	012	6/7/2014	Sulfate	4.9	mg/L	Non-Potable Water	EPA 300.0	1	0.50	6/13/2014	SG

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Cuyahoga Falls, Ohio 44223
TEL: (330) 253-8211 FAX: (330) 253-4489
Website: http://www.settek.com

WO#: **14061016**
Date Reported: **6/17/2014**
Company: University of Akron
Address: Department of Geosciences- MS4101
Akron OH 44325-4101
Received: 6/9/2014
Project#: Bath Bog

Client ID#	Lab ID#	Collected	Analyte	Result	Units	Matrix	Method	DF	RL	Run	Analyst
BNP-9	013	6/7/2014	Calcium(Ca)	21	mg/L	Non-Potable Water	EPA 200.7	1	0.10	6/11/2014	VVK
BNP-9	013	6/7/2014	Magnesium(Mg)	4.6	mg/L	Non-Potable Water	EPA 200.7	1	0.030	6/11/2014	VVK
BNP-9	013	6/7/2014	Potassium(K)	1.3	mg/L	Non-Potable Water	EPA 200.7	1	0.20	6/11/2014	VVK
BNP-9	013	6/7/2014	Sodium(Na)	3.7	mg/L	Non-Potable Water	EPA 200.7	1	0.20	6/11/2014	VVK
BNP-9	013	6/7/2014	Alkalinity, Total (As CaCO3)	130	mg/L	Non-Potable Water	SM 2320 B	1	10	6/14/2014	AYS
BNP-9	013	6/7/2014	Ammonia-N	1.9	mg/L	Non-Potable Water	SM 4500-NH3-E	1	1.0	6/12/2014	AMG
BNP-9	013	6/7/2014	Chloride	3.3	mg/L	Non-Potable Water	EPA 300.0	1	0.50	6/13/2014	SG
BNP-9	013	6/7/2014	Nitrate-N	ND	mg/L	Non-Potable Water	EPA 300.0	1	0.50	6/13/2014	SG
BNP-9	013	6/7/2014	Nitrite-N	ND	mg/L	Non-Potable Water	EPA 300.0	1	0.50	6/13/2014	SG
BNP-9	013	6/7/2014	Orthophosphate-P	ND	mg/L	Non-Potable Water	EPA 300.0	1	0.33	6/13/2014	SG
BNP-9	013	6/7/2014	Sulfate	ND	mg/L	Non-Potable Water	EPA 300.0	1	0.50	6/13/2014	SG

Summit Environmental Technologies, Inc.
3310 Win Street
Cuyahoga Falls, Ohio 44223 Tel: 330.253.8211 Fax: 330.253.4489

Analysis Request/Chain of Custody

For Summit Environmental Technologies, Inc. use only

Page 1 of 2 SET No.

Company Name (Please Print): University of Akron	Project Name: Bath Bog
Company Address: Dept. of Geosciences - MS4101, Akron, OH 44325-4101	Project Address: Bath Nature Preserve, Bath, Ohio
Client Phone No. 330-972-5389	Report to
Client Fax No. Please Fax Results ✓ ☐	PO#
Client Email: ids@uakron.edu Please Email Results ✓ ☒	Quote No. Per Mo
Contact Person: Dr. Ira Sasowsky	
Sampled by: Mezentseva/Sasowsky	Check if Ohio Samples ✓ ☐

1406 1016-001-013

Analytical Parameters and Methods

#	Sample Identification	Date Collected	Time Collected	Grab	Composite	Matrix: S=Solid, L=Liquid, O=Oil, SL=Sludge, A=Air, DW=Drinking Water	Preservative	Number of Containers	① Ca - EPA 200.7 or 6010B	Mg - "	Na - "	K - "	② Total Alkalinity - SM2320B	Cl - SM 4500Cl-E	SO4 - ASTM D516092	③ Nitrate/Nitrite - SM4500-NO3H	Ammonia - USEPA 350.1	④ Phosphate
1	BNP- Bog Outlet	6/7/14	12:35	X		L	SEE NOTES BELOW And numbers above	4	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2	BNP-6	↓	13:~~30~~ 24	↓		↓	↓	↓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
3	BNP-7	↓	14:13	↓		↓	↓	↓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
4	BNP-7A	↓	14:33	↓		↓	↓	↓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
5	BNP-2A	↓	15:15	↓		↓	↓	↓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
6	Tributary 4, BNP	↓	15:36	↓		↓	↓	↓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
7	Tributary 4 Source, BNP	↓	16:00	↓		↓	↓	↓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
8	BNP-1A	↓	16:~~27~~ 33	↓		↓	↓	↓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
9	BNP-8	↓	17:14	↓		↓	↓	↓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
10	BNP-8A	↓	17:02	↓		↓	↓	↓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Please Check Analytical Box ✓

Relinquished by:	Date	Time	Received by:	Date	Time
[signature]	6/9/14	11:15			
Received in lab by: [signature]	6/9/14	1115	Rush Requested By: ______ Date	Must be approved by lab manager	

Notes/Comments: ① – These were field-filtered and preserved with HNO_3. ② Non preserved, non-filtered. ③ Preserved with H_2SO_4 ④ Non-preserved (seperate from item 2, for lab convenience).

White and yellow pages should accompany samples to the laboratory. The client retains the pink page.

76729

Summit Environmental Technologies, Inc.
3310 Win Street
Cuyahoga Falls, Ohio 44223 Tel: 330.253.8211 Fax: 330.253.4489

Analysis Request/Chain of Custody

For Summit Environmental Technologies, Inc. use only
Page 2 of 2. SET No.

Company Name (Please Print): University of Akron
Company Address: Dept of Geosciences - MS 4101 Akron, OH 44325-4101
Client Phone No.: 330-972-5389
Client Fax No. Please Fax Results ✓ ☐
Client Email: ids@uakron.edu Please Email Results ✓ ☒
Contact Person: Dr. Ira Sasowsky
Sampled by: Mezentseva | Sasowsky

Project Name: Bath Bog
Project Address: Bath Nature Preserve, Bath, Ohio
Report to:
PO#:
Quote No.: Per Mo
Check if Ohio VAP samples ✓ ☐

Analytical Parameters and Methods

#	Sample Identification	Date Collected	Time Collected	Grab	Composite	Matrix: S=Solid, L=Liquid, O=Oil SL=Sludge, A=Air, DW=Drinking Water	Preservative	Number of Containers	(1) Ca-EPA 200.7 or 6010B	Mg- "	Na- "	K- "	(2) Total Alkalinity-SM2320B	Cl-SM 4500 Cl-E	SO_4-ASTM D516092	(3) Nitrate/Nitrite-SM 4500-NO_3H	Ammonia-USEPA 350.1	(4) Phosphate
11	BNP-5C	6/7/14	18:00	X		L	SEE NOTES BELOW And numbers above	4	/	/	/	/	/	/	/	/	/	/
12	BNP-5B	↓	18:25					↓	/	/	/	/	/	/	/	/	/	/
13	BNP-9		19:10						/	/	/	/	/	/	/	/	/	/
	— end of batch —																	

Please Check Analytical Box ✓

14061016-001-013

Relinquished by:	Date	Time	Received by:	Date	Time
[signature]	6/9/14	11:15			
Received in lab by: [signature]	6/9/14	1115	Rush Requested By: ____ Date	Must be approved by lab manager	

Notes/Comments: (1) These were field-filtered and preserved with HNO_3. (2) Non preserved non-filtered (3) Preserved with H_2SO_4. (4) Non-preserved (separate from item 2, for lab convenience).

76730

White and yellow pages should accompany samples to the laboratory. The client retains the pink page.

Rev. 12
Date: 07/27/13

Summit Environmental Technologies, Inc.
Cooler Receipt Form

Initials of person inspecting cooler and samples: JK

Client: UA

Order Number:

Date Received: 6-9-14 Time Received: 1115 Date cooler(s) opened and samples inspected: 6-11-14

Number of Coolers/Boxes: 0 N/A

Shipper: FED EX UPS DHL Airborne US Postal Walk-in Pickup Other:

Packaging: Peanuts Bubble Wrap Paper Foam None Other:

Tape on cooler/box	Y	N	N/A	
Custody Seals intact		Y	N	N/A
C-O-C in plastic		Y	N	N/A
Ice ✓ Blue ice		present / absent / melted	N/A	
Sample Temperature IR Gun #16020459 CF 0-U °C		2.9 °C		N/A
Radiological Testing Instrument serial #35127 (see page 2 for scan results)		Y	N	N/A

Use 1 sheet per sample for Radiological Testing. If sample is HOT, the Radiological Safety Officer must be notified immediately.

C-O-C filled out properly	GK	N	N/A
Samples in separate bags	GK	N	N/A
Sample containers intact*	Y	N	N/A

*If no, list broken sample(s):

Sample label(s) complete (ID, date, etc.)	GK	N	N/A
Label(s) agree with C-O-C	GK	N	N/A
Correct containers used	GK	N	N/A
Sufficient sample received	Y	N	N/A
Bubbles absent from 40 mL vials**	Y	N	N/A

** Samples with bubbles <6mm are acceptable. Indicate bubble size if >6mm.

Was client contacted about samples	Y	N
Will client send new samples	Y	N

Client contact:

Date/Time:

Logged in by:

Comments:

G:\QC SHARED\Document Control Templates - Tracking\Cooler receipt form Rev. 12 07-27-13.doc Page 1 of 2

Rev. 12
Date: 07/27/13

Summit Environmental Technologies, Inc.
Sample Receipt

pH test on samples

Client ID	Test	pH
Bog Outlet	Metals	2
	N/N	2
	NH3	2
	[illegible]	6
BNP-6		
BNP-7		
BNP-7A		
-2A		
Tributary 9BNP		

~~Radiological scan on sample~~ test

Client ID	~~scan~~ test	~~CPM~~ ph
Tributary Source	metals	2
	N/N	2
	NH3	2
	[illegible]	6
BNP-1A		
-8		
-8A		
-5C		
-5B		

-9

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Summit Environmental Technologies, Inc.
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November 20, 2014

Dr. Ira Sasowsky
University of Akron
Department of Geosciences- MS4101
Akron, OH 44325-4101
TEL: (330) 972-5389
FAX:

RE: Bath Bog

Order No.: 14111211

Dear Dr. Ira Sasowsky:

Summit Environmental Technologies, Inc. received 13 sample(s) on 11/14/2014 for the analyses presented in the following report.

There were no problems with the analytical events associated with this report unless noted in the Case Narrative.

Quality control data is within laboratory defined or method specified acceptance limits except where noted.

If you have any questions regarding these tests results, please feel free to call the laboratory.

Sincerely,

Dr. Mo Osman

Project Manager

3310 Win St.
Cuyahoga Falls, Ohio 44223

A2LA 0724.01, Alabama 41600, Arizona AZ0788, Arkansas 88-0735, California 07256CA, Colorado, Connecticut PH-0105, Delaware, Florida NELAC E87688, Georgia E87688 and 943, Idaho OH00923, Illinois 200061 and Reg.5, Indiana C-OH-13, Kansas E-10347, Kentucky (Underground Storage Tank) 3, Kentucky 90146, Louisiana 04061 and LA12004, Maine 2012015, Maryland 339, Massachusetts M-OPH923, Minnesota 409711, Montana CERT0099, New Hampshire 2996, New Jersey OH006, New York 11777, North Carolina 39705 and 631, Ohio Drinking Water 4170, Ohio VAP CL0052, Oklahoma 9940, Oregon OH200001, Pennsylvania 68-01335, Rhode Island LA000317, South Carolina 92016001, Tennessee TN04018, Texas T104704466-11-5, Region 8 8TMS-L, USDA/APHIS P330-11-00244, Utah OH009232011-1, Vermont VT-87688, Virginia 00440 and 1581, Washington C891, West Virginia 248 and 9957C and E87688, Wisconsin 399013010

Summit Environmental Technologies, Inc.
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Website: http://www.settek.com

Workorder Sample Summary

WO#: **14111211**

20-Nov-14

CLIENT: University of Akron

Project: Bath Bog

Lab SampleID	Client Sample ID	Tag No	Date Collected	Date Received	Matrix
14111211-001	Well 6		11/9/2014 8:48:00 AM	11/14/2014 9:05:00 AM	Non-Potable Water
14111211-002	Well 7A		11/9/2014 9:36:00 AM	11/14/2014 9:05:00 AM	Non-Potable Water
14111211-003	Well 7		11/9/2014 10:37:00 AM	11/14/2014 9:05:00 AM	Non-Potable Water
14111211-004	Well 5B		11/9/2014 11:18:00 AM	11/14/2014 9:05:00 AM	Non-Potable Water
14111211-005	Well 5C		11/9/2014 11:40:00 AM	11/14/2014 9:05:00 AM	Non-Potable Water
14111211-006	Well 1A		11/9/2014 12:05:00 PM	11/14/2014 9:05:00 AM	Non-Potable Water
14111211-007	Tributary 4		11/9/2014 12:28:00 PM	11/14/2014 9:05:00 AM	Non-Potable Water
14111211-008	Tributary 4 Source		11/9/2014 12:51:00 PM	11/14/2014 9:05:00 AM	Non-Potable Water
14111211-009	Well 8		11/9/2014 1:15:00 PM	11/14/2014 9:05:00 AM	Non-Potable Water
14111211-010	Well 8A		11/9/2014 1:30:00 PM	11/14/2014 9:05:00 AM	Non-Potable Water
14111211-011	Well 2A		11/9/2014 2:04:00 PM	11/14/2014 9:05:00 AM	Non-Potable Water
14111211-012	Well 9		11/9/2014 2:28:00 PM	11/14/2014 9:05:00 AM	Non-Potable Water
14111211-013	Bog outlet		11/9/2014 3:04:00 PM	11/14/2014 9:05:00 AM	Non-Potable Water

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Case Narrative

WO#: **14111211**

Date: **11/20/2014**

CLIENT: University of Akron

Project: Bath Bog

This report in its entirety consists of the documents listed below. All documents contain the Summit Environmental Technologies, Inc. Work Order Number assigned to this report.

Paginated Report including: Cover Letter, Case Narrative, Analytical Results, Applicable Quality Control Summary Reports and copies of the Chain of Custody Documents supplied with this sample set.

Concentrations reported with a J-Flag in the Qualifier Field are values below the Limit of Quantitation (LOQ) but greater than the established Method Detection Limit (MDL).

Method numbers, unless specified as SM (Standard Methods) or ASTM, are EPA methods.

Estimated uncertainty values are available upon request.

Any comments or problems with the analytical events associated with this report are noted below.

Summit Environmental Technologies, Inc.
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Cuyahoga Falls, Ohio 44223
TEL: (330) 253-8211 FAX: (330) 253-4489
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WO#:	**14111211**
Date Reported:	**11/20/2014**
Company:	University of Akron
Address:	Department of Geosciences- MS4101
	Akron OH 44325-4101
Received:	11/14/2014
Project#:	Bath Bog

Client ID#	Lab ID#	Collected	Analyte	Result	Units	Matrix	Method	DF	RL	Run	Analyst
Well 6	001	11/9/2014	Calcium(Ca)	85	mg/L	Non-Potable Water	EPA 200.7	1	0.10	11/17/2014	VVK
Well 6	001	11/9/2014	Magnesium(Mg)	35	mg/L	Non-Potable Water	EPA 200.7	1	0.050	11/17/2014	VVK
Well 6	001	11/9/2014	Potassium(K)	1.1	mg/L	Non-Potable Water	EPA 200.7	1	0.50	11/17/2014	VVK
Well 6	001	11/9/2014	Sodium(Na)	4.1	mg/L	Non-Potable Water	EPA 200.7	1	2.0	11/17/2014	VVK
Well 6	001	11/9/2014	Alkalinity, Total (As CaCO3)	300	mg/L	Non-Potable Water	SM 2320 B	1	10	11/17/2014	AT
Well 6	001	11/9/2014	Ammonia-N	ND	mg/L	Non-Potable Water	SM 4500-NH3-E	1	1.0	11/18/2014	AYS
Well 6	001	11/9/2014	Chloride	ND	mg/L	Non-Potable Water	EPA 300.0	5	2.5	11/18/2014	SG
Well 6	001	11/9/2014	Nitrate-N	ND	mg/L	Non-Potable Water	EPA 300.0	5	0.55	11/18/2014	SG
Well 6	001	11/9/2014	Nitrite-N	ND	mg/L	Non-Potable Water	EPA 300.0	5	0.82	11/18/2014	SG
Well 6	001	11/9/2014	Orthophosphate-P	ND	mg/L	Non-Potable Water	EPA 300.0	5	1.6	11/18/2014	SG
Well 6	001	11/9/2014	Sulfate	36	mg/L	Non-Potable Water	EPA 300.0	5	5.0	11/18/2014	SG

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WO#: **14111211**
Date Reported: **11/20/2014**
Company: University of Akron
Address: Department of Geosciences- MS4101
Akron OH 44325-4101
Received: 11/14/2014
Project#: Bath Bog

Client ID#	Lab ID#	Collected	Analyte	Result	Units	Matrix	Method	DF	RL	Run	Analyst
Well 7A	002	11/9/2014	Calcium(Ca)	17	mg/L	Non-Potable Water	EPA 200.7	1	0.10	11/17/2014	VVK
Well 7A	002	11/9/2014	Magnesium(Mg)	4.3	mg/L	Non-Potable Water	EPA 200.7	1	0.050	11/17/2014	VVK
Well 7A	002	11/9/2014	Potassium(K)	1.2	mg/L	Non-Potable Water	EPA 200.7	1	0.50	11/17/2014	VVK
Well 7A	002	11/9/2014	Sodium(Na)	ND	mg/L	Non-Potable Water	EPA 200.7	1	2.0	11/17/2014	VVK
Well 7A	002	11/9/2014	Alkalinity, Total (As CaCO3)	100	mg/L	Non-Potable Water	SM 2320 B	1	10	11/17/2014	AT
Well 7A	002	11/9/2014	Ammonia-N	4.8	mg/L	Non-Potable Water	SM 4500-NH3-E	1	1.0	11/18/2014	AYS
Well 7A	002	11/9/2014	Chloride	ND	mg/L	Non-Potable Water	EPA 300.0	5	2.5	11/18/2014	SG
Well 7A	002	11/9/2014	Nitrate-N	ND	mg/L	Non-Potable Water	EPA 300.0	5	0.55	11/18/2014	SG
Well 7A	002	11/9/2014	Nitrite-N	ND	mg/L	Non-Potable Water	EPA 300.0	5	0.82	11/18/2014	SG
Well 7A	002	11/9/2014	Orthophosphate-P	ND	mg/L	Non-Potable Water	EPA 300.0	5	1.6	11/18/2014	SG
Well 7A	002	11/9/2014	Sulfate	ND	mg/L	Non-Potable Water	EPA 300.0	5	5.0	11/18/2014	SG

SUMMIT ENVIRONMENTAL TECHNOLOGIES, INC
Analytical Laboratories

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Cuyahoga Falls, Ohio 44223
TEL: (330) 253-8211 FAX: (330) 253-4489
Website: http://www.settek.com

WO#: **14111211**
Date Reported: **11/20/2014**
Company: University of Akron
Address: Department of Geosciences- MS4101
Akron OH 44325-4101
Received: 11/14/2014
Project#: Bath Bog

Client ID#	Lab ID#	Collected	Analyte	Result	Units	Matrix	Method	DF	RL	Run	Analyst
Well 7	003	11/9/2014	Calcium(Ca)	19	mg/L	Non-Potable Water	EPA 200.7	1	0.10	11/17/2014	VVK
Well 7	003	11/9/2014	Magnesium(Mg)	3.3	mg/L	Non-Potable Water	EPA 200.7	1	0.050	11/17/2014	VVK
Well 7	003	11/9/2014	Potassium(K)	0.84	mg/L	Non-Potable Water	EPA 200.7	1	0.50	11/17/2014	VVK
Well 7	003	11/9/2014	Sodium(Na)	ND	mg/L	Non-Potable Water	EPA 200.7	1	2.0	11/17/2014	VVK
Well 7	003	11/9/2014	Alkalinity, Total (As CaCO3)	85	mg/L	Non-Potable Water	SM 2320 B	1	10	11/17/2014	AT
Well 7	003	11/9/2014	Ammonia-N	22	mg/L	Non-Potable Water	SM 4500-NH3-E	1	1.0	11/18/2014	AYS
Well 7	003	11/9/2014	Chloride	2.8	mg/L	Non-Potable Water	EPA 300.0	5	2.5	11/18/2014	SG
Well 7	003	11/9/2014	Nitrate-N	ND	mg/L	Non-Potable Water	EPA 300.0	5	0.55	11/18/2014	SG
Well 7	003	11/9/2014	Nitrite-N	ND	mg/L	Non-Potable Water	EPA 300.0	5	0.82	11/18/2014	SG
Well 7	003	11/9/2014	Orthophosphate-P	ND	mg/L	Non-Potable Water	EPA 300.0	5	1.6	11/18/2014	SG
Well 7	003	11/9/2014	Sulfate	ND	mg/L	Non-Potable Water	EPA 300.0	5	5.0	11/18/2014	SG

Page 6 of 16

SUMMIT ENVIRONMENTAL TECHNOLOGIES, INC
Analytical Laboratories

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WO#: **14111211**
Date Reported: **11/20/2014**
Company: University of Akron
Address: Department of Geosciences- MS4101
Akron OH 44325-4101
Received: 11/14/2014
Project#: Bath Bog

Client ID#	Lab ID#	Collected	Analyte	Result	Units	Matrix	Method	DF	RL	Run	Analyst
Well 5B	004	11/9/2014	Calcium(Ca)	110	mg/L	Non-Potable Water	EPA 200.7	1	0.10	11/17/2014	VVK
Well 5B	004	11/9/2014	Magnesium(Mg)	25	mg/L	Non-Potable Water	EPA 200.7	1	0.050	11/17/2014	VVK
Well 5B	004	11/9/2014	Potassium(K)	4.8	mg/L	Non-Potable Water	EPA 200.7	1	0.50	11/17/2014	VVK
Well 5B	004	11/9/2014	Sodium(Na)	9.2	mg/L	Non-Potable Water	EPA 200.7	1	2.0	11/17/2014	VVK
Well 5B	004	11/9/2014	Alkalinity, Total (As CaCO3)	550	mg/L	Non-Potable Water	SM 2320 B	1	10	11/17/2014	AT
Well 5B	004	11/9/2014	Ammonia-N	18	mg/L	Non-Potable Water	SM 4500-NH3-E	1	1.0	11/18/2014	AYS
Well 5B	004	11/9/2014	Chloride	ND	mg/L	Non-Potable Water	EPA 300.0	5	2.5	11/18/2014	SG
Well 5B	004	11/9/2014	Nitrate-N	ND	mg/L	Non-Potable Water	EPA 300.0	5	0.55	11/18/2014	SG
Well 5B	004	11/9/2014	Nitrite-N	ND	mg/L	Non-Potable Water	EPA 300.0	5	0.82	11/18/2014	SG
Well 5B	004	11/9/2014	Orthophosphate-P	ND	mg/L	Non-Potable Water	EPA 300.0	5	1.6	11/18/2014	SG
Well 5B	004	11/9/2014	Sulfate	32	mg/L	Non-Potable Water	EPA 300.0	5	5.0	11/18/2014	SG

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Website: http://www.settek.com

WO#: **14111211**
Date Reported: **11/20/2014**
Company: University of Akron
Address: Department of Geosciences- MS4101
Akron OH 44325-4101
Received: 11/14/2014
Project#: Bath Bog

