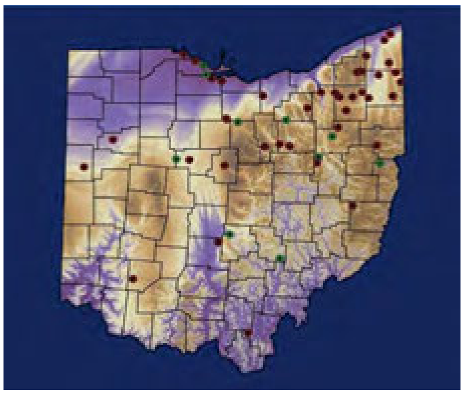
Intensification of the National Wetland Condition Assessment for Ohio: Final Report



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Introduction

According to previous estimates, Ohio has lost approximately 90 percent of its original, pre-settlement wetland habitat (Dahl, 1990). The purpose of this study was to establish the current ecological condition of the remaining wetlands, using a variety of assessment techniques. A randomly selected sample of 50 wetlands were studied between 2011 and 2014 to generate the data necessary to create a statistically valid scorecard of Ohio's wetland condition. This intensification study represents the initial attempt to perform a statewide analysis of ecological condition and will represent a baseline for future temporal studies of this valuable and diminishing resource. The primary objectives of this study are as follows:

1) Generate scorecards of wetland condition based on detailed field assessments of 50 randomly selected wetlands located throughout the state.

2) Compare and contrast results produced using Ohio's Level 1, Level 2 and Level 3 wetland assessment methodology with results generated using protocols developed for the 2011 National Wetland Condition Assessment (NWCA).

3) Based on field experience obtained from 2011 to 2014, identify strengths and weaknesses of NWCA field methodology that could be used to help streamline the monitoring protocols for future state and national wetland condition assessments.

4) Develop a plan to consistently repeat this statewide analysis on a regular schedule to illustrate long-term trends in both wetland quantity and quality in Ohio.

Ohio's Historic and Current Wetland Resources

Dahl's 1990 report "Wetland Losses in the United States: 1780's to 1980's" identifies Ohio and California as the two states with the highest percent loss of original wetland habitat (90 percent and 91 percent, respectively). Current high resolution GIS data now exists that allows us to verify the accuracy of the previous estimate for Ohio. Using Natural Resource Conservation Service (NRCS) Soil Survey Geographic database (SSURGO) data (NRCS, various dates), all areas of the state consisting of mapped hydric soil can be identified. It is inferred that these areas of predominantly hydric soils developed under standing water conditions, and therefore, are an accurate estimate of historic wetland extent in the state. Figure 1 shows all areas of SSURGO mapped hydric soils in Ohio. Multiplying the percent hydric component of each mapped soil polygon by its area and summing these values statewide, produces an overall estimate of original wetland area for Ohio of 5,344,742 acres, which is remarkably similar to the 5,000,000 acre estimate from Dahl's 1990 publication. Virtually all of this wetland habitat occurred within the glaciated area of Ohio. Additionally, a majority of the original wetland acreage was located in an area of northwest Ohio referred to as the "Great Black Swamp". This enormous wetland complex represented approximately 60 percent of Ohio's pre-settlement wetlands (~3,000,000 acres), and has been almost completely converted into productive agricultural land. This conversion occurred within a fairly brief period of time around the time of the Civil War and was accomplished through an elaborately engineered series of surface ditches.

In 2006, Ohio initiated a project to capture high resolution aerial photography for each county in the state. One of the ancillary projects of this Ohio Statewide Imagery Program (OSIP) was the development of an updated layer of National Wetland Inventory (NWI) wetlands based on photo interpretation of these detailed remotely-sensed datasets (OSIP, 2006-2007). The updated NWI was completed and made available to the public in 2010 (U.S. Fish and Wildlife, 2010). This data layer was the primary resource used to estimate current wetland extent in Ohio. Many of the polygons included in the NWI dataset are open water farm ponds which would not meet the necessary criteria to be considered a wetland, based on the Army Corps of Engineers delineation procedures. Therefore, for this analysis, only polygons mapped as aquatic bed, emergent, scrub-shrub or forested wetlands were included. Figure 2 is a map of Ohio illustrating the remaining wetland resources based on the mapped NWI wetlands. A total of 134,736 NWI polygons are included in this GIS layer. Summing the entire area yields an estimate of 507,057 acres of existing wetland habitat. This represents a loss of 90.5 percent of Ohio's original wetlands, which is very similar to the estimate included in Dahl's publication. Given the errors inherent in any GIS layer, these figures should be considered to be rough estimates, but are consistent with previous statewide estimates of historic wetland losses in Ohio.

This analysis also illustrated a stark geographic disparity in the distribution of the remaining wetland resources in Ohio. Approximately 29 percent of the remaining mapped NWI area is located in a small, four county area of northeast Ohio (Ashtabula, Geauga, Portage and Trumbull). Additionally, only 1,323 of the NWI wetlands (about one percent of total NWI polygons) are 50 acres or larger, and 39.8 percent of these large wetlands are relegated to this same four county area (Figure 3). For mapped NWI wetlands considered to be very large (500 acres+), this unequal distribution was even more evident, as approximately 70 percent of these very large wetlands occur in the same small area of northeast Ohio (Figure 4). Given the overall precarious state of wetlands in the state, it is our recommendation that private and public funding programs focused on the preservation of water resources should place much greater emphasis on protecting and expanding these remaining large wetlands located in and around this four county area of Ohio.

Assessment of Ecological Condition of Ohio's Extant Wetlands

Site Selection

Ohio had a total of 11 wetlands that were included as part of the NWCA, so the intensification study required an additional 39 wetlands be included. In order to select these additional sites, a more robust sample draw was needed to account for the many selections that had to be eliminated from the dataset for a variety of reasons, including mapping errors, sites that did not meet the requirements of the target class, and landowner resistance. Ohio EPA provided U.S. EPA Office of Research and Development with a complete set of updated NWI polygons that had been generated by Ducks Unlimited using 2006-2007 high resolution aerial photography. A total of 600 sites were included in the sample draw (50 base sites and 550 oversample sites). The NWCA site selection methodology (U.S. EPA, 2011) was used to select the 50 wetlands that were included in this intensification study (Figure 5).

Assessment Methods

The Ohio EPA Wetland Ecology Group (WEG) has developed a number of level 1, 2 and 3 wetland assessment methods for use within the section 401 certification and isolated wetland permit programs within the state. These include the Ohio Rapid Assessment Method for Wetlands (ORAM) and the Vegetation Index of Biotic Integrity (VIBI), both of which were conducted on each of the 50 wetlands in this study. ORAM is a Level 2, or "rapid" assessment of a wetland's overall condition, and the VIBI is a detailed, Level 3 assessment of the wetland plant community. The WEG has recently developed a simplified vegetation analysis which only requires the calculation of two metrics. This new assessment is referred to as the "VIBI-Floristic Quality" or "VIBI-FQ," which was calculated for each of the wetlands sampled. Additional information on hydrology, soils, vegetation and surrounding buffer was also collected as part of the standard NWCA protocols that was conducted for each wetland included in the Ohio intensification project (U.S. EPA, 2011). A brief description of each Ohio assessment is included below.

1) **ORAM** – A rapid assessment which requires an evaluation of the entire wetland, and generally takes approximately one to two hours to conduct for most Ohio wetlands. Several metrics are included, and these focus on various aspects of a wetland's ecological condition (e.g., buffer integrity, surrounding land use intensity, plant community quality, hydrology/substrate/habitat "intactness"). The final score can range from zero to 100, with very low scores being indicative of degraded or poor quality wetlands and very high scores generally reserved for reference condition, undisturbed wetlands (Mack, 2001).

2) **VIBI** –A detailed assessment of the plant community. All plants overhanging the five 10 meter x 10 meter NWCA vegetation plots were identified and assigned a cover value. All woody stems rooted within each plot that were taller than one meter in height were placed into the appropriate stem size class based on diameter at breast height (DBH) measurements and tallied for each plot. For emergent wetlands, all herbaceous vegetation within 0.1 meter x 0.1 meter quadrats located at opposite corners of each of the five vegetation plots was collected for later biomass measurements. The non-woody vegetation was clipped at ground level, placed in paper bags, dried in an oven at 150 degrees Fahrenheit for 24 hours and weighed to record a g/m^2 biomass measurement. These field data were condensed into a series of 10 metrics, each worth a maximum of 10 points, which were summed to generate a final VIBI score of zero to 100. A detailed description of the VIBI field procedures and metric scoring can be found in the latest version of the field manual (Mack, 2007).

3) **"VIBI-FQ"** – A new, simplified vegetation assessment that calculates a score between zero and 100 based on two equally-weighted metrics: "diversity" and "dominance" (Gara, 2012; Gara and Stapanian, 2015).

- Diversity is a standard Floristic Quality Assessment Index (FQAI) calculation for the vegetation plot data (Andreas, et. al., 2004). The coefficient of conservatism (C of C) scores for each species recorded is summed and divided by the square root of the total number of species identified. Previous studies of natural wetlands in Ohio have indicated that these FQAI calculations for most sites range between 10 (low diversity) and 30 (high diversity). The diversity metric score is scaled proportionally between these values, with all FQAI scores of 10 and below receiving zero metric points, and FQAI scores of 30 and above receiving the maximum metric score of 50.

- The dominance metric is calculated by multiplying the relative cover values for each species by its C of C score and summing these values for all recorded species. This produces a "weighted C of C" score for each site, which ranges between zero (tolerant with little habitat specificity) and 10 (sensitive with extreme habitat sensitivity). In Ohio, species with C of C values above six are considered "sensitive" and are indicative of stable, end-point ecosystems. Therefore, the dominance metric is scaled proportionally between zero (zero metric points) and six plus (50 metric points).

In addition to generating a VIBI-FQ score for each of the 50 Ohio wetlands included in this intensification study, raw field vegetation data was obtained for all wetlands included in the NWCA study nationwide, and a VIBI-FQ was calculated. This allowed for a robust comparison of Ohio's methodology with that of the NWCA vegetation assessment, using this very large dataset of wetlands.

4) **Vegetation Multi-Metric Index (VMMI) –** As part of the nationwide survey of wetlands (NWCA), U.S. EPA developed a vegetation assessment that consisted of four separate metrics:

   - **Floristic Quality Assessment Index**
   - **Total Number of Tolerant (C of C values four or less) Species**
   - **Relative Cover of Native Monocots**
   - **Importance Value of Native Species**

   Detailed information regarding the specific calculations for each of these metrics can be found in the 2011 NWCA technical report (U.S. EPA, 2015B). Once the four metrics were scored from zero to 10, they were summed, divided by 40, and then multiplied by 100 to create a total VMMI score for each Ohio intensification wetland ranging between zero and 100.

5) **Bryophyte Assessment** – The WEG is exploring the utility of this taxonomic group as a potential Level 3 measure of ecological condition. During each wetland field visit for this intensification study, the five vegetation plots were carefully evaluated by an Ohio EPA bryologist, with collections made of all unique species, and information on microhabitat and areal cover recorded for each collection. Field specimens were later identified to the lowest taxonomic level

at the Ohio EPA Groveport Field Office. The following bryophyte metrics have been calculated for comparison with other field assessments made within these wetlands:

- Moss Quality Assessment Index (Moss QAI) - Each moss species included in the Ohio moss flora has been assigned a C of C value (Andreas, et. al., 2004). The Moss QAI is analogous to the standard vascular plant FQAI calculation, in with the C of C scores for each moss species is summed and divided by the square root of the total number of moss species identified.

- Bryophyte Quality Assessment Index (Bryophyte QAI) – Similar to the Moss QAI, but includes recently-established draft C of C assignments for liverwort species found in this study, as well (Andreas and Lucas, personal communication, 2015).

- Number of Bryophyte Species – A simple summation of all bryophyte species identified within the wetland's five vegetation plots.

- Number of Bryophyte Genera – A simple summation of all bryophyte genera identified within the wetland's five vegetation plots.

6) **Water Chemistry –** All wetlands in this study, that contained standing water areas having depths 15 cm or greater, had water samples collected in one liter cubitainers, using the NWCA field methodology. For the Ohio sites that were included in the NWCA study, samples were processed by a U.S. EPA laboratory. Water samples collected from the remaining Ohio intensification wetlands were processed by the Ohio EPA Division of Environmental Services laboratory, located in Reynoldsburg, Ohio.

7) **Soils Assessment –** Standard NWCA soil sampling protocols were used for all Ohio sites to be included in the 2011 national survey. Four soil pits were dug as per the NWCA Field Operations Manual (U.S. EPA, 2011) with the pit identified as being the most representative of the wetland used for the detailed soil characterization and collection of soils for laboratory analysis. These protocols were modified slightly for the additional 39 intensification wetlands. Instead of automatically digging four soil pits, the Ohio EPA soil scientist performed a transect analysis using a soil probe along the assessment area (AA) axis lines to identify the most representative location. Once this was completed, the standard soil pit was constructed and NWCA field protocols for soil characterization and sample collection were followed. For wetlands having standing water throughout the AA on the day of the site visit, a King sampler was used to collect a soil profile that was evaluated the next day at our Groveport Field Office using modified NWCA sampling protocols. This allowed us to capture soil chemistry and structural data for each of the 50 intensification sites.

8) **Buffer Assessment** – NWCA field protocols were used for each of the 50 wetlands included in this study. This proved to be an extremely time-consuming and labor intensive activity for a majority of the wetlands, involving three to four field staff and several hours to conduct as prescribed by the NWCA Field Operations Manual. As an alternative, the WEG has evaluated

several GIS layers to estimate land use intensity, and then compared these parameters with the Ohio Level 2 and Level 3 field assessments that were conducted. We also compared the buffer metrics from the national study to the Ohio buffer methodology for the entire NWCA dataset to evaluate the utility of using a more cost-effective GIS procedure in lieu of laborious field analysis of the surrounding landscape. For the Ohio NWCA intensification study, each wetland AA was buffered using standard ArcGIS desktop 10.0 tools to create four separate buffer zones (ESRI, 2011):

- from the edge of the AA to 100 meters (equivalent to the buffer assessed during the field visit to each wetland);
- from 100 meters to 350 meters;
- from 350 to 1000 meters; and
- from 1000 to 2000 meters.

These buffer zones were then compared to the 2011 National Land Cover Dataset GIS to calculate the number of 30 meter x 30 meter pixels of each land use type that fell within each layer (Fry, et. al, 2011). These values were then multiplied with a landscape development intensity index (LDI) value that has been associated with each land use type for Ohio (Brown and Vivas, 2003; Gara, et. al, 2013). A mean LDI score could then be assigned to the four buffer zones surrounding each assessment area as a predictor of the level of landscape intensity potentially affecting these wetlands. Additionally, the four buffer zones were also compared to a historic land use layer derived from USGS hard copy land use maps produced in the 1970s and 1980s by USGS (Price, et. al, 2006).

A buffer stress assessment comparison was also run for the entire draft NWCA dataset by generating a total of four separate buffer zone LDI scores from 2011 NLCD data. These results were then compared with stressor scores established from the buffer and hydrology field data sheets, as well as VMMI and VIBI-FQ scores for this large dataset.

Results and Discussion

The Ohio NWCA study represented a critical first step towards assessing the ecological condition of the remaining wetlands resources in the state. It proved to be a very large undertaking, as we were building on the 2011 U.S. EPA NWCA study. In addition to the field protocols associated with that study, we also needed to complete data collection for Ohio assessments (ORAM, VIBI and VIBI-FQ). Another large addition to our intensification study was the inclusion of a bryophyte survey performed on the vegetation plots at each of these 50 wetlands, which required a significant amount of field time by our bryologist. Because of the enormous amount of data collected for various aspects of each wetland, these surveys frequently required the participation of seven to eight field researchers, including interns, and several hours to conduct, in sometimes extremely difficult conditions. Therefore, the individual surveys were spread out over the course of four growing seasons (2011-2014). Appendix I consists of site maps for each of the 50 wetlands included in the intensification study.

Completed assessments (ORAM, VIBI, VIBI-FQ, VMMI), buffer zone (inner and outer) LDI calculations, as well as bryophyte work and the soils analysis have all been completed. Additionally, comparisons of the Ohio assessments with those generated as part of the U.S. EPA national wetland survey (e.g., VMMI and buffer stressors) have also been conducted with the draft release of NWCA data for 967 wetlands located throughout the United States (U.S. EPA, 2015A and 2015B).

Wetland Vegetation

A total of 32 emergent, 13 forested and five shrub wetlands were assessed for this study. One of the most important aspects of this research was the extensive evaluation of the five vegetation plots in order to characterize the plant community at each wetland. A total of 427 plant species were recorded during the course of these surveys (Appendix II). The most frequently encountered species are as follows:

- False Nettle (*Boehmeria cylindrica*) - 31 sites
- Green Ash (*Fraxinus pennsylvanica*) - 31 sites
- Reed Canary Grass (*Phalaris arundinacea*) - 30 sites
- American Elm (*Ulmus americana*) - 28 sites
- Poison Ivy (*Toxicodendron radicans*) - 27 sites
- Jewelweed (*Impatiens capensis*) - 26 sites
- Virginia Creeper (*Parthenocissus quinquefolia*) - 23 sites
- Silky Dogwood (*Cornus amomum*) - 23 sites
- Rice Cut Grass (*Leersia oryzoides*) - 22 sites
- Blunt Broom Sedge (*Carex tribuloides*) - 21 sites
- Arrow-leaved Tearthumb (*Polygonum sagittatum*) - 21 sites
- Sensitive Fern (*Onoclea sensibilis*) - 21 sites
- Common Duckweed (*Lemna minor*) - 21 sites

Surprisingly, the only invasive species on this list of the most common plants is Reed Canary Grass (*Phalaris arundinacea*). Unfortunately, several wetlands we surveyed had an abundance of this extremely tolerant species, which is generally considered to be an undesirable component of the flora, and highly adapted to human disturbance. When all plant cover data was combined for the 50 wetlands, Reed Canary Grass represented almost 11 percent of all plant material present in these vegetation plots, which was more than double the relative cover value of the next most dominant species we encountered – Common Duckweed (*Lemna minor*) at five percent. Our observation was that increasing abundance of Reed Canary Grass was typically associated with high levels of nutrient-laden agricultural sediment deposition in the wetland.

Comparison of Ohio Assessment Methods: VIBI, VIBI-FQ and ORAM

Table 1 summarizes the findings of all Level 2 and Level 3 assessments conducted on these 50 intensification study wetlands. One of the strengths of the Ohio EPA Wetland Ecology program is the consistent results that have been generated by the various wetland assessments conducted on sites in our natural wetland reference database. ORAM has always shown to be highly correlated with results derived from the more detailed biological monitoring approaches such as VIBI. This intensification study provides an excellent opportunity to further evaluate these statistical relationships on a random selection of wetlands in Ohio.

Figure 6 compares VIBI and ORAM results for all 50 wetlands included in the Ohio intensification. As has been illustrated in past comparisons, these results are strongly statistically correlated, strengthening the premise that the Ohio Level 2 and Level 3 tools typically provide a consistent answer when determining the ecological condition of wetlands. The intensification wetland study also allows us to compare results from our recently developed, simplified vegetation analysis ("VIBI-FQ") with results from both ORAM and VIBI to verify that this procedure also provides results consistent with those approaches. This is critical to incorporating this new procedure into our suite of tools applicable to monitoring wetland mitigation sites developed through the Ohio 401 certification and isolated wetland permit programs.

Figure 7 shows the comparison between VIBI-FQ and ORAM for the 50 intensification study wetlands and Figure 8 compares VIBI-FQ results with those of VIBI for the same set of wetlands. In each of these graphs, VIBI-FQ is highly correlated to both the Level 2 (ORAM) and Level 3 (VIBI) assessments that have been part of the Ohio EPA wetland regulatory program for more than 10 years. Due to the potential cost savings associated with the simpler to conduct, calculate and interpret VIBI-FQ, Ohio EPA has been considering making this new tool a preferred assessment technique for monitoring certain wetland restoration projects. The results from this intensification study support the contention that the VIBI-FQ provides information on ecological condition that is consistent with our "tried and true" wetland assessment methodologies.

Comparison of Ohio Assessment Methods with the VMMI

As part of the NWCA, U.S. EPA developed an ecological condition assessment based on the plant community. This "Vegetation Multi-Metric Index" (VMMI) consists of four metrics (Floristic Quality Assessment Index, Total Number of Tolerant (C of C values 4 or less) Species, Relative Cover of Native Monocots, and Importance Value of Native Species). These metrics are given equal weighting and combined to generate a VMMI score between 0 and 100, with low scores indicating degraded sites, and high scores reserved for wetlands in relatively intact ecological condition. Table 2 summarizes all VMMI information recorded for the Ohio intensification study wetlands.

To test the utility of this approach for evaluating wetlands, we compared VMMI results with those of ORAM (Figure 9), VIBI (Figure 10) and VIBI-FQ (Figure 11) for the Ohio NWCA intensification dataset. Two of the three approaches (ORAM and VIBI-FQ) showed a significant statistical relationship to the VMMI; however, the overall spread of the data suggested that this relationship was much weaker than a comparison of any of the Ohio assessment procedures against each other (R-squared for VMMI/ORAM was 23.0 percent and for VMMI/VIBI-FQ was 28.7 percent). The relationship between VMMI and traditional 10 metric VIBI scores was not statistically significant (P=0.054 and R-squared=7.5 percent). This is somewhat surprising, as both approaches should be measuring similar elements of the wetland plant community.

Using the NWCA data collected for all wetlands included in the nationwide probabilistic study, a VIBI-FQ score was calculated to determine any potential relationship to the VMMI for these 967 sites (Appendix III). Upon evaluation of the scoring ranges for the two individual parameters included in the VIBI- FQ for the overall dataset, it is apparent that the calculation of metric scores needed to be slightly modified for this probabilistic sample of wetlands. In Ohio, previous research had suggested the FQAI calculations typically fell within the 10 to 30 range, but when considering a much more robust selection of wetlands randomly selected across the country, this range needed to be expanded to between five and 40. Otherwise, many wetlands would have scored either zero or 50, with relatively fewer falling somewhere in between. Likewise, the weighted C of C metric calculation was expanded to between zero and eight (previously in Ohio, we had used between zero and six). Without this slight alteration of metric scoring, a large number of NWCA sights would have scored the maximum of 50 points. Otherwise, the calculation of the national VIBI-FQ (US-VIBI-FQ) is consistent with the previously reported Ohio calculations. Appendix II lists all sites included in the NWCA along with the draft calculation of US-VIBI-FQ scores for each. Figure 12 shows the strong statistical relationship between the two metric US-VIBI-FQ and the VMMI. There is clearly a lot of variability in this comparison of the two procedures, but when the entire 967 wetland dataset is evaluated, the r-squared value of 52.5 percent illustrates the strength of this relationship, and both procedures are providing very similar results. Figure 13 provides the mean US-VIBI-FQ scores for the same 967 NWCA wetlands, when they are grouped by the VMMI condition categories of poor, fair and good. A Tukey's comparison verifies that each of these mean US-VIBI-FQ scores are statistically different from one another when grouped in this manner. Again, these results support the contention that both of these procedures are providing consistent results when scoring wetland plant community condition. This comparison suggests that it would be warranted for future NWCAs to also include US-VIBI-FQ scores in the nationwide analysis of wetland condition.

We appreciate the tremendous amount of work that U.S. EPA put into the development of the VMMI. Having a nationwide vegetation assessment is a large step forward for wetland science. However, in Ohio, the results of our comparisons suggest that the VMMI is not as refined a tool for evaluating wetland condition as the VIBI and VIBI-FQ. Some of the potential limitations we have identified are as follows:

1) One of the principles we use when developing and modifying field procedures is to ensure that these assessments are consistently identifying the "best of the best" and the "worst of the worst" with regards to ecological condition. Although the statistical relationship between the VMMI and VIBI-FQ was significant for the entire Ohio intensification dataset, evaluation of individual scoring did not always conform well with obvious field interpretation of certain sites that fell on each end of the spectrum. For example, one of the Ohio intensification sites is located near the Ohio EPA Groveport Field Office and was one of the NWCA re-visits. The wetland itself was a flooded agricultural wetland that was the

recipient of significant nutrient-laden row crop runoff via subsurface tiling. Very little diversity existed, and the predominant species present was duckweed (*Lemna minor*). All of the Ohio assessments (ORAM, VIBI and VIBI-FQ) identified this wetland as either poor or fair. However, this was the highest scoring Ohio wetland for the VMMI (64.4). Large discrepancies between perceived quality and VMMI scoring for examples such as this is concerning. In our opinion, wetland assessments should be a means to quantify the prevailing understanding of what constitutes high or low quality sites, as observed by trained ecologists. The VIBI-FQ was developed precisely with this intent: sites with low diversity that are dominated by highly tolerant species cannot score high, whereas those that have outstanding diversity and are dominated by sensitive species indicative of stable habitats will always score high. For this reason, the VIBI-FQ would seem to be a much better tool for establishing wetland condition based on plant community factors.

2) The metric which sums the total number of tolerant species (C of C values of four or less) is a raw count, with lower numbers supposedly being associated with higher quality sites and vice versa. For the Ohio NWCA intensification dataset, this was problematic, as several of our most degraded wetlands frequently had very low overall numbers of species. These sites would then receive high scores for this metric, even though most of the few species present were highly tolerant. We also feel that expanding the definition of tolerant to a C of C value of four or less is too large. In Ohio, our tolerance definition is those species having C of C values two or less. The result was that some of our most diverse sites scored very poorly for this metric, as a large number of species present were defined as tolerant by the VMMI but not so based on our Ohio FQAI document (Andreas, et al., 2004). For this particular metric to be valid for Ohio wetlands, the universe of tolerant species should be limited to those with C of C values less than three. Additionally, rather than a total count, we would recommend making this a relative value (i.e., tolerant species to total species present), which would alleviate the issue encountered at sites having extremely low diversity.

3) The metric which evaluates the relative cover of native monocots is also problematic. In Ohio, 95 percent of the original pre-settlement vegetation was forest. Some of our finest remaining wetlands are forested vernal pools and other wet flat woods. Because of the fact that monocots are never woody, these wetlands generally did not score well for this metric, as a vast majority of cover is generally composed of native, sensitive, woody dicot species. There are frequently also sensitive monocots, but these values get dwarfed by the presence of trees and shrubs that will be present in pristine, relatively undisturbed forested sites. Therefore, the VMMI would appear to be penalizing these woody wetlands, whereas, certain types of herbaceous wetlands, such as fens and other sedge meadows, could receive a good score for this metric. Inconsistent metric scoring when considering one type of wetland plant community over another would seem to limit the effectiveness of the procedure. This definitely seems to be the case in Ohio.

We are satisfied that the US-VIBI-FQ does not have any of these limitations and conforms quite well with the observations of wetland ecological condition made by the experienced field biologists who conducted the various assessments for the Ohio NWCA intensification study.

It is important to note that the VMMI was developed to function as a tool to assess large geographic areas in a statistically valid way, which it does quite well. Ohio assessment methodologies were developed for a very different purpose – to evaluate the quality of individual wetland sites to determine the appropriate anti-degradation category for regulatory purposes. The above discussion indicates that the VIBI-FQ is probably a better assessment approach for Ohio wetlands, as it addresses both functions. The VMMI serves its intended purpose well, but has less utility for site specific wetland evaluation as it relates to Ohio wetland regulations.

Ohio Wetland Condition

Table 3 shows the scoring breakdown for the individual metrics which make up the VMMI, as well as the final score and estimated quality breakdown (poor, fair, or good) for this U.S. EPA developed vegetation assessment. Table 2 displays data from ORAM, VIBI and VIBI-FQ, which have established anti-degradation category scoring breakpoints, compiled by approximate ecological condition ranges (poor, fair, good and excellent). It also includes comparable summary information for the VMMI. Somewhat surprisingly, more than half of all wetlands had ORAM scores that fell in the good or excellent ranges. Similarly, for both VIBI and VIBI-FQ assessments, exactly 50 percent of the wetlands surveyed with both of these protocols fell within the upper range of ecological condition. The results for the VMMI did not conform well at all to the Ohio assessment data. According to the VMMI protocols, a whopping 50 percent of Ohio's wetlands are in poor condition and another 34 percent where considered fair. Only 16 percent would be considered to be in good condition using VMMI results. We feel that these are highly inaccurate, and would not base our protection decisions based on this assessment, unless significant refinement occurs. It is possible that the scoring ranges for the types of wetlands occurring in Ohio is simply too coarse, given the very large geographic area that was used to lump the various types, and the possible disparity in wetland condition that may exist when including information over such a broad range.

The ORAM, VIBI and VIBI-FQ intensification study results were also compared to the same assessments conducted on a dataset of 263 natural reference wetlands, surveyed from 1999 to 2010, and broken down by ORAM anti-degradation category. In each of these box and whiskers plots (VIBI [Figure 14], VIBI-FQ [Figure 15] and ORAM [Figure 16]), the mean value generated from the 50 intensification sites corresponded most closely with the mean value for VIBI, VIBI-FQ and ORAM for High Category 2 wetlands grouping (good quality) from the reference database. For each of these assessments, mean values were compared using a Tukey's HSD (honest significant difference) test. The mean VIBI, VIBI-FQ and ORAM values for the 50 intensification wetlands were significantly different from the poor, fair and excellent condition reference wetland groups in all cases. Only the group of good condition wetlands showed no significant difference form the intensification study wetlands for the three assessments. Based on the consistency of these results among these different comparisons, performed on a random selection of sites across the state, it appears that Ohio's remaining wetlands are in good overall ecological condition. This is higher than expected, given the amount of wetland loss experienced historically.

Buffer Assessment: Ohio Intensification Sites

For each of the 50 Ohio intensification sites, four buffer zones were generated around the wetland assessment areas using standard ArcGIS analysis tools (ESRI, 2010). These were:

Buffer 1 = From edge of wetland AA to a distance of 100 meters

Buffer 2 = From 100 meters to 350 meters

Buffer 3 = From 350 meters to 1000 meters

Buffer 4 = From 1000 meters to 2000 meters

These buffer areas were compared to 2011 NLCD Land Use GIS data to calculate LDI scores for each of these buffer zones. Low LDI scores are indicative of undisturbed landscape activities, while higher scores correspond to increasing levels of human disturbances (Brown and Vivas, 2005). Table 4 provides specific LDI values assigned to each land use class included in the 2011 NLCD. Table 5 summarizes all LDI values calculated for each of the buffer zones surrounding each wetland assessment area.

Ohio wetland assessment data was used for the buffer analysis by comparing scores for the subset of wetlands having low LDI scores with those having high LDI scores within each of the buffer zones. LDI scoring breakpoints were determined using best professional judgment to make sure each group had a representative number of sites included. The field assessments included in this Level 1 buffer study were: VIBI, VIBI-FQ and ORAM. These comparisons were made for all four buffer zones described above (Figures 17-20). In each of these comparisons, the patterns were remarkably similar; as land use intensity increases (as quantified by LDI calculations), the assessment scores for ORAM, VIBI and VIBI-FQ all decreased. A Tukey's comparison of mean only found the ORAM scoring differences to be statistically significant, but the consistency of results suggests that a subtle landscape disturbance effect is present, even in this relatively small Ohio dataset. An overall buffer stress score was calculated for each Ohio intensification wetland by combining the LDI data from these four buffer zones and giving added weight to the zones closest to the assessment area border, as follows:

Total 2011 Buffer Stress = (Buffer 1 * 1.0) + (Buffer 2 * 0.75) + (Buffer 3 *0.50) + (Buffer 4 * 0.25)

Comparison of the Ohio assessment data to this summary LDI score yielded similar results to the individual buffer zone LDI analysis: assessment scores for ORAM, VIBI and VIBI-FQ all decreased with increasing LDI landscape disturbance, with only the ORAM scoring discrepancies being statistically significant (Figure 21).

A similar buffer analysis was conducted using the same buffer zones as described above, using historic land use data, which was generated by USGS using hard copy maps from the 1970s and 1980s (Price, et al., 2006). An LDI disturbance calculation was produced for the four buffer zones surrounding each wetland in the study. Table 6 provides the LDI values for each land use category present on the USGS historic land use GIS layer. Table 5 includes all relevant historic LDI calculations for the buffer zones surrounding each of the 50 intensification study wetlands. As with the current land use data, when LDI scores were divided into a low and high group and compared to the ORAM, VIBI and VIBI-FQ scores, the assessment scores were lower for the group having the highest level of landscape disturbance. This pattern was consistent for each of the four buffer zones (Figures 22-25). When a Tukey's comparison was run on the means for each group, only the differences in the ORAM scores for Buffer Zones 2, 3 and 4 were statistically significant. A total buffer stress score was generated for historic LDI scores with the same distance weighting that was used for the 2011 LDI data:

Total Historic Buffer Stress = (Buffer 1 * 1.0) + (Buffer 2 * 0.75) + (Buffer 3 *0.50) + (Buffer 4 * 0.25)

Total Historic Buffer Stress was then compared to ORAM, VIBI and VIBI-FQ scores (Figure 26). The previously described pattern was replicated: all mean assessment scores are lower for the high LDI (increased landscape disturbance) category, with the only statistically significant difference being the ORAM scores.

Although the buffer zone LDI comparisons with plant community assessments did not yield statistically significant differences, the consistency of results for all of these comparisons (for both current [2011] and historic [1970s -1980s] land use data) suggests that performing a Level 1 LDI analysis could be a viable alternative to the much more time and labor intensive NWCA field protocols for assessing buffer condition. It is suspected that the relationship between landscape disturbance, as quantified using LDI, and VIBI or VIBI-FQ data is somewhat faint, for a number of reasons. There can be a lag in the response of plant communities to various types of disturbance. For example, surrounding habitats could be converted for development, eliminating a natural buffer, but it may take a number of years for these alterations to affect the plant community, as more disturbance-tolerant species become established and begin to dominate a previously undisturbed site. Similarly, past disturbances which occurred for many years may have resulted in a highly degraded wetland plant community. As those disturbances are reversed, through abandonment of agricultural activities, for instance, the land use data may suggest that the surrounding landscape has recovered. The plant community, however, is likely to take much longer to recover depending on the nature and duration of the past disturbances. In either of these scenarios, comparing land use to plant community integrity is going to yield inconsistent results. In the case of the Ohio NWCA intensification study, the total number of sites may simply be too small to tease out these differences using standard statistical methodology. Because of these limitations, we decided to perform a comparison of buffer integrity with plant assessment results for the entire NWCA dataset.

Comparison of Ohio Buffer Methodology with NWCA Sites Stressors

Collecting buffer data for the NWCA protocols proved to be an extremely labor intensive and time consuming aspect of the Ohio intensification study. To determine whether a simpler GIS approach may be worth considering for future NWCA analyses, Ohio EPA compared stressor data collected as part of the NWCA field methods with a desktop GIS analysis of wetland buffers for the entire NWCA probabilistic survey. The LDI analysis, using 2011 NLCD data and the AA buffer zones described above, was conducted on all 967 wetlands included in the probabilistic survey. These LDI results were compared with buffer metrics derived from field data and plant assessment results (VMMI and VIBI-FQ) to determine the most cost effective approach for future surveys. Appendix I includes all buffer information for NWCA sites included in the Draft U.S. EPA NWCA report, including field collected stress data and LDI calculations performed by Ohio EPA.

Data collected on the NWCA buffer field data sheets were combined with information from a hydrology field sheet to generate six separate stressor scores: 1) Vegetation Removal, 2) Vegetation Replacement, 3) Damming, 4) Ditching, 5) Hardening, and 6) Filling/Erosion. Each of these stressors was divided into one of three intensity categories (low, moderate and high). Ohio EPA combined this information into a single field buffer stress score by assigning a sequential number to each of the assigned intensity categories (low = 0, moderate = 1 and high = 2) and then summing these six stressor scores for each wetland.

The GIS analysis consisted of generating four different buffer zones around each of the 967 wetlands included in the draft NWCA report (U.S. EPA, 2015A and 2015B) using standard ArcGIS analysis tools (ESRI, 2011). These were:

Buffer 1 = From edge of wetland AA to a distance of 100 meters.

Buffer 2 = From 100 meters to 350 meters.

Buffer 3 = From 350 meters to 1000 meters.

Buffer 4 = From 1000 meters to 2000 meters.

Within each of these independent buffer zones, an LDI calculation was run using 2011 NLCD data to generate a single LDI intensity score. To test for a relationship between LDI and plant community integrity, each of the four buffer zone LDI calculations were grouped into five categories using the quantile classification tool in ArcGIS 10.0 (ESRI, 2011), and compared to VMMI (Figures 27-30) and VIBI-FQ (Figures 31-34) scores for the entire NWCA dataset. For both of these vegetation assessments, the pattern was remarkably similar – overall VMMI and VIBI-FQ scores decreased as the level of disturbance (and LDI score) increased for each of these eight comparisons. Many of the mean values for both the VMMI and VIBI-FQ were statistically different from one another. The consistency of these results supports the argument that a GIS-only LDI approach is a powerful, cost effective alternative approach to buffer analysis.

A final LDI buffer score was then calculated by weighting the LDI scores by distance from the edge of the AA and summing the resultant individual weighted LDI scores for each buffer zone, as follows:

Total LDI = (Buffer 1 * 1.0) + (Buffer 2 * 0.75) + (Buffer 3 *0.50) + (Buffer 4 * 0.25)

To perform the comparison between the two buffer approaches, the NWCA buffer stress score was broken down into five groups based on a quantile classification using ArcGIS 10.0:

Group 1 = zero stressor points
Group 2 = one to 3 stressor points
Group 3 = four to six stressor points
Group 4 = seven to nine stressor points
Group 5 = 10+ stressor points

Figure 35 illustrates the strong statistical relationship that exists between the two alternate approaches to assessing buffer integrity. Although there is clearly a large number of outliers present when running this comparison, an obvious positive correlation exists when comparing the field-collected buffer stress score with the strictly desktop GIS analysis. A Tukey's comparison was run for the mean total LDI scores for each of the field-derived stressor scoring groups, and all were significantly different from one another, suggesting that both approaches are identifying the types of disturbances likely to affect the ecological condition of wetlands.

To determine the relationship between the ecological condition of the NWCA wetlands and the overall estimate of buffer disturbance, the VMMI and VIBI-FQ scores were compared to both the field-collected buffer stress score and the LDI scores for all 967 NWCA wetlands. As had been previously done for the field stressors, the total LDI scoring ranges and field-derived buffer stress score were broken down into five scoring groups using the quantile classification tools in ArcGIS 10.0. Figure 36 illustrates the effect of these stressors on the plant community, as assessed using the VMMI. VMMI scores are progressively lower as the number of identified stressors increase. A Tukey's comparison of the mean VMMI scores for each of the stressor categories indicates that differences between the mean VMMI scores for the lowest two stress levels was significantly different from each other and from the three highest stress groups. Figure 37 shows a similar result when VIBI-FQ scores are compared to the field-derived stress scoring ranges. The mean scores are reduced as disturbance levels increase. The Tukey's comparison verifies that the mean VIBI-Scores for the two lowest stress level categories differ significantly from the three highest. These results are what would be expected, as increasing levels of disturbance typically result in a progressively more degraded plant community.

To test to see if a similar pattern was present when a GIS-only approach was used to quantify buffer stress, the VMMI scores were compared with the LDI scoring ranges for the same set of 967 NWCA wetlands. Figure 38 displays this comparison. As with the field-derived stressor scores, the mean VMMI scores are successively lower as the LDI stress levels increase. Based on the Tukey's comparison, all of the mean VMMI scores are significantly different from one another, except those of the two lowest LDI stress categories. A very similar pattern exists when VIBI-FQ scores are compared to the LDI categories (Figure 39). As with VMMI, the mean VIBI-FQ scores decrease progressively as LDI stress levels increase. The Tukey's comparison illustrates that the mean VIBI-FQ scores for the two highest LDI stress categories are different from one another and from the VIBI-FQ scores for the three lowest LDI stress levels. The results for both VMMI and VIBI-FQ suggest that there may be a quantifiable threshold of disturbance that must be achieved before the plant community becomes significantly degraded.

These comparisons of field-derived buffer stress data with desktop-only GIS analyses of wetland buffers support the contention that the extremely time consuming, labor intensive collection of field buffer data is unnecessary. Ohio EPA recommends eliminating this aspect of the NWCA field assessment for future surveys. Additionally, the GIS approach allows for a more robust analysis of buffer integrity. As was demonstrated above, the surrounding land use for areas much greater than 100 meters from the edge of a wetland can clearly affect the overall functioning of that wetland. Using a GIS LDI analysis, these areas can be assessed in a consistent manner for the entire country. It also eliminates variability of field data that occurs when numerous field researchers are used to collect data. Finally, the GIS approach would allow for the inclusion of temporal data, such as including information of past land uses, by calculating LDI scores for previous iterations of the NLCD. These data are now updated on a five-year cycle by USGS, with previous versions of the layer available for 1992, 2001 and 2006.

Water Chemistry

A total of 33 sites had standing water of sufficient depth to collect samples for water chemistry analysis. This included all 11 NWCA sites for the state, and 22 of the 39 intensification wetlands visited between 2011 and 2014. A total of seven analytes were tested in each of these water samples: conductivity (µS/cm), ammonia (mg/L), nitrate+nitrite (mg/L), pH, total Kjeldahl nitrogen (mg/L), total nitrogen (mg/L) and total phosphorus (mg/L). Table 7 summarizes all water chemistry data for the study. Each of the analyte results was compared with Ohio ecological assessment data to determine if any relationship could be determined between overall ecological condition and chemical degradation. These comparisons are as follows:

- conductivity vs. ORAM, VIBI and VIBI-FQ scores (Figures 40, 41, and 42)
- ammonia vs. ORAM, VIBI and VIBI-FQ scores (Figures 43, 44, and 45)
- nitrate+nitrite vs. ORAM, VIBI and VIBI-FQ scores (Figures 46, 47, and 48)
- pH vs. ORAM, VIBI and VIBI-FQ scores (Figures 49, 50, and 51)
- total Kjeldahl nitrogen vs. ORAM, VIBI and VIBI-FQ scores (Figures 52, 53, and 54)
- total nitrogen vs. ORAM, VIBI and VIBI-FQ scores (Figures 55, 56, and 57)
- total phosphorus vs. ORAM, VIBI and VIBI-FQ scores (Figures 58, 59, and 60)

These comparisons produced very little information that supported the observation that high levels of nutrients negatively affect the ecological condition of wetlands. The only parameter that produced statistically significant results was pH when it was compared to ORAM, VIBI and VIBI-FQ (Figures 49-51), and this relationship was fairly weak, making interpretation difficult. The overall lack of strong correlation for most analytes was expected, as the influx of various chemical constituents is not equally distributed throughout the year, and input spikes would most likely have occurred during other times of the year. Therefore, collecting water samples from a single date at each of the surveyed wetlands does not seem to be of much value. Ohio EPA recommends either modifying the water chemistry sampling protocols to address spatial and temporal inconsistencies in water quality, or eliminating the collection of water samples completely for future NWCA surveys.

Bryophyte Assessment

At each Ohio NWCA intensification wetland sites, the five vegetation plots were evaluated to determine the identification of bryophyte species relative to substrate type, in an effort to discern whether bryophytes can be used as an assessment tool to measure wetland quality, similar to how the VIBI is used for vascular plants. Once a plot was selected, all different substrates present within the plot were identified and their approximate percentages with respect to total plot area were recorded. A complete list of all potential substrate types included in this study is as follows:

- Soil
- Tree Skirt < 30 cm dbh
- Skirt Top to 1/3 m <30 cm dbh
- Above 1/3m <30 cm dbh
- Tree Skirt > 30 cm dbh
- Skirt Top to 1 m >30 cm dbh
- Above 1 m > 30 cm dbh
- Standing Dead Skirt
- Above Standing Dead Skirt
- Corticated Log
- Decorticated Log
- Shrubs
- Soil (Hollows)
- Soil (Hummock)
- Stumps
- Tussocks

For the first plot, cover values for dominant species were also recorded using the following metrics: relative cover, in regards to the bryophyte community, per substrate; total cover for each dominant species per substrate; and total cover of all bryophytes per substrate. The remaining four plots were subsequently examined for presence of any additional bryophytes that were not recorded in the initial plot. In the lab, sampled bryophytes were identified to the lowest possible taxonomic level. The main references and floras used for mosses were: Allen, 2006; Allen, 2014; Crum, 2004; Crum & Anderson, 1981; Flora of North America Editorial Committee, 2007; Flora of North America Editorial Committee, 2014; Ireland, 1982; Welch, 1957. The main references and flora used for liverworts were: Crum, 2004; Hicks, 1992; and Schuster, 1966-1992.

Appendix IV lists all bryophyte species recorded during the course of this study. Several parameters were derived from the individual site bryophyte collections, and these were then compared with the results of the standard Ohio assessment results (ORAM, VIBI and VIBI-FQ) for each of the Ohio NWCA intensification wetlands:

1) Number of bryophyte species = a simple count of all species recorded for a site (Figure 61 [vs. ORAM], Figure 62 [vs. VIBI] and Figure 63 [vs. VIBI-FQ])

2) Number of bryophyte genera = a simple count of all genera recorded for a site (Figure 64 [vs. ORAM], Figure 65 [vs. VIBI] and Figure 66 [vs. VIBI-FQ])

3) Moss Quality Assessment Index (Moss QAI) = Sum of C of C values for all moss species recorded per site, divided by the square root of the total number of moss species (Andreas, et al., 2004) (Figure 67 [vs. ORAM], Figure 68 [vs. VIBI] and Figure 69 [vs. VIBI-FQ])

4) Bryophyte Quality Assessment Index (Bryophyte QAI) = Sum of C of C values for all bryophyte species recorded per site (including liverworts and hornworts), divided by the square root of the total number of bryophyte species (Andreas, et al., 2004; Andreas and Lucas, personal communication, 2015) (Figure 70 [vs. ORAM], Figure 71 [vs. VIBI] and Figure 72 [vs. VIBI-FQ])

Bryophyte Survey Results

For the entire Ohio NWCA dataset, mosses outnumbered liverworts by approximately 6:1. In general, liverworts tend to be less widespread than mosses. In wetlands, except for the most common species, liverworts tend to be associated with higher quality habitats. In the survey, fifty two species were found on one site only. Eighty bryophyte species were found on five sites or less. Nine species were found on 20 or more sites (Appendix IV). Just looking at genera, 35 genera were found on five sites or less. Eight genera were found on 20 or more sites. This indicates the fact that compared with vascular plants, bryophytes have significantly fewer species associated with genera, i.e., they tend to be “species poor”. This opens the possibility that genera in addition to species number might possibly be used as an indicator.

All of the derived bryophyte metrics (number of species, number of genera, Moss QAI and bryophyte QAI) were determined to have a strong statistical correlation when compared with ORAM, VIBI and VIBI-FQ assessment results for the 50 Ohio NWCA intensification study wetlands (Figures 61-72). The strongest statistical relationship exists between the four bryophyte metrics and the VIBI-FQs scores, which corresponded with observations made by the wetland scientists conducting the field assessments.

Further evaluation of these wetlands suggested that several were subjected to perpetual hydrological manipulation which prohibited the development of a robust bryophyte community and is not comparable to wetlands undergoing normal ecological succession. Most of these wetlands were associated with impounded marshes along Lake Erie. Additionally, a few of the study wetlands had recently suffered severe substrate disturbance, and the bryophyte community has not had adequate time to begin the recovery process. Bryophytes are significantly more sensitive to disturbance than vascular plants and take much longer to come back in such settings or do not persist as long.

The same comparisons conducted for all 50 Ohio NWCA Intensification sites above (Figures 61-72) was re-run using a subset of sites, excluding eight sites that were heavily disturbed to determine how removal of these outliers could affect the overall strength of the statistical relationship. For all ORAM and VIBI-FQ comparisons, the r-squared value, which is an estimate of how close the data points fall around a fitted regression line, increased (Table 9). This increase was generally 10 percent or greater. For the four VIBI comparisons, however, the r-squared value decreased very slightly when compared to the eight excluded sites, although this decrease was not substantial. It also appears that the best fit between the various bryophyte parameters and other Ohio wetland assessments was with the VIBI-FQ. We found this tool consistently matched our field observations regarding perceived wetland ecological condition. The fact that for all four bryophyte parameters the r-squared value was largest for VIBI-FQ (for both entire dataset and the subset of 42 sites) suggests that the bryophyte community condition is also an excellent indicator of overall wetland quality.

Each of the four bryophyte metrics identified above was then compared with proposed VIBI-FQ category breakdowns to better understand the relationship between bryophytes and the vascular plant community for the 42 intensification study wetlands that had not been subjected to recent, catastrophic habitat disturbances. In each of these comparisons (number of bryophyte species [Figure 73], number of bryophyte genera [Figure 74], Moss QAI [Figure 75] and Bryophyte QAI [Figure 76]), a significant difference in the mean parameter scores was found for all three of the wetland condition categories, when using a Tukey's two-way comparison. This points out a clear, close relationship with the wetland vascular plant community and a relationship that provides a high degree of potential for the bryophyte community to be used as an indicator of wetland quality.

Bryophyte Cover

During the field seasons 2012-2014 bryophyte cover for each site was estimated. While it was not estimated for the 2011 field season, the actual cover for that season should fit closely the results summarized below.

The methodology used to estimate bryophyte cover is summarized below.

Step 1: Identify the amount of each substrate type within the plot (Substrate cover total may reach over 100%).

Step 2: Convert each substrate cover value for the plot to its value on a 100% scale.

Step 3: Identify the dominant bryophytes upon each substrate type in the plot.

Step 4: Assign them a cover value in comparison to other dominant bryophytes also present on the specific substrate. Dominant species were those bryophyte species representing at least 5% of any given substrate within the wetland.

Step 5: Identify the cover value for each dominant species relative to area of a specific substrate type.

Step 6: Identify an overall cover value for all bryophytes on a specific substrate.

Repeat steps 2 through 6 for each substrate in the plot

Table 10 summarizes the bryophyte cover information for both dominants and non-dominants in terms of the coefficient of conservatism (CC) values and broken down by sites with low numbers of bryophytes (0 to 10 species), moderate numbers of bryophytes (11 to 21 species), and high numbers of bryophytes(21+ species).

There is a trend for both dominants and non-dominants to have higher C of C values as the number of different bryophytes increases per site. Also, more substrates and bryophytes per substrate occur at the same time. This conforms to observations made in the field, as both bryophyte presence and cover would both be expected to increase as the overall wetland habitat develops. These results are somewhat informative, but no statistical relationship was explored, due to the reduced number of sites that had bryophyte cover recorded (36 of the 50).

While some useful information can be gleaned from the collection of bryophyte cover data as described above, determining bryophyte cover is extremely difficult. This is partly due to their very small size relative to vascular plants and also due to their “spotty” growth patterns. One simply cannot estimate bryophyte cover as one does for vascular plants for the VIBI-FQ or for other vascular plant indexes. Due to these difficulties, it appears that it will be more feasible to develop a bryophyte assessment tool focusing on species or genera composition as described above, without attention to bryophyte cover area or substrate type at a particular site. It may be worthy for certain research purposes to examine bryophyte cover, but for developing an index to approximate wetland condition, it does not seem feasible.

Based on this preliminary investigation, there appears to be a very tight relationship between the overall diversity of bryophytes present within a wetland and the ecological condition of the vascular plant community. Developing an index of biotic integrity for this taxonomic group could be extremely beneficial to the Ohio wetland regulatory program, as most bryophytes are present year-round, suggesting a level 3 tool would have far fewer temporal limitations than our current detailed biological assessments, such as VIBI, VIBI-FQ, and the Amphibian IBI (Micacchion, 2004; Micacchion, 2011). The most compelling result from this analysis was the relationship between a simple count of bryophyte genera present at each site and the ecological condition of the plant community as quantified by the VIBI-FQ assessment. Identification of bryophytes to genera alone is a much more manageable task than attempting to identify each to species level. This result strongly suggests that developing an assessment methodology focusing on this taxonomic group is realistic. Ohio EPA intends to continue exploring the potential utility of bryophytes as indicators of wetland quality.

Soil Assessment

All 50 sites were sampled. The NWCA protocol (U.S. EPA, 2015B) was followed as closely as possible. For approximately 30 percent of the sites, which had high levels of standing water, soil samples were collected using PVC samplers ("King Samplers") as described in the NWCA Field Operations Manual (U.S. EPA, 2011). After the first sampling season, a decision was made to dig only one soil pit versus four, which significantly reduced the amount of rigorous field work required for the soil characterization and collection process. The changed protocol was to survey the wetland assessment area, including all 5 plots, with a soil probe. If the soils in the AA were determined to be uniform, then a single soil pit was dug. If there was more than one soil type present, a pit was dug in the predominant soil, with auger descriptions conducted for the minor soil constituent(s). Soil morphological data for all Ohio NWCA intensification sites are presented in Appendix V. Soil chemistry laboratory data are presented in Appendix VI.

Due to the tremendous volume of soil information collected, we focused on aspects of the soil structure and chemistry data that are most likely, based on best professional judgment, to affect the overall ecological integrity of Ohio's wetlands. We examined potential correlations of the NRCS lab data with the VIBI-FQ and wetland quality. The main correlative areas are discussed below. There may be a few more areas that will be discussed in future reports but the discussion below touches on the main connections to wetland quality.

Phosphorous

Lab and morphology data collected in the field were examined. Phosphorus was a main stressor. We used results mainly from the Mehlich Phosphorus test (P-Mehlich), as that laboratory test is most appropriate for the soil pH range found in Ohio. P-Mehlich levels for all 50 Ohio NWCA intensification sites was compared with VIBI-FQ results (Figure 77). Based on this comparison, we divided the P-Mehlich dataset into two levels: "Low" = 0 to 13.6 mg/kg, and "High" = >13.6 mg/kg. Figure 78 compares mean VIBI-FQ scores for these groups, which are statistically significantly different, when using the Tukey comparison (Figure 78). Figure 79 shows the regression results when comparing VIBI-FQ scores with P-Mehlich values for these sites. Although statistically significant at the $p < 0.05$ ($P = 0.021$) level, there is a fairly low r-squared value (10.6), suggesting this relationship is weak.

This evidence suggests that increased phosphorus loading is contributing to decreased wetland quality, illustrated by the clear trend of decreasing VIBI-FQ with increasing phosphorus levels. Increased phosphorus and nitrogen are probably of the most significant reasons for increasing dominance of invasive plants, such as reed canary grass (*Phalaris arundinacea)*. Excess nutrients in wetlands is certainly one of the main, if not the main reason, for the degradation of wetlands in Ohio.

An example of an Ohio NWCA intensification site with one of the heaviest P-Mehlich loadings is shown on Figure 80 (Kipton Reservation, Lorain County; NWCA-3104), which displays the site (purple dot) in its present day surroundings. Figure 81 shows the same view ~55 years ago, when the assessment area was located on the floor of a functioning reservoir. The watershed was dominated by intensive agriculture, with substantial amounts of nutrients presumably flowing into the reservoir. It was subsequently drained, with the sediments heavily laden with phosphorus as the substrate. Currently the vegetation is approaching a monoculture of *Phalaris arundinacea*. *Phalaris arundinacea* can thrive under numerous disturbance factors, including excess phosphorus, and can become a “runaway” species blanketing entire wetlands (Kercher and Zedler, 2004).