Client ID#	Lab ID#	Collected	Analyte	Result	Units	Matrix	Method	DF	RL	Run	Analyst
Well 5C	005	11/9/2014	Calcium(Ca)	54	mg/L	Non-Potable Water	EPA 200.7	1	0.10	11/17/2014	VVK
Well 5C	005	11/9/2014	Magnesium(Mg)	9.0	mg/L	Non-Potable Water	EPA 200.7	1	0.050	11/17/2014	VVK
Well 5C	005	11/9/2014	Potassium(K)	1.3	mg/L	Non-Potable Water	EPA 200.7	1	0.50	11/17/2014	VVK
Well 5C	005	11/9/2014	Sodium(Na)	3.2	mg/L	Non-Potable Water	EPA 200.7	1	2.0	11/17/2014	VVK
Well 5C	005	11/9/2014	Alkalinity, Total (As CaCO3)	160	mg/L	Non-Potable Water	SM 2320 B	1	10	11/17/2014	AT
Well 5C	005	11/9/2014	Ammonia-N	11	mg/L	Non-Potable Water	SM 4500-NH3-E	1	1.0	11/18/2014	AYS
Well 5C	005	11/9/2014	Chloride	ND	mg/L	Non-Potable Water	EPA 300.0	5	2.5	11/18/2014	SG
Well 5C	005	11/9/2014	Nitrate-N	ND	mg/L	Non-Potable Water	EPA 300.0	5	0.55	11/18/2014	SG
Well 5C	005	11/9/2014	Nitrite-N	ND	mg/L	Non-Potable Water	EPA 300.0	5	0.82	11/18/2014	SG
Well 5C	005	11/9/2014	Orthophosphate-P	ND	mg/L	Non-Potable Water	EPA 300.0	5	1.6	11/18/2014	SG
Well 5C	005	11/9/2014	Sulfate	ND	mg/L	Non-Potable Water	EPA 300.0	5	5.0	11/18/2014	SG

SUMMIT ENVIRONMENTAL TECHNOLOGIES, INC
Analytical Laboratories

Summit Environmental Technologies, Inc.
3310 Win St.
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Website: http://www.settek.com

WO#: **14111211**
Date Reported: **11/20/2014**
Company: University of Akron
Address: Department of Geosciences- MS4101
Akron OH 44325-4101
Received: 11/14/2014
Project#: Bath Bog

Client ID#	Lab ID#	Collected	Analyte	Result	Units	Matrix	Method	DF	RL	Run	Analyst
Well 1A	006	11/9/2014	Calcium(Ca)	380	mg/L	Non-Potable Water	EPA 200.7	1	0.10	11/17/2014	VVK
Well 1A	006	11/9/2014	Magnesium(Mg)	160	mg/L	Non-Potable Water	EPA 200.7	1	0.050	11/17/2014	VVK
Well 1A	006	11/9/2014	Potassium(K)	9.1	mg/L	Non-Potable Water	EPA 200.7	1	0.50	11/17/2014	VVK
Well 1A	006	11/9/2014	Sodium(Na)	18	mg/L	Non-Potable Water	EPA 200.7	1	2.0	11/17/2014	VVK
Well 1A	006	11/9/2014	Alkalinity, Total (As CaCO3)	580	mg/L	Non-Potable Water	SM 2320 B	1	10	11/17/2014	AT
Well 1A	006	11/9/2014	Ammonia-N	ND	mg/L	Non-Potable Water	SM 4500-NH3-E	1	1.0	11/18/2014	AYS
Well 1A	006	11/9/2014	Chloride	4.2	mg/L	Non-Potable Water	EPA 300.0	5	2.5	11/18/2014	SG
Well 1A	006	11/9/2014	Nitrate-N	ND	mg/L	Non-Potable Water	EPA 300.0	5	0.55	11/18/2014	SG
Well 1A	006	11/9/2014	Nitrite-N	ND	mg/L	Non-Potable Water	EPA 300.0	5	0.82	11/18/2014	SG
Well 1A	006	11/9/2014	Orthophosphate-P	ND	mg/L	Non-Potable Water	EPA 300.0	5	1.6	11/18/2014	SG
Well 1A	006	11/9/2014	Sulfate	720	mg/L	Non-Potable Water	EPA 300.0	25	25	11/19/2014	SG

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Address: Department of Geosciences- MS4101
Akron OH 44325-4101
Received: 11/14/2014
Project#: Bath Bog

Client ID#	Lab ID#	Collected	Analyte	Result	Units	Matrix	Method	DF	RL	Run	Analyst
Tributary 4	007	11/9/2014	Calcium(Ca)	72	mg/L	Non-Potable Water	EPA 200.7	1	0.10	11/17/2014	VVK
Tributary 4	007	11/9/2014	Magnesium(Mg)	17	mg/L	Non-Potable Water	EPA 200.7	1	0.050	11/17/2014	VVK
Tributary 4	007	11/9/2014	Potassium(K)	2.4	mg/L	Non-Potable Water	EPA 200.7	1	0.50	11/17/2014	VVK
Tributary 4	007	11/9/2014	Sodium(Na)	7.2	mg/L	Non-Potable Water	EPA 200.7	1	2.0	11/17/2014	VVK
Tributary 4	007	11/9/2014	Alkalinity, Total (As CaCO3)	140	mg/L	Non-Potable Water	SM 2320 B	1	10	11/17/2014	AT
Tributary 4	007	11/9/2014	Ammonia-N	ND	mg/L	Non-Potable Water	SM 4500-NH3-E	1	1.0	11/18/2014	AYS
Tributary 4	007	11/9/2014	Chloride	3.1	mg/L	Non-Potable Water	EPA 300.0	5	2.5	11/18/2014	SG
Tributary 4	007	11/9/2014	Nitrate-N	ND	mg/L	Non-Potable Water	EPA 300.0	5	0.55	11/18/2014	SG
Tributary 4	007	11/9/2014	Nitrite-N	ND	mg/L	Non-Potable Water	EPA 300.0	5	0.82	11/18/2014	SG
Tributary 4	007	11/9/2014	Orthophosphate-P	ND	mg/L	Non-Potable Water	EPA 300.0	5	1.6	11/18/2014	SG
Tributary 4	007	11/9/2014	Sulfate	6.3	mg/L	Non-Potable Water	EPA 300.0	5	5.0	11/18/2014	SG

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Date Reported: **11/20/2014**
Company: University of Akron
Address: Department of Geosciences- MS4101
Akron OH 44325-4101
Received: 11/14/2014
Project#: Bath Bog

Client ID#	Lab ID#	Collected	Analyte	Result	Units	Matrix	Method	DF	RL	Run	Analyst
Tributary 4 Source	008	11/9/2014	Calcium(Ca)	87	mg/L	Non-Potable Water	EPA 200.7	1	0.10	11/17/2014	VVK
Tributary 4 Source	008	11/9/2014	Magnesium(Mg)	18	mg/L	Non-Potable Water	EPA 200.7	1	0.050	11/17/2014	VVK
Tributary 4 Source	008	11/9/2014	Potassium(K)	1.4	mg/L	Non-Potable Water	EPA 200.7	1	0.50	11/17/2014	VVK
Tributary 4 Source	008	11/9/2014	Sodium(Na)	7.9	mg/L	Non-Potable Water	EPA 200.7	1	2.0	11/17/2014	VVK
Tributary 4 Source	008	11/9/2014	Alkalinity, Total (As CaCO3)	290	mg/L	Non-Potable Water	SM 2320 B	1	10	11/17/2014	AT
Tributary 4 Source	008	11/9/2014	Ammonia-N	ND	mg/L	Non-Potable Water	SM 4500-NH3-E	1	1.0	11/18/2014	AYS
Tributary 4 Source	008	11/9/2014	Chloride	3.5	mg/L	Non-Potable Water	EPA 300.0	5	2.5	11/18/2014	SG
Tributary 4 Source	008	11/9/2014	Nitrate-N	ND	mg/L	Non-Potable Water	EPA 300.0	5	0.55	11/18/2014	SG
Tributary 4 Source	008	11/9/2014	Nitrite-N	ND	mg/L	Non-Potable Water	EPA 300.0	5	0.82	11/18/2014	SG
Tributary 4 Source	008	11/9/2014	Orthophosphate-P	ND	mg/L	Non-Potable Water	EPA 300.0	5	1.6	11/18/2014	SG
Tributary 4 Source	008	11/9/2014	Sulfate	ND	mg/L	Non-Potable Water	EPA 300.0	5	5.0	11/18/2014	SG

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WO#:	**14111211**
Date Reported:	**11/20/2014**
Company:	University of Akron
Address:	Department of Geosciences- MS4101 Akron OH 44325-4101
Received:	11/14/2014
Project#:	Bath Bog

Client ID#	Lab ID#	Collected	Analyte	Result	Units	Matrix	Method	DF	RL	Run	Analyst
Well 8	009	11/9/2014	Calcium(Ca)	35	mg/L	Non-Potable Water	EPA 200.7	1	0.10	11/17/2014	VVK
Well 8	009	11/9/2014	Magnesium(Mg)	7.9	mg/L	Non-Potable Water	EPA 200.7	1	0.050	11/17/2014	VVK
Well 8	009	11/9/2014	Potassium(K)	1.5	mg/L	Non-Potable Water	EPA 200.7	1	0.50	11/17/2014	VVK
Well 8	009	11/9/2014	Sodium(Na)	8.2	mg/L	Non-Potable Water	EPA 200.7	1	2.0	11/17/2014	VVK
Well 8	009	11/9/2014	Alkalinity, Total (As CaCO3)	250	mg/L	Non-Potable Water	SM 2320 B	1	10	11/17/2014	AT
Well 8	009	11/9/2014	Ammonia-N	7.6	mg/L	Non-Potable Water	SM 4500-NH3-E	1	1.0	11/18/2014	AYS
Well 8	009	11/9/2014	Chloride	5.6	mg/L	Non-Potable Water	EPA 300.0	5	2.5	11/18/2014	SG
Well 8	009	11/9/2014	Nitrate-N	ND	mg/L	Non-Potable Water	EPA 300.0	5	0.55	11/18/2014	SG
Well 8	009	11/9/2014	Nitrite-N	ND	mg/L	Non-Potable Water	EPA 300.0	5	0.82	11/18/2014	SG
Well 8	009	11/9/2014	Orthophosphate-P	ND	mg/L	Non-Potable Water	EPA 300.0	5	1.6	11/18/2014	SG
Well 8	009	11/9/2014	Sulfate	25	mg/L	Non-Potable Water	EPA 300.0	5	5.0	11/18/2014	SG

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Date Reported: **11/20/2014**
Company: University of Akron
Address: Department of Geosciences- MS4101
Akron OH 44325-4101
Received: 11/14/2014
Project#: Bath Bog

Client ID#	Lab ID#	Collected	Analyte	Result	Units	Matrix	Method	DF	RL	Run	Analyst
Well 8A	010	11/9/2014	Calcium(Ca)	39	mg/L	Non-Potable Water	EPA 200.7	1	0.10	11/17/2014	VVK
Well 8A	010	11/9/2014	Magnesium(Mg)	8.0	mg/L	Non-Potable Water	EPA 200.7	1	0.050	11/17/2014	VVK
Well 8A	010	11/9/2014	Potassium(K)	0.62	mg/L	Non-Potable Water	EPA 200.7	1	0.50	11/17/2014	VVK
Well 8A	010	11/9/2014	Sodium(Na)	5.7	mg/L	Non-Potable Water	EPA 200.7	1	2.0	11/17/2014	VVK
Well 8A	010	11/9/2014	Alkalinity, Total (As CaCO3)	200	mg/L	Non-Potable Water	SM 2320 B	1	10	11/17/2014	AT
Well 8A	010	11/9/2014	Ammonia-N	3.6	mg/L	Non-Potable Water	SM 4500-NH3-E	1	1.0	11/18/2014	AYS
Well 8A	010	11/9/2014	Chloride	ND	mg/L	Non-Potable Water	EPA 300.0	5	2.5	11/18/2014	SG
Well 8A	010	11/9/2014	Nitrate-N	ND	mg/L	Non-Potable Water	EPA 300.0	5	0.55	11/18/2014	SG
Well 8A	010	11/9/2014	Nitrite-N	ND	mg/L	Non-Potable Water	EPA 300.0	5	0.82	11/18/2014	SG
Well 8A	010	11/9/2014	Orthophosphate-P	ND	mg/L	Non-Potable Water	EPA 300.0	5	1.6	11/18/2014	SG
Well 8A	010	11/9/2014	Sulfate	ND	mg/L	Non-Potable Water	EPA 300.0	5	5.0	11/18/2014	SG

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Akron OH 44325-4101
Received: 11/14/2014
Project#: Bath Bog

Client ID#	Lab ID#	Collected	Analyte	Result	Units	Matrix	Method	DF	RL	Run	Analyst
Well 2A	011	11/9/2014	Calcium(Ca)	110	mg/L	Non-Potable Water	EPA 200.7	1	0.10	11/17/2014	VVK
Well 2A	011	11/9/2014	Magnesium(Mg)	51	mg/L	Non-Potable Water	EPA 200.7	1	0.050	11/17/2014	VVK
Well 2A	011	11/9/2014	Potassium(K)	2.8	mg/L	Non-Potable Water	EPA 200.7	1	0.50	11/17/2014	VVK
Well 2A	011	11/9/2014	Sodium(Na)	8.4	mg/L	Non-Potable Water	EPA 200.7	1	2.0	11/17/2014	VVK
Well 2A	011	11/9/2014	Alkalinity, Total (As CaCO3)	340	mg/L	Non-Potable Water	SM 2320 B	1	10	11/17/2014	AT
Well 2A	011	11/9/2014	Ammonia-N	ND	mg/L	Non-Potable Water	SM 4500-NH3-E	1	1.0	11/18/2014	AYS
Well 2A	011	11/9/2014	Chloride	3.9	mg/L	Non-Potable Water	EPA 300.0	5	2.5	11/18/2014	SG
Well 2A	011	11/9/2014	Nitrate-N	ND	mg/L	Non-Potable Water	EPA 300.0	5	0.55	11/18/2014	SG
Well 2A	011	11/9/2014	Nitrite-N	ND	mg/L	Non-Potable Water	EPA 300.0	5	0.82	11/18/2014	SG
Well 2A	011	11/9/2014	Orthophosphate-P	ND	mg/L	Non-Potable Water	EPA 300.0	5	1.6	11/18/2014	SG
Well 2A	011	11/9/2014	Sulfate	250	mg/L	Non-Potable Water	EPA 300.0	5	5.0	11/18/2014	SG

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Summit Environmental Technologies, Inc.
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WO#: **14111211**
Date Reported: **11/20/2014**
Company: University of Akron
Address: Department of Geosciences- MS4101
Akron OH 44325-4101
Received: 11/14/2014
Project#: Bath Bog

Client ID#	Lab ID#	Collected	Analyte	Result	Units	Matrix	Method	DF	RL	Run	Analyst
Well 9	012	11/9/2014	Calcium(Ca)	26	mg/L	Non-Potable Water	EPA 200.7	1	0.10	11/17/2014	VVK
Well 9	012	11/9/2014	Magnesium(Mg)	5.0	mg/L	Non-Potable Water	EPA 200.7	1	0.050	11/17/2014	VVK
Well 9	012	11/9/2014	Potassium(K)	0.75	mg/L	Non-Potable Water	EPA 200.7	1	0.50	11/17/2014	VVK
Well 9	012	11/9/2014	Sodium(Na)	2.8	mg/L	Non-Potable Water	EPA 200.7	1	2.0	11/17/2014	VVK
Well 9	012	11/9/2014	Alkalinity, Total (As CaCO3)	77	mg/L	Non-Potable Water	SM 2320 B	1	10	11/18/2014	AT
Well 9	012	11/9/2014	Ammonia-N	9.2	mg/L	Non-Potable Water	SM 4500-NH3-E	1	1.0	11/18/2014	AYS
Well 9	012	11/9/2014	Chloride	ND	mg/L	Non-Potable Water	EPA 300.0	5	2.5	11/18/2014	SG
Well 9	012	11/9/2014	Nitrate-N	ND	mg/L	Non-Potable Water	EPA 300.0	5	0.55	11/18/2014	SG
Well 9	012	11/9/2014	Nitrite-N	ND	mg/L	Non-Potable Water	EPA 300.0	5	0.82	11/18/2014	SG
Well 9	012	11/9/2014	Orthophosphate-P	ND	mg/L	Non-Potable Water	EPA 300.0	5	1.6	11/18/2014	SG
Well 9	012	11/9/2014	Sulfate	ND	mg/L	Non-Potable Water	EPA 300.0	5	5.0	11/18/2014	SG

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Date Reported: **11/20/2014**
Company: University of Akron
Address: Department of Geosciences- MS4101
Akron OH 44325-4101
Received: 11/14/2014
Project#: Bath Bog

Client ID#	Lab ID#	Collected	Analyte	Result	Units	Matrix	Method	DF	RL	Run	Analyst
Bog outlet	013	11/9/2014	Calcium(Ca)	30	mg/L	Non-Potable Water	EPA 200.7	1	0.10	11/17/2014	VVK
Bog outlet	013	11/9/2014	Magnesium(Mg)	7.0	mg/L	Non-Potable Water	EPA 200.7	1	0.050	11/17/2014	VVK
Bog outlet	013	11/9/2014	Potassium(K)	1.7	mg/L	Non-Potable Water	EPA 200.7	1	0.50	11/17/2014	VVK
Bog outlet	013	11/9/2014	Sodium(Na)	3.5	mg/L	Non-Potable Water	EPA 200.7	1	2.0	11/17/2014	VVK
Bog outlet	013	11/9/2014	Alkalinity, Total (As CaCO3)	98	mg/L	Non-Potable Water	SM 2320 B	1	10	11/18/2014	AT
Bog outlet	013	11/9/2014	Ammonia-N	1.3	mg/L	Non-Potable Water	SM 4500-NH3-E	1	1.0	11/18/2014	AYS
Bog outlet	013	11/9/2014	Chloride	2.8	mg/L	Non-Potable Water	EPA 300.0	5	2.5	11/19/2014	SG
Bog outlet	013	11/9/2014	Nitrate-N	ND	mg/L	Non-Potable Water	EPA 300.0	5	0.55	11/19/2014	SG
Bog outlet	013	11/9/2014	Nitrite-N	ND	mg/L	Non-Potable Water	EPA 300.0	5	0.82	11/19/2014	SG
Bog outlet	013	11/9/2014	Orthophosphate-P	ND	mg/L	Non-Potable Water	EPA 300.0	5	1.6	11/19/2014	SG
Bog outlet	013	11/9/2014	Sulfate	7.6	mg/L	Non-Potable Water	EPA 300.0	5	5.0	11/19/2014	SG

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Analysis Request/Chain of Custody

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Page 1 of 2. SET No.

Company Name (Please Print): University of Akron	Project Name: Bath Bog
Company Address: Dept. of Geosciences - MS 4101, Akron, OH 44325-4101	Project Address: Bath Nature Preserve, Bath, Ohio
Client Phone No.: 330-972-5389	Report to
Client Fax No. Please Fax Results ✓ ☐	PO#
Client Email: ids@uakron.edu Please Email Results ✓ ☒	Quote No. Per Mo
Contact Person: Dr. Ira Sasowsky	
Sampled by: Mezentseva / Sasowsky	Check if Ohio VAP samples ✓ ☐

Analytical Parameters and Methods

#	Sample Identification	Date Collected	Time Collected	Grab	Composite	Matrix: S=Solid, L=Liquid, O=Oil SL=Sludge, A=Air, DW=Drinking Water	Preservative	Number of Containers	(1) Ca - EPA 200.7 or 6010 B	Mg - "	Na - "	K - "	Total Alkalinity - SM2320B	(2) Cl - SM 4500Cl-E	SO4 - ASTM D516092	(3) Nitrate/Nitrite - SM4500-NO	Ammonia - USEPA 350.1	(4) Phosphate
1	Well 6	11/9/14	8:48	X		L		4	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2	Well 7A		9:36						✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
3	Well 7		10:37				SEE NOTES BELOW And numbers above		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
4	Well 5B		11:18						✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
5	Well 5C		11:40						✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
6	Well 1A		12:05						✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
7	Tributary 4		12:28						✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
8	Tributary 4 source		12:51						✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
9	Well 8		13:15						✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
10	Well 8A	↓	13:30	↓		↓		↓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Please Check Analytical Box ✓

1411211-001
013

Relinquished by:	Date	Time	Received by:	Date	Time
	11/14/14	9:05			

Received in lab by:	Date	Time
[signature]	11/14/14	9:05

Rush Requested By: ____ Date ____ Must be approved by lab manager

Notes/Comments: (1) These were lab-filtered and preserved with HNO_3. (2) Filtered, non-preserved (3) Filtered and preserved with H_2SO_4. (4) Non-preserved, non-filtered (separated for lab convenience).

White and yellow pages should accompany samples to the laboratory. The client retains the pink page.

108762

APPENDIX D37

Summit Environmental Technologies, Inc.
3310 Win Street
Cuyahoga Falls, Ohio 44223 Tel: 330.253.8211 Fax: 330.253.4489

Analysis Request/Chain of Custody

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Page 2 of 2 SET No.

Company Name (Please Print): University of Akron	Project Name: Bath Bog
Company Address: Dept. of Geosciences - MS 4101 Akron, OH 44325-4101	Project Address: Bath Nature Preserve, Bath, Ohio
Client Phone No.: 330-972-5389	Report to
Client Fax No. Please Fax Results ✓ ☐	PO#
Client Email: ids@uakron.edu Please Email Results ✓ ☒	Quote No. Per Mo
Contact Person: Dr. IRA Sasowsky	
Sampled by: Mezentseva/Sasowsky	Check if Ohio VAP samples ✓ ☐

Analytical Parameters and Methods (Please Check Analytical Box ✓)

(1) Ca, Mg, Na, K; (2) Total Alkalinity, Cl, SO_4; (3) Nitrate/Nitrite, Ammonia; (4) Phosphate

#	Sample Identification	Date Collected	Time Collected	Grab	Composite	Matrix: S=Solid, L=Liquid, O=Oil SL=Sludge, A=Air, DW=Drinking Water	Preservative	Number of Containers	Ca - EPA 200.7 or 6010B	Mg - " " "	Na - " " "	K - " " "	Total Alkalinity - SM2320B	Cl - SM 4500Cl - E	SO_4 - ASTM D516092	Nitrate/Nitrite - SM4500-NO3	Ammonia - USEPA 350.1	Phosphate
11	Well 2A	11/9/14	14:04	X		L	SEE NOTES BELOW and numbers above	4	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
12	Well 9		14:28						✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
13	Bog outlet		15:04						✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
									✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
									✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
									✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Relinquished by:	Date	Time	Received by:	Date	Time
	11/14/14	9:05			
Received in lab by:	**Date**	**Time**	**Rush Requested By:** ______ Date	Must be approved by lab manager	
[signature]	11/14/14	9:05			

Notes/Comments: (1) These were lab-filtered and preserved with HNO_3. (2) Filtered, non-preserved. (3) Filtered and preserved with H_2SO_4. (4) Non-preserved, non-filtered (separated for lab convenience).

108767

White and yellow pages should accompany samples to the laboratory. The client retains the pink page.

Rev. 12
Date: 07/27/13

Summit Environmental Technologies, Inc.
Cooler Receipt Form

Client: University of Akron

Initials of person inspecting cooler and samples: F.C.