Figure 82 shows another site with very high soil phosphorus loadings (Mosquito Creek Wildlife Area, Trumbull County, NWCA-3142). Figure 83 displays present day conditions and Figure 84 shows the site as it appeared 50-60 years ago, as displayed on a USGS topographic map. The assessment area is located within an open emergent plant community. The wetland was impounded and a moderate size lake has formed with the surrounding watershed a moderately prominent agricultural land use. A reconnaissance of the edges of the impounded site had a varied vegetation – probably similar to what the site had as a whole before it was impounded. The impounded site was dominated by spatterdock (*Nuphar advena)*. The whole site was covered by this species, with the rhizomes so solid, that we had difficulty getting our PVC soil sampler through the rhizome layer to sample the soil. The site is similar to the site mentioned above, as the impoundment has resulted in high phosphorus loadings from phosphorus-laden sediment deposition at the bottom of the reservoir or lake. It has a different twist in that the phosphorus is presumably having a strong fertilizer effect on the vegetation in the water vs a drained area. The result is somewhat the same – dominance by a single species, *Nuphar advena,* which responds aggressively to eutrophic conditions (Egertson, et. al., 2004), which is signaled in this site by the very high phosphorus loadings (>50 mg/ kg).

Nitrogen

No correlation could be seen with nitrogen amounts. That is not surprising, as wetlands can dissipate significant amounts of nitrogen through denitrification. However, nitrogen flowing into wetlands can still have a fertilizer effect, that alone, or in combination with phosphorus, can encourage plant composition to be dominated by aggressive species. Although excess nitrogen or unwanted fertilization is likely to commonly co-occur with excess phosphorus, Figure 84 (Portage County; NWCA-3070) displays an example of a site where it is likely that nitrogen is the main culprit in wetland degradation. The purple dot represents the site location. Although fairly well buffered, the contour lines show drainage pathways to the site area. Whereas phosphorus, which is mostly transported in sediment in overland flow, would largely be captured by the buffer area; nitrogen, which is in a form which moves readily with water, could be coming through drainage pathways into the wetland areas from intensive agricultural areas outside of forested buffer. This site had heavy stands of common reed (*Phragmites australis)*. Research has shown that this species responds well to added N and is a probable factor in it displacing native vegetation (Rickey and Anderson, 2004).

Soil Structure

As most of the sites sampled for Ohio's NWCA intensification study were natural wetlands, soil structure issues were not an issue. But for those that had been heavily disturbed, soil structure problems played a large role in the wetlands overall ecological condition. Two sites included in this study had severe soil disturbance and are discussed below.

One site was along the Cuyahoga River, and while superficially it appears to be a typical forested site (Figure 85 [Cuyhoga County; NWCA-3081], with purple dot marking the assessment area), the substrate investigation revealed that the soil was mostly without structure or having massively loamy material with very weak structure starting to form in the 2nd horizon. Laboratory data shows it to have relatively low carbon percentages - 1.94 percent in the surface horizon, then falling to 0.46 percent in the next horizon. A historic photo showed an old gravel operation that had been there 50-60 years ago. One can see mining operations in Figure 85 close by; this section of the Cuyahoga River has had many such operations through the years. Apparently, fill had been brought in and trees had been begun to colonize the site, but the overall condition of the wetland vegetation is still quite low (VIBI-FQ = 31). Our experience with mitigation wetlands suggests that severe soil structure disturbance may require a significant amount of time to recover. The site depicted in Figure 85 appears to be recovering, as it now has a low clay content and extensive tree growth, although complete recovery, leading to a higher quality plant community, may take several decades (or longer) to return to a natural soil structure.

The second site exhibiting substantial soil structure disturbances is shown in Figure 86 (Ashtabula County; NWCA-3138). The lack of vegetation in and around the assessment area was readily apparent. The plant community present seemed to be having a difficult time establishing. The site appeared to be some sort of borrow area and there was no evidence that any fill material had been added following the borrow-related disturbance activity, as had been the case for the Cuyahoga River site. The soil was mostly without structure or it had massive clayey material with very weak structure starting to form in the 2nd horizon. Lab data shows it to have relatively low carbon percentage (1.94 percent in the surface horizon, then falling to 0.46 percent in the next horizon). The VIBI-FQ of 24 was very low. This site, with virtually no soil structure, little vegetation to help develop structure, and relatively high clay content faces a very long road to recovery if a higher ecological condition will ever be achieved. It would be our recommendation that sites displaying this level of soil structural disturbance should be remediated to address underlying soil structure issues prior to attempting to re-establish a robust wetland plant community.

Disturbed soils with poor soil structure can cause almost catastrophic lowering of the quality of wetlands. Note that in the above-mentioned wetlands there was really no indicator in the NWCA to capture the poor soil structure, as soil structure descriptions for the profile were not required. Bulk density in these cases does not capture this information. The bulk density values in both the above two cases were within the normal conditions. High bulk densities are caused largely by compaction activities. Many soils, such as the two sites described above, have poor soil structure that is not necessarily caused by compaction. Soil structure is an important component that should be considered for future assessments, although capturing it takes a higher level of skill in soil descriptions.

We strongly suspect that, if there had been significant soil structural problems in the wetlands studied, there likely would have been a corresponding increase in the amount of degradation observed. In our experience, soil structural concerns are more prevalent for mitigation or proposed mitigation wetlands. This will be discussed more in the soil health card section, later in the report.

Hydric Soil Indicators

Of 89 soil profiles examined for the 50 sites included in this study, 25, or 28 percent of them, did not have indicators listed. Of those 25, 16 (18%) were determined to be hydric and 9 (10 percent) were determined to be non-hydric. Most of the non-hydric profiles were "minority" soils in which extra profile descriptions were taken in addition to the main pit description. This is in keeping with the hydric soil section of the U.S. Army Corps of Engineers regional supplements. It states, "*Many of the hydric soil indicators were developed specifically for wetland delineation purposes. During the development of these indicators, soils in the interior of wetlands were not always examined; therefore, there are wetlands that lack any of the approved hydric soil indicators in the wettest interior portions*." (U. S. Army Corps of Engineers, 2010). Most of the sites we surveyed were a long distance from the margin and in the deeper areas of the wetland. In addition, the section on problematic hydric soils mentions two areas that were part of this study where often hydric indicators may not be seen - Fluvial Sediments within Floodplains and Seasonally Ponded Soils – both of which were represented in the study. Hydric Soil Indicators for each site can be found in Appendix V.

Sedimentation

Buried Soil Profiles

There were a number of buried soil horizons seen in the soil profiles. These buried soils had a slightly less than average VIBI-FQ score than did sites without buried soil horizons. Determining how much past sedimentation has affected the trajectory of a wetland is difficult. There are numerous other factors that could come into play, including groundwater influences, time the site has been stabilized, amount of buffer, etc. Even in undisturbed watersheds, alluvial soils are formed by episodic flooding events which produce stratified soils with irregular vertical distribution of soil constituents like C and P within soil profiles. However, in undisturbed watersheds, deposition is relatively slow, the difference in characteristics of the sediment is less prominent, and the degree of irregularity becomes even less evident as the stratified materials are mixed over time. Disturbance of soils within the watershed accelerates and accentuates the episodic depositional process, and the irregular distribution of C, P, and other analytes is pronounced.

It is obvious that historic accelerated sedimentation events, which resulted in buried soil horizons, would have a detrimental effect on wetland quality. The length (duration) of these detrimental effects depends on the factors mentioned above, or other factors not included in this study.

Percent Carbon Decrease

We looked at percent carbon decrease throughout the profiles from data received from the NRCS laboratory. About two thirds of the profiles had irregular carbon decreases. About 58 percent of these were associated with alluvial areas Often multiple increases in percent carbon were observed going down a soil profile. The soil profile collected for site OH-3049 (see Appendix V) demonstrates this pattern.

The data for each site profile was examined and for those having an irregular decrease (N =31), the largest increase was used for correlating to vegetative data. Examining the data revealed that larger irregular carbon decreases results in a trend toward lower VIBI-FQ scores (Figure 87). Additionally, for the 12 Ohio NWCA intensification sites exhibiting greater than three percent irregular carbon decreases, none scored above the proposed VIBI-FQ category 3 threshold of 60 (i.e. "excellent quality"). The subset of sites having irregular carbon decreases was then divided into "low" (0% to <3 percent carbon decrease) and "high" (>3 percent carbon decrease) groups for comparison with VIBI-FQ scores (Figure 88). These mean VIBI-FQ scores were significantly different, based the Tukey's test, with plant communities associated with larger percent carbon decreases scoring lower than those without evidence of this disturbance.

Each site with positive differences of percent carbon in excess of three percent while going down the soil profile was examined in GIS data. There seem to be two basic settings for such sites, both potentially negative to wetland quality. First, there are sites in which organic soils are predominant, usually as deep mucks, that are or have been used for agriculture or have had their water table lowered because of surrounding development. The upper surface horizons are being oxidized and therefore losing carbon, whereas the lower horizons are still staying saturated for long enough periods of time that their percent carbon values are staying higher. An example of this is shown in Figure 89 (Portage County; NWCA-3118). This site, marked by the purple dot, is an area of deep organic soils. To the north is a large developed area. To the south is a large mining operation. The day of the survey showed the soil, even down past 60 cm, as very dry, although there was no drought going on. The VIBI-FQ for the site was a 35 and this was obviously a degraded wetland.

The second setting for large increases in percent carbon, while going down the profile, was for sites situated low in the landscape and which are organic building sites and also high depositional areas. In these kinds of areas, one often finds buried soils with either relatively high organic mineral or organic soils. An example is shown in Figure 90 (Portage County; NWCA-3058). It was developing a layer of muck on the surface that was 30 cm thick, but it also had both a buried organic horizon and a buried high organic mineral horizon. Although it has a small stream running through the site, it was obviously in a headwater setting. It had sloping soils going down to it that the ~60 year old topographic maps showed had been in agriculture - probably an area of past heavy deposition. The site had a VIBI-FQ of 53, and is possibly an area with deeper ground water present. The site is now more buffered, so this is an example of site that had been heavily disturbed by sedimentation, but is now well on the way to recovery.

Elevated Phosphorous in Lower Horizons

In much the same way as we saw an irregular decrease in percent carbon in soil profiles, we also saw an irregular decrease in Mehlich phosphorus in the profile. About 75 percent of the profiles had irregular phosphorus decreases. Many of the soil profiles with irregular decreases had multiple episodes where the phosphorus levels increased when going down the profile (e.g., site OH-3068, Appendix V). Interestingly, there was little overlap with the profiles that saw large amounts of irregular percent carbon decreases, as only two sites overlapped between the elevated phosphorus and the elevated percent carbon in lower horizons. About 43 percent of these sites were associated with alluvial areas. Examining the data revealed that in much the same way as percent carbon, larger irregular phosphorus decreases trended toward a lower VIBI-FQ score and lower amount of high quality (i.e., category 3 wetlands), as shown in Figures 91 and 92. Although these trends are not statistically significant, the pattern is consistent with our observations, and should be investigated further in future NWCA surveys.

As discussed with percent carbon, it can be surmised that these instances of large phosphorus decrease are related to sedimentation events, in which topsoil, where phosphorus levels are usually highest, was covered by sediment. This, in turn, can change the trajectory of wetland development toward a lower quality level, affected not only by sediment deposition but also increased nutrients and possibly changed hydrology.

The sites with the larger irregular phosphorus decreases were examined using current and historic GIS data. These sites were almost always in strongly depositional environments (wetlands with sloping land adjacent to the wetland), surrounded by land in intensive agriculture, such as row crops where high phosphorus soils would be expected. These sites are very unstable (or have been until relatively recently), and as such, are subjected to multiple erosion events that deposit large layers of sediment into the wetland or cover the existing top soil horizon which is already high in phosphorus. These sedimentary events result in a trajectory of wetland development that steers toward a lower quality level, affected not only by incoming large sediment deposits but also increased nutrients and possibly changed hydrology. Even if such situations are stabilized, it will probably take a considerable amount of time for such wetlands to recover. In extreme situations of sedimentation, land surface elevations can be raised, and hydrology may be permanently altered. Of the seven sites with the largest P increases within the profile, two had VIBI-FQs in the single digits, two were in the 30s, and two were in the 40s.

The one exception, which had a VIBI-FQ in the mid-50s, straddled both the heavy depositional environment in an impounded area and an area that was outside the impounded area.

The above analysis suggests that pronounced irregular decreases in contents of carbon or phosphorus can be used to indicate present or past unstable depositional environments which have potentially affected a wetland's ecological condition.

GIS Analysis of Soil Disturbances – Present and Historical

In collecting field data for the NWCA, we are essentially observing a synthesis of the past. Plant life, whether vascular plant or bryophyte communities, reflect the conditions under which they grow, which includes what we see in the present as well as what has occurred in the past. The state of wetland quality for any particular site is at least partly, if not largely, a function of how the environment and the area in which it occurs and the surrounding area have changed through time. In short, to better understand and be able to predict wetland quality for a site, we need to be able to estimate not only stressors as they occur in the present but also in the past.

An initial attempt was made to look at stressors – in particular nutrient and sediment flows, and hydrology both in present and in the past. Each site was examined in a GIS environment looking at recent high resolution photography and historic USGS 7.5 minute topographic maps that were late 1950s to early-mid 1960s vintage. An estimate of the level of disturbance (e.g., potential nutrient and sediment flows) was made for all 50 sites, both for the present and the past. A scale of 1-3 was used with 3 representing minimum impacts, 1 represented high impacts, and 2 represented moderate impacts. The same estimation was conducted for hydrology-related impacts. Criteria used to make the ratings are included in Table 11. A table of the ratings along with notes to explain the ratings as needed is shown in Table 12.

The total soil/habitat disturbance score was then compared with VIBI-FQ scores for the Ohio NWCA intensification sites (Figure 93). There was an extremely strong statistical correlation between this desktop estimate of disturbance and the very detailed, level 3 analysis of the plant community ($df = 49$, $F = 111.20$, $p < 0.001$, R-squared = 69.8 percent). This is a very noteworthy result, as this procedure opens the door for additional level one assessment metric that could be used to estimate wetland condition. Previous level 1 investigations focused on automated GIS scoring procedures, such as LDI, which are limited in that they are strongly influenced by current land use, and miss out on the capture of critical historic land use disturbances. Additionally, although somewhat subjective, there is benefit to having a pair of trained human eyes which can synthesize the landscape surrounding a wetland more effectively when attempting to quantify historic and present c disturbances in a manner that may not be possible using automated approaches. Incorporating human decision parameters into a Level 1 wetland assessment will require additional research to develop specific, objective criteria for scoring these metrics consistently and without bias.

Enhanced Level 1 Tool for Predicting Wetland Quality

Ohio's study has underlined the main reasons for much of the wetland degradation that occurs: nutrients, sediments, development, and changes in hydrology. An enhanced Level 1 predictive tool for wetland quality could potentially capture information on these critical factors, using remotely sensed information. Based on what we have explored regarding level one assessments in previous studies (Gara and Micacchion, 2010; Gara, et. al., 2013), as well as the information provided in this report, there appears to be a high potential for developing an enhanced, significantly more accurate level 1 tool. Combining more automated approaches (e.g., LDI) with desktop evaluations conducted using codified, objective criteria, to estimate varying levels of habitat, substrate, and hydrologic disturbances would greatly expand our ability to assess wetland condition. One possibility for starting to develop such criteria is to adapt sections of ORAM for estimation using GIS. Below are some parts of the ORAM assessment that could possibly be adapted for us in a predictive GIS tool (Ohio EPA 2001).

- Wetland Area (size)
- Upland buffers and surrounding land use
- Hydrology connectivity
- Modifications to natural hydrologic regime

Other areas that are more germane to a GIS environment could be added.

- Conduits for nutrients and sediment from intensive agricultural or developed areas
- Degree of agriculture or development in area around wetland
- Narrowest area in buffer around wetland
- Habitat disturbance scale

As mentioned above, all of the above and other parameters or metrics could be examined using both recent photography and historic photography and/or USGS 7.5 minute topographic maps. As additional information from other time periods become accessible, these could also be used. Metrics could be summed and a calibrated using Level 2 and Level 3 assessment data to verify that Level 1 scores correlated with these more robust field investigations to predict wetland quality. This approach could be a cost effective method planning tool to identify wetlands likely to be high quality resources, warranting additional field research. Ohio EPA will continue to investigate the possibilities of this Level 1 approach in future studies.

Framework for Wetland Soil Quality Score Card for Ohio

In addition to work with the NWCA, Ohio EPA's wetland ecology group has been working extensively with wetland mitigation issues. It has explored a number of the soil related issues that affect the establishment of successful mitigation wetlands. Soil concerns such as soil structure are of greater concern for mitigation wetlands than natural wetlands with intact soil profiles. This experience, along with the Ohio NWCA intensification survey, has sparked the idea for a wetland soil quality card for Ohio. Soil related issues such as excess soil nutrients, soil hydrology, soil structure and compaction concerns, and other issues have shown the importance of an understanding of soil principals in predicting the trajectory of wetland development.

Soil health issues for agronomic purposes have been pursued strongly in both land grant and agency settings. In Ohio, the Ohio State University Extension Service and The Natural Resource Conservation Service (NRCS) have been pursuing this topic. A fact sheet put out by the NRCS states that “Soil health, also referred to as soil quality, is defined as the continued capacity of soil to function as a vital living ecosystem that sustains plants, animals, and humans.” (NRCS, 2015). This statement is as applicable to wetlands and other ecological systems as it is to agronomic situations. Soil health cards have been developed for different states, including Ohio (The Ohio State University Extension Service, 2015).

Ohio’s score card “evaluates a soil’s health or quality as a function of soil, water, plant, and other biological properties. It provides a qualitative assessment of soil health, and evaluation ratings that do not represent an absolute measure or value. The purpose is not to measure one soil type against another, but rather to use indicators that assess each soil’s ability to function within its capabilities and site limitations,” (The Ohio State University Extension Service, 2015).

The card evaluates with a simple qualitative scale, among other things, soil compaction and structure, soil life, soil water, and soil fertility. In our opinion such a card could be adapted to look at wetland soil and soil hydrology issues. The card could be adapted to look at both natural wetlands and mitigation or potential mitigation sites with a goal to assist in making decisions regarding protecting existing wetland and successfully restoring wetlands.

With that goal in mind, Ohio EPA intends to explore and build upon previous work involving wetland mitigation, as well as the Ohio NWCA intensification study, by partnering with others to develop a relatively simple soil evaluation tool for Ohio wetlands. Such a tool could possibly look similar to the Ohio soil health score card as it stands now, but from the perspective of wetland ecosystems rather than agronomic systems.

Conclusions and Recommendations for Future Wetland Surveys

The Ohio intensification of the NWCA has proven to be a valuable first step towards characterizing the state’s remaining wetland resources. Previous estimates have suggested that Ohio has lost approximately 90 percent of its original wetland habitat since European colonization. For this project, current high resolution GIS data available for the state (NRCS SSURGO soils and NWI wetlands) was used to verify this previous estimate. The updated analysis supports these previous measurements, as the geo-spatial analysis of these data layers places the wetland loss amount at 90.5 percent for Ohio. This confirms Ohio’s status as one of the top two states with regards to having the largest proportion of loss of this valuable resource, making it important to develop a baseline ecological condition of the remaining wetlands.

A total of 50 randomly-selected wetlands were studied in detail using NWCA protocols and Ohio's level 2 (ORAM) and level 3 (VIBI, VIBI-FQ) assessment protocols. The results of these assessments suggest that Ohio wetland resources are in overall good ecological condition. It should be noted that the sample design for this project is area-weighted, and a majority of the remaining wetland area is contained within a relatively small percent of the total mapped NWI wetlands – only seven percent of the NWI forested, scrub-shrub, and emergent wetlands are larger than 10 acres in size, but combined, these represent 60 percent of the remaining wetland area in Ohio. Wetlands 50 acres or larger in size make up less than one percent of total wetland number, but constitute 24 percent of extant wetland area. A large proportion of these larger wetlands are relegated to a four-county area in northeast Ohio (Ashtabula, Trumbull, Geauga, and Portage counties). Because of geographic distribution of wetland area, a large proportion of the sites included in Ohio's intensification study were located in the northeastern part of the state.

The information gained from the Ohio NWCA intensification has been invaluable to our understanding of this critical resource. We recommend repeating this statewide wetland assessment in Ohio every 10 years. Due to the tremendous amount of work associated with each wetland survey, approximately 10 wetlands should be targeted per year for a 5-year period, followed by a 5-year pause in data collection. A proposed scheduled for future surveys would be as follows.

Baseline: Data Collection (2011-2014) with summary report completed in 2015

Survey 2: Data Collection (2020-2024) with summary report completed in 2025

Survey 3: Data Collection (2030-2034) with summary report completed in 2035, etc.

Due to current staffing limitations, it is unlikely that a more aggressive schedule than what is listed above would be possible for follow-up surveys. At a minimum, however, this proposed schedule is reasonable, and would provide extremely valuable information regarding the status of Ohio's wetland resources into the foreseeable future.

Additionally, several "lessons learned" from the associated field work will allow us to streamline the field protocols substantially when conducting future surveys. The following recommendations apply to subsequent Ohio and national wetland assessments.

1) Soils – NWCA protocols required a total of four soils pits to be dug within each wetland to determine the "representative" location for soil characterization and collections for laboratory analysis. The NWCA soils information collected was extremely important for characterizing wetland ecological condition, but we found this level of effort to be unnecessary. The Ohio EPA soils scientist participating in the surveys modified this approach for the 39 intensification sites by using a soil probe analysis along each cardinal transect line to determine this representative location. Once this location was identified, a single pit was dug to collect soils data as required for the NWCA. In many wetlands, eliminating the requirement to dig three of four soil pits saved a considerable amount of time and energy, with no loss of data quality. Future surveys should definitely retain the soils analysis component of the study, but the field protocols should be

modified as described above. Detailed identification and sampling of soil horizons is necessary to characterize the vertical distribution of key analytical components within soil profiles. The extent of horizon differentiation and sampling in the OH intensification assessment was probably greater than in the nationwide NWCA and should be continued future assessments.

2) Buffer – Many of the wetlands surveyed over the course of this project presented a number of challenges when conducting the NWCA buffer analysis. These included: 1) denial of permission from landowners to access property encompassing some of the buffer plots, 2) difficulty to safely traverse one or more buffer lines due to deep water, extremely dense vegetation, or steep slopes, and 3) ambiguity in the buffer data sheets requiring too much interpretation in the field for buffer team members. In a large proportion of the wetlands studied, the buffer analysis required two to three participants and several hours to successfully navigate the four 100 meter lines emanating from the AA in order to record the data as prescribed. Due to these difficulties, our field crew did not feel the quality of information collected during this buffer work justified the tremendous energy required to complete the task. The Ohio intensification study incorporated a GIS LDI analysis to capture critical buffer data using high resolution land use data to characterize buffer integrity. This analysis proved to be a suitable replacement to the laborious field buffer survey included in the 2011 NWCA. This approach would also provide a more consistent analysis, as the NLCD land use layers are available for the entire United States for a given timeframe. Modifying the protocols to use GIS instead of valuable field resources would allow a greater emphasis on the assessments that provide much greater "bang for the buck" and must be conducted during the site visit (e.g., vegetation and soils). A similar LDI analysis for all NWCA sites nationwide verified the utility of this GIS approach as a viable alternative to field buffer data collection for future wetland surveys.

3) Vegetation assessment protocols – The assessment of the plant community proved to be one of the most valuable aspects to the Ohio NWCA intensification study. However, there are a few ways that the NWCA protocols could be modified slightly to streamline the vegetation work for future surveys. Setting up five individual 10 meter x 10 meter vegetation plots arranged along the north/south and east/west axis lines proved to be more time consuming than necessary. We would recommend placing a 20 meter x 50 meter "Whittaker" plot, composed of ten individual 10 meter x 10 meter modules, within the 40-meter radius AA. Detailed data could be collected from four of these modules, which is the field protocol employed by Ohio EPA when a typical VIBI assessment is conducted. Modifying the plot set-up in this manner would reduce field time and not detract from the vegetation assessment quality. A second way to improve the vegetation analysis would be to eliminate the forms for recording vegetation types and ground surface attributes. Much of the information required on these forms was redundant, difficult to estimate properly (e.g., litter depth, arboreal lichen cover, etc.), and increased the field time necessary for the veg team to complete their data collection. Future surveys should focus on species presence, DBH measurements, and cover estimates, as this information is readily translated to metrics that clearly correspond to ecological condition. Some of the information

collected on the additional two forms appeared to be superfluous and could therefore be eliminated without losing any vital information.

We would also like to reiterate our strong belief that the two metric VIBI-FQ should be included either in addition to, or as a replacement for the VMMI. Results we have generated for the entire NWCA dataset (967 wetlands) and included with this grant report clearly show the utility of this approach. Additionally, limitations with using the VMMI as an assessment in Ohio wetlands, are completely avoided with the VIBI-FQ. These include:

- Native Monocot Relative Cover metric scores will be relatively lower for woody wetlands, even if they are in reference condition.

- The tolerant species metric using a *sum of species* instead of a *proportion of species* is problematic for highly degraded wetlands, which may have an extremely small number of total species, and could, therefore, score well for this metric. Switching to a proportional metric would also minimize the problem of all vegetation plots within a given wetland AA not always consisting of the same plant community type, which sometimes occurred in Ohio. Finally, Ohio C of C values considered to be tolerant are two or less (not four or less as used for the NWCA analysis). Having this tolerance range too high negatively affected this metric for wetlands that have a very large number of total species. Even on the most pristine wetland sites, this produced extremely low scores for this metric.

- Current VMMI scoring ranges appear to be too coarse to be of use when evaluating Ohio wetlands. Results from Ohio assessments (ORAM, VIBI, and VIBI-FQ) all produced very similar results with regards to the distribution of poor, fair, good, and excellent wetlands. The VMMI, however, did not match at all with these results, as most wetlands scored as poor or fair when the proposed NWCA scoring ranges were used.

Although a statistical correlation exists when comparing the VIBI-FQ scores with VMMI results for the very large NWCA dataset, at the individual site level, the VMMI does not conform well with observations related to ecological condition. In Ohio, some of the sites scoring the best for VMMI clearly were highly degraded. These sites generally scored low using VIBI-FQ methodology. We are hesitant to incorporate the VMMI into our 401 regulatory program unless it is demonstrated to consistently identify the “best of the best” and the “worst of the worst.” The VIBI-FQ was developed specifically to do so – sites with low diversity and dominated with highly tolerant and/or invasive species will never score well, whereas those wetlands having high diversity and being mostly composed of more sensitive species will always score very high on the scale. This makes the VIBI-FQ a more appropriate tool for evaluating Ohio wetland condition. As stated previously in this document, the VMMI was developed to assess large geographic areas in a statistically valid way. It has been demonstrated to function as desired, based on the preliminary results of the NWCA (U.S. EPA, 2015A; 2015B). The limitations discussed above are only valid when considering the VMMI as a site specific wetland analysis tool.

4) Water chemistry – Due to the limitations of collecting water samples at a single location on a single day, Ohio EPA recommends considering the elimination of this aspect of future NWCA surveys. Interpreting these “snapshot in time” data is very difficult and unlikely to yield much relevant information, unless protocols are modified to address temporal inconsistencies in water quality. If the NWCA continues to be a single day event, water sample collection should be excluded from the protocols.

5) Plot Set-up Flexibility – NWCA protocols established the AA center for each wetland, which if necessary, could be shifted up to 60 meters to ensure that the entire AA was within a mapped wetland and did not cross HGM boundaries. We would recommend also allowing for minor shifts to prevent having the vegetation plots cross obviously different plant community boundaries. Several metrics in the traditional Ohio EPA VIBI analysis can be artificially inflated when the sample plots cover more than one plant community type. In a few instances, this appeared to be the case for wetlands in the Ohio NWCA intensification study. This should not affect VIBI-FQ scoring, but vegetation metrics that are based on species counts within the sample area clearly could be affected. If possible, NWCA data should be investigated to determine if this scenario occurred often enough to affect ecological condition scores on some of the included wetland sites.

The analysis of bryophytes conducted as part of this project revealed a very close relationship between the overall condition of the vascular plant community, as assessed via the VIBI-FQ, and the diversity of mosses and liverworts present within these wetlands. Four metrics were evaluated: number of bryophyte species, number of bryophyte genera, Moss QAI, and Bryophyte QAI. Each of these had a high degree of statistical correlation to the VIBI-FQ scores. The relationship was strengthened further when outlier sites, which have been subjected to recent catastrophic habitat disturbances that precluded the development of a bryophyte community, were removed from the analysis. Due to the sensitive life cycle requirements of mosses, liverworts and hornworts, recovery from these high levels of habitat disturbance is likely to require substantially more time for recovery to occur, as opposed to vascular plants. This disconnect in recovery time could be an extremely valuable tool for determining historic levels of wetland disturbances. Based on these very promising results, Ohio EPA intends to continue exploring the utility of bryophytes as indicators of wetland ecological condition in Ohio.

The soils analysis included in this study suggests that important information about wetland condition can be obtained with a relative handful of soil parameters, along with the structural analysis obtained via the soil pit. Excessive sedimentation and nutrient inputs are closely correlated with plant community condition. Understanding both present and past disturbances and how these have affected the soil structure is critical to understanding long term trends in wetland condition, both past and future. The Ohio EPA intends to continue exploring the use of GIS as a tool for measuring past disturbances and to continue building a Level 1 assessment that will improve our understanding how these various disturbances affect wetland health. Additionally, we intend to develop a soil health card to help identify sites whose soils may be damaged and need remediation prior to initiating wetland restoration activities, such as those associated with mitigation projects.

The 2011-2014 intensification project provided a unique opportunity to monitor a random sample of wetlands in Ohio. We recommend replicating this wetland survey on a regular basis (every 10 years) to track temporal trends in both wetland quality and quantity. The Ohio EPA will be exploring new techniques for wetland mapping that will improve our ability to define wetland extent and quantify areas. Future surveys should target some of the larger remaining wetlands as defined by this improved mapping. These studies should also focus on the data collection elements that provided the most valuable information as part of this intensification of the NWCA: ORAM, VIBI, VIBI-FQ, bryophytes, and soils analyses. Superfluous elements, such as water chemistry testing, excessive habitat measurements, and field buffer data, should be dramatically altered or eliminated altogether to make each wetland assessment more manageable with little or no loss of critical information. Whenever possible, future Ohio statewide surveys should continue to be done in conjunction with the already-established NWCA monitoring projects for maximum efficiency of effort.

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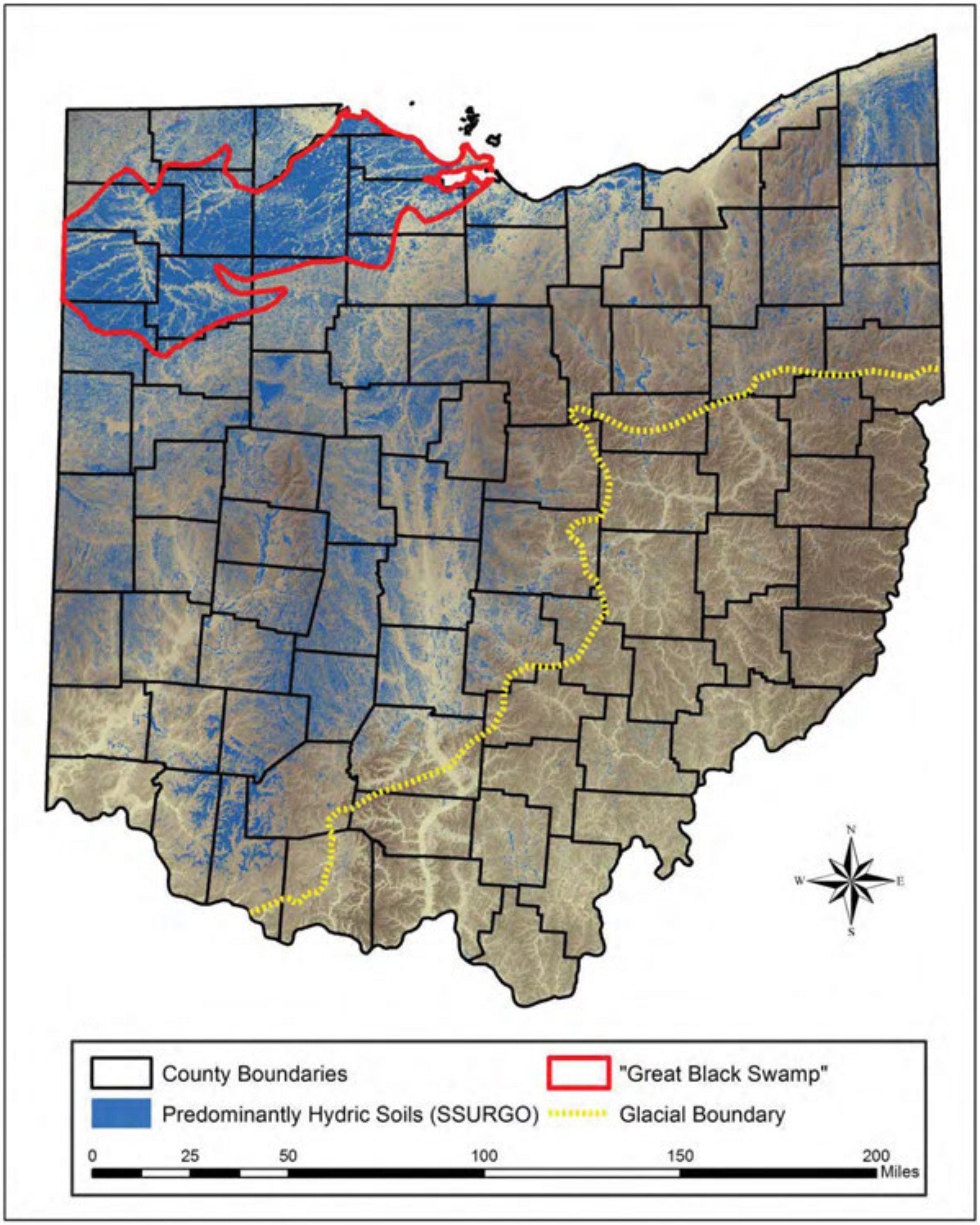


Figure 1. Approximate extent of pre-settlement wetlands in Ohio, based on SSURGO hydric soil mapping.

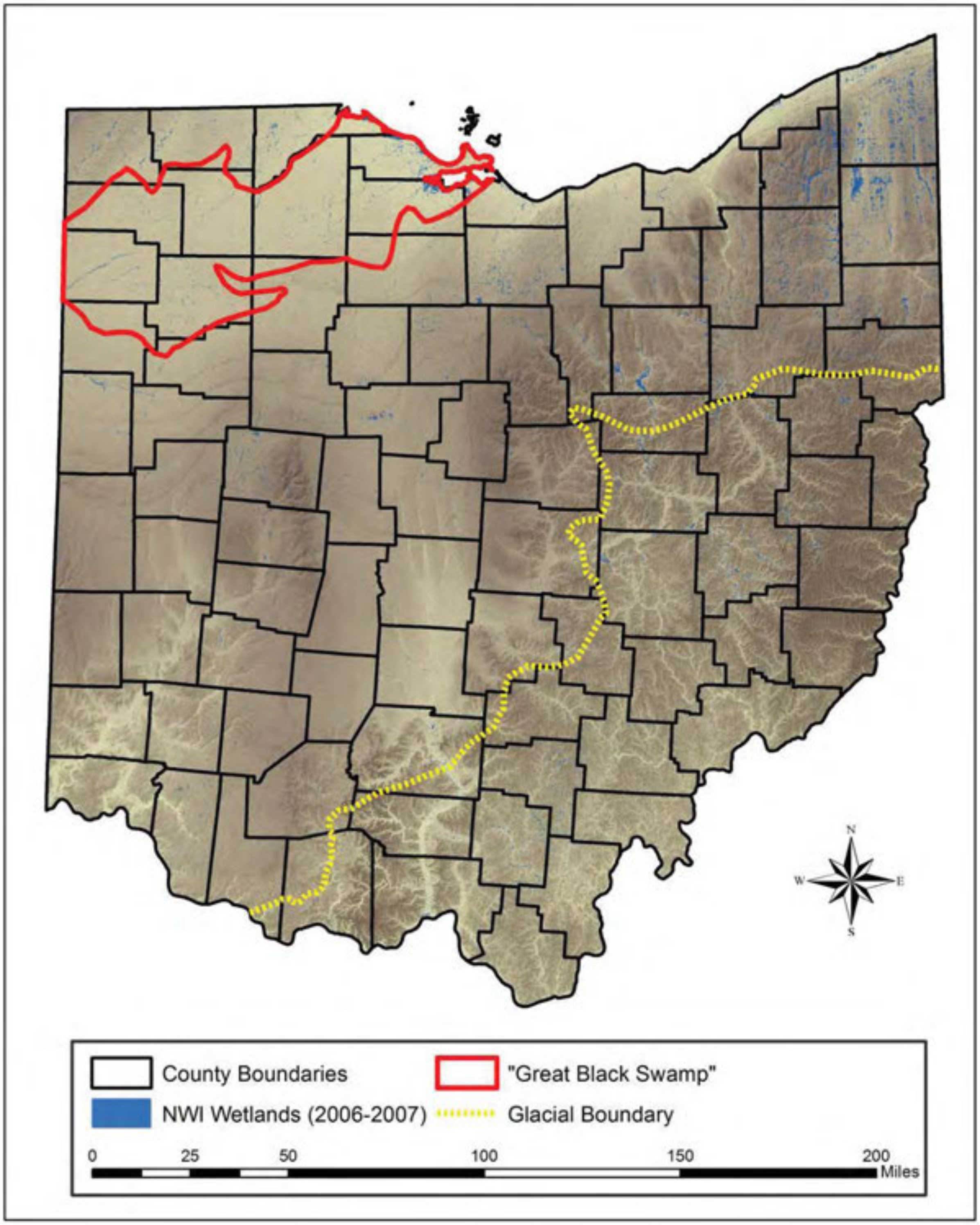


Figure 2. Extant wetland area in Ohio, based on National Wetland Inventory (NWI) mapping of emergent, scrub-shrub and forested wetlands.

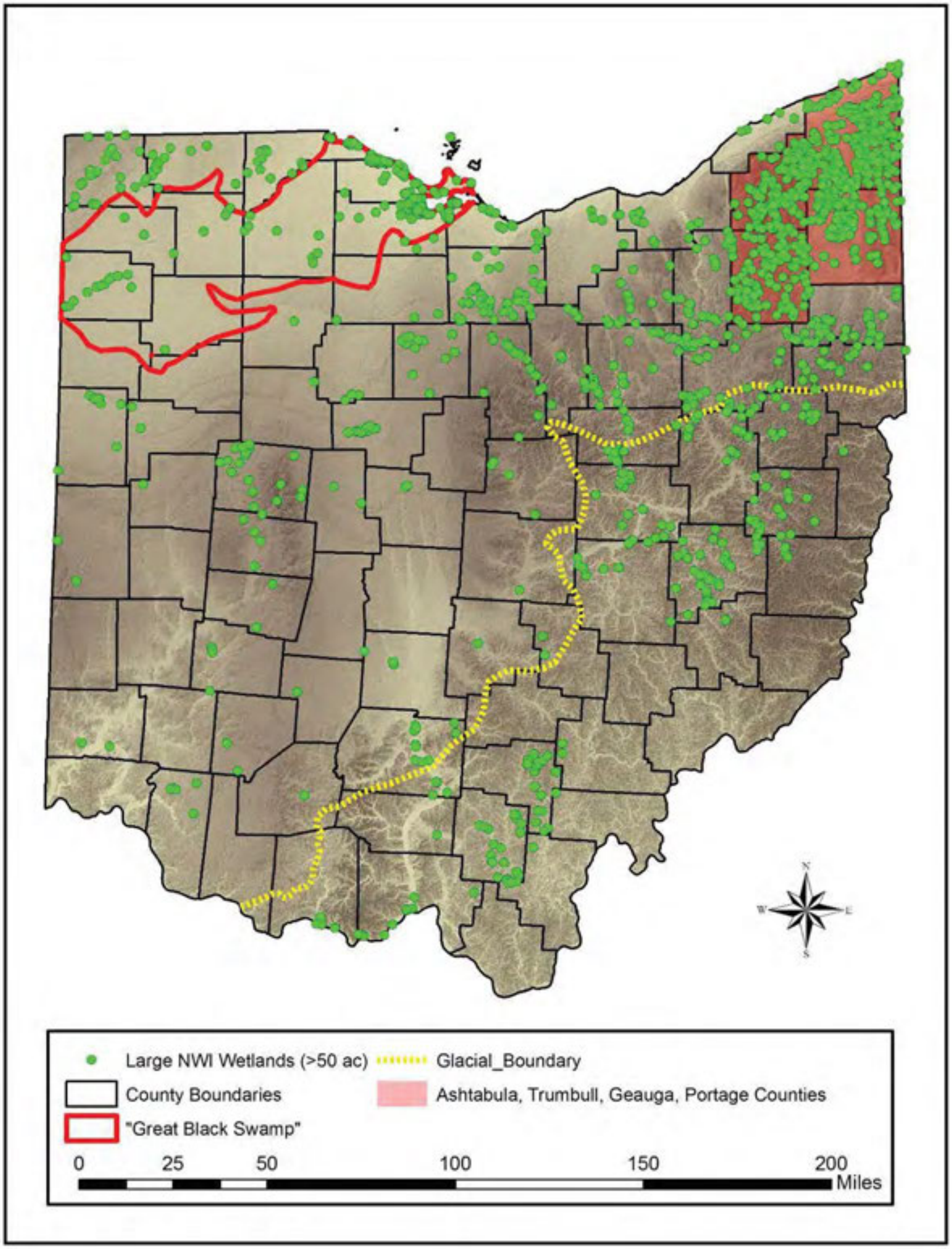


Figure 3. 50 acre and larger wetland areas in Ohio, based on National Wetland Inventory (NWI) mapping of emergent, scrub-shrub and forested wetlands.

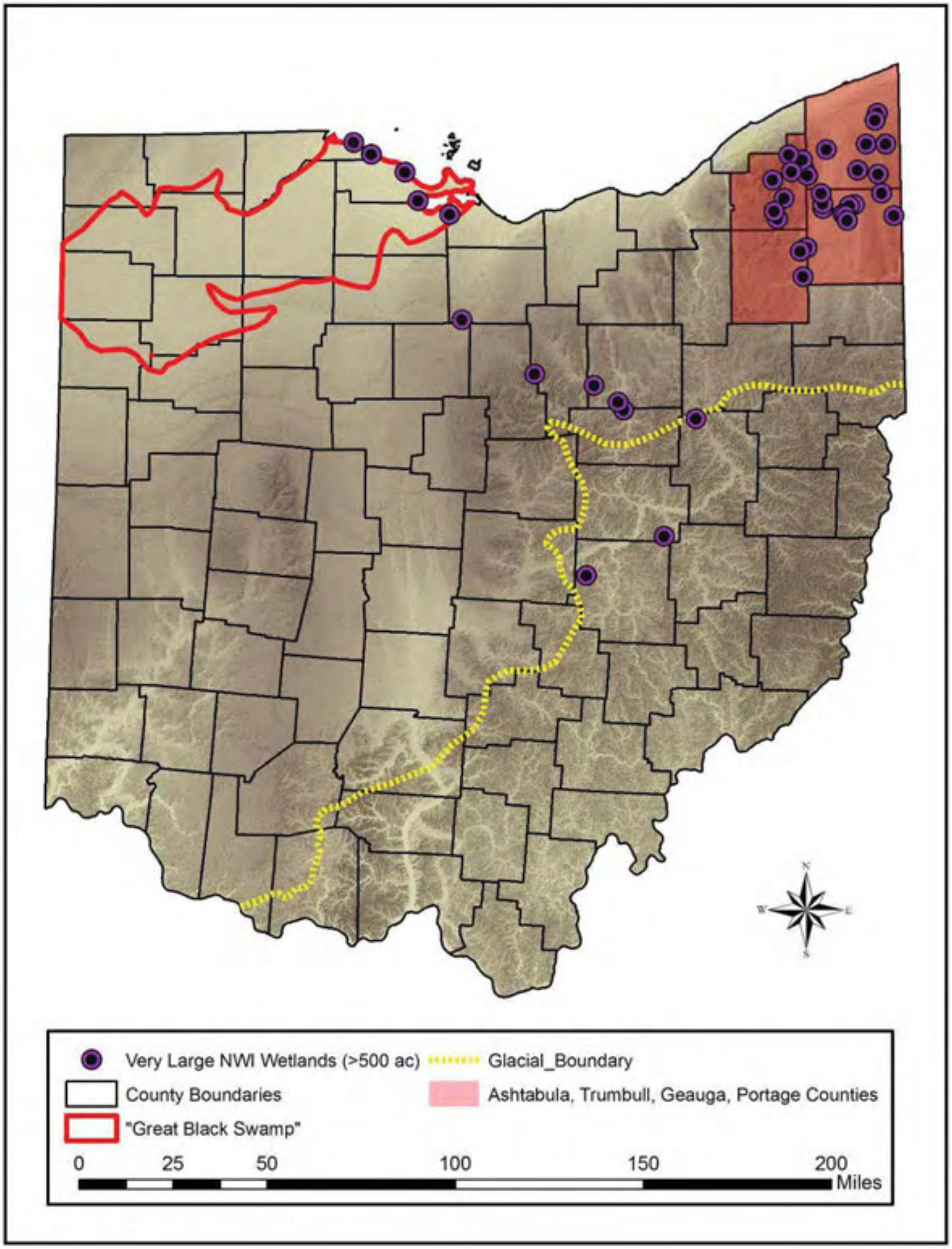


Figure 4. 500 acre and larger wetland areas in Ohio, based on National Wetland Inventory (NWI) mapping of emergent, scrub-shrub and forested wetlands.

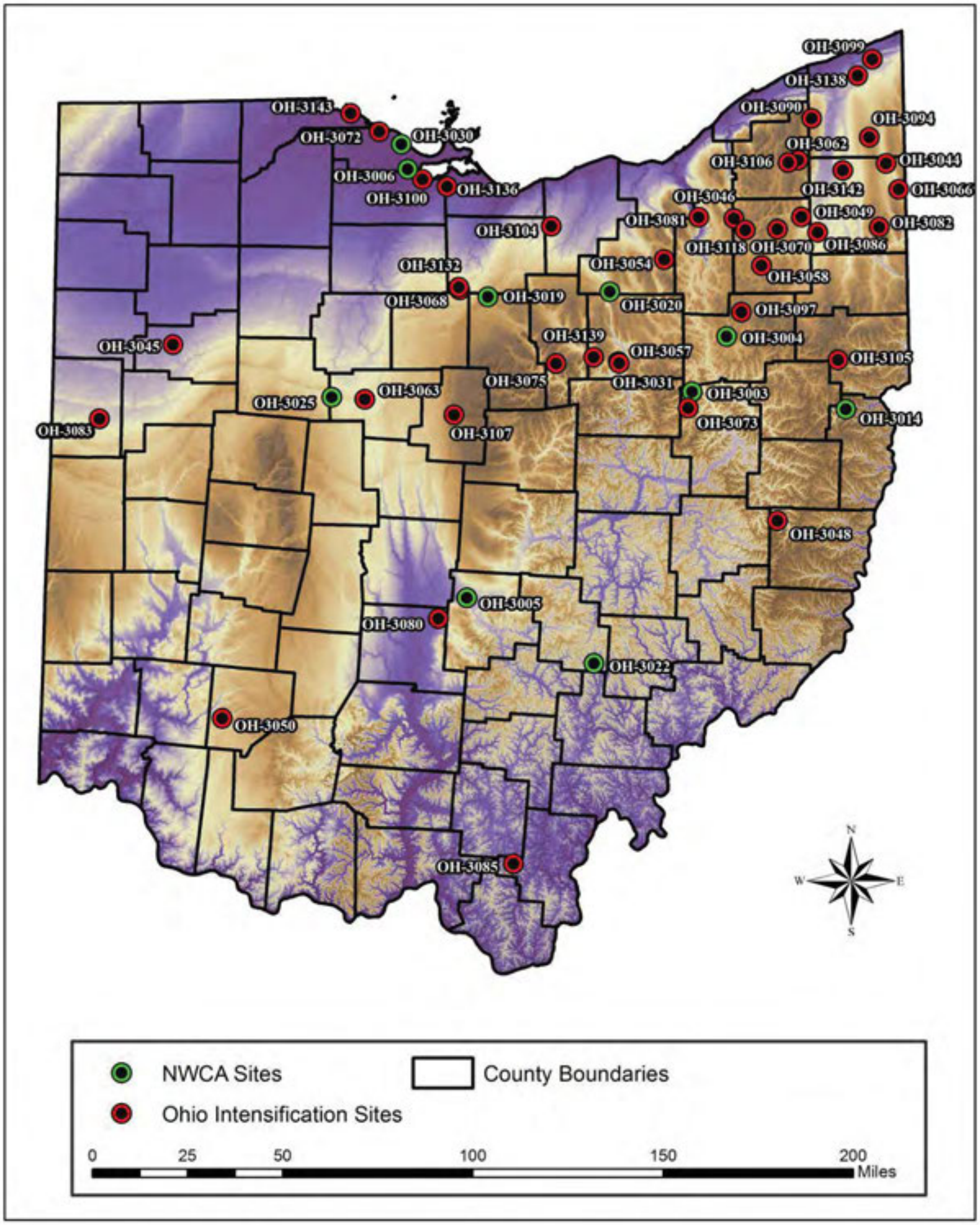
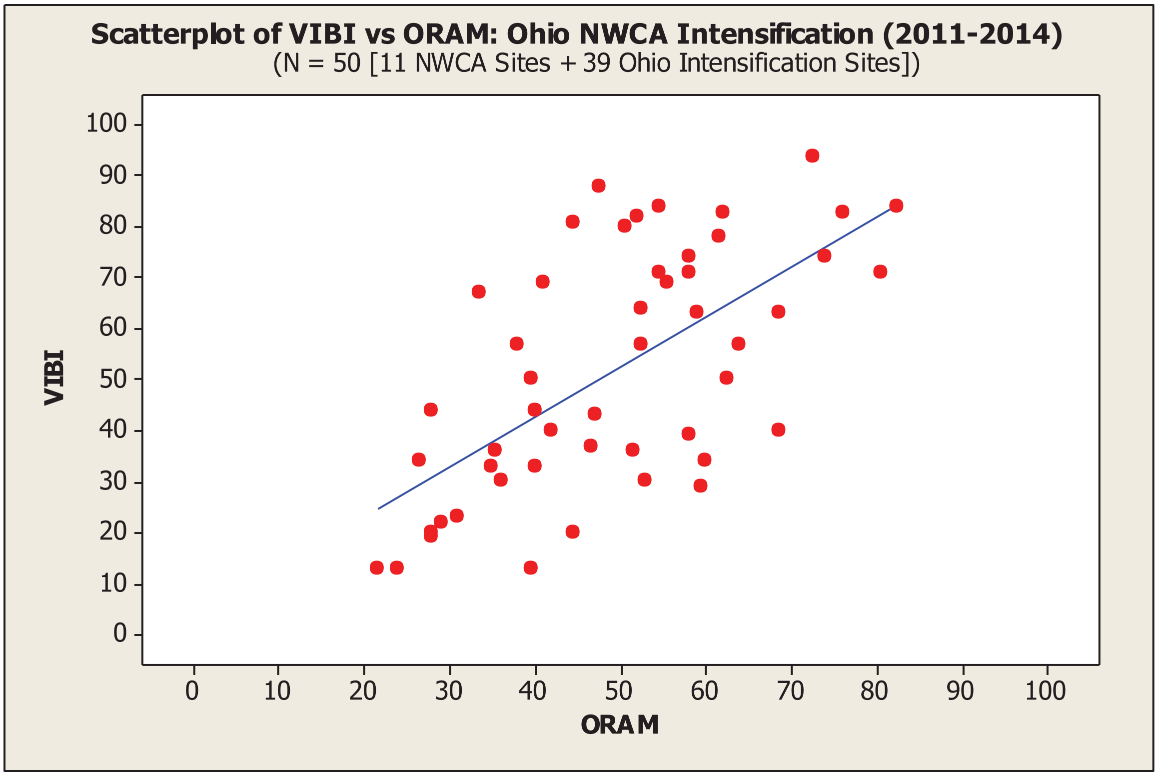


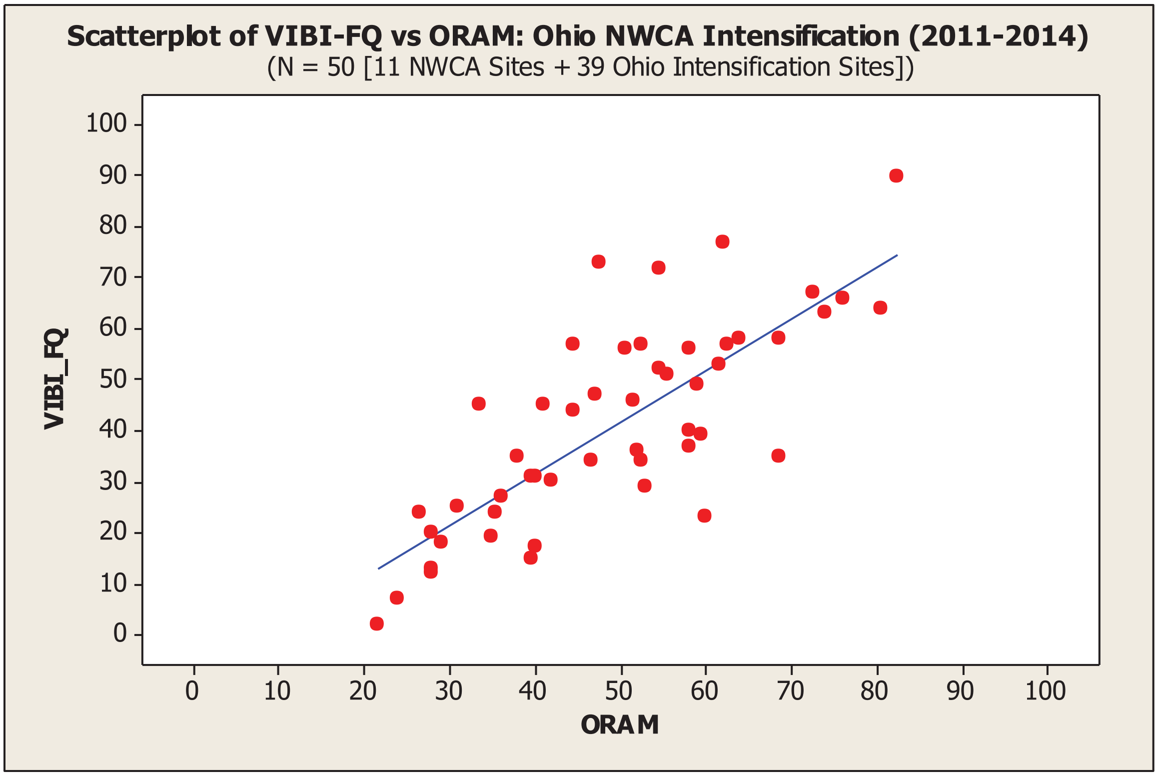
Figure 5. All NWCA and intensification sites included in the study.