Order Number: ____

Date Received: 11/14/14 Time Received: 9:05 AM Date cooler(s) opened and samples inspected: ____

Number of Coolers/Boxes: 1 N/A

Shipper: FED EX UPS DHL Airborne US Postal Walk-in Pickup Other: ____

Packaging: Peanuts Bubble Wrap Paper Foam None Other plastic Bags

Tape on cooler/box:	Y	N	N/A
Custody Seals intact	Y	N	N/A
C-O-C in plastic	Y	N	N/A
Ice ✓ Blue ice ____	present / absent / melted		N/A
Sample Temperature IR Gun #16020459 CF ____ °C	1.5 °C		
Radiological Testing Instrument serial #35127 (see page 2 for scan results)	Y	N	N/A

****Use 1 sheet per sample for Radiological Testing. If sample is HOT, the Radiological Safety Officer must be notified immediately.**

C-O-C filled out properly	Y	N	N/A
Samples in separate bags	Y	N	N/A
Sample containers intact*	Y	N	N/A

*If no, list broken sample(s): ____

Sample label(s) complete (ID, date, etc.)	Y	N	N/A
Label(s) agree with C-O-C	Y	N	N/A
Correct containers used	Y	N	N/A
Sufficient sample received	Y	N	N/A
Bubbles absent from 40 mL vials**	Y	N	N/A

** Samples with bubbles <6mm are acceptable. Indicate bubble size if >6mm. ____

Was client contacted about samples	Y	N
Will client send new samples	Y	N

Client contact: ____

Date/Time: ____

Logged in by: ____

Comments: ____

G:\QC SHARED\Document Control Templates - Tracking\Cooler receipt form Rev. 12 07-27-13.doc

Summit Environmental Technologies, Inc.
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May 13, 2015

Dr. Ira Sasowsky
University of Akron
Department of Geosciences- MS4101
Akron, OH 44325-4101
TEL: (330) 972-5389
FAX:

RE: Bath Bog

Order No.: 15042016

Dear Dr. Ira Sasowsky:

Summit Environmental Technologies, Inc. received 13 sample(s) on 4/20/2015 for the analyses presented in the following report.

There were no problems with the analytical events associated with this report unless noted in the Case Narrative.

Quality control data is within laboratory defined or method specified acceptance limits except where noted.

If you have any questions regarding these tests results, please feel free to call the laboratory.

Sincerely,

Dr. Mo Osman
Project Manager
3310 Win St.
Cuyahoga Falls, Ohio 44223

A2LA 0724.01, Alabama 41600, Arizona AZ0788, Arkansas 88-0735, California 07256CA, Colorado, Connecticut PH-0105, Delaware, Florida NELAC E87688, Georgia E87688 and 943, Idaho OH00923, Illinois 200061 and Reg.5, Indiana C-OH-13, Kansas E-10347, Kentucky (Underground Storage Tank) 3, Kentucky 90146, Louisiana 04061 and LA12004, Maine 2012015, Maryland 339, Massachusetts M-OPH923, Minnesota 409711, Montana CERT0099, New Hampshire 2996, New Jersey OH006, New York 11777, North Carolina 39705 and 631, Ohio Drinking Water 4170, Ohio VAP CL0052, Oklahoma 9940, Oregon OH200001, Pennsylvania 68-01335, Rhode Island LA000317, South Carolina 92016001, Tennessee TN04018, Texas T104704466-11-5, Region 8 8TMS-L, USDA/APHIS P330-11-00244, Utah OH009232011-1, Vermont VT-87688, Virginia 00440 and 1581, Washington C891, West Virginia 248 and 9957C and E87688, Wisconsin 399013010

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Case Narrative

WO#: **15042016**
Date: **5/13/2015**

CLIENT: University of Akron
Project: Bath Bog

This report in its entirety consists of the documents listed below. All documents contain the Summit Environmental Technologies, Inc., Work Order Number assigned to this report.

Paginated Report including Cover Letter, Case Narrative, Analytical Results, Applicable Quality Control Summary Reports, and copies of the Chain of Custody Documents are supplied with this sample set.

Concentrations reported with a J-Flag in the Qualifier Field are values below the Limit of Quantitation (LOQ) but greater than the established Method Detection Limit (MDL).

Method numbers, unless specified as SM (Standard Methods) or ASTM, are EPA methods.

Estimated uncertainty values are available upon request.

Analysis performed by DBM, VRM, or SG were performed at Summit Labs 2704 Eatonton Highway Haddock, GA 31033

All results for Solid Samples are reported on an "as received" or "wet weight" basis unless indicated as "dry weight" using the "-dry" designation on the reporting units.

Summit Environmental Technologies, Inc., holds the accreditations/certifications listed at the bottom of the cover letter that may or may not pertain to this report.

This report is believed to meet all of the requirements of NELAC or the accrediting / certifying agency. Any comments or problems with the analytical events associated with this report are noted below.
Analytical Comments for AMMONIA_NPW(4500-NH3-E), Sample R35816CCV, Batch ID R35816 : Ammonia Batch R35816 was analyzed without inclusion of an MS/MSD Pair; Control was exhibited

by the LCS and Matrix Duplicate.
Analytical Comments for AMMONIA_NPW(4500-NH3-E), Sample 15042016-013A, Batch ID R35816 : Ammonia Batch R35816 was analyzed without inclusion of an MS/MSD Pair; Control was exhibited by the LCS and Matrix Duplicate.
Analytical Comments for AMMONIA_NPW(4500-NH3-E), Sample 15042016-012ADUP, Batch ID R35816 : Ammonia Batch R35816 was analyzed without inclusion of an MS/MSD Pair; Control was exhibited by the LCS and Matrix Duplicate.
Analytical Comments for AMMONIA_NPW(4500-NH3-E), Sample 15042016-012A, Batch ID R35816 : Ammonia Batch R35816 was analyzed without inclusion of an MS/MSD Pair; Control was exhibited by the LCS and Matrix Duplicate.
Analytical Comments for AMMONIA_NPW(4500-NH3-E), Sample 15042016-011A, Batch ID R35816 : Ammonia Batch R35816 was analyzed without inclusion of an MS/MSD Pair; Control was exhibited by the LCS and Matrix Duplicate.

Per client, samples for metals were field-filtered and preserved with HNO3.
REVISED REPORT:
Revised report includes results for Charge Balance and revised results.

Summit Environmental Technologies, In
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Cuyahoga Falls, Ohio 4422
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Qualifiers and Acronyms

WO#: **15042016**
Date: **5/13/2015**

These commonly used Qualifiers and Acronyms may or may not be present in this report.

Qualifiers

U	The compound was analyzed for but was not detected.
J	The reported value is greater than the Method Detection Limit but less than the Reporting Limit.
H	The hold time for sample preparation and/or analysis was exceeded.
D	The result is reported from a dilution.
E	The result exceeded the linear range of the calibration or is estimated due to interference.
MC	The result is below the Minimum Compound Limit.
*****	The result exceeds the Regulatory Limit or Maximum Contamination Limit.
m	Manual integration was used to determine the area response.
N	The result is presumptive based on a Mass Spectral library search assuming a 1:1 response.
P	The second column confirmation exceeded 25% difference.
C	The result has been confirmed by GC/MS.
X	The result was not confirmed when GC/MS Analysis was performed.
B/MB+	The analyte was detected in the associated blank.
G	The ICB or CCB contained reportable amounts of analyte.
QC-/+	The CCV recovery failed low (-) or high (+).
R/QDR	The RPD was outside of accepted recovery limits.
QL-/+	The LCS or LCSD recovery failed low (-) or high (+).
QLR	The LCS/LCSD RPD was outside of accepted recovery limits.
QM-/+	The MS or MSD recovery failed low (-) or high (+).
QMR	The MS/MSD RPD was outside of accepted recovery limits.
QV-/+	The ICV recovery failed low (-) or high (+).
S	The spike result was outside of accepted recovery limits.

Acronyms

ND	Not Detected	**RL**	Reporting Limit
QC	Quality Control	**MDL**	Method Detection Limit
MB	Method Blank	**LOD**	Level of Detection
LCS	Laboratory Control Sample	**LOQ**	Level of Quantitation
LCSD	Laboratory Control Sample Duplicate	**PQL**	Practical Quantitation Limit
QCS	Quality Control Sample	**CRQL**	Contract Required Quantitation Limit
DUP	Duplicate	**PL**	Permit Limit
MS	Matrix Spike	**RegLvl**	Regulatory Limit
MSD	Matrix Spike Duplicate	**MCL**	Maximum Contamination Limit
RPD	Relative Percent Different	**MinCL**	Minimum Compound Limit
ICV	Initial Calibration Verification	**RA**	Reanalysis
ICB	Initial Calibration Blank	**RE**	Reextraction
CCV	Continuing Calibration Verification	**TIC**	Tentatively Identified Compound
CCB	Continuing Calibration Blank	**RT**	Retention Time
RLC	Reporting Limit Check	**CF**	Calibration Factor
DF	Dilution Factor	**RF**	Response Factor

This list of Qualifiers and Acronyms reflects the most commonly utilized Qualifiers and Acronyms for reporting. Please refer to the Analytical Notes in the Case Narrative for any Qualifiers or Acronyms that do not appear in this list or for additional information regarding the use of these Qualifiers on reported data.

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Workorder Sample Summary

WO#: **15042016**

13-May-15

CLIENT: University of Akron
Project: Bath Bog

Lab SampleID	Client Sample ID	Tag No	Date Collected	Date Received	Matrix
15042016-001	BNP-6		4/18/2015 8:27:00 AM	4/20/2015 8:15:00 AM	Non-Potable Water
15042016-002	BNP- Trib 5		4/18/2015 9:14:00 AM	4/20/2015 8:15:00 AM	Non-Potable Water
15042016-003	BNP-7		4/18/2015 9:57:00 AM	4/20/2015 8:15:00 AM	Non-Potable Water
15042016-004	BNP-7A		4/18/2015 10:29:00 AM	4/20/2015 8:15:00 AM	Non-Potable Water
15042016-005	BNP-2A		4/18/2015 10:54:00 AM	4/20/2015 8:15:00 AM	Non-Potable Water
15042016-006	BNP-TRIB 4		4/18/2015 11:23:00 AM	4/20/2015 8:15:00 AM	Non-Potable Water
15042016-007	BNP-1A		4/18/2015 11:47:00 AM	4/20/2015 8:15:00 AM	Non-Potable Water
15042016-008	BNP-8		4/18/2015 12:10:00 PM	4/20/2015 8:15:00 AM	Non-Potable Water
15042016-009	BNP-8A		4/18/2015 12:15:00 PM	4/20/2015 8:15:00 AM	Non-Potable Water
15042016-010	BNP-5C		4/18/2015 1:32:00 PM	4/20/2015 8:15:00 AM	Non-Potable Water
15042016-011	BNP-5B		4/18/2015 1:46:00 PM	4/20/2015 8:15:00 AM	Non-Potable Water
15042016-012	BNP-BOG OUTLET		4/18/2015 3:00:00 PM	4/20/2015 8:15:00 AM	Non-Potable Water
15042016-013	BNP-9		4/18/2015 3:38:00 PM	4/20/2015 8:15:00 AM	Non-Potable Water

SUMMIT ENVIRONMENTAL TECHNOLOGIES, INC
Analytical Laboratories

Summit Environmental Technologies, Inc.
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Website: http://www.settek.com

WO#: **15042016**
Date Reported: **5/13/2015**
Company: University of Akron
Address: Department of Geosciences- MS4101
Akron OH 44325-4101
Received: 4/20/2015
Project#: Bath Bog

Client ID#	Lab ID#	Collected	Analyte	Result	Units	Qual	Matrix	Method	DF	MDL	LOQ	Run	Analyst
BNP-6	001	4/18/2015	Calcium(Ca)	95.0	mg/L		Non-Potable Water	EPA 200.7	1	0.00650	0.100	4/21/2015	VVK
BNP-6	001	4/18/2015	Magnesium(Mg)	38.0	mg/L		Non-Potable Water	EPA 200.7	1	0.00910	0.0500	4/21/2015	VVK
BNP-6	001	4/18/2015	Potassium(K)	1.10	mg/L		Non-Potable Water	EPA 200.7	1	0.0494	0.500	4/21/2015	VVK
BNP-6	001	4/18/2015	Sodium(Na)	5.30	mg/L		Non-Potable Water	EPA 200.7	1	0.502	2.00	4/21/2015	VVK
BNP-6	001	4/18/2015	Alkalinity, Total (As CaCO3)	347	mg/L		Non-Potable Water	SM 2320 B	1		10.0	4/27/2015	DHC
BNP-6	001	4/18/2015	Ammonia-N	ND	mg/L		Non-Potable Water	SM 4500-NH3-E	1	0.0677	1.00	4/20/2015	AYS
BNP-6	001	4/18/2015	Chloride	1.82	mg/L	[D]	Non-Potable Water	EPA 300.0	10	0.110	1.00	4/22/2015	SG
BNP-6	001	4/18/2015	Sulfate	30.8	mg/L	[D]	Non-Potable Water	EPA 300.0	10	0.290	5.00	4/22/2015	SG
BNP-6	001	4/18/2015	Cation/Anion Balance	1.07			Non-Potable Water	WC-Calculation	1			5/11/2015	CM

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WO#: **15042016**
Date Reported: **5/13/2015**
Company: University of Akron
Address: Department of Geosciences- MS4101
Akron OH 44325-4101
Received: 4/20/2015
Project#: Bath Bog

Client ID#	Lab ID#	Collected	Analyte	Result	Units	Qual	Matrix	Method	DF	MDL	LOQ	Run	Analyst
BNP- Trib 5	002	4/18/2015	Calcium(Ca)	9.91	mg/L		Non-Potable Water	EPA 200.7	1	0.00650	0.100	4/21/2015	VVK
BNP- Trib 5	002	4/18/2015	Magnesium(Mg)	3.00	mg/L		Non-Potable Water	EPA 200.7	1	0.00910	0.0500	4/21/2015	VVK
BNP- Trib 5	002	4/18/2015	Potassium(K)	1.90	mg/L		Non-Potable Water	EPA 200.7	1	0.0494	0.500	4/21/2015	VVK
BNP- Trib 5	002	4/18/2015	Sodium(Na)	ND	mg/L	J	Non-Potable Water	EPA 200.7	1	0.502	2.00	4/21/2015	VVK
BNP- Trib 5	002	4/18/2015	Alkalinity, Total (As CaCO3)	26.3	mg/L		Non-Potable Water	SM 2320 B	1		10.0	4/27/2015	DHC
BNP- Trib 5	002	4/18/2015	Ammonia-N	ND	mg/L		Non-Potable Water	SM 4500-NH3-E	1	0.0677	1.00	4/20/2015	AYS
BNP- Trib 5	002	4/18/2015	Chloride	1.74	mg/L		Non-Potable Water	EPA 300.0	10	0.110	1.00	4/29/2015	SG
BNP- Trib 5	002	4/18/2015	Sulfate	6.16	mg/L		Non-Potable Water	EPA 300.0	10	0.290	1.00	4/29/2015	SG
BNP- Trib 5	002	4/18/2015	Cation/Anion Balance	1.13			Non-Potable Water	WC-Calculation	1			5/11/2015	CM

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WO#: **15042016**
Date Reported: **5/13/2015**
Company: University of Akron
Address: Department of Geosciences- MS4101
Akron OH 44325-4101

Received: 4/20/2015
Project#: Bath Bog

Client ID#	Lab ID#	Collected	Analyte	Result	Units	Qual	Matrix	Method	DF	MDL	LOQ	Run	Analyst
BNP-7	003	4/18/2015	Calcium(Ca)	23.0	mg/L		Non-Potable Water	EPA 200.7	1	0.00650	0.100	4/21/2015	VVK
BNP-7	003	4/18/2015	Magnesium(Mg)	3.90	mg/L		Non-Potable Water	EPA 200.7	1	0.00910	0.0500	4/21/2015	VVK
BNP-7	003	4/18/2015	Potassium(K)	1.20	mg/L		Non-Potable Water	EPA 200.7	1	0.0494	0.500	4/21/2015	VVK
BNP-7	003	4/18/2015	Sodium(Na)	ND	mg/L	J	Non-Potable Water	EPA 200.7	1	0.502	2.00	4/21/2015	VVK
BNP-7	003	4/18/2015	Alkalinity, Total (As CaCO3)	149	mg/L		Non-Potable Water	SM 2320 B	1		10.0	4/27/2015	DHC
BNP-7	003	4/18/2015	Ammonia-N	20.8	mg/L		Non-Potable Water	SM 4500-NH3-E	1	0.0677	1.00	4/20/2015	AYS
BNP-7	003	4/18/2015	Chloride	3.50	mg/L		Non-Potable Water	EPA 300.0	1	0.0110	0.500	5/1/2015	MO
BNP-7	003	4/18/2015	Sulfate	1.70	mg/L		Non-Potable Water	EPA 300.0	1	0.0290	0.500	5/1/2015	MO
BNP-7	003	4/18/2015	Cation/Anion Balance	0.880			Non-Potable Water	WC-Calculation	1			5/11/2015	CM

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WO#: **15042016**
Date Reported: **5/13/2015**
Company: University of Akron
Address: Department of Geosciences- MS4101
Akron OH 44325-4101
Received: 4/20/2015
Project#: Bath Bog

Client ID#	Lab ID#	Collected	Analyte	Result	Units	Qual	Matrix	Method	DF	MDL	LOQ	Run	Analyst
BNP-7A	004	4/18/2015	Calcium(Ca)	13.5	mg/L		Non-Potable Water	EPA 200.7	1	0.00650	0.100	4/21/2015	VVK
BNP-7A	004	4/18/2015	Magnesium(Mg)	3.40	mg/L		Non-Potable Water	EPA 200.7	1	0.00910	0.0500	4/21/2015	VVK
BNP-7A	004	4/18/2015	Potassium(K)	1.15	mg/L		Non-Potable Water	EPA 200.7	1	0.0494	0.500	4/21/2015	VVK
BNP-7A	004	4/18/2015	Sodium(Na)	2.10	mg/L		Non-Potable Water	EPA 200.7	1	0.502	2.00	4/21/2015	VVK
BNP-7A	004	4/18/2015	Alkalinity, Total (As $CaCO_3$)	54.5	mg/L		Non-Potable Water	SM 2320 B	1		10.0	4/27/2015	DHC
BNP-7A	004	4/18/2015	Ammonia-N	4.71	mg/L		Non-Potable Water	SM 4500-NH3-E	1	0.0677	1.00	4/20/2015	AYS
BNP-7A	004	4/18/2015	Chloride	1.94	mg/L		Non-Potable Water	EPA 300.0	1	0.0110	0.500	5/1/2015	MO
BNP-7A	004	4/18/2015	Sulfate	1.40	mg/L		Non-Potable Water	EPA 300.0	1	0.0290	0.500	5/1/2015	MO
BNP-7A	004	4/18/2015	Cation/Anion Balance	1.14			Non-Potable Water	WC-Calculation	1			5/11/2015	CM

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Date Reported: **5/13/2015**
Company: University of Akron
Address: Department of Geosciences- MS4101
Akron OH 44325-4101
Received: 4/20/2015
Project#: Bath Bog

Client ID#	Lab ID#	Collected	Analyte	Result	Units	Qual	Matrix	Method	DF	MDL	LOQ	Run	Analyst
BNP-2A	005	4/18/2015	Calcium(Ca)	106	mg/L		Non-Potable Water	EPA 200.7	1	0.00650	0.100	4/21/2015	VVK
BNP-2A	005	4/18/2015	Magnesium(Mg)	47.7	mg/L		Non-Potable Water	EPA 200.7	1	0.00910	0.0500	4/21/2015	VVK
BNP-2A	005	4/18/2015	Potassium(K)	1.79	mg/L		Non-Potable Water	EPA 200.7	1	0.0494	0.500	4/21/2015	VVK
BNP-2A	005	4/18/2015	Sodium(Na)	6.40	mg/L		Non-Potable Water	EPA 200.7	1	0.502	2.00	4/21/2015	VVK
BNP-2A	005	4/18/2015	Alkalinity, Total (As CaCO3)	253	mg/L		Non-Potable Water	SM 2320 B	1		10.0	5/1/2015	DHC
BNP-2A	005	4/18/2015	Ammonia-N	ND	mg/L		Non-Potable Water	SM 4500-NH3-E	1	0.0677	1.00	4/20/2015	AYS
BNP-2A	005	4/18/2015	Chloride	3.76	mg/L		Non-Potable Water	EPA 300.0	1	0.0110	0.500	5/1/2015	MO
BNP-2A	005	4/18/2015	Sulfate	211	mg/L		Non-Potable Water	EPA 300.0	1	0.0290	0.500	5/1/2015	MO
BNP-2A	005	4/18/2015	Cation/Anion Balance	1.00			Non-Potable Water	WC-Calculation	1			5/11/2015	CM

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Date Reported: **5/13/2015**
Company: University of Akron
Address: Department of Geosciences- MS4101
Akron OH 44325-4101
Received: 4/20/2015
Project#: Bath Bog

Client ID#	Lab ID#	Collected	Analyte	Result	Units	Qual	Matrix	Method	DF	MDL	LOQ	Run	Analyst
BNP-TRIB 4	006	4/18/2015	Calcium(Ca)	67.0	mg/L		Non-Potable Water	EPA 200.7	1	0.00650	0.100	4/21/2015	VVK
BNP-TRIB 4	006	4/18/2015	Magnesium(Mg)	14.7	mg/L		Non-Potable Water	EPA 200.7	1	0.00910	0.0500	4/21/2015	VVK
BNP-TRIB 4	006	4/18/2015	Potassium(K)	1.60	mg/L		Non-Potable Water	EPA 200.7	1	0.0494	0.500	4/21/2015	VVK
BNP-TRIB 4	006	4/18/2015	Sodium(Na)	4.40	mg/L		Non-Potable Water	EPA 200.7	1	0.502	2.00	4/21/2015	VVK
BNP-TRIB 4	006	4/18/2015	Alkalinity, Total (As CaCO3)	186	mg/L		Non-Potable Water	SM 2320 B	1		10.0	5/1/2015	DHC
BNP-TRIB 4	006	4/18/2015	Ammonia-N	ND	mg/L		Non-Potable Water	SM 4500-NH3-E	1	0.0677	1.00	4/20/2015	AYS
BNP-TRIB 4	006	4/18/2015	Chloride	2.04	mg/L		Non-Potable Water	EPA 300.0	1	0.0110	0.500	5/1/2015	MO
BNP-TRIB 4	006	4/18/2015	Sulfate	18.5	mg/L		Non-Potable Water	EPA 300.0	1	0.0290	0.500	5/1/2015	MO
BNP-TRIB 4	006	4/18/2015	Cation/Anion Balance	1.15			Non-Potable Water	WC-Calculation	1			5/11/2015	CM

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Company: University of Akron
Address: Department of Geosciences- MS4101
Akron OH 44325-4101
Received: 4/20/2015
Project#: Bath Bog

Client ID#	Lab ID#	Collected	Analyte	Result	Units	Qual	Matrix	Method	DF	MDL	LOQ	Run	Analyst
BNP-1A	007	4/18/2015	Calcium(Ca)	247	mg/L		Non-Potable Water	EPA 200.7	1	0.00650	0.100	4/21/2015	VVK
BNP-1A	007	4/18/2015	Magnesium(Mg)	118	mg/L		Non-Potable Water	EPA 200.7	1	0.00910	0.0500	4/21/2015	VVK
BNP-1A	007	4/18/2015	Potassium(K)	6.70	mg/L		Non-Potable Water	EPA 200.7	1	0.0494	0.500	4/21/2015	VVK
BNP-1A	007	4/18/2015	Sodium(Na)	12.7	mg/L		Non-Potable Water	EPA 200.7	1	0.502	2.00	4/21/2015	VVK
BNP-1A	007	4/18/2015	Alkalinity, Total (As CaCO3)	404	mg/L		Non-Potable Water	SM 2320 B	1		10.0	5/1/2015	DHC
BNP-1A	007	4/18/2015	Ammonia-N	ND	mg/L		Non-Potable Water	SM 4500-NH3-E	1	0.0677	1.00	4/20/2015	AYS
BNP-1A	007	4/18/2015	Chloride	4.92	mg/L		Non-Potable Water	EPA 300.0	1	0.0110	0.500	5/1/2015	MO
BNP-1A	007	4/18/2015	Sulfate	748	mg/L		Non-Potable Water	EPA 300.0	1	0.0290	0.500	5/1/2015	MO
BNP-1A	007	4/18/2015	Cation/Anion Balance	0.960			Non-Potable Water	WC-Calculation	1			5/11/2015	CM