Regression Analysis: VIBI versus ORAM

```
The regression equation is
VIBI = 3.40 + 0.980 ORAM


Predictor     Coef  SE Coef     T      P
Constant     3.404    8.790  0.39  0.700
ORAM        0.9803   0.1702  5.76  0.000


S = 18.3266   R-Sq = 40.9%   R-Sq(adj) = 39.6%


Analysis of Variance

Source          DF     SS     MS      F      P
Regression       1  11141  11141  33.17  0.000
Residual Error  48  16121    336
Total           49  27263
```

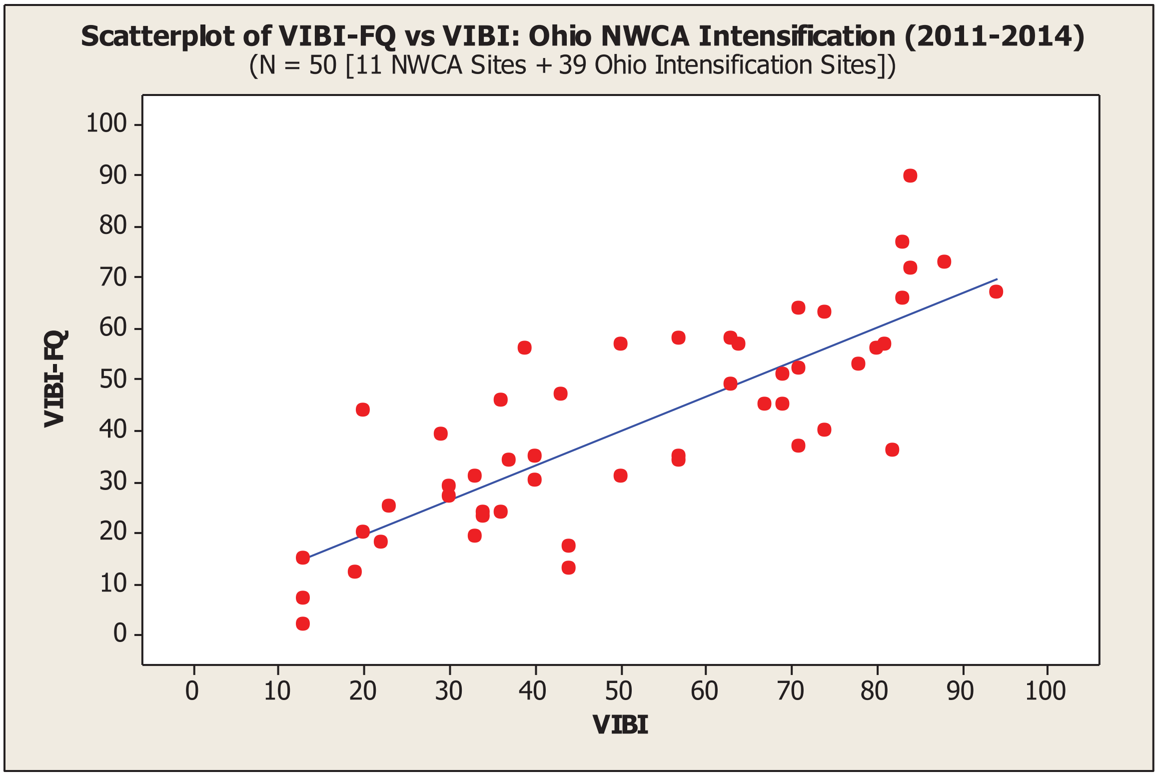
Figure 6. Scatterplot, Fitted line regression plot and Minitab output of VIBI and ORAM assessment results for 50 Ohio intensification study wetlands (df = 49, F = 33.17, p < 0.001, R-squared = 40.9 percent).



Regression Analysis: VIBI_FQ versus ORAM

```
The regression equation is
VIBI_FQ = - 8.74 + 1.01 ORAM


Predictor     Coef  SE Coef      T      P
Constant    -8.737    5.993  -1.46  0.151
ORAM        1.0119   0.1160   8.72  0.000


S = 12.4937   R-Sq = 61.3%   R-Sq(adj) = 60.5%


Analysis of Variance

Source          DF     SS     MS      F      P
Regression       1  11872  11872  76.05  0.000
Residual Error  48   7492    156
Total           49  19364
```

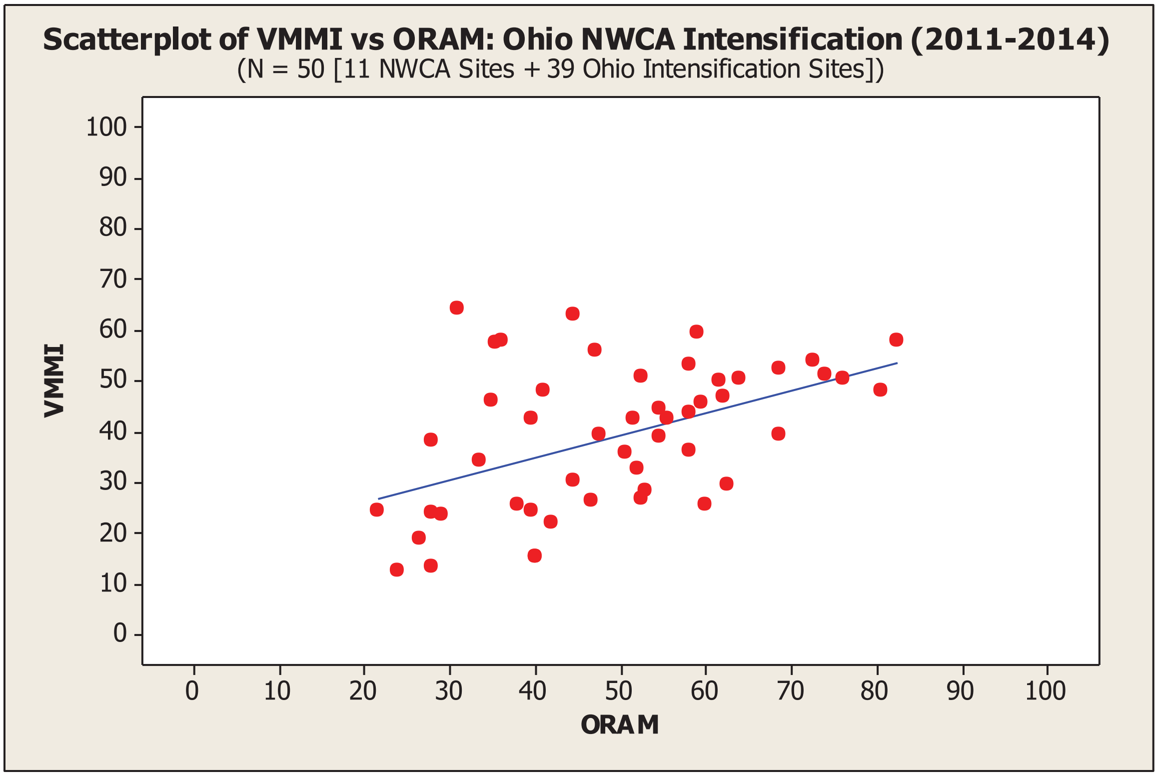
Figure 7. Scatterplot, Fitted line regression plot and Minitab output of VIBI-FQ and ORAM assessment results for 50 Ohio intensification study wetlands (df = 49, F = 76.05, p < 0.001, R-squared = 61.3 percent).



Regression Analysis: VIBI_FQ versus VIBI

```
The regression equation is
VIBI_FQ = 5.83 + 0.683 VIBI


Predictor      Coef  SE Coef     T      P
Constant      5.835    4.048  1.44  0.156
VIBI        0.68299  0.07127  9.58  0.000


S = 11.7673   R-Sq = 65.7%   R-Sq(adj) = 65.0%


Analysis of Variance

Source          DF     SS     MS      F      P
Regression       1  12717  12717  91.84  0.000
Residual Error  48   6647    138
Total           49  19364
```

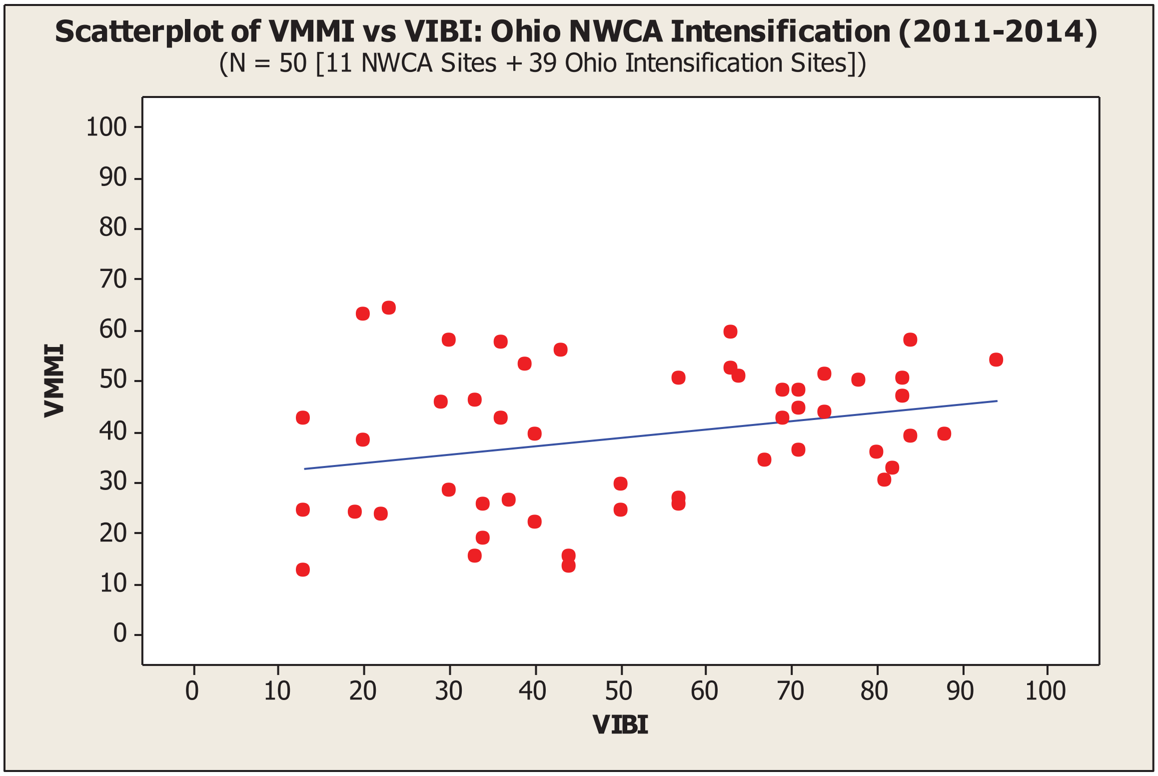
Figure 8. Scatterplot, Fitted line regression plot and Minitab output of VIBI-FQ and VIBI assessment results for 50 Ohio intensification study wetlands (df = 49, F = 91.84, p < 0.001, R-squared = 65.7 percent).



Regression Analysis: VMMI versus ORAM

```
The regression equation is
VMMI = 17.5 + 0.440 ORAM


Predictor      Coef  SE Coef     T      P
Constant     17.473    6.001  2.91  0.005
ORAM         0.4397   0.1162  3.78  0.000

S = 12.5109   R-Sq = 23.0%   R-Sq(adj) = 21.4%

Analysis of Variance

Source          DF      SS      MS      F      P
Regression       1  2241.2  2241.2  14.32  0.000
Residual Error  48  7513.0   156.5
Total           49  9754.2
```

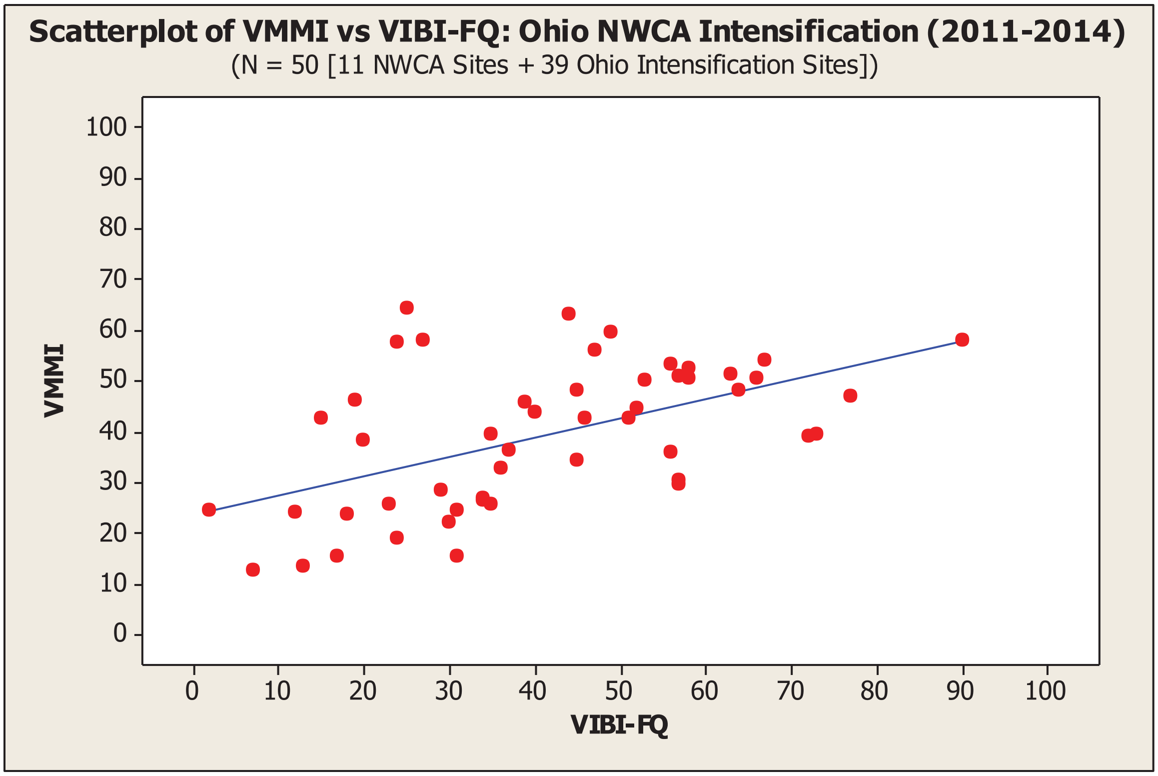
Figure 9. Scatterplot, Fitted line regression plot and Minitab output of VMMI and ORAM assessment results for 50 Ohio intensification study wetlands (df = 49, F = 14.32, p < 0.001, R-squared = 23.0 percent).



Regression Analysis: VMMI versus VIBI

```
The regression equation is
VMMI = 30.7 + 0.164 VIBI


Predictor      Coef  SE Coef     T      P
Constant     30.676    4.716  6.50  0.000
VIBI        0.16404  0.08303  1.98  0.054


S = 13.7087   R-Sq = 7.5%   R-Sq(adj) = 5.6%


Analysis of Variance

Source          DF      SS     MS     F      P
Regression       1   733.6  733.6  3.90  0.054
Residual Error  48  9020.6  187.9
Total           49  9754.2
```

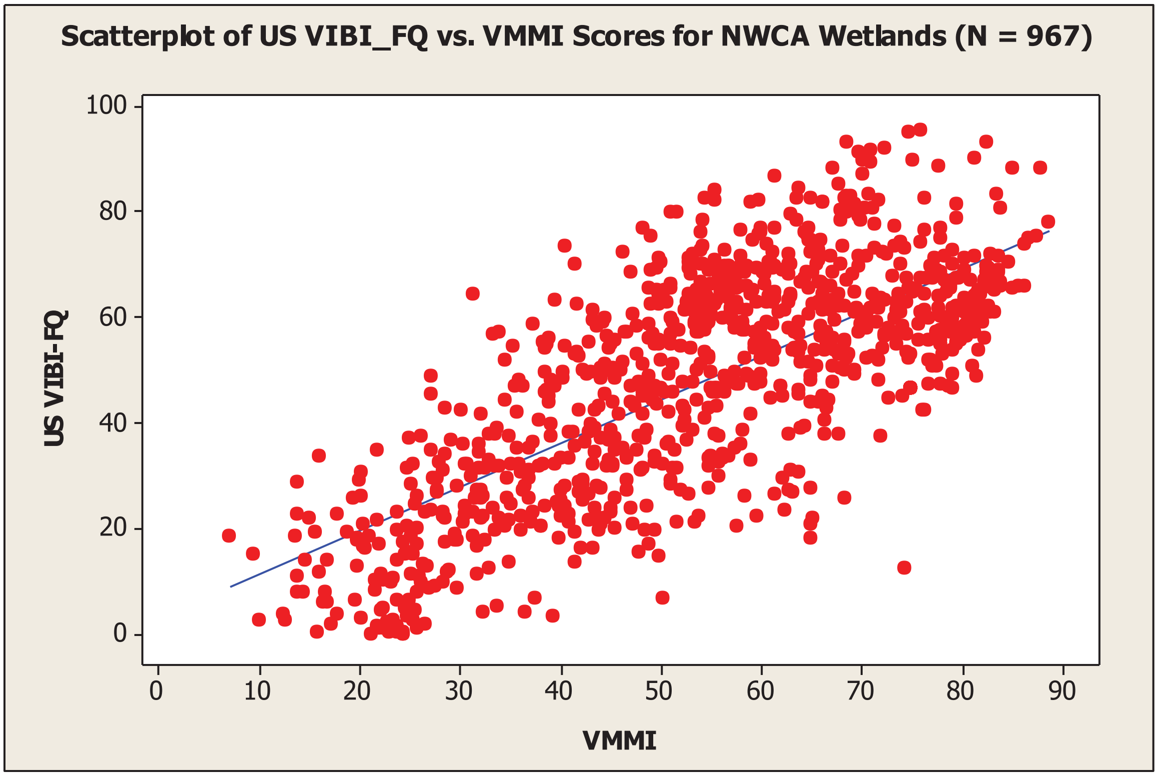
Figure 10. Scatterplot, Fitted line regression plot and Minitab output of VMMI and VIBI assessment results for 50 Ohio intensification study wetlands (df = 49, F = 3.90, p = 0.054, R-squared = 7.5 percent).



Regression Analysis: VMMI versus VIBI-FQ

```
The regression equation is
VMMI = 23.5 + 0.380 VIBI_FQ


Predictor      Coef  SE Coef     T      P
Constant     23.501    3.949  5.95  0.000
VIBI-FQ     0.38033  0.08649  4.40  0.000


S = 12.0357   R-Sq = 28.7%   R-Sq(adj) = 27.2%


Analysis of Variance

Source          DF      SS      MS      F      P
Regression       1  2801.0  2801.0  19.34  0.000
Residual Error  48  6953.2   144.9
Total           49  9754.2
```

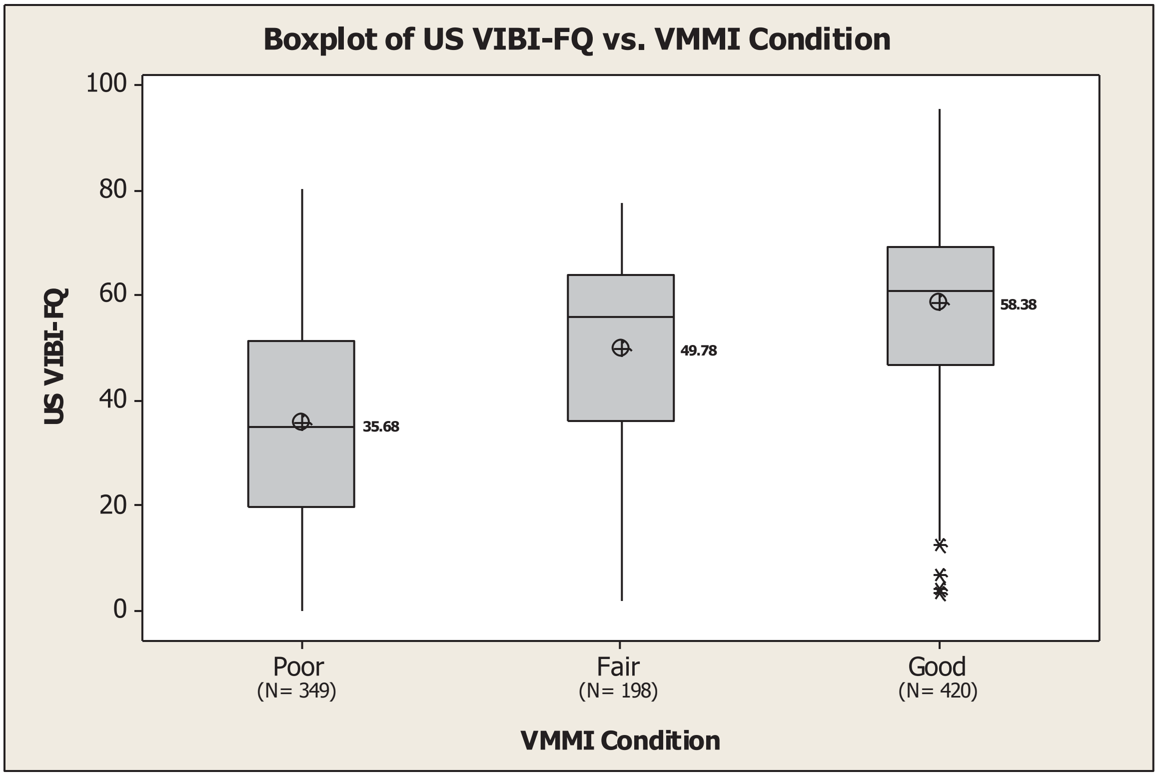
Figure 11. Scatterplot, Fitted line regression plot and Minitab output of VMMI and VIBI-FQ assessment results for 50 Ohio intensification study wetlands (df = 49, F = 19.34, p < 0.001, R-squared = 28.7 percent).



Regression Analysis: US_VIBI_FQ versus VMMI

```
The regression equation is
US_VIBI_FQ = 3.16 + 0.827 VMMI


Predictor      Coef  SE Coef      T      P
Constant      3.159    1.461   2.16  0.031
VMMI        0.82692  0.02530  32.68  0.000


S = 14.4390   R-Sq = 52.5%   R-Sq(adj) = 52.5%


Analysis of Variance

Source           DF      SS      MS        F      P
Regression        1  222721  222721  1068.29  0.000
Residual Error  965  201187     208
Total           966  423908
```

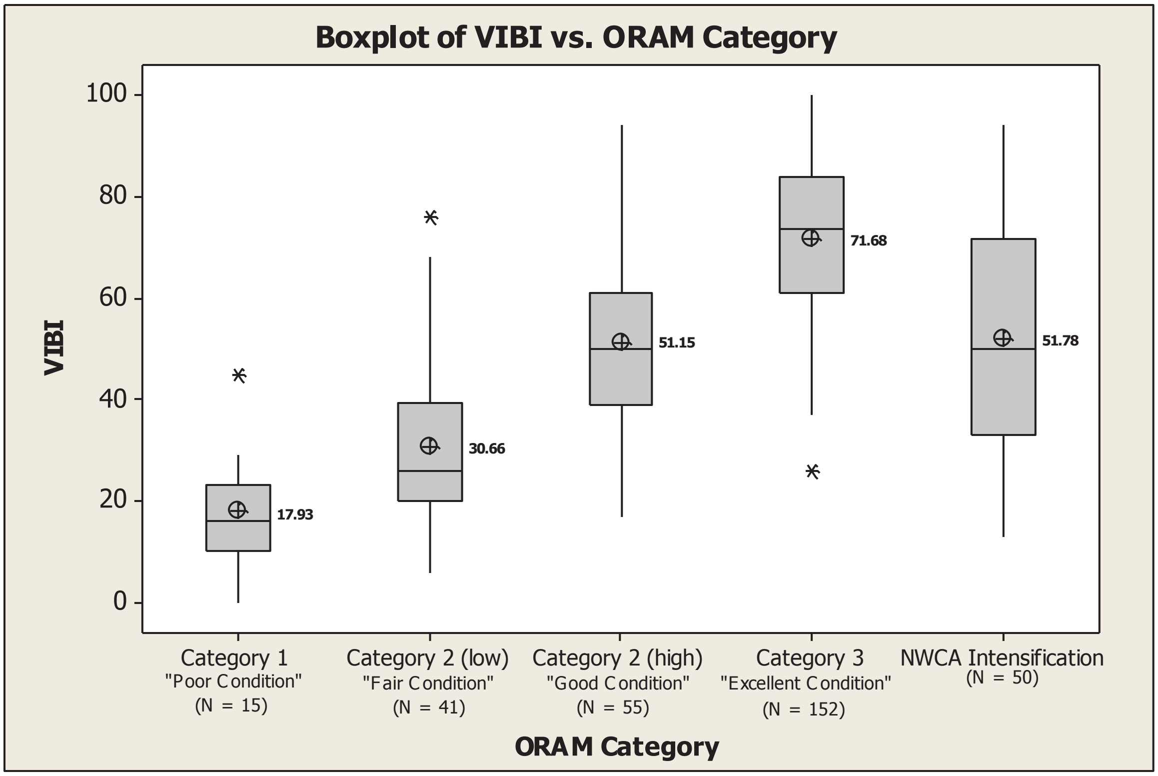
Figure 12. Scatterplot, Fitted line regression plot and Minitab output of US VIBI-FQ and VMMI assessment results for 967 NWCA wetlands (df = 966, F = 1068.29, p < 0.001, R-squared = 52.5 percent).



One-way ANOVA: US VIBI-FQ versus VEGCOND

```
Source    DF      SS     MS       F      P
VEGCOND    2   98622  49311  146.14  0.000
Error    964  325286    337
Total    966  423908

S = 18.37   R-Sq = 23.26%   R-Sq(adj) = 23.11%

Level                     N   Mean  StDev
1-Poor                  349  35.68  19.73
2-Fair                  198  49.78  18.21
3-Good                  420  58.38  17.23

                         Individual 95% CIs For Mean Based on
                         Pooled StDev
Level                     --+---------+---------+---------+-------
1-Poor                    (--*--)
2-Fair                                       (---*---)
3-Good                                                     (-*--)
                          --+---------+---------+---------+-------
                         35.0      42.0      49.0      56.0
Pooled StDev = 18.37

Grouping Information Using Tukey Method

VEGCOND      N          Mean           Grouping
3-Good     420         58.38           A
2-Fair     198         49.78             B
1-Poor     349         35.68               C

Means that do not share a letter are significantly different.
```

Figure 13. Box and whiskers plot and Minitab output of VIBI-FQ scores for 967 NWCA wetlands, broken down by VMMI vegetation condition categories.

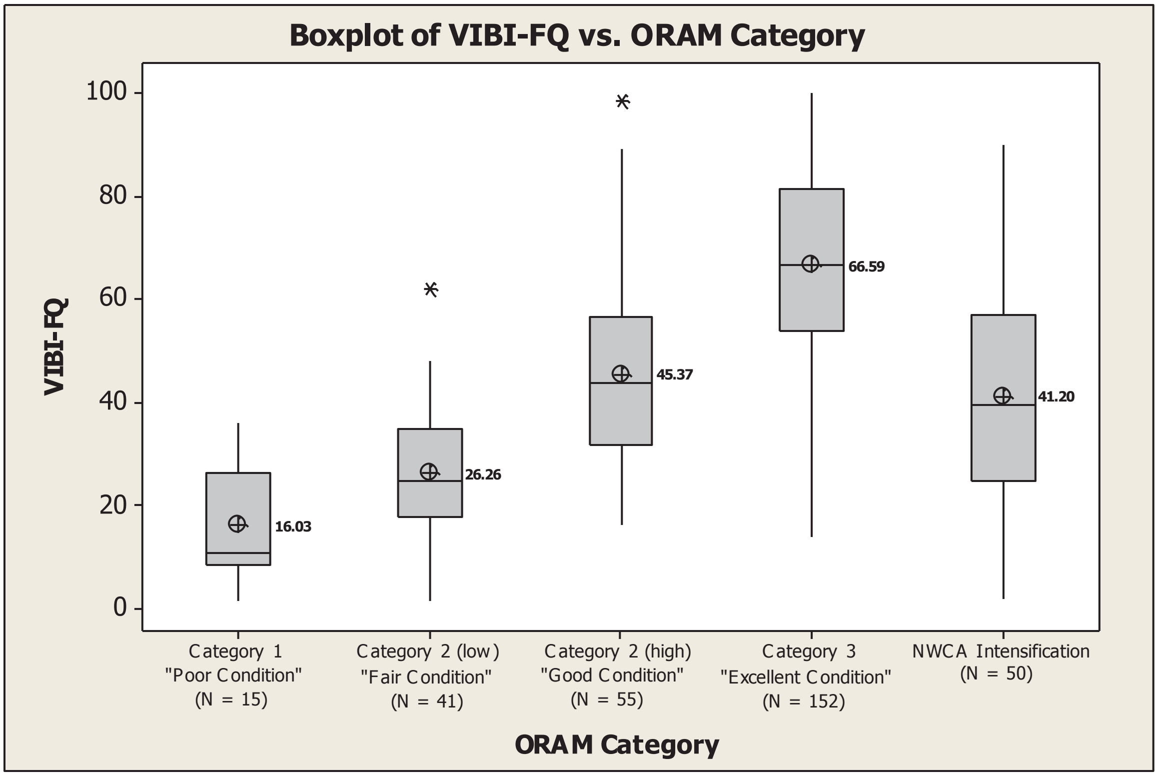


One-way ANOVA: VIBI versus GROUP2

```
Source   DF      SS     MS      F      P
GROUP2    4   87364  21841  70.22  0.000
Error   308   95802    311
Total   312  183166

S = 17.64   R-Sq = 47.70%   R-Sq(adj) = 47.02%

Level                  N   Mean  StDev
Category 1            15  17.93  11.60
Category 2A           41  30.66  15.51
Category 2B           55  51.15  18.13
Category 3           152  71.68  16.13
NWCA                  50  51.78  23.59

                      Individual 95% CIs For Mean Based on
                      Pooled StDev
Level                 ------+---------+---------+---------+---
Category 1            (----*---)
Category 2A                    (-*--)
Category 2B                              (--*-)
Category 3                                          (-*)
NWCA                                     (--*-)
                      ------+---------+---------+---------+---
                           20        40        60        80
Pooled StDev = 17.64

Grouping Information Using Tukey Method
GROUP2                 N   Mean  Grouping
Category 3           152  71.68  A
NWCA                  50  51.78    B
Category 2B           55  51.15    B
Category 2A           41  30.66      C
Category 1            15  17.93      C
```

Means that do not share a letter are significantly different.

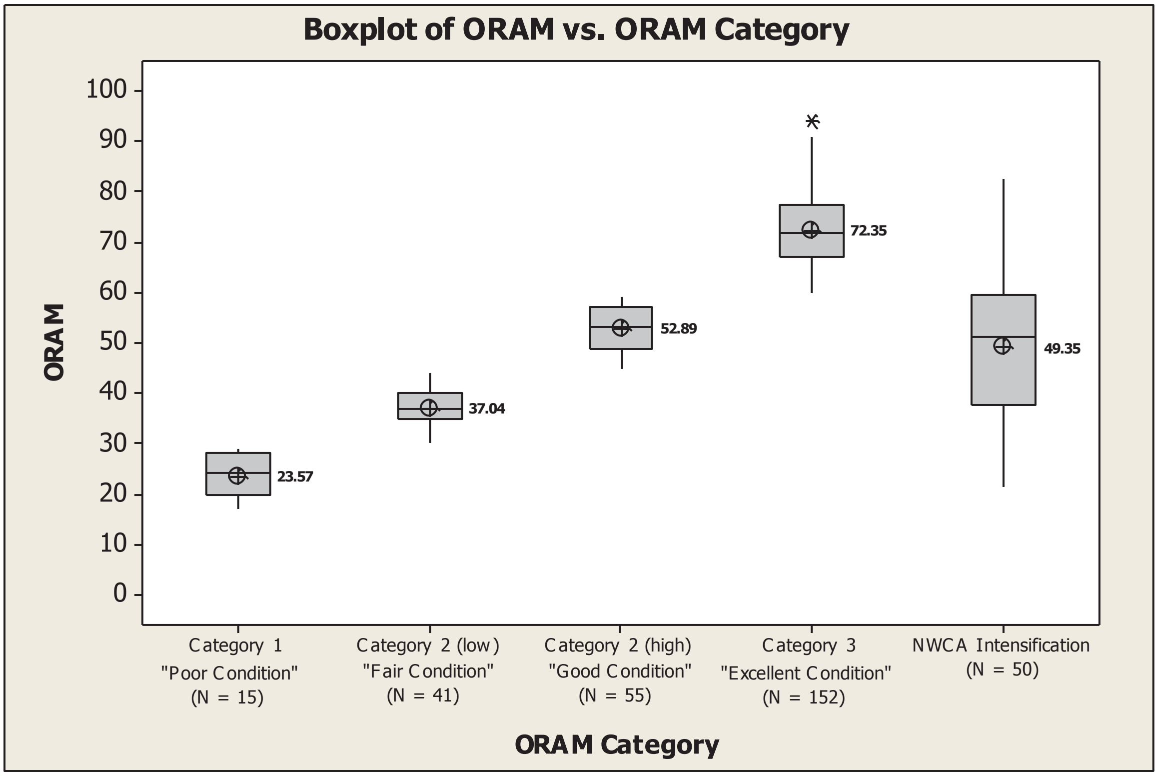
Figure 14. Box and whiskers plot and Minitab output of VIBI scores for 50 Ohio intensification study wetlands compared with VIBI scores for Ohio EPA natural reference wetland dataset, broken down by ORAM categories.



One-way ANOVA: VIBI-FQ versus GROUP2

```
Source   DF      SS     MS      F      P
GROUP2    4   86948  21737  64.81  0.000
Error   308  103303    335
Total   312  190251

S = 18.31   R-Sq = 45.70%   R-Sq(adj) = 45.00%

Level                  N   Mean  StDev
Category 1            15  16.03  10.87
Category 2A           41  26.26  12.64
Category 2B           55  45.37  18.75
Category 3           152  66.59  19.41
NWCA                  50  41.20  19.88

                      Individual 95% CIs For Mean Based on
                      Pooled StDev
Level                 ------+---------+---------+---------+---
Category 1            (-----*-----)
Category 2A                    (--*---)
Category 2B                                (--*--)
Category 3                                               (-*)
NWCA                                     (--*--)
                      ------+---------+---------+---------+---
                           16        32        48        64
Pooled StDev = 18.31

Grouping Information Using Tukey Method
GROUP2                 N   Mean  Grouping
Category 3           152  66.59  A
Category 2B           55  45.37    B
NWCA                  50  41.20    B
Category 2A           41  26.26      C
Category 1            15  16.03      C

Means that do not share a letter are significantly different.
```

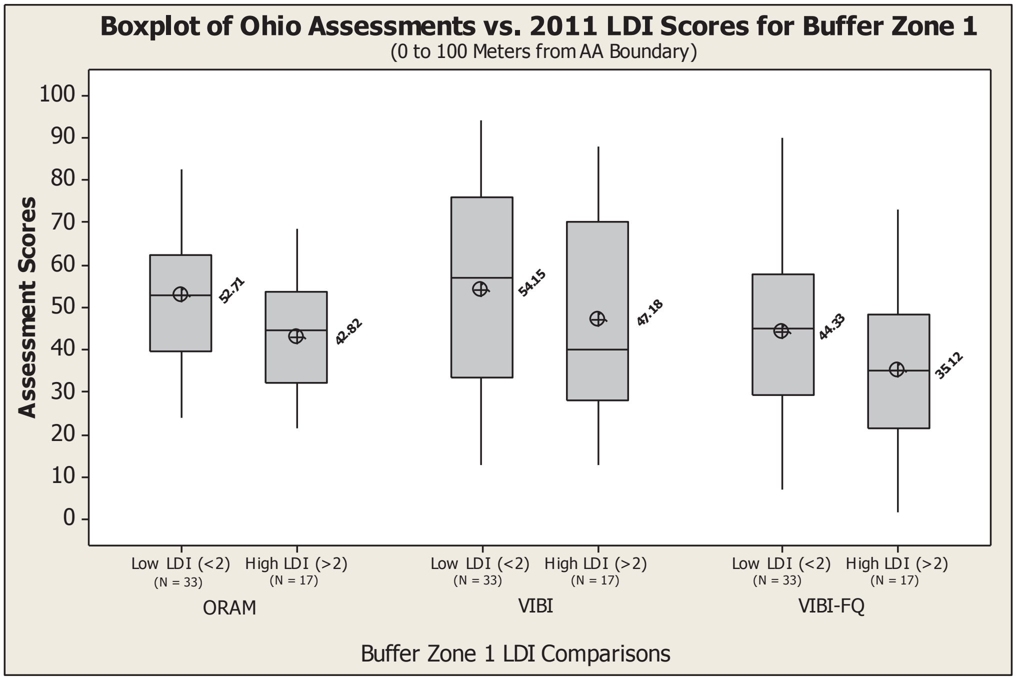
Figure 15. Box and whiskers plot and Minitab output of VIBI-FQ scores for 50 Ohio intensification study wetlands compared with VIBI-FQ scores for Ohio EPA natural reference wetland dataset, broken down by ORAM categories.



One-way ANOVA: ORAM versus GROUP2

```
Source   DF       SS       MS       F      P
GROUP2    4  72233.3  18058.3  258.68  0.000
Error   308  21501.2     69.8
Total   312  93734.5

S = 8.355   R-Sq = 77.06%   R-Sq(adj) = 76.76%

Level                  N    Mean   StDev
Category 1            15  23.567   4.161
Category 2A           41  37.037   3.898
Category 2B           55  52.891   4.316
Category 3           152  72.345   7.302
NWCA                  50  49.350  15.382

                      Individual 95% CIs For Mean Based on
                      Pooled StDev
Level                 -------+---------+---------+---------+--
Category 1            (--*--)
Category 2A                     (-*)
Category 2B                                (*-)
Category 3                                             (*)
NWCA                                    (-*)
                      -------+---------+---------+---------+--
                            30        45        60        75
Pooled StDev = 8.355

Grouping Information Using Tukey Method
GROUP2                 N    Mean  Grouping
Category 3           152  72.345  A
Category 2B           55  52.891    B
NWCA                  50  49.350    B
Category 2A           41  37.037      C
Category 1            15  23.567        D

Means that do not share a letter are significantly different.
```

Figure 16. Box and whiskers plot and Minitab output of ORAM scores for 50 Ohio intensification study wetlands compared with ORAM scores for Ohio EPA natural reference wetland dataset, broken down by ORAM categories.



One-way ANOVA:
ORAM versus B1_LDI_GRP

```
Source      DF     SS    MS     F      P
B1_LDI_GRP   1   1097  1097  5.02  0.030
Error       48  10497   219
Total       49  11594
S = 14.79   R-Sq = 9.46%   R-Sq(adj) = 7.58%

                                 Individual 95% CIs For Mean Based on Pooled StDev
Level        N   Mean  StDev    -+---------+---------+---------+--------
1 - Low     33  52.71  15.64                        (--------*-------)
2 - High    17  42.82  12.93    (-----------*-----------)
                                -+---------+---------+---------+--------
Pooled StDev = 14.79            36.0      42.0      48.0      54.0

Grouping Information Using Tukey Method
B1_LDI_GRP   N   Mean  Grouping
1 - Low     33  52.71  A
2 - High    17  42.82    B              Means that do not share a letter are significantly different
----------------------------------------------------------------------------------------------------
```

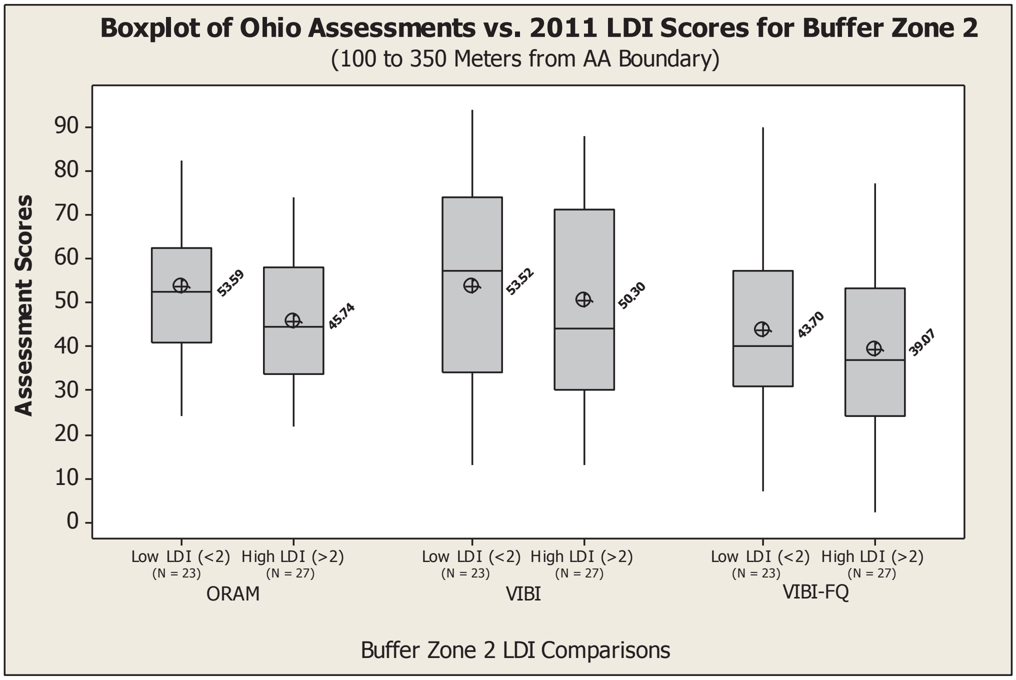
One-way ANOVA:
VIBI versus B1_LDI_GRP

```
Source      DF     SS   MS     F      P
B1_LDI_GRP   1    546  546  0.98  0.327
Error       48  26717  557
Total       49  27263
S = 23.59   R-Sq = 2.00%   R-Sq(adj) = 0.00%

                                  Individual 95% CIs For Mean Based on Pooled StDev
Level        N   Mean  StDev  ---------+---------+---------+---------+
1 - Low     33  54.15  23.61                (----------*-----------)
2 - High    17  47.18  23.56  (----------------*----------------)
                              ---------+---------+---------+---------+
Pooled StDev = 23.59                42.0      49.0      56.0      63.0

Grouping Information Using Tukey Method
B1_LDI_GRP   N   Mean  Grouping
1 - Low     33  54.15  A
2 - High    17  47.18  A                Means that do not share a letter are significantly different
----------------------------------------------------------------------------------------------------
```

One-way ANOVA:
VIBI-FQ versus B1_LDI_GRP

```
Source      DF     SS   MS     F      P
B1_LDI_GRP   1    953  953  2.48  0.122
Error       48  18411  384
Total       49  19364
S = 19.58   R-Sq = 4.92%   R-Sq(adj) = 2.94%

                              Individual 95% CIs For Mean Based on Pooled StDev
Level        N   Mean  StDev  ---+---------+---------+---------+------
1 - Low     33  44.33  20.23                  (--------*---------)
2 - High    17  35.12  18.23  (------------*-------------)
                              ---+---------+---------+---------+------
Pooled StDev = 19.58           28.0      35.0      42.0      49.0

Grouping Information Using Tukey Method
B1_LDI_GRP   N   Mean  Grouping
1 - Low     33  44.33  A
2 - High    17  35.12  A                Means that do not share a letter are significantly different
----------------------------------------------------------------------------------------------------
```

Figure 17. Box and whiskers plot and Minitab output of ORAM, VIBI, and VIBI-FQ scores for 50 Ohio intensification study wetlands compared with 2011 LDI scores for buffer 1 zone (0 to 100 meters) surrounding each assessment area.



One-way ANOVA:
ORAM versus B2_LDI_GRP

```
Source      DF     SS   MS     F      P
B2_LDI_GRP   1    765  765  3.39  0.072
Error       48  10830  226
Total       49  11594
S = 15.02   R-Sq = 6.59%   R-Sq(adj) = 4.65%

                                 Individual 95% CIs For Mean Based on Pooled StDev
Level        N   Mean  StDev     +---------+---------+---------+---------
1 - Low     23  53.59  15.59                    (-----------*------------)
2 - High    27  45.74  14.53     (----------*-----------)
                                 +---------+---------+---------+---------
Pooled StDev = 15.02          40.0      45.0      50.0      55.0

Grouping Information Using Tukey Method
B2_LDI_GRP   N   Mean  Grouping
1 - Low     23  53.59  A
2 - High    27  45.74  A                Means that do not share a letter are significantly different
----------------------------------------------------------------------------------------------------
```

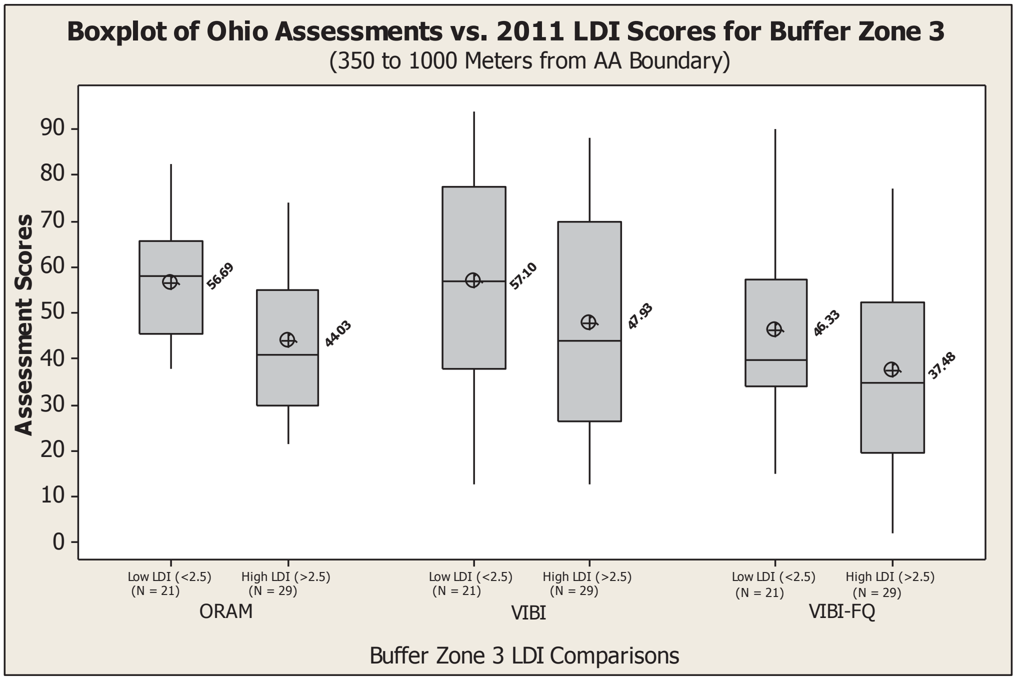
One-way ANOVA:
VIBI versus B2_LDI_GRP

```
Source      DF     SS   MS     F      P
B2_LDI_GRP   1    129  129  0.23  0.635
Error       48  27133  565
Total       49  27263
S = 23.78   R-Sq = 0.47%   R-Sq(adj) = 0.00%

                              Individual 95% CIs For Mean Based on Pooled StDev
Level        N   Mean  StDev   --+---------+---------+---------+-------
1 - Low     23  53.52  23.94        (----------------*----------------)
2 - High    27  50.30  23.64   (----------------*---------------)
                               --+---------+---------+---------+-------
Pooled StDev = 23.78          42.0      48.0      54.0      60.0

Grouping Information Using Tukey Method
B2_LDI_GRP   N   Mean  Grouping
1 - Low     23  53.52  A
2 - High    27  50.30  A               Means that do not share a letter are significantly different
----------------------------------------------------------------------------------------------------
```

One-way ANOVA:
VIBI-FQ versus B2_LDI_GRP

```
Source      DF     SS   MS     F      P
B2_LDI_GRP   1    265  265  0.67  0.418
Error       48  19099  398
Total       49  19364
S = 19.95   R-Sq = 1.37%   R-Sq(adj) = 0.00%

                              Individual 95% CIs For Mean Based on Pooled StDev
Level        N   Mean  StDev  --------+---------+---------+---------+-
1 - Low     23  43.70  19.58         (-------------*-------------)
2 - High    27  39.07  20.25  (------------*------------)
                              --------+---------+---------+---------+-
Pooled StDev = 19.95               36.0      42.0      48.0      54.0

Grouping Information Using Tukey Method
B2_LDI_GRP   N   Mean  Grouping
1 - Low     23  43.70  A
2 - High    27  39.07  A                Means that do not share a letter are significantly different
----------------------------------------------------------------------------------------------------
```

Figure 18. Box and whiskers plot and Minitab output of ORAM, VIBI, and VIBI-FQ scores for 50 Ohio intensification study wetlands compared with 2011 LDI scores for buffer 2 zone (100 to 350 meters) surrounding each assessment area.



One-way ANOVA: ORAM versus B3_LDI_GRP

```
Source      DF     SS    MS     F      P
B3_LDI_GRP   1   1951  1951  9.71  0.003
Error       48   9643   201
Total       49  11594
S = 14.17   R-Sq = 16.83%   R-Sq(adj) = 15.09%

                           Individual 95% CIs For Mean Based on Pooled StDev
Level        N   Mean  StDev  -----+---------+---------+---------+----
1 - Low     21  56.69  13.41                  (--------*--------)
2 - High    29  44.03  14.70  (-------*------)
                              -----+---------+---------+---------+----
Pooled StDev = 14.17            42.0      49.0      56.0      63.0

Grouping Information Using Tukey Method
B3_LDI_GRP   N   Mean  Grouping
1 - Low     21  56.69  A
2 - High    29  44.03    B              Means that do not share a letter are significantly different
----------------------------------------------------------------------------------------------------
```

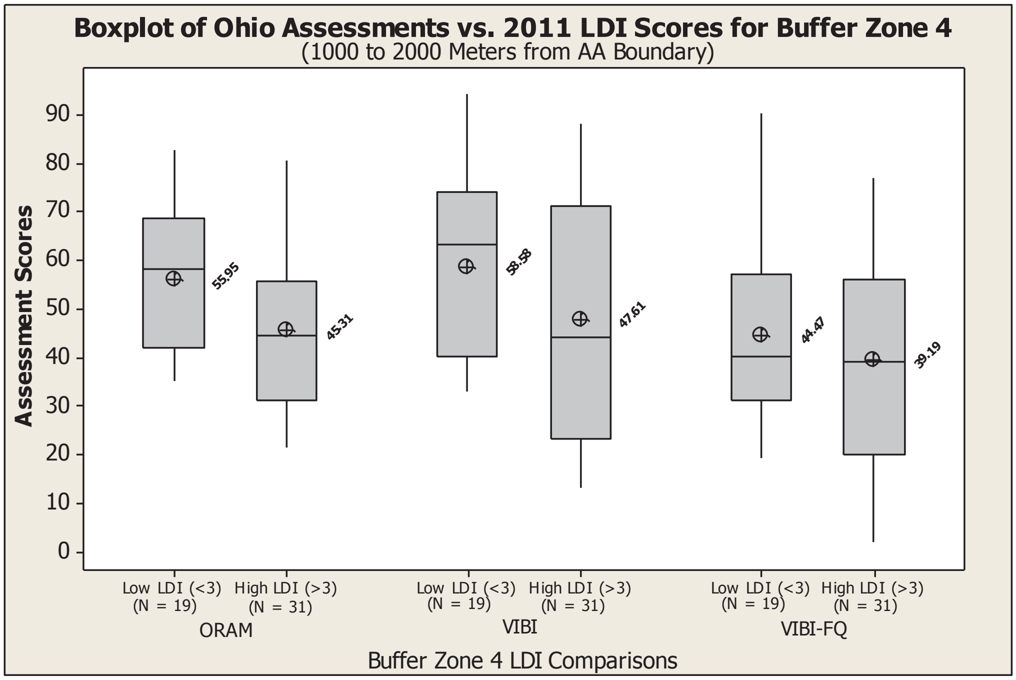
One-way ANOVA: VIBI versus B3_LDI_GRP

```
Source      DF     SS    MS     F      P
B3_LDI_GRP   1   1023  1023  1.87  0.178
Error       48  26240   547
Total       49  27263
S = 23.38   R-Sq = 3.75%   R-Sq(adj) = 1.75%

                           Individual 95% CIs For Mean Based on Pooled StDev
Level        N   Mean  StDev    -+---------+---------+---------+--------
1 - Low     21  57.10  22.16              (-----------*------------)
2 - High    29  47.93  24.21    (----------*----------)
                                -+---------+---------+---------+--------
Pooled StDev = 23.38          40.0      48.0      56.0      64.0

Grouping Information Using Tukey Method
B3_LDI_GRP   N   Mean  Grouping
1 - Low     21  57.10  A
2 - High    29  47.93  A                Means that do not share a letter are significantly different
----------------------------------------------------------------------------------------------------
```

One-way ANOVA: VIBI-FQ versus B3_LDI_GRP

```
Source      DF     SS   MS     F      P
B3_LDI_GRP   1    954  954  2.49  0.121
Error       48  18410  384
Total       49  19364
S = 19.58   R-Sq = 4.93%   R-Sq(adj) = 2.95%

                           Individual 95% CIs For Mean Based on Pooled StDev
Level        N   Mean  StDev  -------+---------+---------+---------+--
1 - Low     21  46.33  17.82             (-----------*-----------)
2 - High    29  37.48  20.75  (----------*---------)
                              -------+---------+---------+---------+--
Pooled StDev = 19.58              35.0      42.0      49.0      56.0

Grouping Information Using Tukey Method
B3_LDI_GRP   N   Mean  Grouping
1 - Low     21  46.33  A
2 - High    29  37.48  A                Means that do not share a letter are significantly different
----------------------------------------------------------------------------------------------------
```

Figure 19. Box and whiskers plot and Minitab output of ORAM, VIBI, and VIBI-FQ scores for 50 Ohio intensification study wetlands compared with 2011 LDI scores for buffer 3 zone (350 to 1000 meters) surrounding each assessment area.