Summit Environmental Technologies, Inc.
3310 Win St.
Cuyahoga Falls, Ohio 44223
TEL: (330) 253-8211 FAX: (330) 253-4489
Website: http://www.settek.com

WO#: **15042016**
Date Reported: **5/13/2015**
Company: University of Akron
Address: Department of Geosciences- MS4101
Akron OH 44325-4101
Received: 4/20/2015
Project#: Bath Bog

Client ID#	Lab ID#	Collected	Analyte	Result	Units	Qual	Matrix	Method	DF	MDL	LOQ	Run	Analyst
BNP-8	008	4/18/2015	Calcium(Ca)	33.0	mg/L		Non-Potable Water	EPA 200.7	1	0.00650	0.100	4/21/2015	VVK
BNP-8	008	4/18/2015	Magnesium(Mg)	6.50	mg/L		Non-Potable Water	EPA 200.7	1	0.00910	0.0500	4/21/2015	VVK
BNP-8	008	4/18/2015	Potassium(K)	0.700	mg/L		Non-Potable Water	EPA 200.7	1	0.0494	0.500	4/21/2015	VVK
BNP-8	008	4/18/2015	Sodium(Na)	5.80	mg/L		Non-Potable Water	EPA 200.7	1	0.502	2.00	4/21/2015	VVK
BNP-8	008	4/18/2015	Alkalinity, Total (As CaCO3)	135	mg/L		Non-Potable Water	SM 2320 B	1		10.0	5/1/2015	DHC
BNP-8	008	4/18/2015	Ammonia-N	6.28	mg/L		Non-Potable Water	SM 4500-NH3-E	1	0.0677	1.00	4/20/2015	AYS
BNP-8	008	4/18/2015	Chloride	3.40	mg/L		Non-Potable Water	EPA 300.0	1	0.0110	0.500	5/1/2015	MO
BNP-8	008	4/18/2015	Sulfate	ND	mg/L	J	Non-Potable Water	EPA 300.0	1	0.0290	0.500	5/1/2015	MO
BNP-8	008	4/18/2015	Cation/Anion Balance	1.00			Non-Potable Water	WC-Calculation	1			5/11/2015	CM

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Date Reported: **5/13/2015**
Company: University of Akron
Address: Department of Geosciences- MS4101
Akron OH 44325-4101
Received: 4/20/2015
Project#: Bath Bog

Client ID#	Lab ID#	Collected	Analyte	Result	Units	Qual	Matrix	Method	DF	MDL	LOQ	Run	Analyst
BNP-8A	009	4/18/2015	Calcium(Ca)	48.0	mg/L		Non-Potable Water	EPA 200.7	1	0.00650	0.100	4/21/2015	VVK
BNP-8A	009	4/18/2015	Magnesium(Mg)	10.2	mg/L		Non-Potable Water	EPA 200.7	1	0.00910	0.0500	4/21/2015	VVK
BNP-8A	009	4/18/2015	Potassium(K)	0.700	mg/L		Non-Potable Water	EPA 200.7	1	0.0494	0.500	4/21/2015	VVK
BNP-8A	009	4/18/2015	Sodium(Na)	12.5	mg/L		Non-Potable Water	EPA 200.7	1	0.502	2.00	4/21/2015	VVK
BNP-8A	009	4/18/2015	Alkalinity, Total (As CaCO3)	164	mg/L		Non-Potable Water	SM 2320 B	1		10.0	5/1/2015	DHC
BNP-8A	009	4/18/2015	Ammonia-N	3.53	mg/L		Non-Potable Water	SM 4500-NH3-E	1	0.0677	1.00	4/20/2015	AYS
BNP-8A	009	4/18/2015	Chloride	1.82	mg/L		Non-Potable Water	EPA 300.0	1	0.0110	0.500	5/1/2015	MO
BNP-8A	009	4/18/2015	Sulfate	0.550	mg/L		Non-Potable Water	EPA 300.0	1	0.0290	0.500	5/1/2015	MO
BNP-8A	009	4/18/2015	Cation/Anion Balance	1.19			Non-Potable Water	WC-Calculation	1			5/11/2015	CM

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WO#: **15042016**
Date Reported: **5/13/2015**
Company: University of Akron
Address: Department of Geosciences- MS4101
Akron OH 44325-4101
Received: 4/20/2015
Project#: Bath Bog

Client ID#	Lab ID#	Collected	Analyte	Result	Units	Qual	Matrix	Method	DF	MDL	LOQ	Run	Analyst
BNP-5C	010	4/18/2015	Calcium(Ca)	68.0	mg/L		Non-Potable Water	EPA 200.7	1	0.00650	0.100	4/21/2015	VVK
BNP-5C	010	4/18/2015	Magnesium(Mg)	11.0	mg/L		Non-Potable Water	EPA 200.7	1	0.00910	0.0500	4/21/2015	VVK
BNP-5C	010	4/18/2015	Potassium(K)	1.40	mg/L		Non-Potable Water	EPA 200.7	1	0.0494	0.500	4/21/2015	VVK
BNP-5C	010	4/18/2015	Sodium(Na)	3.00	mg/L		Non-Potable Water	EPA 200.7	1	0.502	2.00	4/21/2015	VVK
BNP-5C	010	4/18/2015	Alkalinity, Total (As CaCO3)	234	mg/L		Non-Potable Water	SM 2320 B	1		10.0	5/1/2015	DHC
BNP-5C	010	4/18/2015	Ammonia-N	11.8	mg/L		Non-Potable Water	SM 4500-NH3-E	1	0.0677	1.00	4/20/2015	AYS
BNP-5C	010	4/18/2015	Chloride	7.20	mg/L		Non-Potable Water	EPA 300.0	1	0.0110	0.500	5/1/2015	MO
BNP-5C	010	4/18/2015	Sulfate	1.70	mg/L		Non-Potable Water	EPA 300.0	1	0.0290	0.500	5/1/2015	MO
BNP-5C	010	4/18/2015	Cation/Anion Balance	1.04			Non-Potable Water	WC-Calculation	1			5/11/2015	CM

SUMMIT ENVIRONMENTAL TECHNOLOGIES, INC
Analytical Laboratories

Summit Environmental Technologies, Inc.
3310 Win St.
Cuyahoga Falls, Ohio 44223
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WO#: **15042016**
Date Reported: **5/13/2015**
Company: University of Akron
Address: Department of Geosciences- MS4101
Akron OH 44325-4101
Received: 4/20/2015
Project#: Bath Bog

Client ID#	Lab ID#	Collected	Analyte	Result	Units	Qual	Matrix	Method	DF	MDL	LOQ	Run	Analyst
BNP-5B	011	4/18/2015	Calcium(Ca)	110	mg/L		Non-Potable Water	EPA 200.7	1	0.00650	0.100	4/21/2015	VVK
BNP-5B	011	4/18/2015	Magnesium(Mg)	24.5	mg/L		Non-Potable Water	EPA 200.7	1	0.00910	0.0500	4/21/2015	VVK
BNP-5B	011	4/18/2015	Potassium(K)	5.00	mg/L		Non-Potable Water	EPA 200.7	1	0.0494	0.500	4/21/2015	VVK
BNP-5B	011	4/18/2015	Sodium(Na)	8.00	mg/L		Non-Potable Water	EPA 200.7	1	0.502	2.00	4/21/2015	VVK
BNP-5B	011	4/18/2015	Alkalinity, Total (As CaCO3)	452	mg/L		Non-Potable Water	SM 2320 B	1		10.0	5/1/2015	DHC
BNP-5B	011	4/18/2015	Ammonia-N	10.8	mg/L		Non-Potable Water	SM 4500-NH3-E	1	0.0677	1.00	4/20/2015	AYS
BNP-5B	011	4/18/2015	Chloride	6.10	mg/L		Non-Potable Water	EPA 300.0	1	0.0110	0.500	5/1/2015	MO
BNP-5B	011	4/18/2015	Sulfate	2.60	mg/L		Non-Potable Water	EPA 300.0	1	0.0290	0.500	5/1/2015	MO
BNP-5B	011	4/18/2015	Cation/Anion Balance	0.930			Non-Potable Water	WC-Calculation	1			5/11/2015	CM

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Date Reported: **5/13/2015**
Company: University of Akron
Address: Department of Geosciences- MS4101
Akron OH 44325-4101
Received: 4/20/2015
Project#: Bath Bog

Client ID#	Lab ID#	Collected	Analyte	Result	Units	Qual	Matrix	Method	DF	MDL	LOQ	Run	Analyst
BNP-BOG OUTLET	012	4/18/2015	Calcium(Ca)	35.4	mg/L		Non-Potable Water	EPA 200.7	1	0.00650	0.100	4/21/2015	VVK
BNP-BOG OUTLET	012	4/18/2015	Magnesium(Mg)	8.10	mg/L		Non-Potable Water	EPA 200.7	1	0.00910	0.0500	4/21/2015	VVK
BNP-BOG OUTLET	012	4/18/2015	Potassium(K)	1.66	mg/L		Non-Potable Water	EPA 200.7	1	0.0494	0.500	4/21/2015	VVK
BNP-BOG OUTLET	012	4/18/2015	Sodium(Na)	3.60	mg/L		Non-Potable Water	EPA 200.7	1	0.502	2.00	4/21/2015	VVK
BNP-BOG OUTLET	012	4/18/2015	Alkalinity, Total (As CaCO3)	111	mg/L		Non-Potable Water	SM 2320 B	1		10.0	5/1/2015	DHC
BNP-BOG OUTLET	012	4/18/2015	Ammonia-N	ND	mg/L		Non-Potable Water	SM 4500-NH3-E	1	0.0677	1.00	4/20/2015	AYS
BNP-BOG OUTLET	012	4/18/2015	Chloride	2.10	mg/L		Non-Potable Water	EPA 300.0	1	0.0110	0.500	5/1/2015	MO
BNP-BOG OUTLET	012	4/18/2015	Sulfate	11.1	mg/L		Non-Potable Water	EPA 300.0	1	0.0290	0.500	5/1/2015	MO
BNP-BOG OUTLET	012	4/18/2015	Cation/Anion Balance	1.05			Non-Potable Water	WC-Calculation	1			5/11/2015	CM

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Date Reported: **5/13/2015**
Company: University of Akron
Address: Department of Geosciences- MS4101
Akron OH 44325-4101
Received: 4/20/2015
Project#: Bath Bog

Client ID#	Lab ID#	Collected	Analyte	Result	Units	Qual	Matrix	Method	DF	MDL	LOQ	Run	Analyst
BNP-9	013	4/18/2015	Calcium(Ca)	28.0	mg/L		Non-Potable Water	EPA 200.7	1	0.00650	0.100	4/21/2015	VVK
BNP-9	013	4/18/2015	Magnesium(Mg)	5.40	mg/L		Non-Potable Water	EPA 200.7	1	0.00910	0.0500	4/21/2015	VVK
BNP-9	013	4/18/2015	Potassium(K)	0.900	mg/L		Non-Potable Water	EPA 200.7	1	0.0494	0.500	4/21/2015	VVK
BNP-9	013	4/18/2015	Sodium(Na)	3.98	mg/L		Non-Potable Water	EPA 200.7	1	0.502	2.00	4/21/2015	VVK
BNP-9	013	4/18/2015	Alkalinity, Total (As CaCO3)	119	mg/L		Non-Potable Water	SM 2320 B	1		10.0	5/1/2015	DHC
BNP-9	013	4/18/2015	Ammonia-N	11.5	mg/L		Non-Potable Water	SM 4500-NH3-E	1	0.0677	1.00	4/20/2015	AYS
BNP-9	013	4/18/2015	Chloride	9.30	mg/L		Non-Potable Water	EPA 300.0	1	0.0110	0.500	5/5/2015	MO
BNP-9	013	4/18/2015	Sulfate	9.05	mg/L		Non-Potable Water	EPA 300.0	1	0.0290	0.500	5/5/2015	MO
BNP-9	013	4/18/2015	Cation/Anion Balance	1.02			Non-Potable Water	WC-Calculation	1			5/11/2015	CM

Summit Environmental Technologies, Inc.
3310 Win Street
Cuyahoga Falls, Ohio 44223 Tel: 330.253.8211 Fax: 330.253.4489

Analysis Request/Chain of Custody

For Summit Environmental Technologies, Inc. use only

Page 1 of 2 SET No.

Company Name (Please Print): University of AKRON	Project Name: Bath Bog
Company Address: Dept. of Geosciences-MS4101 AKRON, OH 44325-4101	Project Address: Bath Nature Preserve Bath, Ohio
Client Phone No. 330-972-5389	Report to
Client Fax No. Please Fax Results ✓ ☐	PO# 86549
Client Email Please Email Results ✓ ☒ ids@uakron.EDU	Quote No. Per Mo
Contact Person: Dr. Ira Sasowsky	
Sampled by: Mezentseva/Sasowsky	Check if Ohio VAP samples ✓ ☐

Analytical Parameters and Methods (Please Check Analytical Box ✓)

#	Sample Identification	Date Collected	Time Collected	Grab	Composite	Matrix: S=Solid, L=Liquid, O=Oil SL=Sludge, A=Air, DW=Drinking Water	Preservative	Number of Containers	(1) Ca-EPA 200.7 or 6010 B	Mg-"	Na-"	K-"	(2) Total Alkalinity-SM2320 B	Cl-SM 4500Cl-E	SO_4-ASTM D516092	(3) Ammonium-USEPA 350.1	Charge Balance
N/A	Desired Detection Limits (mg/L)	n/a	n/a	X		L	SEE NOTES BELOW AND NUMBERS ABOVE		0.1	.03	0.2	0.2	10	0.5	0.5	1.0	
1	BNP-6	4/18/15	8:27					3	X	X	X	X	X	X	X	X	X
2	BNP-Trib 5		9:14														
3	BNP-7		9:57														
4	BNP-7A		10:29														
5	BNP 2A		10:54														
6	BNP-Trib 4		11:23														
7	BNP-1A		11:47														
8	BNP-8 1504201G 001 013		12:10														
9	BNP-8A CSC		12:15														

Relinquished by:	Date	Time	Received by:	Date	Time
D D [signature]	4/20/15	8:15			
Received in lab by:	Date	Time	Rush Requested By: ____ Date	Must be approved by lab manager	
[signature]	4/[illegible]	8:15			

Notes/Comments: (1) These were field-filtered and preserved with HNO_3. (2) Non-preserved, ~~non~~ filtered. (3) Preserved with H_2SO_4, filtered. Please note desired detection limits in first ~~column~~ row. Please check charge balance.

White and yellow pages should accompany samples to the laboratory. The client retains the pink page.

76734

Summit Environmental Technologies, Inc.

3310 Win Street
Cuyahoga Falls, Ohio 44223 Tel: 330.253.8211 Fax: 330.253.4489

Analysis Request/Chain of Custody

For Summit Environmental Technologies, Inc. use only

Page 2 of 2. SET No.

Company Name (Please Print): University of Akron

Company Address: Dept. of Geosciences - ~~MS~~ 4101 Akron, OH 44325-4101

Client Phone No.: 330-972-5389

Client Fax No. Please Fax Results ✓ ☐

Client Email: ids@uakron.EDU Please Email Results ✓ ☒

Contact Person: Dr. Ira Sasowsky

Sampled by: Mezentseva/Sasowsky

Project Name: Bath Bog

Project Address: Bath Nature Preserve Bath, Ohio

Report to:

PO# 86549

Quote No.: per Mo

Check if Ohio VAP samples ✓ ☐

Analytical Parameters and Methods (Please Check Analytical Box ✓)

#	Sample Identification	Date Collected	Time Collected	Grab	Composite	Matrix: S=Solid, L=Liquid, O=Oil SL=Sludge, A=Air, DW=Drinking Water	Preservative	Number of Containers	Ca-EPA 200.7 or 6010 B (1)	Mg- " (1)	Na- " (1)	K- " (1)	Total Alkalinity-SM 2320B (2)	Cl-SM 4500 Cl-E (2)	SO4-ASTM D516092 (2)	Ammonium-USEPA 350.1 (3)	Charge Balance	
10	BNP-5C	4/18/15	13:32	X		L	SEE NOTES BELOW AND NUMBERS ABOVE	3	X	X	X	X	X	X	X	X	X	
11	BNP-5B		13:46															
12	BNP-Bog outlet		15:00															
13	BNP-9		15:38															
--	--- End of Set ---	--	--															

Relinquished by:	Date	Time	Received by:	Date	Time
D. D. [signature]	4/20/15	8:15			
Received in lab by:	Date	Time	Rush Requested By: ______ Date	Must be approved by lab manager	
[signature]	4/20/15	815			

Notes/Comments: ① These were field-filtered and preserved with HNO_3. ② non-preserved filtered. ③ Preserved with H_2SO_4, filtered

SEE PAGE 1 NOTES

White and yellow pages should accompany samples to the laboratory. The client retains the pink page.

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Summit Environmental Technologies, Inc.
Cooler Receipt Form

Client: University of Akron
Initials of person inspecting cooler and samples: F.C.
Order Number: 1504 2016
Date Received: 4-20-15 Time Received: 8:15AM Date cooler(s) opened and samples inspected: ______ N/A
Number of Coolers/Boxes: 2
Shipper: FED EX UPS DHL Airborne US Postal Walk-in Pickup Other: ______
Packaging: Peanuts Bubble Wrap Paper Foam None Other: ______
Tape on cooler/box: Y N N/A
Custody Seals intact Y N N/A
C-O-C in plastic Y N N/A
Ice ✓ Blue ice ______ present / absent / melted N/A
Sample Temperature IR Gun #16020459 CF ______ °C 1.1 °C
Radiological Testing Instrument serial #35127 (see page 2 for scan results) Y N N/A
Use 1 sheet per sample for Radiological Testing. If sample is HOT, the Radiological Safety Officer must be notified immediately.

C-O-C filled out properly Y N N/A
Samples in separate bags Y N N/A
Sample containers intact* Y N N/A
*If no, list broken sample(s): ______

Sample label(s) complete (ID, date, etc.) Y N N/A
Label(s) agree with C-O-C Y N N/A
Correct containers used Y N N/A
Sufficient sample received Y N N/A
Bubbles absent from 40 mL vials** Y N N/A
** Samples with bubbles <6mm are acceptable. Indicate bubble size if >6mm. ______
Was client contacted about samples Y N
Will client send new samples Y N
Client contact: ______
Date/Time: ______
Logged in by: ______
Comments: ______

Summit Environmental Technologies, Inc.
Sample Receipt

pH test on samples

Client ID	Test	pH
BNP-6 x2	✓	<2
BNP-6 Wet Chem	✓	6
BNP-Trib5 x2	✓	<2
BNP-Trib5 Wet Chem	✓	6
BNP-7 x2	✓	<2
BNP-7 Wet Chem	✓	6
BNP-7A x2	✓	<2
BNP-7 Wet Chem	✓	6
BNP-2A x2	✓	<2
BNP-2A Wet Chem	✓	6
BNP-Trib4 x2	✓	<2
BNP-Trib4 Wet Chem	✓	6
BNP-1A x2	✓	<2
BNP-1A Wet Chem	✓	6
BNP-8 x2	✓	<2
BNP-8 Wet Chem	✓	6
BNP-8A x2	✓	<2
BNP-8A Wet Chem	✓	6
BNP-5C x2	✓	<2
BNP-5B Wet Chem	✓	6
BNP-Bog x2	✓	<2
BNP-Wet Chem	✓	6
BNP-9 x2	✓	<2
BNP-9 Wet Chem	✓	6

Radiological scan on sample

Client ID	scan	CPM

Summit Environmental Technologies, Inc.
3310 Win St.
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Website: http://www.settek.com

June 20, 2016

Dr. Ira Sasowsky
University of Akron
Department of Geosciences- MS4101
Akron, OH 44325-4101
TEL: (330) 972-5389
FAX:

RE: Bath Bog - Event 5

Order No.: 16060309

Dear Dr. Ira Sasowsky:

Summit Environmental Technologies, Inc. received 11 sample(s) on 6/6/2016 for the analyses presented in the following report.

There were no problems with the analytical events associated with this report unless noted in the Case Narrative.

Quality control data is within laboratory defined or method specified acceptance limits except where noted.

If you have any questions regarding these tests results, please feel free to call the laboratory.

Sincerely,

Bachar Najm
Project Manager
3310 Win St.
Cuyahoga Falls, Ohio 44223

Alabama 41600, Arkansas 88-0735, California 07256CA, Colorado, Connecticut PH-0105, Delaware, Florida NELAC E87688, Georgia E87688 and 943, Idaho OH00923, Illinois 200061 and Reg.5, Indiana C-OH-13, Kansas E-10347, Kentucky (Underground Storage Tank) 3, Kentucky 90146, Louisiana 04061 and LA12004, Maine 2012015, Maryland 339, Massachusetts M-OPH923, Minnesota 409711, Montana CERT0099, New Hampshire 2996, New Jersey OH006, New York 11777, North Carolina 39705 and 631, Ohio Drinking Water 4170, Ohio VAP CL0052, Oklahoma 9940, Oregon OH200001, Rhode Island LA000317, South Carolina 92016001, Texas T104704466-11-5, Region 8 8TMS-L, USDA/APHIS P330-11-00244, Utah OH009232011-1, Vermont VT-87688, Virginia 00440 and 1581, Washington C891, West Virginia 248 and 9957C and E87688, Wisconsin 399013010

Summit Environmental Technologies, Inc.
3310 Win St.
Cuyahoga Falls, Ohio 44223
TEL: (330) 253-8211 FAX: (330) 253-4489
Website: http://www.settek.com

Case Narrative

WO#: **16060309**
Date: **6/20/2016**

CLIENT: University of Akron
Project: Bath Bog - Event 5

This report in its entirety consists of the documents listed below. All documents contain the Summit Environmental Technologies, Inc., Work Order Number assigned to this report.

Paginated Report including Cover Letter, Case Narrative, Analytical Results, Applicable Quality Control Summary Reports, and copies of the Chain of Custody Documents are supplied with this sample set.

Concentrations reported with a J-Flag in the Qualifier Field are values below the Limit of Quantitation (LOQ) but greater than the established Method Detection Limit (MDL).

Method numbers, unless specified as SM (Standard Methods) or ASTM, are EPA methods.

Estimated uncertainty values are available upon request.

Analysis performed by DBM, VRM, or SFG were performed at Summit Labs 2704 Eatonton Highway Haddock, GA 31033

All results for Solid Samples are reported on an "as received" or "wet weight" basis unless indicated as "dry weight" using the "-dry" designation on the reporting units.

Summit Environmental Technologies, Inc., holds the accreditations/certifications listed at the bottom of the cover letter that may or may not pertain to this report.

 The results contained in this report are only representative of the samples received. Conditions can vary at different times and at different sampling conditions. Summit Environmental Technologies, Inc. is not responsible for use or interpretation of the data included herein.

This report is believed to meet all of the requirements of NELAC or the accrediting / certifying agency. Any comments or problems with the analytical events associated with this report are noted below.

Qualifiers and Acronyms

WO#: **16060309**
Date: **6/20/2016**

These commonly used Qualifiers and Acronyms may or may not be present in this report.

Qualifiers

U	The compound was analyzed for but was not detected.
J	The reported value is greater than the Method Detection Limit but less than the Reporting Limit.
H	The hold time for sample preparation and/or analysis was exceeded.
D	The result is reported from a dilution.
E	The result exceeded the linear range of the calibration or is estimated due to interference.
MC	The result is below the Minimum Compound Limit.
*****	The result exceeds the Regulatory Limit or Maximum Contamination Limit.
m	Manual integration was used to determine the area response.
N	The result is presumptive based on a Mass Spectral library search assuming a 1:1 response.
P	The second column confirmation exceeded 25% difference.
C	The result has been confirmed by GC/MS.
X	The result was not confirmed when GC/MS Analysis was performed.
B/MB+	The analyte was detected in the associated blank.
G	The ICB or CCB contained reportable amounts of analyte.
QC-/+	The CCV recovery failed low (-) or high (+).
R/QDR	The RPD was outside of accepted recovery limits.
QL-/+	The LCS or LCSD recovery failed low (-) or high (+).
QLR	The LCS/LCSD RPD was outside of accepted recovery limits.
QM-/+	The MS or MSD recovery failed low (-) or high (+).
QMR	The MS/MSD RPD was outside of accepted recovery limits.
QV-/+	The ICV recovery failed low (-) or high (+).
S	The spike result was outside of accepted recovery limits.
Z	Deviation; A deviation from the method was performed; Please refer to the Case Narrative for additional information

Acronyms

ND	Not Detected	**RL**	Reporting Limit
QC	Quality Control	**MDL**	Method Detection Limit
MB	Method Blank	**LOD**	Level of Detection
LCS	Laboratory Control Sample	**LOQ**	Level of Quantitation
LCSD	Laboratory Control Sample Duplicate	**PQL**	Practical Quantitation Limit
QCS	Quality Control Sample	**CRQL**	Contract Required Quantitation Limit
DUP	Duplicate	**PL**	Permit Limit
MS	Matrix Spike	**RegLvl**	Regulatory Limit
MSD	Matrix Spike Duplicate	**MCL**	Maximum Contamination Limit
RPD	Relative Percent Different	**MinCL**	Minimum Compound Limit
ICV	Initial Calibration Verification	**RA**	Reanalysis
ICB	Initial Calibration Blank	**RE**	Reextraction
CCV	Continuing Calibration Verification	**TIC**	Tentatively Identified Compound
CCB	Continuing Calibration Blank	**RT**	Retention Time
RLC	Reporting Limit Check	**CF**	Calibration Factor
DF	Dilution Factor	**RF**	Response Factor

This list of Qualifiers and Acronyms reflects the most commonly utilized Qualifiers and Acronyms for reporting. Please refer to the Analytical Notes in the Case Narrative for any Qualifiers or Acronyms that do not appear in this list or for additional information regarding the use of these Qualifiers on reported data.

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Workorder Sample Summary

WO#: **16060309**
20-Jun-16

CLIENT: University of Akron
Project: Bath Bog - Event 5

Lab SampleID	Client Sample ID	Tag No	Date Collected	Date Received	Matrix
16060309-001	BNP-6		6/4/2016 8:23:00 AM	6/6/2016 9:00:00 AM	Non-Potable Water
16060309-002	BNP- 2A		6/4/2016 9:00:00 AM	6/6/2016 9:00:00 AM	Non-Potable Water
16060309-003	BNP-9		6/4/2016 9:30:00 AM	6/6/2016 9:00:00 AM	Non-Potable Water
16060309-004	BNP-7		6/4/2016 10:10:00 AM	6/6/2016 9:00:00 AM	Non-Potable Water
16060309-005	BNP-7A		6/4/2016 10:30:00 AM	6/6/2016 9:00:00 AM	Non-Potable Water
16060309-006	BNP-Trib 4		6/4/2016 11:10:00 AM	6/6/2016 9:00:00 AM	Non-Potable Water
16060309-007	BNP-1A		6/4/2016 11:30:00 AM	6/6/2016 9:00:00 AM	Non-Potable Water
16060309-008	BNP-8A		6/4/2016 12:55:00 PM	6/6/2016 9:00:00 AM	Non-Potable Water
16060309-009	BNP-8		6/4/2016 1:10:00 PM	6/6/2016 9:00:00 AM	Non-Potable Water
16060309-010	BNP-5C		6/4/2016 1:35:00 PM	6/6/2016 9:00:00 AM	Non-Potable Water
16060309-011	BNP-5B		6/4/2016 1:50:00 PM	6/6/2016 9:00:00 AM	Non-Potable Water

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Analytical Report

(base report)

WO#: **16060309**

Date Reported: **6/20/2016**

CLIENT: University of Akron
Tag Number:
Matrix: NON-POTABLE WATER
Collection Date: 6/4/2016 8:23:00 AM
Lab ID: 16060309-001A
Project: Bath Bog - Event 5
Client Sample ID BNP-6

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
AKR-OH-44325-BATH BOG METALS (EPA 200.7)				**E200.7**	**E200.2**	Analyst: **VVK**
Calcium(Ca)	100	0.100		mg/L	1	6/10/2016 3:23:18 PM
Magnesium(Mg)	40.3	0.0500		mg/L	1	6/10/2016 3:23:18 PM
Potassium(K)	0.900	0.500		mg/L	1	6/10/2016 3:23:18 PM
Sodium(Na)	4.10	2.00		mg/L	1	6/10/2016 3:23:18 PM

Qualifiers:

H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
ND	Not Detected at the Reporting Limit	PL	Permit Limit
RL	Reporting Detection Limit	W	Sample container temperature is out of limit as specified at testcode

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Analytical Report

(base report)

WO#: **16060309**

Date Reported: **6/20/2016**

CLIENT: University of Akron
Matrix: NON-POTABLE WATER
Lab ID: 16060309-002A
Project: Bath Bog - Event 5
Client Sample ID BNP- 2A

Tag Number:
Collection Date: 6/4/2016 9:00:00 AM

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
AKR-OH-44325-BATH BOG METALS (EPA 200.7)				**E200.7**	**E200.2**	Analyst: **VVK**
Calcium(Ca)	130	0.100		mg/L	1	6/10/2016 3:23:18 PM
Magnesium(Mg)	59.5	0.0500		mg/L	1	6/10/2016 3:23:18 PM
Potassium(K)	2.20	0.500		mg/L	1	6/10/2016 3:23:18 PM
Sodium(Na)	8.30	2.00		mg/L	1	6/10/2016 3:23:18 PM

Qualifiers:

H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
ND	Not Detected at the Reporting Limit	PL	Permit Limit
RL	Reporting Detection Limit	W	Sample container temperature is out of limit as specified at testcode

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Analytical Report

(base report)

WO#: **16060309**

Date Reported: **6/20/2016**

CLIENT: University of Akron

Tag Number:

Matrix: NON-POTABLE WATER

Collection Date: 6/4/2016 9:30:00 AM

Lab ID: 16060309-003A

Project: Bath Bog - Event 5

Client Sample ID BNP-9

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
AKR-OH-44325-BATH BOG METALS (EPA 200.7)				**E200.7**	**E200.2**	Analyst: **VVK**
Calcium(Ca)	29.0	0.100		mg/L	1	6/10/2016 3:23:18 PM
Magnesium(Mg)	5.70	0.0500		mg/L	1	6/10/2016 3:23:18 PM
Potassium(K)	0.700	0.500		mg/L	1	6/10/2016 3:23:18 PM
Sodium(Na)	2.90	2.00		mg/L	1	6/10/2016 3:23:18 PM

Qualifiers:

H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
ND	Not Detected at the Reporting Limit	PL	Permit Limit
RL	Reporting Detection Limit	W	Sample container temperature is out of limit as specified at testcode

Original

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Analytical Report

(base report)

WO#: **16060309**

Date Reported: **6/20/2016**

CLIENT: University of Akron
Matrix: NON-POTABLE WATER
Lab ID: 16060309-004A
Project: Bath Bog - Event 5
Client Sample ID BNP-7

Tag Number:
Collection Date: 6/4/2016 10:10:00 AM

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
AKR-OH-44325-BATH BOG METALS (EPA 200.7)				**E200.7**	**E200.2**	Analyst: **VVK**
Calcium(Ca)	22.7	0.100		mg/L	1	6/10/2016 3:23:18 PM
Magnesium(Mg)	3.90	0.0500		mg/L	1	6/10/2016 3:23:18 PM
Potassium(K)	1.10	0.500		mg/L	1	6/10/2016 3:23:18 PM
Sodium(Na)	ND	2.00		mg/L	1	6/10/2016 3:23:18 PM

Qualifiers:

H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
ND	Not Detected at the Reporting Limit	PL	Permit Limit
RL	Reporting Detection Limit	W	Sample container temperature is out of limit as specified at testcode

Original

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Analytical Report

(base report)

WO#: **16060309**

Date Reported: **6/20/2016**

CLIENT: University of Akron
Tag Number:
Matrix: NON-POTABLE WATER
Collection Date: 6/4/2016 10:30:00 AM
Lab ID: 16060309-005A
Project: Bath Bog - Event 5
Client Sample ID BNP-7A

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
AKR-OH-44325-BATH BOG METALS (EPA 200.7)				**E200.7**	**E200.2**	Analyst: **VVK**
Calcium(Ca)	18.4	0.100		mg/L	1	6/10/2016 3:23:18 PM
Magnesium(Mg)	4.60	0.0500		mg/L	1	6/10/2016 3:23:18 PM
Potassium(K)	1.70	0.500		mg/L	1	6/10/2016 3:23:18 PM
Sodium(Na)	2.20	2.00		mg/L	1	6/10/2016 3:23:18 PM

Qualifiers:

H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
ND	Not Detected at the Reporting Limit	PL	Permit Limit
RL	Reporting Detection Limit	W	Sample container temperature is out of limit as specified at testcode

Original

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Analytical Report

(base report)

WO#: **16060309**

Date Reported: **6/20/2016**

CLIENT: University of Akron
Tag Number:
Matrix: NON-POTABLE WATER
Collection Date: 6/4/2016 11:10:00 AM
Lab ID: 16060309-006A
Project: Bath Bog - Event 5
Client Sample ID BNP-Trib 4

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
AKR-OH-44325-BATH BOG METALS (EPA 200.7)				**E200.7**	**E200.2**	Analyst: **VVK**
Calcium(Ca)	90.0	0.100		mg/L	1	6/10/2016 3:23:18 PM
Magnesium(Mg)	20.5	0.0500		mg/L	1	6/10/2016 3:23:18 PM
Potassium(K)	2.10	0.500		mg/L	1	6/10/2016 3:23:18 PM
Sodium(Na)	4.80	2.00		mg/L	1	6/10/2016 3:23:18 PM

Qualifiers:

H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
ND	Not Detected at the Reporting Limit	PL	Permit Limit
RL	Reporting Detection Limit	W	Sample container temperature is out of limit as specified at testcode

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Analytical Report

(base report)

WO#: **16060309**

Date Reported: **6/20/2016**

CLIENT: University of Akron
Matrix: NON-POTABLE WATER
Lab ID: 16060309-007A
Project: Bath Bog - Event 5
Client Sample ID BNP-1A

Tag Number:
Collection Date: 6/4/2016 11:30:00 AM

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
AKR-OH-44325-BATH BOG METALS (EPA 200.7)				**E200.7**	**E200.2**	Analyst: **VVK**
Calcium(Ca)	250	0.100		mg/L	1	6/10/2016 3:23:18 PM
Magnesium(Mg)	120	0.0500		mg/L	1	6/10/2016 3:23:18 PM
Potassium(K)	6.60	0.500		mg/L	1	6/10/2016 3:23:18 PM
Sodium(Na)	14.8	2.00		mg/L	1	6/10/2016 3:23:18 PM

Qualifiers:

H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
ND	Not Detected at the Reporting Limit	PL	Permit Limit
RL	Reporting Detection Limit	W	Sample container temperature is out of limit as specified at testcode

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Analytical Report

(base report)

WO#: **16060309**

Date Reported: **6/20/2016**

CLIENT: University of Akron

Matrix: NON-POTABLE WATER

Lab ID: 16060309-008A

Project: Bath Bog - Event 5

Client Sample ID BNP-8A

Tag Number:

Collection Date: 6/4/2016 12:55:00 PM

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
AKR-OH-44325-BATH BOG METALS (EPA 200.7)				**E200.7**	**E200.2**	Analyst: **VVK**
Calcium(Ca)	53.0	0.100		mg/L	1	6/10/2016 3:23:18 PM
Magnesium(Mg)	11.5	0.0500		mg/L	1	6/10/2016 3:23:18 PM
Potassium(K)	0.700	0.500		mg/L	1	6/10/2016 3:23:18 PM
Sodium(Na)	24.0	2.00		mg/L	1	6/10/2016 3:23:18 PM

Qualifiers:

H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
ND	Not Detected at the Reporting Limit	PL	Permit Limit
RL	Reporting Detection Limit	W	Sample container temperature is out of limit as specified at testcode

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Analytical Report

(base report)

WO#: **16060309**

Date Reported: **6/20/2016**

CLIENT: University of Akron

Matrix: NON-POTABLE WATER

Lab ID: 16060309-009A

Project: Bath Bog - Event 5

Client Sample ID BNP-8

Tag Number:

Collection Date: 6/4/2016 1:10:00 PM

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
AKR-OH-44325-BATH BOG METALS (EPA 200.7)				**E200.7**	**E200.2**	Analyst: **VVK**
Calcium(Ca)	36.6	0.100		mg/L	1	6/10/2016 3:23:18 PM
Magnesium(Mg)	7.40	0.0500		mg/L	1	6/10/2016 3:23:18 PM
Potassium(K)	0.800	0.500		mg/L	1	6/10/2016 3:23:18 PM
Sodium(Na)	7.60	2.00		mg/L	1	6/10/2016 3:23:18 PM

Qualifiers:

H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
ND	Not Detected at the Reporting Limit	PL	Permit Limit
RL	Reporting Detection Limit	W	Sample container temperature is out of limit as specified at testcode

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Analytical Report

(base report)

WO#: **16060309**

Date Reported: **6/20/2016**

CLIENT: University of Akron
Tag Number:
Matrix: NON-POTABLE WATER
Collection Date: 6/4/2016 1:35:00 PM
Lab ID: 16060309-010A
Project: Bath Bog - Event 5
Client Sample ID BNP-5C

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
AKR-OH-44325-BATH BOG METALS (EPA 200.7)				**E200.7**	**E200.2**	Analyst: **VVK**
Calcium(Ca)	72.0	0.100		mg/L	1	6/10/2016 3:23:18 PM
Magnesium(Mg)	12.5	0.0500		mg/L	1	6/10/2016 3:23:18 PM
Potassium(K)	1.40	0.500		mg/L	1	6/10/2016 3:23:18 PM
Sodium(Na)	3.80	2.00		mg/L	1	6/10/2016 3:23:18 PM

Qualifiers:

H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
ND	Not Detected at the Reporting Limit	PL	Permit Limit
RL	Reporting Detection Limit	W	Sample container temperature is out of limit as specified at testcode

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Analytical Report

(base report)

WO#: **16060309**

Date Reported: **6/20/2016**

CLIENT: University of Akron

Tag Number:

Matrix: NON-POTABLE WATER

Collection Date: 6/4/2016 1:50:00 PM

Lab ID: 16060309-011A

Project: Bath Bog - Event 5

Client Sample ID BNP-5B

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
AKR-OH-44325-BATH BOG METALS (EPA 200.7)				**E200.7**	**E200.2**	Analyst: **VVK**
Calcium(Ca)	130	0.100		mg/L	1	6/10/2016 3:23:18 PM
Magnesium(Mg)	26.8	0.0500		mg/L	1	6/10/2016 3:23:18 PM
Potassium(K)	4.90	0.500		mg/L	1	6/10/2016 3:23:18 PM
Sodium(Na)	10.0	2.00		mg/L	1	6/10/2016 3:23:18 PM

Qualifiers:

H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
ND	Not Detected at the Reporting Limit	PL	Permit Limit
RL	Reporting Detection Limit	W	Sample container temperature is out of limit as specified at testcode

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Website: http://www.settek.com

Analytical Report

(consolidated)

WO#: **16060309**

Date Reported: **6/20/2016**

CLIENT:	University of Akron	**Collection Date:**	6/4/2016 8:23:00 AM
Project:	Bath Bog - Event 5		
Lab ID:	16060309-001	**Matrix:**	NON-POTABLE WATER
Client Sample ID	BNP-6		

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
AKR-OH-44325-BATH BOG ALKALINITY (SM2320B)				**A2320**		Analyst: **DHC**
Alkalinity, Total (As CaCO3)	362	10.0		mg/L	1	6/17/2016 9:00:00 AM
AKR-OH-44325-BATH BOG AMMONIA (SM4500-NH3 D)				**A4500-NH3-D**		Analyst: **RMT**
Ammonia-N	ND	0.500		mg/L	1	6/7/2016 1:21:00 PM
AKR-OH-44325-BATH BOG CHLORIDE BY IC (EPA 300.0)				**E300.0**		Analyst: **RMT**
Chloride	2.60	0.100		mg/L	1	6/7/2016 7:41:00 AM
AKR-OH-44325-BATH BOG SULFATE ANALYSIS BY IC (EPA 300.0)				**E300.0**		Analyst: **RMT**
Sulfate	39.6	0.100		mg/L	1	6/7/2016 7:41:00 AM

Qualifiers:

H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
ND	Not Detected at the Reporting Limit	PL	Permit Limit
RL	Reporting Detection Limit	W	Sample container temperature is out of limit as specified at testcode

Original

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Website: http://www.settek.com

Analytical Report

(consolidated)

WO#: **16060309**

Date Reported: **6/20/2016**

CLIENT:	University of Akron	**Collection Date:**	6/4/2016 9:00:00 AM
Project:	Bath Bog - Event 5		
Lab ID:	16060309-002	**Matrix:**	NON-POTABLE WATER
Client Sample ID	BNP- 2A		

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
AKR-OH-44325-BATH BOG ALKALINITY (SM2320B)				**A2320**		Analyst: **DHC**
Alkalinity, Total (As CaCO3)	260	10.0		mg/L	1	6/17/2016 9:00:00 AM
AKR-OH-44325-BATH BOG AMMONIA (SM4500-NH3 D)				**A4500-NH3-D**		Analyst: **RMT**
Ammonia-N	ND	0.500		mg/L	1	6/7/2016 1:21:00 PM
AKR-OH-44325-BATH BOG CHLORIDE BY IC (EPA 300.0)				**E300.0**		Analyst: **RMT**
Chloride	5.10	0.100		mg/L	1	6/7/2016 7:41:00 AM
AKR-OH-44325-BATH BOG SULFATE ANALYSIS BY IC (EPA 300.0)				**E300.0**		Analyst: **RMT**
Sulfate	258	1.00		mg/L	10	6/7/2016 7:41:00 AM

Qualifiers:

H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
ND	Not Detected at the Reporting Limit	PL	Permit Limit
RL	Reporting Detection Limit	W	Sample container temperature is out of limit as specified at testcode

Original

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Analytical Report

(consolidated)

WO#: **16060309**

Date Reported: **6/20/2016**

CLIENT: University of Akron

Collection Date: 6/4/2016 9:30:00 AM

Project: Bath Bog - Event 5

Lab ID: 16060309-003

Matrix: NON-POTABLE WATER

Client Sample ID BNP-9

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
AKR-OH-44325-BATH BOG ALKALINITY (SM2320B)				**A2320**		Analyst: **DHC**
Alkalinity, Total (As CaCO3)	128	10.0		mg/L	1	6/17/2016 9:00:00 AM
AKR-OH-44325-BATH BOG AMMONIA (SM4500-NH3 D)				**A4500-NH3-D**		Analyst: **RMT**
Ammonia-N	9.05	0.500		mg/L	1	6/7/2016 1:21:00 PM
AKR-OH-44325-BATH BOG CHLORIDE BY IC (EPA 300.0)				**E300.0**		Analyst: **RMT**
Chloride	2.58	0.100		mg/L	1	6/7/2016 7:41:00 AM
AKR-OH-44325-BATH BOG SULFATE ANALYSIS BY IC (EPA 300.0)				**E300.0**		Analyst: **RMT**
Sulfate	0.204	0.100		mg/L	1	6/7/2016 7:41:00 AM

Qualifiers:

H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
ND	Not Detected at the Reporting Limit	PL	Permit Limit
RL	Reporting Detection Limit	W	Sample container temperature is out of limit as specified at testcode

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Analytical Report

(consolidated)

WO#: **16060309**

Date Reported: **6/20/2016**

CLIENT: University of Akron

Collection Date: 6/4/2016 10:10:00 AM

Project: Bath Bog - Event 5

Lab ID: 16060309-004

Matrix: NON-POTABLE WATER

Client Sample ID BNP-7

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
AKR-OH-44325-BATH BOG ALKALINITY (SM2320B)				**A2320**		Analyst: **DHC**
Alkalinity, Total (As CaCO3)	160	10.0		mg/L	1	6/17/2016 9:00:00 AM
AKR-OH-44325-BATH BOG AMMONIA (SM4500-NH3 D)				**A4500-NH3-D**		Analyst: **RMT**
Ammonia-N	25.0	0.500		mg/L	1	6/7/2016 1:21:00 PM
AKR-OH-44325-BATH BOG CHLORIDE BY IC (EPA 300.0)				**E300.0**		Analyst: **RMT**
Chloride	4.69	0.100		mg/L	1	6/7/2016 7:41:00 AM
AKR-OH-44325-BATH BOG SULFATE ANALYSIS BY IC (EPA 300.0)				**E300.0**		Analyst: **RMT**
Sulfate	0.125	0.100		mg/L	1	6/7/2016 7:41:00 AM

Qualifiers:

H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
ND	Not Detected at the Reporting Limit	PL	Permit Limit
RL	Reporting Detection Limit	W	Sample container temperature is out of limit as specified at testcode

Original

Summit Environmental Technologies, Inc.
3310 Win St.
Cuyahoga Falls, Ohio 44223
TEL: (330) 253-8211 FAX: (330) 253-4489
Website: http://www.settek.com

Analytical Report

(consolidated)

WO#: **16060309**

Date Reported: **6/20/2016**

CLIENT: University of Akron

Collection Date: 6/4/2016 10:30:00 AM

Project: Bath Bog - Event 5

Lab ID: 16060309-005

Matrix: NON-POTABLE WATER

Client Sample ID BNP-7A

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
AKR-OH-44325-BATH BOG ALKALINITY (SM2320B)				**A2320**		Analyst: **DHC**
Alkalinity, Total (As CaCO3)	65.0	10.0		mg/L	1	6/17/2016 9:00:00 AM
AKR-OH-44325-BATH BOG AMMONIA (SM4500-NH3 D)				**A4500-NH3-D**		Analyst: **RMT**
Ammonia-N	2.33	0.500		mg/L	1	6/7/2016 1:21:00 PM
AKR-OH-44325-BATH BOG CHLORIDE BY IC (EPA 300.0)				**E300.0**		Analyst: **RMT**
Chloride	2.05	0.100		mg/L	1	6/7/2016 7:41:00 AM
AKR-OH-44325-BATH BOG SULFATE ANALYSIS BY IC (EPA 300.0)				**E300.0**		Analyst: **RMT**
Sulfate	0.270	0.100		mg/L	1	6/7/2016 7:41:00 AM