One-way ANOVA: ORAM versus B4_LDI_GRP

```
Source      DF     SS    MS     F      P
B4_LDI_GRP   1   1334  1334  6.24  0.016
Error       48  10260   214
Total       49  11594
S = 14.62   R-Sq = 11.50%   R-Sq(adj) = 9.66%

                          Individual 95% CIs For Mean Based on Pooled StDev
Level        N   Mean  StDev  ---+---------+---------+---------+------
1 - Low     19  55.95  13.79                 (----------*----------)
2 - High    31  45.31  15.10  (--------*-------)
                              ---+---------+---------+---------+------
Pooled StDev = 14.62          42.0      48.0      54.0      60.0

Grouping Information Using Tukey Method
B4_LDI_GRP   N   Mean  Grouping
1 - Low     19  55.95  A
2 - High    31  45.31    B              Means that do not share a letter are significantly different
----------------------------------------------------------------------------------------------------
```

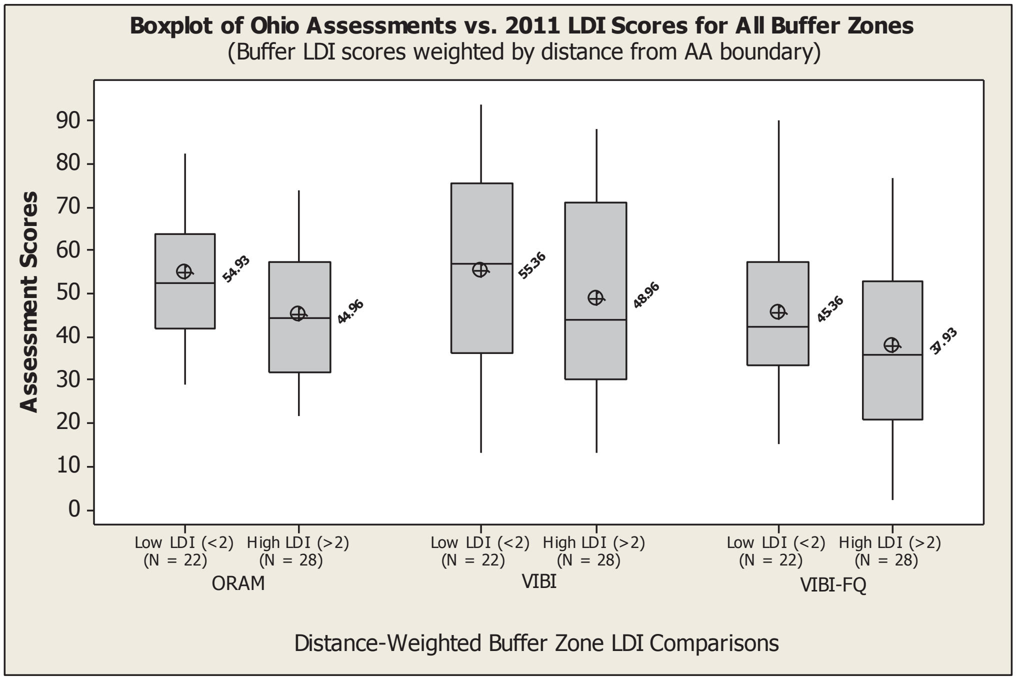
One-way ANOVA: VIBI versus B4_LDI_GRP

```
Source      DF     SS    MS     F      P
B4_LDI_GRP   1   1417  1417  2.63  0.111
Error       48  25846   538
Total       49  27263
S = 23.20   R-Sq = 5.20%   R-Sq(adj) = 3.22%

                           Individual 95% CIs For Mean Based on Pooled StDev
Level        N   Mean  StDev    -+---------+---------+---------+--------
1 - Low     19  58.58  19.79              (-------------*-------------)
2 - High    31  47.61  25.03    (----------*---------)
                                -+---------+---------+---------+--------

Pooled StDev = 23.20          40.0      48.0      56.0      64.0

Grouping Information Using Tukey Method
B4_LDI_GRP   N   Mean  Grouping
1 - Low     19  58.58  A
2 - High    31  47.61  A                Means that do not share a letter are significantly different
----------------------------------------------------------------------------------------------------
```

One-way ANOVA: VIBI-FQ versus B4_LDI_GRP

```
Source      DF     SS   MS     F      P
B4_LDI_GRP   1    328  328  0.83  0.367
Error       48  19036  397
Total       49  19364
S = 19.91   R-Sq = 1.70%   R-Sq(adj) = 0.00%

                           Individual 95% CIs For Mean Based on Pooled StDev
Level        N   Mean  StDev  -------+---------+---------+---------+--
1 - Low     19  44.47  18.00        (--------------*--------------)
2 - High    31  39.19  20.98  (-----------*-----------)
                              -------+---------+---------+---------+--
Pooled StDev = 19.91              36.0      42.0      48.0      54.0

Grouping Information Using Tukey Method
B4_LDI_GRP   N   Mean  Grouping
1 - Low     19  44.47  A
2 - High    31  39.19  A                Means that do not share a letter are significantly different
----------------------------------------------------------------------------------------------------
```

Figure 20. Box and whiskers plot and Minitab output of ORAM, VIBI, and VIBI-FQ scores for 50 Ohio intensification study wetlands compared with 2011 LDI scores for buffer 4 zone (1000 to 2000 meters) surrounding each assessment area.



One-way ANOVA: ORAM versus TOTLDI_GRP

```
Source      DF     SS    MS     F      P
TOTLDI_GRP   1   1224  1224  5.67  0.021
Error       48  10370   216
Total       49  11594
S = 14.70   R-Sq = 10.56%   R-Sq(adj) = 8.69%

                             Individual 95% CIs For Mean Based on Pooled StDev
Level        N   Mean  StDev  ----+---------+---------+---------+-----
1 - Low     22  54.93  14.52                  (----------*---------)
2 - High    28  44.96  14.83  (--------*--------)
                              ----+---------+---------+---------+-----
Pooled StDev = 14.70           42.0      48.0      54.0      60.0

Grouping Information Using Tukey Method
TOTLDI_GRP   N   Mean  Grouping
1 - Low     22  54.93  A
2 - High    28  44.96    B              Means that do not share a letter are significantly different
----------------------------------------------------------------------------------------------------
```

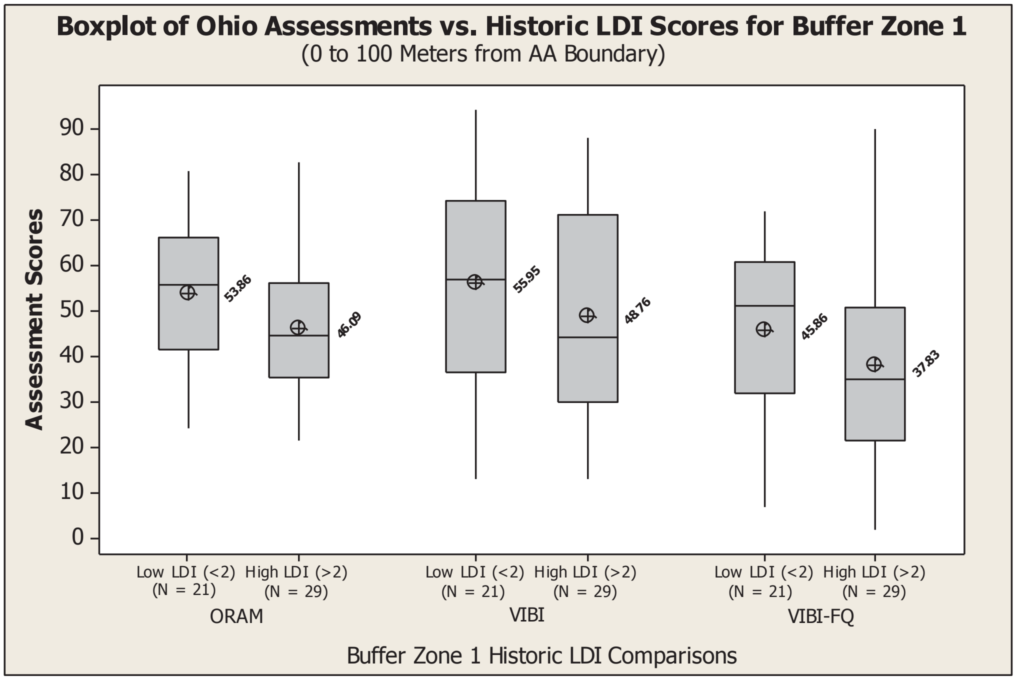
One-way ANOVA: VIBI versus TOTLDI_GRP

```
Source      DF     SS   MS     F      P
TOTLDI_GRP   1    505  505  0.91  0.346
Error       48  26758  557
Total       49  27263
S = 23.61   R-Sq = 1.85%   R-Sq(adj) = 0.00%

                            Individual 95% CIs For Mean Based on Pooled StDev
Level        N   Mean  StDev  ---+---------+---------+---------+------
1 - Low     22  55.36  22.77          (-------------*--------------)
2 - High    28  48.96  24.24  (------------*------------)
                              ---+---------+---------+---------+------
Pooled StDev = 23.61          42.0      49.0      56.0      63.0

Grouping Information Using Tukey Method
TOTLDI_GRP   N   Mean  Grouping
1 - Low     22  55.36  A
2 - High    28  48.96  A                Means that do not share a letter are significantly different
----------------------------------------------------------------------------------------------------
```

One-way ANOVA: VIBI-FQ versus TOTLDI_GRP

```
Source      DF     SS   MS     F      P
TOTLDI_GRP   1    681  681  1.75  0.192
Error       48  18683  389
Total       49  19364
S = 19.73   R-Sq = 3.52%   R-Sq(adj) = 1.51%

                             Individual 95% CIs For Mean Based on Pooled StDev
Level        N   Mean  StDev  ---------+---------+---------+---------+
1 - Low     22  45.36  18.30             (-------------*-------------)
2 - High    28  37.93  20.78  (-----------*------------)
                              ---------+---------+---------+---------+
Pooled StDev = 19.73                36.0      42.0      48.0      54.0

Grouping Information Using Tukey Method
TOTLDI_GRP   N   Mean  Grouping
1 - Low     22  45.36  A
2 - High    28  37.93  A                Means that do not share a letter are significantly different
----------------------------------------------------------------------------------------------------
```

Figure 21. Box and whiskers plot and Minitab output of ORAM, VIBI, and VIBI-FQ scores for 50 Ohio intensification study wetlands compared with 2011 distance-weighted LDI scores for entire buffer zone surrounding each assessment area.



One-way ANOVA: ORAM versus B1HSLDIGRP

```
Source      DF     SS   MS     F      P
B1HSLDIGRP   1    736  736  3.25  0.078
Error       48  10859  226
Total       49  11594
S = 15.04   R-Sq = 6.34%   R-Sq(adj) = 4.39%

                             Individual 95% CIs For Mean Based on Pooled StDev
Level        N   Mean  StDev  ---------+---------+---------+---------+
1 - Low     21  53.86  16.41                (------------*------------)
2 - High    29  46.09  13.98  (----------*----------)
                              ---------+---------+---------+---------+
Pooled StDev = 15.04                45.0      50.0      55.0      60.0

Grouping Information Using Tukey Method
B1HSLDIGRP   N   Mean  Grouping
1 - Low     21  53.86  A
2 - High    29  46.09  A                Means that do not share a letter are significantly different
----------------------------------------------------------------------------------------------------
```

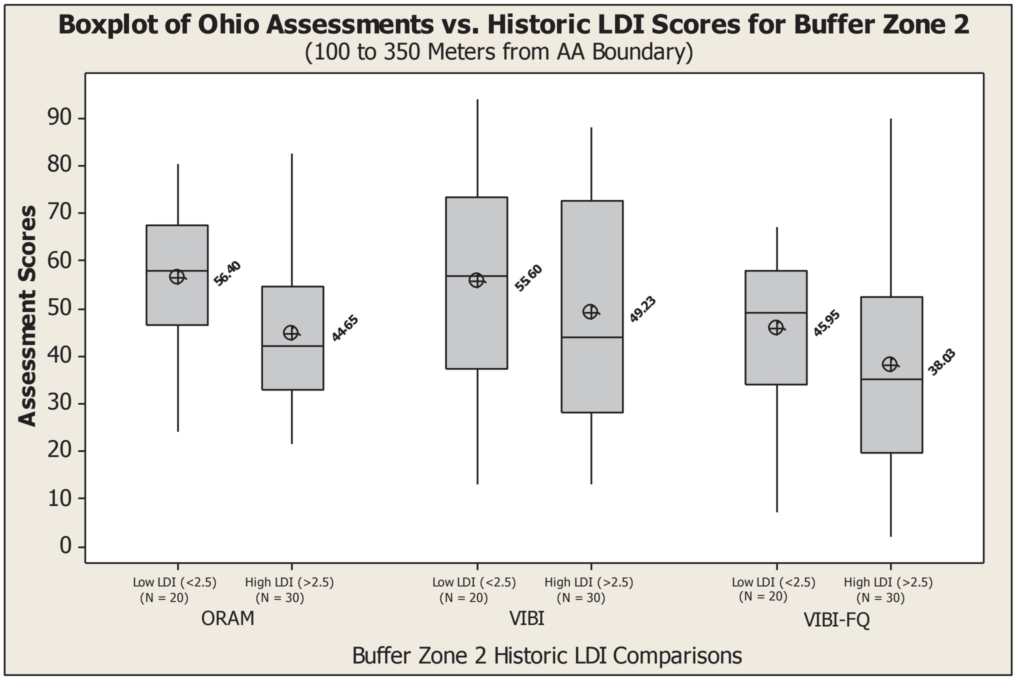
One-way ANOVA: VIBI versus B1HSLDIGRP

```
Source      DF     SS   MS     F      P
B1HSLDIGRP   1    630  630  1.14  0.292
Error       48  26632  555
Total       49  27263
S = 23.56   R-Sq = 2.31%   R-Sq(adj) = 0.28%

                             Individual 95% CIs For Mean Based on Pooled StDev
Level        N   Mean  StDev  ---+---------+---------+---------+------
1 - Low     21  55.95  22.75          (--------------*--------------)
2 - High    29  48.76  24.11  (------------*-----------)
                              ---+---------+---------+---------+------
Pooled StDev = 23.56          42.0      49.0      56.0      63.0

Grouping Information Using Tukey Method
B1HSLDIGRP   N   Mean  Grouping
1 - Low     21  55.95  A
2 - High    29  48.76  A                Means that do not share a letter are significantly different
----------------------------------------------------------------------------------------------------
```

One-way ANOVA: VIBI-FQ versus B1HSLDIGRP

```
Source      DF     SS   MS     F      P
B1HSLDIGRP   1    785  785  2.03  0.161
Error       48  18579  387
Total       49  19364
S = 19.67   R-Sq = 4.06%   R-Sq(adj) = 2.06%

                             Individual 95% CIs For Mean Based on Pooled StDev
Level        N   Mean  StDev  ------+---------+---------+---------+---
1 - Low     21  45.86  18.26           (------------*-----------)
2 - High    29  37.83  20.63  (----------*----------)
                              ------+---------+---------+---------+---
Pooled StDev = 19.67             35.0      42.0      49.0      56.0

Grouping Information Using Tukey Method
B1HSLDIGRP   N   Mean  Grouping
1 - Low     21  45.86  A
2 - High    29  37.83  A                Means that do not share a letter are significantly different
----------------------------------------------------------------------------------------------------
```

Figure 22. Box and whiskers plot and Minitab output of ORAM, VIBI, and VIBI-FQ scores for 50 Ohio intensification study wetlands compared with historic LDI scores for buffer 1 zone (0 to 100 meters) surrounding each assessment area.



One-way ANOVA:
ORAM versus B2HSLDIGRP

```
Source      DF     SS    MS     F      P
B2HSLDIGRP   1   1657  1657  8.00  0.007
Error       48   9937   207
Total       49  11594
S = 14.39   R-Sq = 14.29%   R-Sq(adj) = 12.50%

                            Individual 95% CIs For Mean Based on Pooled StDev
Level        N   Mean  StDev  ----+---------+---------+---------+-----
1 - Low     20  56.40  14.46                   (----------*----------)
2 - High    30  44.65  14.34  (-------*--------)
                              ----+---------+---------+---------+-----
Pooled StDev = 14.39           42.0      48.0      54.0      60.0

Grouping Information Using Tukey Method
B2HSLDIGRP   N   Mean  Grouping
1 - Low     20  56.40  A
2 - High    30  44.65    B              Means that do not share a letter are significantly different
----------------------------------------------------------------------------------------------------
```

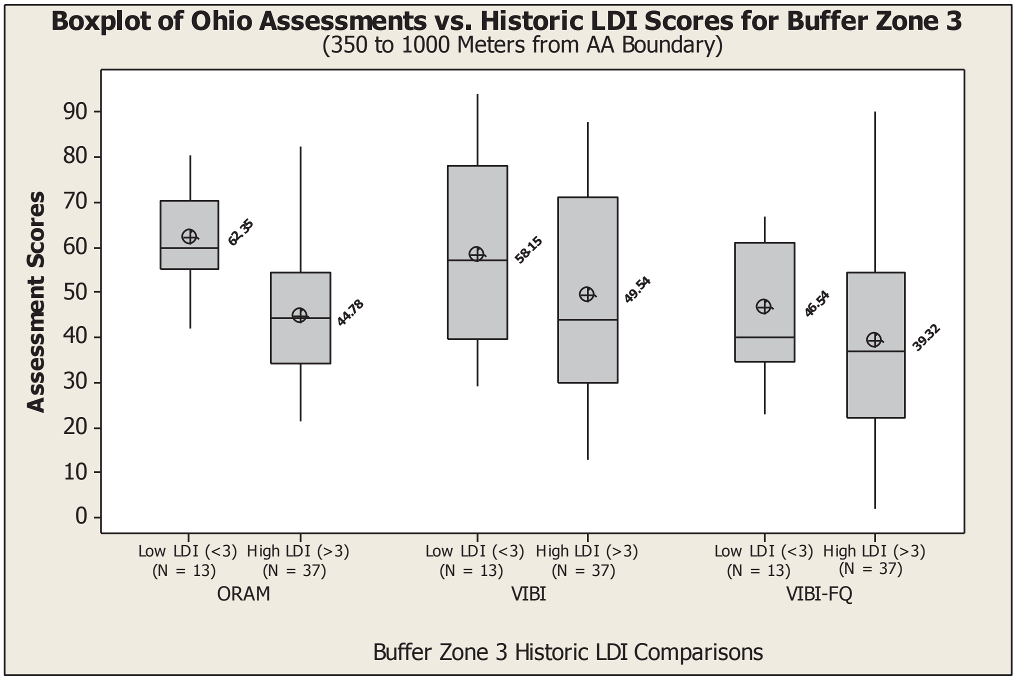
One-way ANOVA:
VIBI versus B2HSLDIGRP

```
Source      DF     SS   MS     F      P
B2HSLDIGRP   1    486  486  0.87  0.355
Error       48  26776  558
Total       49  27263
S = 23.62   R-Sq = 1.78%   R-Sq(adj) = 0.00%

                           Individual 95% CIs For Mean Based on Pooled StDev
Level        N   Mean  StDev   --+---------+---------+---------+-------
1 - Low     20  55.60  21.25         (--------------*---------------)
2 - High    30  49.23  25.05   (-----------*------------)
                               --+---------+---------+---------+-------
Pooled StDev = 23.62          42.0      49.0      56.0      63.0

Grouping Information Using Tukey Method
B2HSLDIGRP   N   Mean  Grouping
1 - Low     20  55.60  A
2 - High    30  49.23  A                Means that do not share a letter are significantly different
----------------------------------------------------------------------------------------------------
```

One-way ANOVA:
VIBI-FQ versus B2HSLDIGRP

```
Source      DF     SS   MS     F      P
B2HSLDIGRP   1    752  752  1.94  0.170
Error       48  18612  388
Total       49  19364
S = 19.69   R-Sq = 3.88%   R-Sq(adj) = 1.88%

                              Individual 95% CIs For Mean Based on Pooled StDev
Level        N   Mean  StDev  ---------+---------+---------+---------+
1 - Low     20  45.95  16.63              (--------------*-------------)
2 - High    30  38.03  21.46  (-----------*-----------)
                              ---------+---------+---------+---------+
Pooled StDev = 19.69                36.0      42.0      48.0      54.0

Grouping Information Using Tukey Method
B2HSLDIGRP   N   Mean  Grouping
1 - Low     20  45.95  A
2 - High    30  38.03  A                Means that do not share a letter are significantly different
----------------------------------------------------------------------------------------------------
```

Figure 23. Box and whiskers plot and Minitab output of ORAM, VIBI, and VIBI-FQ scores for 50 Ohio intensification study wetlands compared with historic LDI scores for buffer 2 zone (100 to 350 meters) surrounding each assessment area.



One-way ANOVA: ORAM versus B3HSLDIGRP

```
Source      DF     SS    MS      F      P
B3HSLDIGRP   1   2967  2967  16.51  0.000
Error       48   8627   180
Total       49  11594
S = 13.41   R-Sq = 25.59%   R-Sq(adj) = 24.04%

                              Individual 95% CIs For Mean Based on Pooled StDev
Level        N   Mean  StDev     +---------+---------+---------+---------
1 - Low     13  62.35  10.66                       (--------*--------)
2 - High    37  44.78  14.20     (-----*-----)
                                 +---------+---------+---------+---------
Pooled StDev = 13.41          40.0      48.0      56.0      64.0

Grouping Information Using Tukey Method
B3HSLDIGRP   N   Mean  Grouping
1 - Low     13  62.35  A
2 - High    37  44.78    B              Means that do not share a letter are significantly different
----------------------------------------------------------------------------------------------------
```

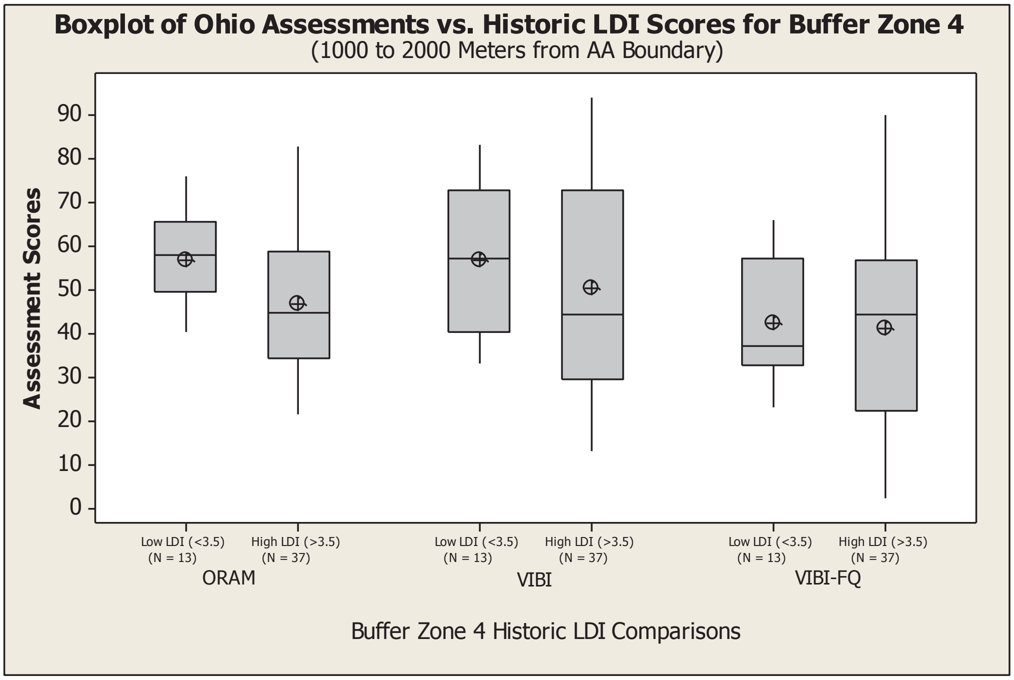
One-way ANOVA: VIBI versus B3HSLDIGRP

```
Source      DF     SS   MS     F      P
B3HSLDIGRP   1    714  714  1.29  0.262
Error       48  26549  553
Total       49  27263
S = 23.52   R-Sq = 2.62%   R-Sq(adj) = 0.59%

                            Individual 95% CIs For Mean Based on Pooled StDev
Level        N   Mean  StDev  --------+---------+---------+---------+-
1 - Low     13  58.15  21.29      (----------------*---------------)
2 - High    37  49.54  24.22  (---------*---------)
                              --------+---------+---------+---------+-
Pooled StDev = 23.52               48.0      56.0      64.0      72.0

Grouping Information Using Tukey Method
B3HSLDIGRP   N   Mean  Grouping
1 - Low     13  58.15  A
2 - High    37  49.54  A                Means that do not share a letter are significantly different
----------------------------------------------------------------------------------------------------
```

One-way ANOVA: VIBI-FQ versus B3HSLDIGRP

```
Source      DF     SS   MS     F      P
B3HSLDIGRP   1    501  501  1.27  0.265
Error       48  18863  393
Total       49  19364
S = 19.82   R-Sq = 2.59%   R-Sq(adj) = 0.56%

                             Individual 95% CIs For Mean Based on Pooled StDev
Level        N   Mean  StDev  ---+---------+---------+---------+------
1 - Low     13  46.54  15.17      (--------------*---------------)
2 - High    37  39.32  21.15  (--------*---------)
                              ---+---------+---------+---------+------
Pooled StDev = 19.82          35.0      42.0      49.0      56.0

Grouping Information Using Tukey Method
B3HSLDIGRP   N   Mean  Grouping
1 - Low     13  46.54  A
2 - High    37  39.32  A                Means that do not share a letter are significantly different
----------------------------------------------------------------------------------------------------
```

Figure 24. Box and whiskers plot and Minitab output of ORAM, VIBI, and VIBI-FQ scores for 50 Ohio intensification study wetlands compared with historic LDI scores for buffer 3 zone (350 to 1000 meters) surrounding each assessment area.



One-way ANOVA: ORAM versus B4HSLDIGRP

```
Source      DF     SS   MS     F      P
B4HSLDIGRP   1    957  957  4.32  0.043
Error       48  10637  222
Total       49  11594
S = 14.89   R-Sq = 8.25%   R-Sq(adj) = 6.34%

                              Individual 95% CIs For Mean Based on Pooled StDev
Level        N   Mean  StDev     +---------+---------+---------+---------
1 - Low     13  56.73  10.59                (-------------*------------)
2 - High    37  46.76  16.07     (-------*-------)
                                 +---------+---------+---------+---------
Pooled StDev = 14.89          42.0      48.0      54.0      60.0

Grouping Information Using Tukey Method
B4HSLDIGRP   N   Mean  Grouping
1 - Low     13  56.73  A
2 - High    37  46.76    B              Means that do not share a letter are significantly different
-----------------------------------------------------------------------------------------------------
```

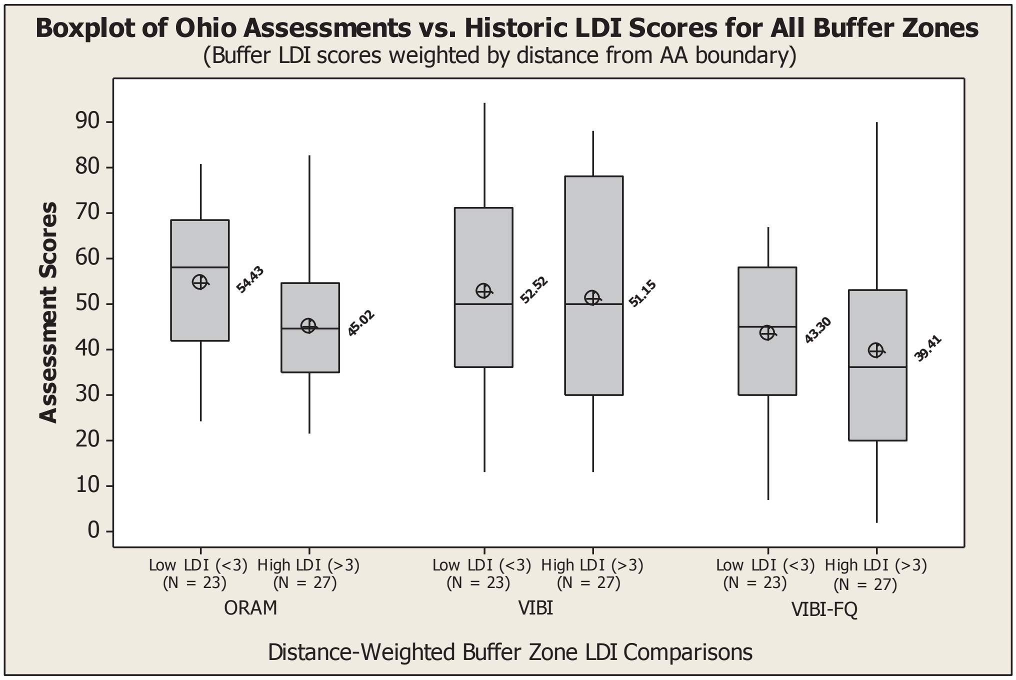
One-way ANOVA: VIBI versus B4HSLDIGRP

```
Source      DF     SS   MS     F      P
B4HSLDIGRP   1    385  385  0.69  0.411
Error       48  26878  560
Total       49  27263
S = 23.66   R-Sq = 1.41%   R-Sq(adj) = 0.00%

                              Individual 95% CIs For Mean Based on Pooled StDev
Level        N   Mean  StDev     +---------+---------+---------+---------
1 - Low     13  56.46  17.78       (------------------*------------------)
2 - High    37  50.14  25.32     (-----------*----------)
                                 +---------+---------+---------+---------
Pooled StDev = 23.66          42.0      49.0      56.0      63.0

Grouping Information Using Tukey Method
B4HSLDIGRP   N   Mean  Grouping
1 - Low     13  56.46  A
2 - High    37  50.14  A                Means that do not share a letter are significantly different
-----------------------------------------------------------------------------------------------------
```

One-way ANOVA: VIBI-FQ versus B4HSLDIGRP

```
Source      DF     SS   MS     F      P
B4HSLDIGRP   1     25   25  0.06  0.806
Error       48  19339  403
Total       49  19364
S = 20.07   R-Sq = 0.13%   R-Sq(adj) = 0.00%

                              Individual 95% CIs For Mean Based on Pooled StDev
Level        N   Mean  StDev  --------+---------+---------+---------+-
1 - Low     13  42.38  13.26  (------------------*-----------------)
2 - High    37  40.78  21.88       (----------*----------)
                              --------+---------+---------+---------+-
Pooled StDev = 20.07               36.0      42.0      48.0      54.0

Grouping Information Using Tukey Method
B4HSLDIGRP   N   Mean  Grouping
1 - Low     13  42.38  A
2 - High    37  40.78  A                Means that do not share a letter are significantly different
-----------------------------------------------------------------------------------------------------
```

Figure 25. Box and whiskers plot and Minitab output of ORAM, VIBI, and VIBI-FQ scores for 50 Ohio intensification study wetlands compared with historic LDI scores for buffer 4 zone (1000 to 2000 meters) surrounding each assessment area.