Qualifiers:

H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
ND	Not Detected at the Reporting Limit	PL	Permit Limit
RL	Reporting Detection Limit	W	Sample container temperature is out of limit as specified at testcode

Original

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Analytical Report

(consolidated)

WO#: **16060309**

Date Reported: **6/20/2016**

CLIENT: University of Akron
Collection Date: 6/4/2016 11:10:00 AM
Project: Bath Bog - Event 5
Lab ID: 16060309-006
Matrix: NON-POTABLE WATER
Client Sample ID BNP-Trib 4

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
AKR-OH-44325-BATH BOG ALKALINITY (SM2320B)				**A2320**		Analyst: **DHC**
Alkalinity, Total (As CaCO3)	274	10.0		mg/L	1	6/17/2016 9:00:00 AM
AKR-OH-44325-BATH BOG AMMONIA (SM4500-NH3 D)				**A4500-NH3-D**		Analyst: **RMT**
Ammonia-N	ND	0.500		mg/L	1	6/7/2016 1:21:00 PM
AKR-OH-44325-BATH BOG CHLORIDE BY IC (EPA 300.0)				**E300.0**		Analyst: **RMT**
Chloride	2.35	0.100		mg/L	1	6/7/2016 7:41:00 AM
AKR-OH-44325-BATH BOG SULFATE ANALYSIS BY IC (EPA 300.0)				**E300.0**		Analyst: **RMT**
Sulfate	22.7	0.100		mg/L	1	6/7/2016 7:41:00 AM

Qualifiers:

H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
ND	Not Detected at the Reporting Limit	PL	Permit Limit
RL	Reporting Detection Limit	W	Sample container temperature is out of limit as specified at testcode

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Analytical Report

(consolidated)

WO#: **16060309**

Date Reported: **6/20/2016**

CLIENT: University of Akron
Collection Date: 6/4/2016 11:30:00 AM
Project: Bath Bog - Event 5
Lab ID: 16060309-007
Matrix: NON-POTABLE WATER
Client Sample ID BNP-1A

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
AKR-OH-44325-BATH BOG ALKALINITY (SM2320B)				**A2320**		Analyst: **DHC**
Alkalinity, Total (As CaCO3)	422	10.0		mg/L	1	6/17/2016 9:00:00 AM
AKR-OH-44325-BATH BOG AMMONIA (SM4500-NH3 D)				**A4500-NH3-D**		Analyst: **RMT**
Ammonia-N	ND	0.500		mg/L	1	6/7/2016 1:21:00 PM
AKR-OH-44325-BATH BOG CHLORIDE BY IC (EPA 300.0)				**E300.0**		Analyst: **RMT**
Chloride	5.12	0.100		mg/L	1	6/7/2016 7:41:00 AM
AKR-OH-44325-BATH BOG SULFATE ANALYSIS BY IC (EPA 300.0)				**E300.0**		Analyst: **RMT**
Sulfate	772	2.50		mg/L	25	6/7/2016 7:41:00 AM

Qualifiers:

H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
ND	Not Detected at the Reporting Limit	PL	Permit Limit
RL	Reporting Detection Limit	W	Sample container temperature is out of limit as specified at testcode

Original

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Analytical Report

(consolidated)

WO#: **16060309**

Date Reported: **6/20/2016**

CLIENT: University of Akron

Project: Bath Bog - Event 5

Lab ID: 16060309-008

Client Sample ID BNP-8A

Collection Date: 6/4/2016 12:55:00 PM

Matrix: NON-POTABLE WATER

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
AKR-OH-44325-BATH BOG ALKALINITY (SM2320B)				**A2320**		Analyst: **DHC**
Alkalinity, Total (As CaCO3)	221	10.0		mg/L	1	6/17/2016 9:00:00 AM
AKR-OH-44325-BATH BOG AMMONIA (SM4500-NH3 D)				**A4500-NH3-D**		Analyst: **RMT**
Ammonia-N	2.95	0.500		mg/L	1	6/7/2016 1:21:00 PM
AKR-OH-44325-BATH BOG CHLORIDE BY IC (EPA 300.0)				**E300.0**		Analyst: **RMT**
Chloride	3.00	0.100		mg/L	1	6/7/2016 7:41:00 AM
AKR-OH-44325-BATH BOG SULFATE ANALYSIS BY IC (EPA 300.0)				**E300.0**		Analyst: **RMT**
Sulfate	0.365	0.100		mg/L	1	6/7/2016 7:41:00 AM

Qualifiers:

H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
ND	Not Detected at the Reporting Limit	PL	Permit Limit
RL	Reporting Detection Limit	W	Sample container temperature is out of limit as specified at testcode

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Analytical Report

(consolidated)

WO#: **16060309**

Date Reported: **6/20/2016**

CLIENT: University of Akron

Collection Date: 6/4/2016 1:10:00 PM

Project: Bath Bog - Event 5

Lab ID: 16060309-009

Matrix: NON-POTABLE WATER

Client Sample ID BNP-8

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
AKR-OH-44325-BATH BOG ALKALINITY (SM2320B)				**A2320**		Analyst: **DHC**
Alkalinity, Total (As CaCO3)	148	10.0		mg/L	1	6/17/2016 9:00:00 AM
AKR-OH-44325-BATH BOG AMMONIA (SM4500-NH3 D)				**A4500-NH3-D**		Analyst: **RMT**
Ammonia-N	9.20	0.500		mg/L	1	6/7/2016 1:21:00 PM
AKR-OH-44325-BATH BOG CHLORIDE BY IC (EPA 300.0)				**E300.0**		Analyst: **RMT**
Chloride	5.09	0.100		mg/L	1	6/7/2016 7:41:00 AM
AKR-OH-44325-BATH BOG SULFATE ANALYSIS BY IC (EPA 300.0)				**E300.0**		Analyst: **RMT**
Sulfate	0.236	0.100		mg/L	1	6/7/2016 7:41:00 AM

Qualifiers:

H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
ND	Not Detected at the Reporting Limit	PL	Permit Limit
RL	Reporting Detection Limit	W	Sample container temperature is out of limit as specified at testcode

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Analytical Report

(consolidated)

WO#: **16060309**

Date Reported: **6/20/2016**

CLIENT: University of Akron

Collection Date: 6/4/2016 1:35:00 PM

Project: Bath Bog - Event 5

Lab ID: 16060309-010

Matrix: NON-POTABLE WATER

Client Sample ID BNP-5C

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
AKR-OH-44325-BATH BOG ALKALINITY (SM2320B)				**A2320**		Analyst: **DHC**
Alkalinity, Total (As CaCO3)	260	10.0		mg/L	1	6/17/2016 9:00:00 AM
AKR-OH-44325-BATH BOG AMMONIA (SM4500-NH3 D)				**A4500-NH3-D**		Analyst: **RMT**
Ammonia-N	11.3	0.500		mg/L	1	6/8/2016 1:12:00 PM
AKR-OH-44325-BATH BOG CHLORIDE BY IC (EPA 300.0)				**E300.0**		Analyst: **RMT**
Chloride	1.44	0.100		mg/L	1	6/7/2016 7:41:00 AM
AKR-OH-44325-BATH BOG SULFATE ANALYSIS BY IC (EPA 300.0)				**E300.0**		Analyst: **RMT**
Sulfate	2.12	0.100		mg/L	1	6/7/2016 7:41:00 AM

Qualifiers:

H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
ND	Not Detected at the Reporting Limit	PL	Permit Limit
RL	Reporting Detection Limit	W	Sample container temperature is out of limit as specified at testcode

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Analytical Report

(consolidated)

WO#: **16060309**

Date Reported: **6/20/2016**

CLIENT: University of Akron

Collection Date: 6/4/2016 1:50:00 PM

Project: Bath Bog - Event 5

Lab ID: 16060309-011

Matrix: NON-POTABLE WATER

Client Sample ID BNP-5B

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
AKR-OH-44325-BATH BOG ALKALINITY (SM2320B)				**A2320**		Analyst: **DHC**
Alkalinity, Total (As CaCO3)	410	10.0		mg/L	1	6/17/2016 9:00:00 AM
AKR-OH-44325-BATH BOG AMMONIA (SM4500-NH3 D)				**A4500-NH3-D**		Analyst: **RMT**
Ammonia-N	18.3	0.500		mg/L	1	6/8/2016 1:12:00 PM
AKR-OH-44325-BATH BOG CHLORIDE BY IC (EPA 300.0)				**E300.0**		Analyst: **RMT**
Chloride	1.37	0.100		mg/L	1	6/7/2016 7:41:00 AM
AKR-OH-44325-BATH BOG SULFATE ANALYSIS BY IC (EPA 300.0)				**E300.0**		Analyst: **RMT**
Sulfate	0.222	0.100		mg/L	1	6/7/2016 7:41:00 AM

Qualifiers:

H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
ND	Not Detected at the Reporting Limit	PL	Permit Limit
RL	Reporting Detection Limit	W	Sample container temperature is out of limit as specified at testcode

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QC SUMMARY REPORT

WO#: **16060309**
20-Jun-16

Client: University of Akron
Project: Bath Bog - Event 5
BatchID: 20954

Sample ID **MB-20954** SampType: **MBLK** TestCode: **Mtl-ICP_NPW** Units: **mg/L** Prep Date: **6/7/2016** RunNo: **54854**
Client ID: **PBW** Batch ID: **20954** TestNo: **E200.7** **E200.2** Analysis Date: **6/9/2016** SeqNo: **874859**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Calcium(Ca)	ND	1.00									
Magnesium(Mg)	ND	0.500									
Potassium(K)	ND	1.00									

Sample ID **LCS-20954** SampType: **LCS** TestCode: **Mtl-ICP_NPW** Units: **mg/L** Prep Date: **6/7/2016** RunNo: **54854**
Client ID: **LCSW** Batch ID: **20954** TestNo: **E200.7** **E200.2** Analysis Date: **6/9/2016** SeqNo: **874860**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Calcium(Ca)	2.04	1.00	2.000	0	102	85	115				
Magnesium(Mg)	2.05	0.500	2.000	0	103	85	115				
Potassium(K)	20.5	1.00	2.000	0	1020	85	115				S

Sample ID **16060273-001AMSD** SampType: **MSD** TestCode: **Mtl-ICP_NPW** Units: **mg/L** Prep Date: **6/7/2016** RunNo: **54854**
Client ID: **BatchQC** Batch ID: **20954** TestNo: **E200.7** **E200.2** Analysis Date: **6/9/2016** SeqNo: **877611**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Calcium(Ca)	ND	1.00	1.000	0	0	70	130	0	0	20	S
Magnesium(Mg)	ND	0.500	1.000	0	0	70	130	0	0	20	S
Potassium(K)	ND	1.00	10.00	0	0	70	130	0	0	20	S

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits	M	Manual Integration used to determine
MC	Value is below Minimum Compound Limit.	ND	Not Detected at the Reporting Limit	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit	R	RPD outside accepted recovery limits

SUMMIT ENVIRONMENTAL TECHNOLOGIES, INC
Analytical Laboratories

Summit Environmental Technologies, Inc.
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TEL: (330) 253-8211 FAX: (330) 253-4489
Website: http://www.settek.com

QC SUMMARY REPORT

WO#: **16060309**
20-Jun-16

Client: University of Akron
Project: Bath Bog - Event 5 **BatchID:** **R54746**

Sample ID **MB-R54746** SampType: **MBLK** TestCode: **AMMONIA_N** Units: **mg/L** Prep Date: RunNo: **54746**
Client ID: **PBW** Batch ID: **R54746** TestNo: **A4500-NH3-D** Analysis Date: **6/7/2016** SeqNo: **873142**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Ammonia-N	ND	0.500		0	0						

Sample ID **LCS-R54746** SampType: **LCS** TestCode: **AMMONIA_N** Units: **mg/L** Prep Date: RunNo: **54746**
Client ID: **LCSW** Batch ID: **R54746** TestNo: **A4500-NH3-D** Analysis Date: **6/7/2016** SeqNo: **873144**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Ammonia-N	10.3	0.500	10.00	0	103	85	115				

Sample ID **16060247-001BDUP** SampType: **DUP** TestCode: **AMMONIA_N** Units: **mg/L** Prep Date: RunNo: **54746**
Client ID: **BatchQC** Batch ID: **R54746** TestNo: **A4500-NH3-D** Analysis Date: **6/7/2016** SeqNo: **873154**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Ammonia-N	18.3	0.500		0	0			19.30	5.32	10	

Sample ID **16060309-009AMS** SampType: **MS** TestCode: **AMMONIA_N** Units: **mg/L** Prep Date: RunNo: **54746**
Client ID: **BNP-8** Batch ID: **R54746** TestNo: **A4500-NH3-D** Analysis Date: **6/7/2016** SeqNo: **873166**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Ammonia-N	19.6	0.500	10.00	9.200	104	90	110				

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits	M	Manual Integration used to determine
MC	Value is below Minimum Compound Limit.	ND	Not Detected at the Reporting Limit	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit	R	RPD outside accepted recovery limits

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Cuyahoga Falls, Ohio 44223
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QC SUMMARY REPORT

WO#: **16060309**
20-Jun-16

Client: University of Akron
Project: Bath Bog - Event 5
BatchID: R54746

Sample ID **16060309-009AMS** SampType: **MS** TestCode: **AMMONIA_N** Units: **mg/L** Prep Date: RunNo: **54746**
Client ID: **BNP-8** Batch ID: **R54746** TestNo: **A4500-NH3-D** Analysis Date: **6/7/2016** SeqNo: **873166**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual

Sample ID **16060309-009AMSD** SampType: **MSD** TestCode: **AMMONIA_N** Units: **mg/L** Prep Date: RunNo: **54746**
Client ID: **BNP-8** Batch ID: **R54746** TestNo: **A4500-NH3-D** Analysis Date: **6/7/2016** SeqNo: **873167**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Ammonia-N	19.5	0.500	10.00	9.200	103	90	110	19.60	0.512	5	

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits	M	Manual Integration used to determine
MC	Value is below Minimum Compound Limit.	ND	Not Detected at the Reporting Limit	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit	R	RPD outside accepted recovery limits

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QC SUMMARY REPORT

WO#: **16060309**
20-Jun-16

Client: University of Akron
Project: Bath Bog - Event 5
BatchID: R54770

Sample ID **16060309-001ADUP** SampType: **DUP** TestCode: **An-Sulfate_N** Units: **mg/L** Prep Date: RunNo: **54770**
Client ID: **BNP-6** Batch ID: **R54770** TestNo: **E300.0** Analysis Date: **6/7/2016** SeqNo: **873576**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfate	39.5	0.100		0	0			39.58	0.116	30	

Sample ID **16060309-006AMS** SampType: **MS** TestCode: **An-Sulfate_N** Units: **mg/L** Prep Date: RunNo: **54770**
Client ID: **BNP-Trib 4** Batch ID: **R54770** TestNo: **E300.0** Analysis Date: **6/7/2016** SeqNo: **873588**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfate	66.6	0.500	50.00	22.66	87.8	80	120				

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits	M	Manual Integration used to determine
MC	Value is below Minimum Compound Limit.	ND	Not Detected at the Reporting Limit	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit	R	RPD outside accepted recovery limits

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QC SUMMARY REPORT

WO#: **16060309**

20-Jun-16

Client: University of Akron

Project: Bath Bog - Event 5

BatchID: R54770

Sample ID **MB-R54770** SampType: **MBLK** TestCode: **Anions_NPW** Units: **mg/L** Prep Date: RunNo: **54770**
Client ID: **PBW** Batch ID: **R54770** TestNo: **E300.0** Analysis Date: **6/7/2016** SeqNo: **873564**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chloride	ND	0.100		0	0						
Sulfate	ND	0.100		0	0						

Sample ID **LCS-R54770** SampType: **LCS** TestCode: **Anions_NPW** Units: **mg/L** Prep Date: RunNo: **54770**
Client ID: **LCSW** Batch ID: **R54770** TestNo: **E300.0** Analysis Date: **6/7/2016** SeqNo: **873566**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chloride	19.0	0.100	20.00	0	94.9	90	110				
Sulfate	18.2	0.100	20.00	0	91.0	90	110				

Sample ID **LCSD-R54770** SampType: **LCSD** TestCode: **Anions_NPW** Units: **mg/L** Prep Date: RunNo: **54770**
Client ID: **LCSS02** Batch ID: **R54770** TestNo: **E300.0** Analysis Date: **6/7/2016** SeqNo: **873567**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chloride	18.7	0.100	20.00	0	93.6	90	110	18.99	1.41	20	
Sulfate	18.0	0.100	20.00	0	90.1	90	110	18.20	0.959	20	

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits	M	Manual Integration used to determine
MC	Value is below Minimum Compound Limit.	ND	Not Detected at the Reporting Limit	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit	R	RPD outside accepted recovery limits

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QC SUMMARY REPORT

WO#: **16060309**
20-Jun-16

Client: University of Akron
Project: Bath Bog - Event 5
BatchID: R54770

Sample ID **16060309-001ADUP** SampType: **DUP** TestCode: **An-Chloride_** Units: **mg/L** Prep Date: RunNo: **54770**
Client ID: **BNP-6** Batch ID: **R54770** TestNo: **E300.0** Analysis Date: **6/7/2016** SeqNo: **873574**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chloride	2.61	0.100		0	0			2.598	0.491	30	

Sample ID **16060309-006AMS** SampType: **MS** TestCode: **An-Chloride_** Units: **mg/L** Prep Date: RunNo: **54770**
Client ID: **BNP-Trib 4** Batch ID: **R54770** TestNo: **E300.0** Analysis Date: **6/7/2016** SeqNo: **873586**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chloride	48.1	0.500	50.00	2.348	91.5	80	120				

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits	M	Manual Integration used to determine
MC	Value is below Minimum Compound Limit.	ND	Not Detected at the Reporting Limit	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit	R	RPD outside accepted recovery limits

Summit Environmental Technologies, Inc.
3310 Win St.
Cuyahoga Falls, Ohio 44223
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Website: http://www.settek.com

QC SUMMARY REPORT

WO#: **16060309**
20-Jun-16

Client: University of Akron
Project: Bath Bog - Event 5
BatchID: **R54812**

Sample ID **MB-R54812** SampType: **MBLK** TestCode: **AMMONIA_N** Units: **mg/L** Prep Date: RunNo: **54812**
Client ID: **PBW** Batch ID: **R54812** TestNo: **A4500-NH3-D** Analysis Date: **6/8/2016** SeqNo: **874296**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Ammonia-N	ND	0.500		0	0						

Sample ID **LCS-R54812** SampType: **LCS** TestCode: **AMMONIA_N** Units: **mg/L** Prep Date: RunNo: **54812**
Client ID: **LCSW** Batch ID: **R54812** TestNo: **A4500-NH3-D** Analysis Date: **6/8/2016** SeqNo: **874298**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Ammonia-N	10.8	0.500	10.00	0	108	85	115				

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits	M	Manual Integration used to determine
MC	Value is below Minimum Compound Limit.	ND	Not Detected at the Reporting Limit	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit	R	RPD outside accepted recovery limits

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Website: http://www.settek.com

QC SUMMARY REPORT

WO#: **16060309**
20-Jun-16

Client: University of Akron
Project: Bath Bog - Event 5 **BatchID:** R55231

Sample ID **MB-R55231** SampType: **MBLK** TestCode: **Alkalinity_NP** Units: **mg/L** Prep Date: RunNo: **55231**
Client ID: **PBW** Batch ID: **R55231** TestNo: **A2320** Analysis Date: **6/17/2016** SeqNo: **881003**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Alkalinity, Total (As CaCO3)	ND	10.0									

Sample ID **LCS-R55231** SampType: **LCS** TestCode: **Alkalinity_NP** Units: **mg/L** Prep Date: RunNo: **55231**
Client ID: **LCSW** Batch ID: **R55231** TestNo: **A2320** Analysis Date: **6/17/2016** SeqNo: **881004**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Alkalinity, Total (As CaCO3)	106	10.0	100.0	0	106	85	115				

Sample ID **16060309-003ADUP** SampType: **DUP** TestCode: **Alkalinity_NP** Units: **mg/L** Prep Date: RunNo: **55231**
Client ID: **BNP-9** Batch ID: **R55231** TestNo: **A2320** Analysis Date: **6/17/2016** SeqNo: **881018**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Alkalinity, Total (As CaCO3)	130	10.0		0	0			128.0	1.55	5	

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits	M	Manual Integration used to determine
MC	Value is below Minimum Compound Limit.	ND	Not Detected at the Reporting Limit	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit	R	RPD outside accepted recovery limits

Summit Environmental Technologies, Inc.

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Cuyahoga Falls, Ohio 44223 Tel: 330.253.8211 Fax: 330.253.4489

Analysis Request/Chain of Custody

For Summit Environmental Technologies, Inc. use only

Page 1 of 2 SET No.

Company Name (Please Print): University of Akron	Project Name: Bath Bog - Event 5
Company Address: Dept. of Geosciences - MS4101 Akron, Ohio 44325-4101	Project Address: Bath Nature Preserve Bath, Ohio
Client Phone No.: 330-972-5389	Report to
Client Fax No. Please Fax Results ✓ ☐	PO#: 88326
Client Email: ids@uakron.edu Please Email Results ✓ ☐	Quote No. ← IDS@UAKRON.EDU
Contact Person: Dr. Ira Sasowsky	
Sampled by: Dr. Ira Sasowsky	Check if Ohio VAP samples ✓ ☐

Analytical Parameters and Methods

Please Check Analytical Box ✓

#	Sample Identification	Date Collected	Time Collected	Grab	Composite	Matrix: S=Solid, L=Liquid, O=Oil SL=Sludge, A=Air, DW=Drinking Water	Preservative	Number of Containers	Ca - EPA 200.7 or 6010 B (1)	Mg - "	Na - "	K - "	Total Alkalinity - SM2320 B	Cl - SM 4500 Cl-E (2)	SO4 - ASTM D516092	Ammonium - USEPA 350.1 (3)	Charge Balance	
N/A	Desired of Detection limits (mg/L)	N/A	N/A	X		L			.1	.03	.2	.2	10	.5	.5	1.0		
1	BNP-6	6-9-16	8:23				See notes below and numbers above	3	X	X	X	X	X	X	X	X	X	
2	BNP-2A		9:00															
3	BNP-9		9:30															
4	BNP-7		10:10															
5	BNP-7A		10:30															
6	BNP-Trib. 4		11:10															
7	BNP-1A		11:30															
8	BNP-8A		12:55															
9	BNP-8		13:10															

Please note required detection limits on line 1

16060309-001-011sc

Relinquished by:	Date	Time	Received by:	Date	Time
D [signature]	6/6/16	9AM			
Received in lab by:	Date	Time	Rush Requested By: ____ Date	Must be approved by lab manager	
[signature]	6/6/16	0900			

Notes/Comments: (1) These were field filtered and preserved with HNO3. (2) Non-preserved filtered. (3) Preserved with H2SO4, filtered. Please note desired detection limits in first row.

White and yellow pages should accompany samples to the laboratory. The client retains the pink page.

76744

Summit Environmental Technologies, Inc.

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Cuyahoga Falls, Ohio 44223   Tel: 330.253.8211   Fax: 330.253.4489

Analysis Request/Chain of Custody

For Summit Environmental Technologies, Inc. use only

Page 2 of 2   SET No.

Company Name (Please Print): University of Akron	Project Name: Bath Bog - Event 5
Company Address: Dept. of Geosciences - M59101, Akron, Ohio 44325-4101	Project Address: Bath Nature Preserve, Bath, Ohio
Client Phone No.: 330-972-5389	Report to
Client Fax No. — Please Fax Results ✓ ☐	PO#: 88326
Client Email: lds@uakron.edu — Please Email Results ✓ ☐	Quote No.
Contact Person: Dr. Ira Sasowsky	
Sampled by: Dr. Ira Sasowsky	Check if Ohio VAP samples ✓ ☐

Analytical Parameters and Methods (Please Check Analytical Box ✓)

#	Sample Identification	Date Collected	Time Collected	Grab	Composite	Matrix: S=Solid, L=Liquid, O=Oil, SL=Sludge, A=Air, DW=Drinking Water	Preservative	Number of Containers	Ca - EPA 200.7 or 6010B	Mg - "	Na - "	K - "	Total Alkalinity - SM 2320B	Cl - SM 4500 Cl-E	SO4 - ASTM D516092	Ammonium - USEPA 350.1	Charge Balance	
10	BNP-5C	6-9-16 → [illegible]	13:35 ~~13:50~~	X		L	See notes ~~below~~ and numbers above	3	X	X	X	X	X	X	X	X	X	
11	BNP-5B	↓	13:50 ~~13:35~~	↓		↓		↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	
	END OF SET																	

16060309-001-011sc

Relinquished by:	Date	Time	Received by:	Date	Time
D. D. M.	6/6/16	9 Am			
Received in lab by:	Date	Time	Rush Requested By: ____ Date	Must be approved by lab manager	
S. McGphee					

Notes/Comments:

See Page 1 notes

White and yellow pages should accompany samples to the laboratory. The client retains the pink page.

76745

DC-7
Rev. 15

02/16/16

Summit Environmental Technologies, Inc.
Cooler Receipt Form

Client: U of Akron

Initials of person inspecting cooler and samples: SC

Order Number:

Date Received: 6-6-16 Time Received: 0900 Date cooler(s) opened and samples inspected: 6-6

Number of Coolers/Boxes: 1 N/A

Shipper: FED EX UPS DHL Airborne US Postal Walk-in Pickup Other:

Packaging: Peanuts Bubble Wrap Paper Foam None Other:

Tape on cooler/box:	Y	N	N/A
Custody Seals intact	Y	N	N/A
C-O-C in plastic	Y	N	N/A
Ice_____ Blue ice _______	present / absent / melted		N/A
Sample Temperature IR Gun #16020459 CF 0.0 °C	2.9 °C		N/A
Radiological Testing Instrument serial #35127 (see page 2 for scan results)	Y	N	N/A

****Use 1 sheet per sample for Radiological Testing. If sample is HOT, the Radiological Safety Officer must be notified immediately.**

C-O-C filled out properly	Y	N	N/A
Samples in separate bags	Y	N	N/A
Sample containers intact*	Y	N	N/A

*If no, list broken sample(s):

Sample label(s) complete (ID, date, etc.)	Y	N	N/A
Label(s) agree with C-O-C	Y	N	N/A
Correct containers used	Y	N	N/A
Sufficient sample received	Y	N	N/A
Samples received within holding time	Y	N	
Bubbles absent from 40 mL vials**	Y	N	N/A

** Samples with bubbles <6mm are acceptable. Indicate bubble size if >6mm.

Was client contacted about samples	Y	N
Will client send new samples	Y	N

Client contact:

Date/Time:

Logged in by:

Comments:

Summit Environmental Technologies, Inc.
Sample Receipt

pH and Chlorine test on samples

pH strip SET (0-14)# WC-03-0919 pH strip (2.8-4.6) SET#OES-01-0250
Total DPD packet SET#OES-02-0239 Free DPD packet SET#OES-01-0290
Disp. Pipette SET# WC-03-0510

ID	Method	pH	Chlorine (±)	Comments
MH15x11	✓	2		
WH-Clem VII	|	6		
NH3x11	|	2		

Radiological scan on sample

ID	scan	CPM

P = Permanganate interference
504.1, 508, 515.1, 525.2, 547, 548.1, 549.1, 531.2, 1613 methods checked for **Total** chlorine
552.2 checked for **Free** chlorine
531.2 pH is checked for ~3.8 (SET# OES-01-0250)
524.2 = pH and Chlorine checked at bench and not log in department

Summit Environmental Technologies, Inc.
3310 Win St.
Cuyahoga Falls, Ohio 44223
TEL: (330) 253-8211 FAX: (330) 253-4489
Website: http://www.settek.com

October 30, 2015

Dr. Ira Sasowsky
University of Akron
Department of Geosciences- MS4101
Akron, OH 44325-4101
TEL: (330) 972-5389
FAX:

RE: Bath Bog - Event 4

Dear Dr. Ira Sasowsky:

Order No.: 15101803

Summit Environmental Technologies, Inc. received 10 sample(s) on 10/26/2015 for the analyses presented in the following report.

There were no problems with the analytical events associated with this report unless noted in the Case Narrative.

Quality control data is within laboratory defined or method specified acceptance limits except where noted.

If you have any questions regarding these tests results, please feel free to call the laboratory.

Sincerely,

Ana C. Slocum
Project Manager
3310 Win St.
Cuyahoga Falls, Ohio 44223

Summit Environmental Technologies, Inc.
3310 Win St.
Cuyahoga Falls, Ohio 44223
TEL: (330) 253-8211 FAX: (330) 253-4489
Website: http://www.settek.com

Case Narrative

WO#: **15101803**
Date: **10/30/2015**

CLIENT: University of Akron
Project: Bath Bog - Event 4

This report in its entirety consists of the documents listed below. All documents contain the Summit Environmental Technologies, Inc., Work Order Number assigned to this report.

Paginated Report including Cover Letter, Case Narrative, Analytical Results, Applicable Quality Control Summary Reports, and copies of the Chain of Custody Documents are supplied with this sample set.

Concentrations reported with a J-Flag in the Qualifier Field are values below the Limit of Quantitation (LOQ) but greater than the established Method Detection Limit (MDL).

Method numbers, unless specified as SM (Standard Methods) or ASTM, are EPA methods.

Estimated uncertainty values are available upon request.

Analysis performed by DBM, VRM, or SFG were performed at Summit Labs 2704 Eatonton Highway Haddock, GA 31033

All results for Solid Samples are reported on an "as received" or "wet weight" basis unless indicated as "dry weight" using the "-dry" designation on the reporting units.

Summit Environmental Technologies, Inc., holds the accreditations/certifications listed at the bottom of the cover letter that may or may not pertain to this report.

The information contained in this analytical report is the sole property of Summit Environmental Technologies, Inc. and that of the customer. It cannot be reproduced in any form without the consent of Summit Environmental Technologies, Inc. or the customer for which this report was issued. The results contained in this report are only representative of the samples received. Conditions can vary at different times and at different sampling conditions. Summit Environmental Technologies, Inc. is not responsible for use or interpretation of the data included herein.

This report is believed to meet all of the requirements of NELAC or the accrediting / certifying agency. Any comments or problems with the analytical events associated with this report are noted below.

Summit Environmental Technologies, In
3310 Win S
Cuyahoga Falls, Ohio 4422
TEL: (330) 253-8211 FAX: (330) 253-448
Website: http://www.settek.co

Qualifiers and Acronyms

WO#: **15101803**
Date: **10/30/2015**

These commonly used Qualifiers and Acronyms may or may not be present in this report.

Qualifiers

U	The compound was analyzed for but was not detected.
J	The reported value is greater than the Method Detection Limit but less than the Reporting Limit.
H	The hold time for sample preparation and/or analysis was exceeded.
D	The result is reported from a dilution.
E	The result exceeded the linear range of the calibration or is estimated due to interference.
MC	The result is below the Minimum Compound Limit.
*****	The result exceeds the Regulatory Limit or Maximum Contamination Limit.
m	Manual integration was used to determine the area response.
N	The result is presumptive based on a Mass Spectral library search assuming a 1:1 response.
P	The second column confirmation exceeded 25% difference.
C	The result has been confirmed by GC/MS.
X	The result was not confirmed when GC/MS Analysis was performed.
B/MB+	The analyte was detected in the associated blank.
G	The ICB or CCB contained reportable amounts of analyte.
QC-/+	The CCV recovery failed low (-) or high (+).
R/QDR	The RPD was outside of accepted recovery limits.
QL-/+	The LCS or LCSD recovery failed low (-) or high (+).
QLR	The LCS/LCSD RPD was outside of accepted recovery limits.
QM-/+	The MS or MSD recovery failed low (-) or high (+).
QMR	The MS/MSD RPD was outside of accepted recovery limits.
QV-/+	The ICV recovery failed low (-) or high (+).
S	The spike result was outside of accepted recovery limits.
Z	Deviation; A deviation from the method was performed; Please refer to the Case Narrative for additional information

Acronyms

ND	Not Detected	**RL**	Reporting Limit
QC	Quality Control	**MDL**	Method Detection Limit
MB	Method Blank	**LOD**	Level of Detection
LCS	Laboratory Control Sample	**LOQ**	Level of Quantitation
LCSD	Laboratory Control Sample Duplicate	**PQL**	Practical Quantitation Limit
QCS	Quality Control Sample	**CRQL**	Contract Required Quantitation Limit
DUP	Duplicate	**PL**	Permit Limit
MS	Matrix Spike	**RegLvl**	Regulatory Limit
MSD	Matrix Spike Duplicate	**MCL**	Maximum Contamination Limit
RPD	Relative Percent Different	**MinCL**	Minimum Compound Limit
ICV	Initial Calibration Verification	**RA**	Reanalysis
ICB	Initial Calibration Blank	**RE**	Reextraction
CCV	Continuing Calibration Verification	**TIC**	Tentatively Identified Compound
CCB	Continuing Calibration Blank	**RT**	Retention Time
RLC	Reporting Limit Check	**CF**	Calibration Factor
DF	Dilution Factor	**RF**	Response Factor

This list of Qualifiers and Acronyms reflects the most commonly utilized Qualifiers and Acronyms for reporting. Please refer to the Analytical Notes in the Case Narrative for any Qualifiers or Acronyms that do not appear in this list or for additional information regarding the use of these Qualifiers on reported data.

Summit Environmental Technologies, Inc.
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Workorder Sample Summary

WO#: **15101803**

30-Oct-15

CLIENT: University of Akron

Project: Bath Bog - Event 4

Lab SampleID	Client Sample ID	Tag No	Date Collected	Date Received	Matrix
15101803-001	BNP-6		10/24/2015 8:00:00 AM	10/26/2015 10:40:00 AM	Non-Potable Water
15101803-002	BNP- 7		10/24/2015 9:00:00 AM	10/26/2015 10:40:00 AM	Non-Potable Water
15101803-003	BNP-7A		10/24/2015 8:30:00 AM	10/26/2015 10:40:00 AM	Non-Potable Water
15101803-004	BNP-2A		10/24/2015 9:30:00 AM	10/26/2015 10:40:00 AM	Non-Potable Water
15101803-005	BNP-8A		10/24/2015 10:00:00 AM	10/26/2015 10:40:00 AM	Non-Potable Water
15101803-006	BNP-8		10/24/2015 10:15:00 AM	10/26/2015 10:40:00 AM	Non-Potable Water
15101803-007	BNP-1A		10/24/2015 10:45:00 AM	10/26/2015 10:40:00 AM	Non-Potable Water
15101803-008	BNP-5B		10/24/2015 11:10:00 AM	10/26/2015 10:40:00 AM	Non-Potable Water
15101803-009	BNP-5C		10/24/2015 11:25:00 AM	10/26/2015 10:40:00 AM	Non-Potable Water
15101803-010	BNP-9		10/24/2015 11:50:00 AM	10/26/2015 10:40:00 AM	Non-Potable Water

SUMMIT ENVIRONMENTAL TECHNOLOGIES, INC
Analytical Laboratories

Summit Environmental Technologies, Inc.
3310 Win St.
Cuyahoga Falls, Ohio 44223
TEL: (330) 253-8211 FAX: (330) 253-4489
Website: http://www.settek.com

WO#: **15101803**
Date Reported: **10/30/2015**
Company: University of Akron
Address: Department of Geosciences- MS4101
Akron OH 44325-4101
Received: 10/26/2015
Project#: Bath Bog - Event

Client ID#	Lab ID#	Collected	Analyte	Result	Units	Matrix	Method	DF	RL	Run	Analyst
BNP-6	001	10/24/2015	Calcium(Ca)	87.2	mg/L	Non-Potable Water	EPA 200.7	1	0.100	10/27/2015	VVK
BNP-6	001	10/24/2015	Magnesium(Mg)	32.9	mg/L	Non-Potable Water	EPA 200.7	1	0.0500	10/27/2015	VVK
BNP-6	001	10/24/2015	Potassium(K)	1.16	mg/L	Non-Potable Water	EPA 200.7	1	0.500	10/27/2015	VVK
BNP-6	001	10/24/2015	Sodium(Na)	4.85	mg/L	Non-Potable Water	EPA 200.7	1	2.00	10/27/2015	VVK
BNP-6	001	10/24/2015	Alkalinity, Total (As CaCO3)	252	mg/L	Non-Potable Water	SM 2320 B	1	10.0	10/27/2015	DHC
BNP-6	001	10/24/2015	Ammonia-N	ND	mg/L	Non-Potable Water	SM 4500-NH3-E	1	0.0500	10/28/2015	CXS
BNP-6	001	10/24/2015	Chloride	2.57	mg/L	Non-Potable Water	EPA 300.0	1	0.500	10/27/2015	RMT
BNP-6	001	10/24/2015	Sulfate	42.7	mg/L	Non-Potable Water	EPA 300.0	1	0.500	10/27/2015	RMT

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WO#: **15101803**
Date Reported: **10/30/2015**
Company: University of Akron
Address: Department of Geosciences- MS4101
Akron OH 44325-4101
Received: 10/26/2015
Project#: Bath Bog - Event

Client ID#	Lab ID#	Collected	Analyte	Result	Units	Matrix	Method	DF	RL	Run	Analyst
BNP- 7	002	10/24/2015	Calcium(Ca)	19.8	mg/L	Non-Potable Water	EPA 200.7	1	0.100	10/27/2015	VVK
BNP- 7	002	10/24/2015	Magnesium(Mg)	3.10	mg/L	Non-Potable Water	EPA 200.7	1	0.0500	10/27/2015	VVK
BNP- 7	002	10/24/2015	Potassium(K)	1.05	mg/L	Non-Potable Water	EPA 200.7	1	0.500	10/27/2015	VVK
BNP- 7	002	10/24/2015	Sodium(Na)	2.22	mg/L	Non-Potable Water	EPA 200.7	1	2.00	10/27/2015	VVK
BNP- 7	002	10/24/2015	Alkalinity, Total (As CaCO3)	154	mg/L	Non-Potable Water	SM 2320 B	1	10.0	10/27/2015	DHC
BNP- 7	002	10/24/2015	Ammonia-N	27.6	mg/L	Non-Potable Water	SM 4500-NH3-E	1	0.0500	10/28/2015	CXS
BNP- 7	002	10/24/2015	Chloride	4.42	mg/L	Non-Potable Water	EPA 300.0	1	0.500	10/27/2015	RMT
BNP- 7	002	10/24/2015	Sulfate	ND	mg/L	Non-Potable Water	EPA 300.0	1	0.500	10/27/2015	RMT

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Website: http://www.settek.com

WO#: **15101803**
Date Reported: **10/30/2015**
Company: University of Akron
Address: Department of Geosciences- MS4101
Akron OH 44325-4101
Received: 10/26/2015
Project#: Bath Bog - Event

Client ID#	Lab ID#	Collected	Analyte	Result	Units	Matrix	Method	DF	RL	Run	Analyst
BNP-7A	003	10/24/2015	Calcium(Ca)	17.3	mg/L	Non-Potable Water	EPA 200.7	1	0.100	10/27/2015	VVK
BNP-7A	003	10/24/2015	Magnesium(Mg)	3.98	mg/L	Non-Potable Water	EPA 200.7	1	0.0500	10/27/2015	VVK
BNP-7A	003	10/24/2015	Potassium(K)	1.34	mg/L	Non-Potable Water	EPA 200.7	1	0.500	10/27/2015	VVK
BNP-7A	003	10/24/2015	Sodium(Na)	2.87	mg/L	Non-Potable Water	EPA 200.7	1	2.00	10/27/2015	VVK
BNP-7A	003	10/24/2015	Alkalinity, Total (As CaCO3)	73.0	mg/L	Non-Potable Water	SM 2320 B	1	10.0	10/27/2015	DHC
BNP-7A	003	10/24/2015	Ammonia-N	4.07	mg/L	Non-Potable Water	SM 4500-NH3-E	1	0.0500	10/28/2015	CXS
BNP-7A	003	10/24/2015	Chloride	2.10	mg/L	Non-Potable Water	EPA 300.0	1	0.500	10/27/2015	RMT
BNP-7A	003	10/24/2015	Sulfate	ND	mg/L	Non-Potable Water	EPA 300.0	1	0.500	10/27/2015	RMT

SUMMIT ENVIRONMENTAL TECHNOLOGIES, INC
Analytical Laboratories

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TEL: (330) 253-8211 FAX: (330) 253-4489
Website: http://www.settek.com

WO#: **15101803**
Date Reported: **10/30/2015**
Company: University of Akron
Address: Department of Geosciences- MS4101
Akron OH 44325-4101
Received: 10/26/2015
Project#: Bath Bog - Event

Client ID#	Lab ID#	Collected	Analyte	Result	Units	Matrix	Method	DF	RL	Run	Analyst
BNP-2A	004	10/24/2015	Calcium(Ca)	110	mg/L	Non-Potable Water	EPA 200.7	1	0.100	10/27/2015	VVK
BNP-2A	004	10/24/2015	Magnesium(Mg)	27.7	mg/L	Non-Potable Water	EPA 200.7	1	0.0500	10/27/2015	VVK
BNP-2A	004	10/24/2015	Potassium(K)	2.51	mg/L	Non-Potable Water	EPA 200.7	1	0.500	10/27/2015	VVK
BNP-2A	004	10/24/2015	Sodium(Na)	8.09	mg/L	Non-Potable Water	EPA 200.7	1	2.00	10/27/2015	VVK
BNP-2A	004	10/24/2015	Alkalinity, Total (As CaCO3)	244	mg/L	Non-Potable Water	SM 2320 B	1	10.0	10/27/2015	DHC
BNP-2A	004	10/24/2015	Ammonia-N	0.223	mg/L	Non-Potable Water	SM 4500-NH3-E	1	0.0500	10/28/2015	CXS
BNP-2A	004	10/24/2015	Chloride	5.11	mg/L	Non-Potable Water	EPA 300.0	1	0.500	10/27/2015	RMT
BNP-2A	004	10/24/2015	Sulfate	246	mg/L	Non-Potable Water	EPA 300.0	10	5.00	10/27/2015	RMT

SUMMIT ENVIRONMENTAL TECHNOLOGIES, INC
Analytical Laboratories

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Date Reported: **10/30/2015**
Company: University of Akron
Address: Department of Geosciences- MS4101
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Received: 10/26/2015
Project#: Bath Bog - Event

Client ID#	Lab ID#	Collected	Analyte	Result	Units	Matrix	Method	DF	RL	Run	Analyst
BNP-8A	005	10/24/2015	Calcium(Ca)	42.3	mg/L	Non-Potable Water	EPA 200.7	1	0.100	10/27/2015	VVK
BNP-8A	005	10/24/2015	Magnesium(Mg)	8.27	mg/L	Non-Potable Water	EPA 200.7	1	0.0500	10/27/2015	VVK
BNP-8A	005	10/24/2015	Potassium(K)	0.778	mg/L	Non-Potable Water	EPA 200.7	1	0.500	10/27/2015	VVK
BNP-8A	005	10/24/2015	Sodium(Na)	12.2	mg/L	Non-Potable Water	EPA 200.7	1	2.00	10/27/2015	VVK
BNP-8A	005	10/24/2015	Alkalinity, Total (As CaCO3)	177	mg/L	Non-Potable Water	SM 2320 B	1	10.0	10/27/2015	DHC
BNP-8A	005	10/24/2015	Ammonia-N	3.36	mg/L	Non-Potable Water	SM 4500-NH3-E	1	0.0500	10/28/2015	CXS
BNP-8A	005	10/24/2015	Chloride	2.93	mg/L	Non-Potable Water	EPA 300.0	1	0.500	10/27/2015	RMT
BNP-8A	005	10/24/2015	Sulfate	ND	mg/L	Non-Potable Water	EPA 300.0	1	0.500	10/27/2015	RMT

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Date Reported:	**10/30/2015**
Company:	University of Akron
Address:	Department of Geosciences- MS4101 Akron OH 44325-4101
Received:	10/26/2015
Project#:	Bath Bog - Event

Client ID#	Lab ID#	Collected	Analyte	Result	Units	Matrix	Method	DF	RL	Run	Analyst
BNP-8	006	10/24/2015	Calcium(Ca)	31.3	mg/L	Non-Potable Water	EPA 200.7	1	0.100	10/27/2015	VVK
BNP-8	006	10/24/2015	Magnesium(Mg)	5.79	mg/L	Non-Potable Water	EPA 200.7	1	0.0500	10/27/2015	VVK
BNP-8	006	10/24/2015	Potassium(K)	0.678	mg/L	Non-Potable Water	EPA 200.7	1	0.500	10/27/2015	VVK
BNP-8	006	10/24/2015	Sodium(Na)	6.92	mg/L	Non-Potable Water	EPA 200.7	1	2.00	10/27/2015	VVK
BNP-8	006	10/24/2015	Alkalinity, Total (As CaCO3)	144	mg/L	Non-Potable Water	SM 2320 B	1	10.0	10/29/2015	DHC
BNP-8	006	10/24/2015	Ammonia-N	10.7	mg/L	Non-Potable Water	SM 4500-NH3-E	1	0.0500	10/28/2015	CXS
BNP-8	006	10/24/2015	Chloride	5.89	mg/L	Non-Potable Water	EPA 300.0	1	0.500	10/28/2015	RMT
BNP-8	006	10/24/2015	Sulfate	1.10	mg/L	Non-Potable Water	EPA 300.0	1	0.500	10/28/2015	RMT

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Company: University of Akron
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Received: 10/26/2015
Project#: Bath Bog - Event

Client ID#	Lab ID#	Collected	Analyte	Result	Units	Matrix	Method	DF	RL	Run	Analyst
BNP-1A	007	10/24/2015	Calcium(Ca)	210	mg/L	Non-Potable Water	EPA 200.7	1	0.100	10/27/2015	VVK
BNP-1A	007	10/24/2015	Magnesium(Mg)	100	mg/L	Non-Potable Water	EPA 200.7	1	0.0500	10/27/2015	VVK
BNP-1A	007	10/24/2015	Potassium(K)	7.00	mg/L	Non-Potable Water	EPA 200.7	1	0.500	10/27/2015	VVK
BNP-1A	007	10/24/2015	Sodium(Na)	14.0	mg/L	Non-Potable Water	EPA 200.7	1	2.00	10/27/2015	VVK
BNP-1A	007	10/24/2015	Alkalinity, Total (As CaCO3)	409	mg/L	Non-Potable Water	SM 2320 B	1	10.0	10/29/2015	DHC
BNP-1A	007	10/24/2015	Ammonia-N	0.0940	mg/L	Non-Potable Water	SM 4500-NH3-E	1	0.0500	10/28/2015	CXS
BNP-1A	007	10/24/2015	Chloride	5.32	mg/L	Non-Potable Water	EPA 300.0	1	0.500	10/28/2015	RMT
BNP-1A	007	10/24/2015	Sulfate	719	mg/L	Non-Potable Water	EPA 300.0	25	12.5	10/28/2015	RMT

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Received: 10/26/2015
Project#: Bath Bog - Event

Client ID#	Lab ID#	Collected	Analyte	Result	Units	Matrix	Method	DF	RL	Run	Analyst
BNP-5B	008	10/24/2015	Calcium(Ca)	104	mg/L	Non-Potable Water	EPA 200.7	1	0.100	10/27/2015	VVK
BNP-5B	008	10/24/2015	Magnesium(Mg)	20.5	mg/L	Non-Potable Water	EPA 200.7	1	0.0500	10/27/2015	VVK
BNP-5B	008	10/24/2015	Potassium(K)	4.22	mg/L	Non-Potable Water	EPA 200.7	1	0.500	10/27/2015	VVK
BNP-5B	008	10/24/2015	Sodium(Na)	8.48	mg/L	Non-Potable Water	EPA 200.7	1	2.00	10/27/2015	VVK
BNP-5B	008	10/24/2015	Alkalinity, Total (As CaCO3)	488	mg/L	Non-Potable Water	SM 2320 B	1	10.0	10/29/2015	DHC
BNP-5B	008	10/24/2015	Ammonia-N	18.8	mg/L	Non-Potable Water	SM 4500-NH3-E	1	0.0500	10/28/2015	CXS
BNP-5B	008	10/24/2015	Chloride	1.37	mg/L	Non-Potable Water	EPA 300.0	1	0.500	10/28/2015	RMT
BNP-5B	008	10/24/2015	Sulfate	2.86	mg/L	Non-Potable Water	EPA 300.0	1	0.500	10/28/2015	RMT

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Date Reported: **10/30/2015**
Company: University of Akron
Address: Department of Geosciences- MS4101
Akron OH 44325-4101
Received: 10/26/2015
Project#: Bath Bog - Event

Client ID#	Lab ID#	Collected	Analyte	Result	Units	Matrix	Method	DF	RL	Run	Analyst
BNP-5C	009	10/24/2015	Calcium(Ca)	60.1	mg/L	Non-Potable Water	EPA 200.7	1	0.100	10/27/2015	VVK
BNP-5C	009	10/24/2015	Magnesium(Mg)	9.54	mg/L	Non-Potable Water	EPA 200.7	1	0.0500	10/27/2015	VVK
BNP-5C	009	10/24/2015	Potassium(K)	1.38	mg/L	Non-Potable Water	EPA 200.7	1	0.500	10/27/2015	VVK
BNP-5C	009	10/24/2015	Sodium(Na)	3.45	mg/L	Non-Potable Water	EPA 200.7	1	2.00	10/27/2015	VVK
BNP-5C	009	10/24/2015	Alkalinity, Total (As CaCO3)	242	mg/L	Non-Potable Water	SM 2320 B	1	10.0	10/29/2015	DHC
BNP-5C	009	10/24/2015	Ammonia-N	11.1	mg/L	Non-Potable Water	SM 4500-NH3-E	1	0.0500	10/28/2015	CXS
BNP-5C	009	10/24/2015	Chloride	1.45	mg/L	Non-Potable Water	EPA 300.0	1	0.500	10/28/2015	RMT
BNP-5C	009	10/24/2015	Sulfate	ND	mg/L	Non-Potable Water	EPA 300.0	1	0.500	10/28/2015	RMT

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Date Reported: **10/30/2015**
Company: University of Akron
Address: Department of Geosciences- MS4101
Akron OH 44325-4101
Received: 10/26/2015
Project#: Bath Bog - Event

Client ID#	Lab ID#	Collected	Analyte	Result	Units	Matrix	Method	DF	RL	Run	Analyst
BNP-9	010	10/24/2015	Calcium(Ca)	26.2	mg/L	Non-Potable Water	EPA 200.7	1	0.100	10/27/2015	VVK
BNP-9	010	10/24/2015	Magnesium(Mg)	4.76	mg/L	Non-Potable Water	EPA 200.7	1	0.0500	10/27/2015	VVK
BNP-9	010	10/24/2015	Potassium(K)	0.780	mg/L	Non-Potable Water	EPA 200.7	1	0.500	10/27/2015	VVK
BNP-9	010	10/24/2015	Sodium(Na)	2.86	mg/L	Non-Potable Water	EPA 200.7	1	2.00	10/27/2015	VVK
BNP-9	010	10/24/2015	Alkalinity, Total (As CaCO3)	119	mg/L	Non-Potable Water	SM 2320 B	1	10.0	10/29/2015	DHC
BNP-9	010	10/24/2015	Ammonia-N	10.8	mg/L	Non-Potable Water	SM 4500-NH3-E	1	0.0500	10/28/2015	CXS
BNP-9	010	10/24/2015	Chloride	2.61	mg/L	Non-Potable Water	EPA 300.0	1	0.500	10/28/2015	RMT
BNP-9	010	10/24/2015	Sulfate	ND	mg/L	Non-Potable Water	EPA 300.0	1	0.500	10/28/2015	RMT

Summit Environmental Technologies, Inc.

3310 Win Street
Cuyahoga Falls, Ohio 44223 Tel: 330.253.8211 Fax: 330.253.4489

Analysis Request/Chain of Custody

For Summit Environmental Technologies, Inc. use only

Page 1 of 2. SET No.

Company Name (Please Print): University of Akron	Project Name: Bath Bog - Event 4
Company Address: Dept. of Geosciences - NS4101, Akron, OH 44325-4101	Project Address: Bath Nature Preserve, Bath, Ohio
Client Phone No.: 330-972-5389	Report to:
Client Fax No.: Please Fax Results ✓ ☐	PO#: 88326
Client Email: ids@uakron.edu Please Email Results ✓ ☒	Quote No.: per Mo
Contact Person: Dr. Ira Sasowsky	
Sampled by: Mezentseva/Sasowsky	Check if Ohio VAP samples ✓ ☐

Analytical Parameters and Methods (Please Check Analytical Box ✓)

#	Sample Identification	Date Collected	Time Collected	Grab	Composite	Matrix: S=Solid, L=Liquid, O=Oil SL=Sludge, A=Air, DW=Drinking Water	Preservative	Number of Containers	Ca - EPA 200.7 or 6010B (1)	Mg - "	Na - "	K - "	Total Alkalinity - SM 2320 B (2)	Cl - SM 4500 Cl - E	SO_4 - ASTM D516092	Ammonium - USEPA350.1 (3)		
N/A	Desired Detection Limits (mg/L)	n/a	n/a	X		L			0.1	.03	0.2	0.2	10	0.5	0.5	1.0		
1	BNP-6	10/24/15	8:00					3										
2	BNP-7		9:00															
3	BNP-7A		8:30															
4	BNP-2A		9:30															
5	BNP-8A		10:00															
6	BNP-8		10:15															
7	BNP-1A		10:45															
8	BNP-5B		11:10															
9	BNP-5C		11:25															

1510180З-
001-010SC

Relinquished by:	Date	Time	Received by:	Date	Time
Dr. D. Daly	10/26/15	10:40			
Received in lab by:	Date	Time	Rush Requested By: ______ Date	Must be approved by lab manager	
[illegible]	10/26/15	10:40			

Notes/Comments: (1) These were field-filtered and preserved with HNO_3. (2) Non-preserved, filtered. (3) Preserved with H_2SO_4, filtered. Please note desired detection limits in first row.

White and yellow pages should accompany samples to the laboratory. The client retains the pink page.

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Summit Environmental Technologies, Inc.
3310 Win Street
Cuyahoga Falls, Ohio 44223   Tel: 330.253.8211   Fax: 330.253.4489

Analysis Request/Chain of Custody

For Summit Environmental Technologies, Inc. use only
Page 2 of 2.   SET No.

Company Name (Please Print): University of Akron	Project Name: Bath Bog - Event 4
Company Address: Dept. of Geosciences MS4101 Akron, OH 44325-4101	Project Address: Bath Nature Preserve. Bath, Ohio
Client Phone No.: 330-972-5389	Report to
Client Fax No. Please Fax Results ✓ ☐	PO# 88324
Client Email: ids@uakron.edu Please Email Results ✓ ☐	Quote No. Per Mo
Contact Person: Dr. Ira Sasowsky	
Sampled by: Mezentseva / Sasowsky	Check if Ohio VAP samples ✓ ☐

Analytical Parameters and Methods (Please Check Analytical Box ✓)

#	Sample Identification	Date Collected	Time Collected	Grab	Composite	Matrix: S=Solid, L=Liquid, O=Oil SL=Sludge, A=Air, DW=Drinking Water	Preservative	Number of Containers	1 Ca-EPA 200.7 or 6010 B	Mg- "	Na- "	K- "	2 Total Alkalinity - SM 2320 B	Cl-SM 4500 Cl-E	SO4-ASTM D516092	3 Ammonium-USEPA 350.1		
~~N/A~~	~~Required Detection Limits (mg/L)~~			X		L		3	~~.1~~	~~.3~~	~~.2~~	~~.2~~	~~10~~	~~.5~~	~~.5~~	~~.10~~		
10	BNP-9	10/24/15	11:50					3	X	X	X	X	X	X	X	X		
–	– – – – END OF SET – –	–	– –				–	–	–	–	–	–	–	–	–	–	–	–

1570803-001 - 010 SC

Relinquished by:	Date	Time	Received by:	Date	Time
D. D. [illegible]	10/26/15	10:40			
Received in lab by:	Date	Time	Rush Requested By: ______ Date	Must be approved by lab manager	
[illegible signature]	10/26/15	10:40			

Notes/Comments:
SEE PAGE 1 NOTES
PLEASE NOTE REQ'D DETECT. LIMITS

White and yellow pages should accompany samples to the laboratory. The client retains the pink page.

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DC-7
Rev. 14

08/15/15

Summit Environmental Technologies, Inc.
Cooler Receipt Form

Client: University of Akron

Initials of person inspecting cooler and samples: F.C

Order Number:

Date Received: 10/26/15 Time Received: 10:40 AM Date cooler(s) opened and samples inspected: 10/26/15

Number of Coolers/Boxes: 1

N/A

Shipper: FED EX UPS DHL Airborne US Postal Walk-in Pickup Other:

Packaging: Peanuts Bubble Wrap Paper Foam None Other:

	Y	N	N/A
Tape on cooler/box:	Y	N	N/A
Custody Seals intact	Y	N	N/A
C-O-C in plastic	Y	N	N/A
Ice ✓ Blue ice ____	present / absent / melted		N/A
Sample Temperature IR Gun #16020459 CF 0.0 °C	2.1 °C		N/A
Radiological Testing Instrument serial #35127 (see page 2 for scan results)	Y	N	N/A

Use 1 sheet per sample for Radiological Testing. If sample is HOT, the Radiological Safety Officer must be notified Immediately.

	Y	N	N/A
C-O-C filled out properly	Y	N	N/A
Samples in separate bags	Y	N	N/A
Sample containers intact*	Y	N	N/A

*If no, list broken sample(s):

	Y	N	N/A
Sample label(s) complete (ID, date, etc.)	Y	N	N/A
Label(s) agree with C-O-C	Y	N	N/A
Correct containers used	Y	N	N/A
Sufficient sample received	Y	N	N/A
Samples received within holding time	Y	N	
Bubbles absent from 40 mL vials**	Y	N	N/A

** Samples with bubbles <6mm are acceptable. Indicate bubble size if >6mm.

	Y	N
Was client contacted about samples	Y	N
Will client send new samples	Y	N

Client contact:

Date/Time:

Logged in by:

Comments:

Summit Environmental Technologies, Inc.
Sample Receipt

pH and Chlorine test on samples

pH strip SET (0-14)# OES-01-0207 pH strip (2.8-4.6) SET#OES-01-0149
Total DPD packet SET#__________ Free DPD packet SET#__________
Disp. Pipette SET# WC-03-0510

ID	Method	pH	Chlorine (±)	Comments
BNP-6	METALS	<2		
"	WETCHEM	6		
"	NO3/NO2	<2		
BNP-7	METALS	<2		
"	WETCHEM	6		
"	NO3/NO2	<2		
BNP-7A	METALS	<2		
"	WET CHEM	6		
"	NO3/NO2	<2		
BNP-2A	METALS	<2		
"	WETCHEM	6		
"	NO3/NO2	<2		
BNP-8A	METALS	<2		
"	WETCHEM	6		
"	NO3/NO2	<2		
BNP-8	METALS	<2		
"	WETCHEM	6		
"	NO3/NO2	<2		
BNP-1A	METALS	<2		
"	WETCHEM	6		
"	NO3/NO2	<2		

Radiological scan on sample

ID	scan	CPM

P = Permanganate interference
504.1, 508, 515.1, 525.2, 547, 548.1, 549.1, 531.2, 1613 methods checked for **Total** chlorine
552.2 checked for **Free** chlorine
531.2 pH is checked for ~3.8 (SET# OES-01-0149)
524.2 = pH and Chlorine checked at bench and not log in department

Summit Environmental Technologies, Inc.
Sample Receipt

pH and Chlorine test on samples

pH strip SET (0-14)# OES-01-0207 pH strip (2.8-4.6) SET#OES-01-0149
Total DPD packet SET#_________ Free DPD packet SET#__________
Disp. Pipette SET# WC-03-0510

ID	Method	pH	Chlorine (±)	Comments
BNP-5B	METALS	<2		
"	WETCHEM	6		
"	NO_3/NO_2	<2		
BNP-5C	METALS	<2		
"	WETCHEM	6		
"	NO_3/NO_2	<2		
BNP-9	METALS	<2		
"	WETCHEM	6		
"	NO_3/NO_2	<2		

Radiological scan on sample

ID	scan	CPM

P = Permanganate interference
504.1, 508, 515.1, 525.2, 547, 548.1, 549.1, 531.2, 1613 methods checked for **Total** chlorine
552.2 checked for **Free** chlorine
531.2 pH is checked for ~3.8 (SET# OES-01-0149)
524.2 = pH and Chlorine checked at bench and not log in department

Plot S1 (Enhancement) Repeat photos

2013

Summer 2013- Looking South. from NW corner

2013 Plot S1- IMG_2034.jpg

2014

2014: S1 NE Corner looking south west to SW Corner

2015

2015: Plot s1 from north photo dsc3952

2015: Plot S1 IMG_5467 (action shots before and after)

2015: Plot S1 from south DSC_3953

2015: Plot S1 from SE: DSC_3992

2016

Plot 2016 Plot S1 from SE DSC_25233

2016 Plot S1 from NE DSC_5328

Plot S2 (Edge) Repeat Photos

2013

2013 Plot S2 DSCN 2062

2014: S2 NE Corner to SW Corner

2014

2014 Plot S2 from NE. IMG_2100.JPG

2015: Plot S2 from NorthEast

2016

2016 Plot S2 from SE DSC_5241

2016 Plot S2 (looking SW from NE corner). DSC_5242

2016 Plot S2 from NE DSC_5243

2016 Plot S2 looking SE from NW DSC_5244

2016 Plot S2 looking SE from NE?. Note girdling frill on red maple.   DSC_5245

2016 Plot S2 From NW corner DSC_5246

2016 Plot S2. From SW to north. DSC 5247

Plot S3 (Core) Repeat Photos.

2013

2013 Plot S3 img_2107.jpg

2013 Plot S img_2109.jpg

2014

2014: S3 NE Corner to SW Corner

2015: Probably Plot S3 from north DSC_3970

2015: Core plot - S3 or S5 DSC3974

2015: Plot S3 (?) (CHECK DATES AND TIMES) IMG_5443

2015: Plot S3 (?) IMG_5442

2015: Probably Plot S3 from north DSC_3970

2016

2016 Plot S3 from SE DSC_5198

2016 Plot S3 from SW DSC_5199

2016 plot S3 from NW DSC 5271

2016 plot s3 from NW DSC 5272

2016 Plot S2 from NE DSC 5273

Plot s4 (Enhancement) Repeat Photos

2013

Plot S4 img2113.jpg

Plot S4 Img2119.jpg

2013 plot S4 img_5762.jpg

2013 Plot S4 img_5761.jpg

2014

2014 Photo: S4 NE Corner to SW Corner

2015: Plot s4 dsc_3955

2014 Plot S4 DSCN6736

2014 Plot S4 DSCB6737

2015

2015: Plot S4 DSC_3956

2016

2016. Plot S4 SE DSC 5225 (several other photos not included here)

2016 Plot S4 from   DSC_5228

2016 Plot S4 from NW DSC 5230

Plot S5 (Core) Repeat Photos

2013

2013 Plot S5 South. Img_2122.jpg

2014

2014 Plot S5 “VIBI S5 NE Corner to NW Corner short side.jpg”

2014 Plot S5 “”VIBI S5 NE Corner to SW Corner.jpg”

2015

2015: S5 NE Corner to SW Corner

2015: Core bog plot from north - probably S5? DSC_3976 (& 75, & perhaps 74)

NE Plot stake - S5? on mat DSC_4010

2015: View of plot s5(?) from NE DSC_4011

2015 Plot S5 IMG_5445 (and actions shots through img_5449)

2016

2016 Plot S5 from NW DSC_5257

2016 plot S5 from NE DSC_5259

2016 plot S5 from SW (probably). DSC_5257

2016 plot S5 DSC_5258

2016 plot S5 from SW DSC 5267

2016 plot S5 from SW DSC 5268

2016 plot S5 DSC 5269

2016 plot S5 DSC 5270

2016 plot S5 fromNW DSC 5256

2016 plot S5 fromNW (?) DSC 5257

Plot S6 (Edge) Repeat Photos

2013: no formal photo

2014

2014 Plot S6 DSCN6746jpg

2014 plot S6 DSCN6747.jpg

2014: Kate wellert checking stakes on eastern side (Plot 6?) IMG_3161

2014: perhaps Plot S6 IMG_4134

2015

2015: Plot S6 DSC_4049

2015: Plot S6 DSC_4050

2016

2016 Plot S6 from NE   DSC_5200

2016 – Plot S6 from NW DSC_5201

2016 Plot S6 SW DSC_5209

2016 Plot S2 DSC 5210

2016 Plot S6 SW DSC_5211

Plot S7 (Enhancement) Repeat Photos

2013: no formal photo

2014

2014 Plot S7 DSCN6740.jpg

Plot 7 DSCN 6741.jpg

2014: Probably plot 7 – img_4123.jpg

2015

2015: Plot S7 DSC_4057

2015: Plot S7 DSC_4058

2015: Plot S7 DSC_4059

2015: Plot S7 (from north) DSC_4060

2016

2016 - Plot S7 From NE DSC_5205

2016 Plot s7 DSC 5206

2016 - Plot S7 From SW DSC_5207

2016 - Plot S7 From SE DSC_5208

Plot S8 (Core) Repeat Photos

2013- no formal photo

2014

2014: S8 NE Corner to SW Corner

2015

2015: Plot S8 NE: DSC_4015

2015: Plot S8 from NEn

2015: see also IMG_5340, 5341

2015: Plot S8NE IMG_5342

2015: Plot S8NE   IMG_5343

2015: Plot S8NE IMG_5344:

2016

2016- Plot S8 from NW DSC 5261

2016 Plot s8 DSC 5262

2016 Plot S8 from NE DSC 5262

206 Plot S8 from SW DSC 5264

206 Plot S8 from SW DSC 5265

206 Plot S8 from SW DSC 526

Plot S9 (Edge) Repeat Photos

2013:

2013 near plot s9 (east end looking east) img 1477.jpg

2014:

2014 near plot S9 img3346.jpg

2015

2015: View of plot S9 from NW. Tony Miller in Plot 9. DSC_4044, and see also 4045

2016

2016 Plot S9 from NW DSC)_5213 (and some other photos not pasted here)

2016 Plot S9 from NW(?) DSC)_5215

2016. Plot S9 From SE DSC_5216

2016. Plot S9 From SE DSC_5218

Plot S10 (Edge) Repeat Photos

2013

2013- near plot S10- Img_1475

2013 Near Plot s10 img_1478

2013 Near Plot s10 img_1479

2014

2014: S10 NE Corner to SW Corner

2015: Plot S10 DSC_4027

2015: View from Plot S10 NW

2015: View from Plot S10 SW DSC_4029

2016: Plot 10 from NE DSC_5195 (there are several other photos not pasted here)

2016 - Plot S10 from NW DSC_5197

Plot S11 (Enhancement) Repeat Photos

2013
2013 Plot S11 IMG_2182.jpg

2014

2014: S11 NE Corner to SW Corner

2015

2015: View of Plot 11 from sw DSC_3943

2015: View of Plot 11 from SE- DSC3947

2015: Plot S11 IMG_5451 (with action and habitat shots on 5440 through ~5460)

2016 Plot S11 Se DSC_5250

2016 - Plot S11 NW DSC_5253 (several other photos of this plot available)

Transect photos T1

2013

2013 T1 looking into bog (north) at T1 origin. IMG_2146.jpg

2014

2014 T1 FACING NE.jpg

2014- Plot T1-" Transect 1 to Bog from Upland Post.jpg"

2014 Plot T1 – “Transect 1 into Bog from Bog Post.JPG” north into bog at origin

2015

2015 T1FACING NE

2016

2016 T1FACING NE

Transect photos T2

2013

2013 IMG_2388- t2 origin looking in

2014

2014 T2 FACING NE.jpg

2015

2015 T2 FACING NE

2016- Plot T2 DSC_5280

2016

2016 T2 FACING NE

Plot T3 repeat Photos

2013

2013 T3 looking in from wetland stake IMG_2453.jpg

2014

2014 T3 Facing nw.jpg

2014 during spring flood T3 at bog side IMG_3132.jpg

2015

2015 T3 FACING NW.jpg

2016

2016 T3 Facing NW

2016- Plot T3 repeat Photos DSC_5223

Plot s4 (Enhancement) Repeat Photos

2013

Plot S4 img2113.jpg

Plot S4 Img2119.jpg

2013 plot S4 img_5762.jpg

2013 Plot S4 img_5761.jpg

2014

2014 Photo: S4 NE Corner to SW Corner

2015: Plot s4 dsc_3955

2014 Plot S4 DSCN6736

2014 Plot S4 DSCB6737

2015

2015: Plot S4 DSC_3956

2016

2016. Plot S4 SE DSC 5225 (several other photos not included here)

2016 Plot S4 from DSC_5228

2016 Plot S4 from NW DSC 5230

T5 transect photos

2013

2013 T5 origin looking in IMG_2416.jpg

2014

2014 T65 FACING SW.jpg

2015

2015 T5 FACING SW.JPG

2016

2016 T5B FACING SW.JPG

2016 Plot T5 from inside DSC_5240

Transect 6 photos

2013

2013 Inside looking in IMG_2426.jpg

2014

2014 T6 FACING SE.JPG

2015

2015 T6 FACING SE.jpg

20156

2016 T6 FACING SE.jpg

2016 Plot T6 from dsc_5249,

2016- DSC_5248 February

Transect T7 photos

2013

2013 inside looking in T7 IMG_2485.jpg

2014

2014 T7 FACING SE.jpg

2015

2015 T7 FACING SE.JPG (was the plot moved in 10m this year?)

2016

2016 T7 FACTING SE.JPG

2016 Repeat photos of site T7 (from inside; DSC_5203)

2016 Repeat photos of site T7 (from inside; DSC_5204) looking out

Repeat Photos plot T8

2013

2013 T8 looking out from wetland tag G22 IMG_2468.jpg

2014

2014 T8 Facing SE.jpg

2014 T8 Facing SW.jpg

2015

2015 T8 FACING SE.JPG

2016

2016 T8 FACING SE.JPG

2016 Plot T8 from inside. DSC_52212

2016Plot T8 Repeat photos from inside DSC_5279