One-way ANOVA: ORAM versus TTHSLDIGRP

```
Source      DF     SS    MS     F      P
TTHSLDIGRP   1   1101  1101  5.04  0.029
Error       48  10493   219
Total       49  11594
S = 14.79   R-Sq = 9.50%   R-Sq(adj) = 7.61%

                             Individual 95% CIs For Mean Based on Pooled StDev
Level        N   Mean  StDev  -----+---------+---------+---------+----
1 - Low     23  54.43  16.06                 (----------*---------)
2 - High    27  45.02  13.61  (---------*---------)
                              -----+---------+---------+---------+----
Pooled StDev = 14.79            42.0      48.0      54.0      60.0

Grouping Information Using Tukey Method
TTHSLDIGRP   N   Mean  Grouping
1 - Low     23  54.43  A
2 - High    27  45.02    B              Means that do not share a letter are significantly different
----------------------------------------------------------------------------------------------------
```

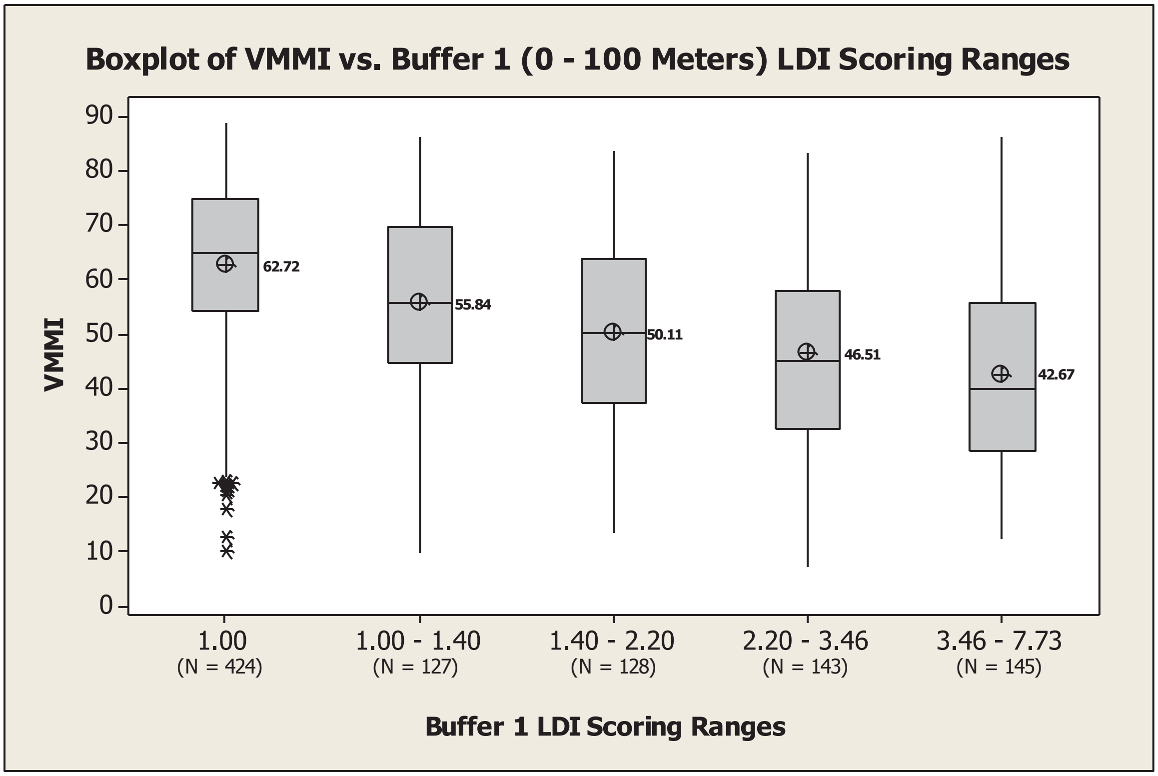
One-way ANOVA: VIBI versus TTHSLDIGRP

```
Source      DF     SS   MS     F      P
TTHSLDIGRP   1     23   23  0.04  0.840
Error       48  27239  567
Total       49  27263
S = 23.82   R-Sq = 0.09%   R-Sq(adj) = 0.00%

                             Individual 95% CIs For Mean Based on Pooled StDev
Level        N   Mean  StDev     +---------+---------+---------+---------
1 - Low     23  52.52  21.53      (----------------*---------------)
2 - High    27  51.15  25.60     (--------------*---------------)
                                 +---------+---------+---------+---------
Pooled StDev = 23.82          42.0      48.0      54.0      60.0

Grouping Information Using Tukey Method
TTHSLDIGRP   N   Mean  Grouping
1 - Low     23  52.52  A
2 - High    27  51.15  A                Means that do not share a letter are significantly different
----------------------------------------------------------------------------------------------------
```

One-way ANOVA: VIBI-FQ versus TTHSLDIGRP

```
Source      DF     SS   MS     F      P
TTHSLDIGRP   1    189  189  0.47  0.495
Error       48  19175  399
Total       49  19364
S = 19.99   R-Sq = 0.97%   R-Sq(adj) = 0.00%

                            Individual 95% CIs For Mean Based on Pooled StDev
Level        N   Mean  StDev  -------+---------+---------+---------+--
1 - Low     23  43.30  17.16       (-------------*-------------)
2 - High    27  39.41  22.10  (------------*------------)
                              -------+---------+---------+---------+--
Pooled StDev = 19.99              36.0      42.0      48.0      54.0

Grouping Information Using Tukey Method
TTHSLDIGRP   N   Mean  Grouping
1 - Low     23  43.30  A
2 - High    27  39.41  A                Means that do not share a letter are significantly different
----------------------------------------------------------------------------------------------------
```

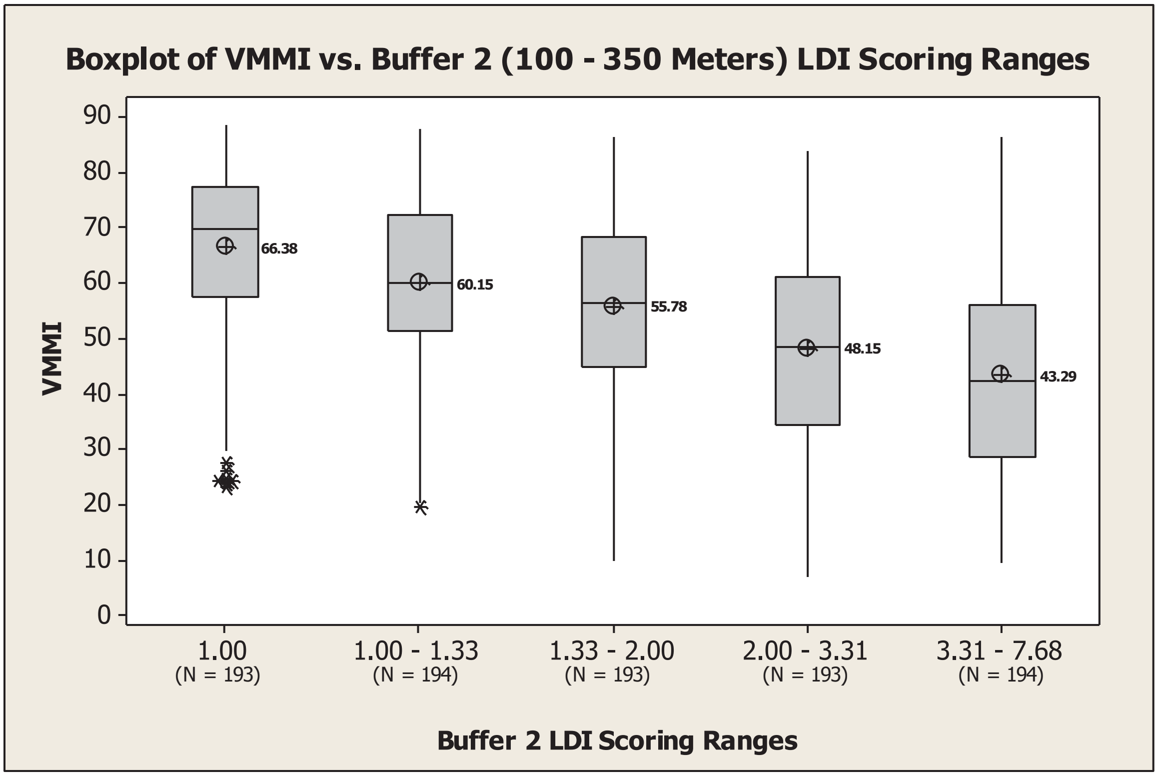
Figure 26. Box and whiskers plot and Minitab output of ORAM, VIBI, and VIBI-FQ scores for 50 Ohio intensification study wetlands compared with historic distance-weighted LDI scores for entire buffer zone surrounding each assessment area.



One-way ANOVA: VMMI versus B1_LDI_GP2

```
Source       DF      SS     MS      F      P
B1_LDI_GP2    4   60682  15170  55.07  0.000
Error       962  265028    275
Total       966  325709

S = 16.60   R-Sq = 18.63%   R-Sq(adj) = 18.29%

                          Individual 95% CIs For Mean Based on
                          Pooled StDev
Level    N   Mean  StDev  ---+---------+---------+---------+------
1      424  62.72  15.55                               (--*-)
2      127  55.84  17.65                    (---*---)
3      128  50.11  16.81           (----*---)
4      143  46.51  17.28       (--*---)
5      145  42.67  17.71  (---*---)
                          ---+---------+---------+---------+------
                          42.0      49.0      56.0      63.0
Pooled StDev = 16.60

Grouping Information Using Tukey Method

B1_LDI_GP2    N   Mean  Grouping
1           424  62.72  A
2           127  55.84    B
3           128  50.11      C
4           143  46.51      C D
5           145  42.67        D

Means that do not share a letter are significantly different.
```

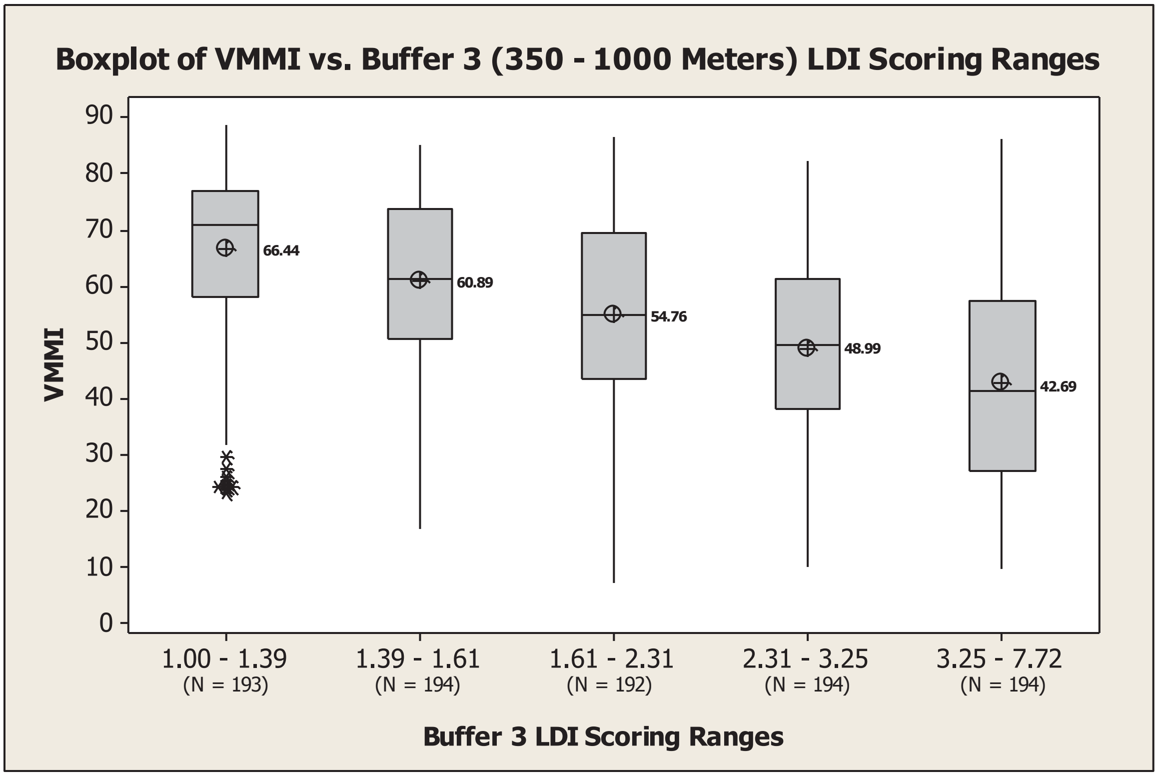
Figure 27. Box and whiskers plot and Minitab output of VMMI scores for 967 NWCA wetlands compared with 2011 LDI scores for buffer 1 zone (0 to 100 meters) surrounding each assessment area.



One-way ANOVA: VMMI versus B2_LDI_GP2

```
Source       DF      SS     MS      F      P
B2_LDI_GP2    4   65825  16456  60.92  0.000
Error       962  259884    270
Total       966  325709

S = 16.44   R-Sq = 20.21%   R-Sq(adj) = 19.88%

                          Individual 95% CIs For Mean Based on Pooled StDev
Level    N   Mean  StDev    -+---------+---------+---------+--------
1      193  66.38  14.62                                    (--*--)
2      194  60.15  15.17                           (--*--)
3      193  55.78  17.16                    (---*--)
4      193  48.15  17.41         (---*--)
5      194  43.29  17.59   (--*--)
                            -+---------+---------+---------+--------
                          42.0      49.0      56.0      63.0
Pooled StDev = 16.44

Grouping Information Using Tukey Method

B2_LDI_GP2    N   Mean  Grouping
1           193  66.38  A
2           194  60.15    B
3           193  55.78    B
4           193  48.15      C
5           194  43.29        D

Means that do not share a letter are significantly different.
```

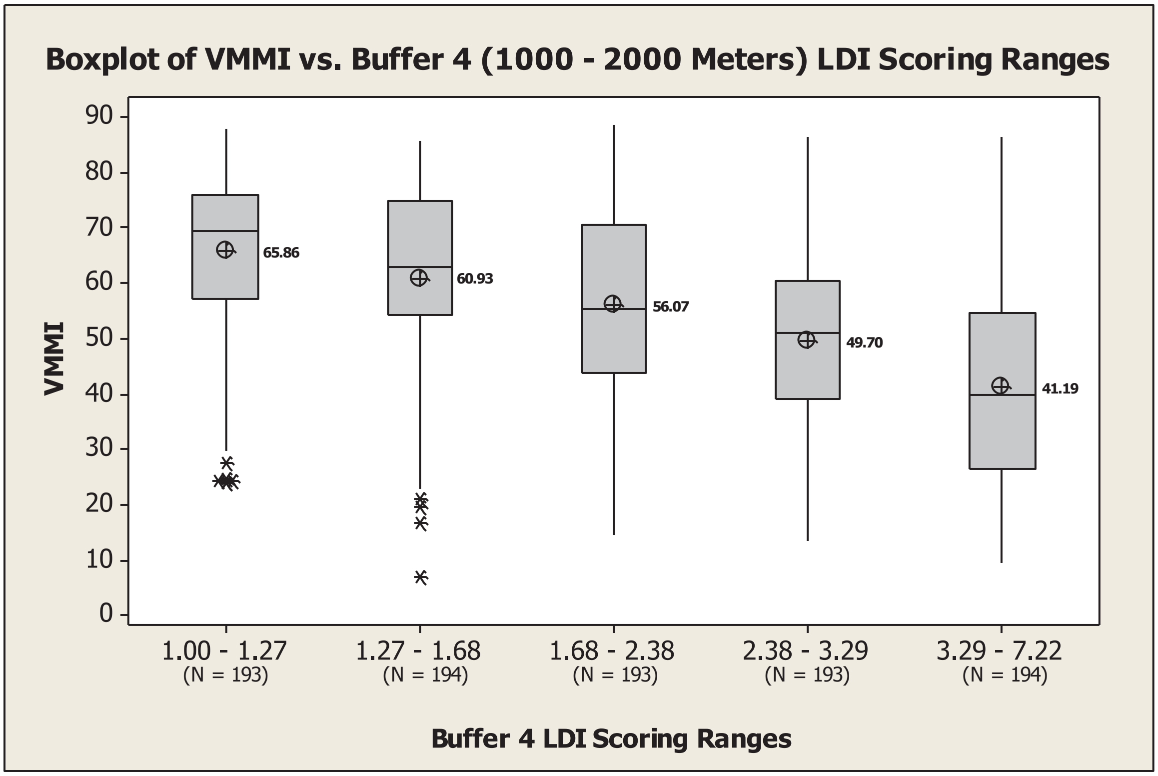
Figure 28. Box and whiskers plot and Minitab output of VMMI scores for 967 NWCA wetlands compared with 2011 LDI scores for buffer 2 zone (100 to 350 meters) surrounding each assessment area.



One-way ANOVA: VMMI versus B3_LDI_GP2

```
Source        DF      SS     MS      F      P
B3_LDI_GP3     4   68345  17086  63.87  0.000
Error        962  257365    268
Total        966  325709

S = 16.36   R-Sq = 20.98%   R-Sq(adj) = 20.65%

                           Individual 95% CIs For Mean Based on Pooled StDev
Level    N   Mean  StDev      +---------+---------+---------+---------
1      193  66.44  14.75                                (--*--)
2      194  60.89  15.05                         (--*--)
3      192  54.76  17.48                  (-*--)
4      194  48.99  16.07          (--*--)
5      194  42.69  18.17      (--*--)
                              +---------+---------+---------+---------
                           40.0      48.0      56.0      64.0
Pooled StDev = 16.36

Grouping Information Using Tukey Method

B3_LDI_GP2    N   Mean  Grouping
1           193  66.44  A
2           194  60.89    B
3           192  54.76      C
4           194  48.99        D
5           194  42.69          E

Means that do not share a letter are significantly different.
```

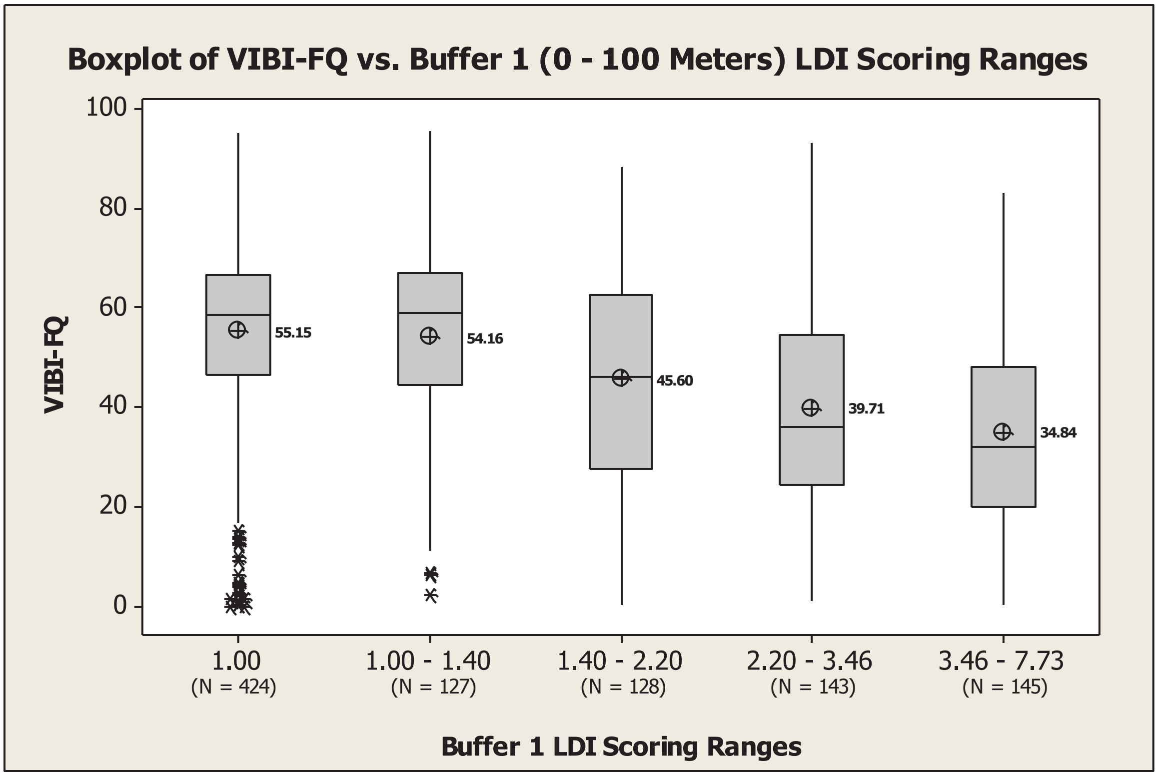
Figure 29. Box and whiskers plot and Minitab output of VMMI scores for 967 NWCA wetlands compared with 2011 LDI scores for buffer 3 zone (350 to 1000 meters) surrounding each assessment area.



One-way ANOVA: VMMI versus B4_LDI_GP2

```
Source       DF      SS     MS      F      P
B4_LDI_GP2    4   72180  18045  68.47  0.000
Error       962  253530    264
Total       966  325709

S = 16.23   R-Sq = 22.16%   R-Sq(adj) = 21.84%

                           Individual 95% CIs For Mean Based on Pooled StDev
Level    N   Mean  StDev     -+---------+---------+---------+--------
1      193  65.86  14.36                                  (--*--)
2      194  60.93  16.09                            (--*--)
3      193  56.07  17.12                      (--*--)
4      193  49.70  16.23              (--*--)
5      194  41.19  17.21     (-*--)
                             -+---------+---------+---------+--------
                           40.0      48.0      56.0      64.0
Pooled StDev = 16.23

Grouping Information Using Tukey Method

B4_LDI_GP2    N   Mean  Grouping
1           193  65.86  A
2           194  60.93    B
3           193  56.07      C
4           193  49.70        D
5           194  41.19          E

Means that do not share a letter are significantly different.
```

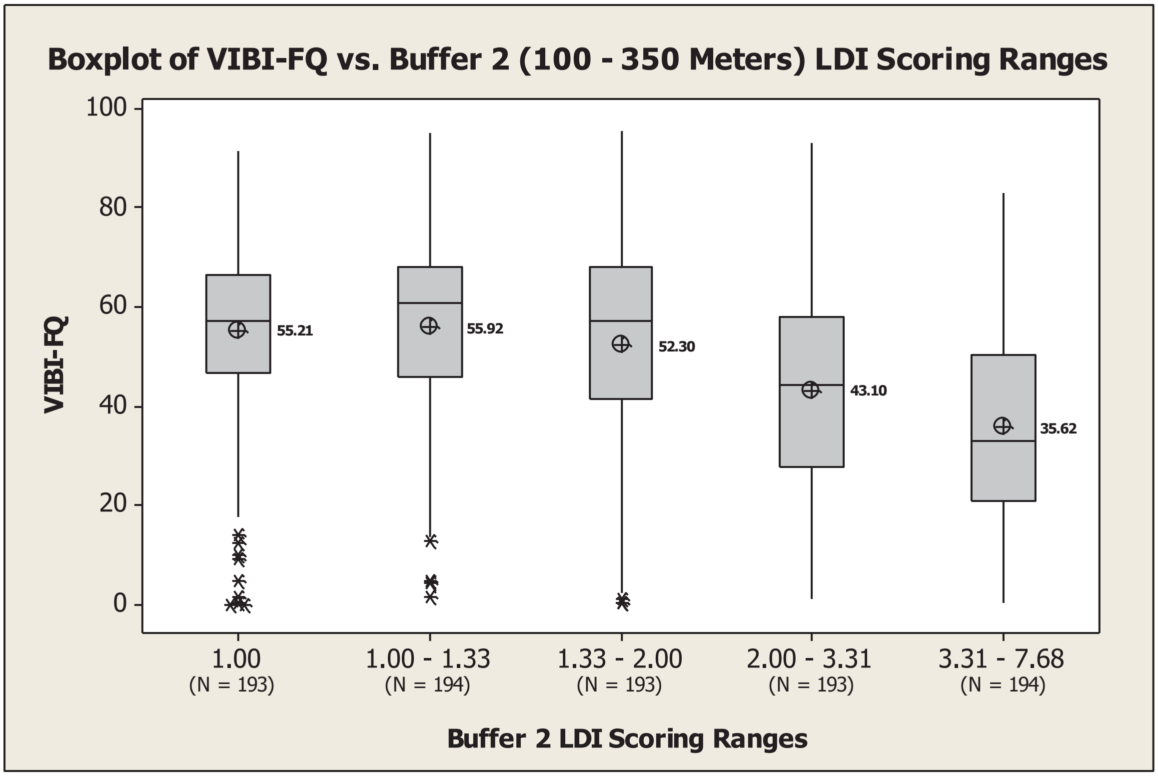
Figure 30. Box and whiskers plot and Minitab output of VMMI scores for 967 NWCA wetlands compared with 2011 LDI scores for buffer 4 zone (1000 to 2000 meters) surrounding each assessment area.



One-way ANOVA: US_VIBI_FQ versus B1_LDI_GP2

```
Source        DF      SS     MS      F      P
B1_LDI_GP2     4   61969  15492  41.18  0.000
Error        962  361939    376
Total        966  423908

S = 19.40   R-Sq = 14.62%   R-Sq(adj) = 14.26%

                             Individual 95% CIs For Mean Based on
                             Pooled StDev
Level    N   Mean  StDev  -----+---------+---------+---------+----
1      424  55.15  18.70                               (--*-)
2      127  54.16  19.69                            (---*----)
3      128  45.60  21.12               (----*----)
4      143  39.71  19.86       (----*---)
5      145  34.84  19.08  (----*---)
                          -----+---------+---------+---------+----
                             35.0      42.0      49.0      56.0
Pooled StDev = 19.40

Grouping Information Using Tukey Method

B1_LDI_GP2    N   Mean  Grouping
1           424  55.15  A
2           127  54.16  A
3           128  45.60    B
4           143  39.71    B C
5           145  34.84      C

Means that do not share a letter are significantly different.
```

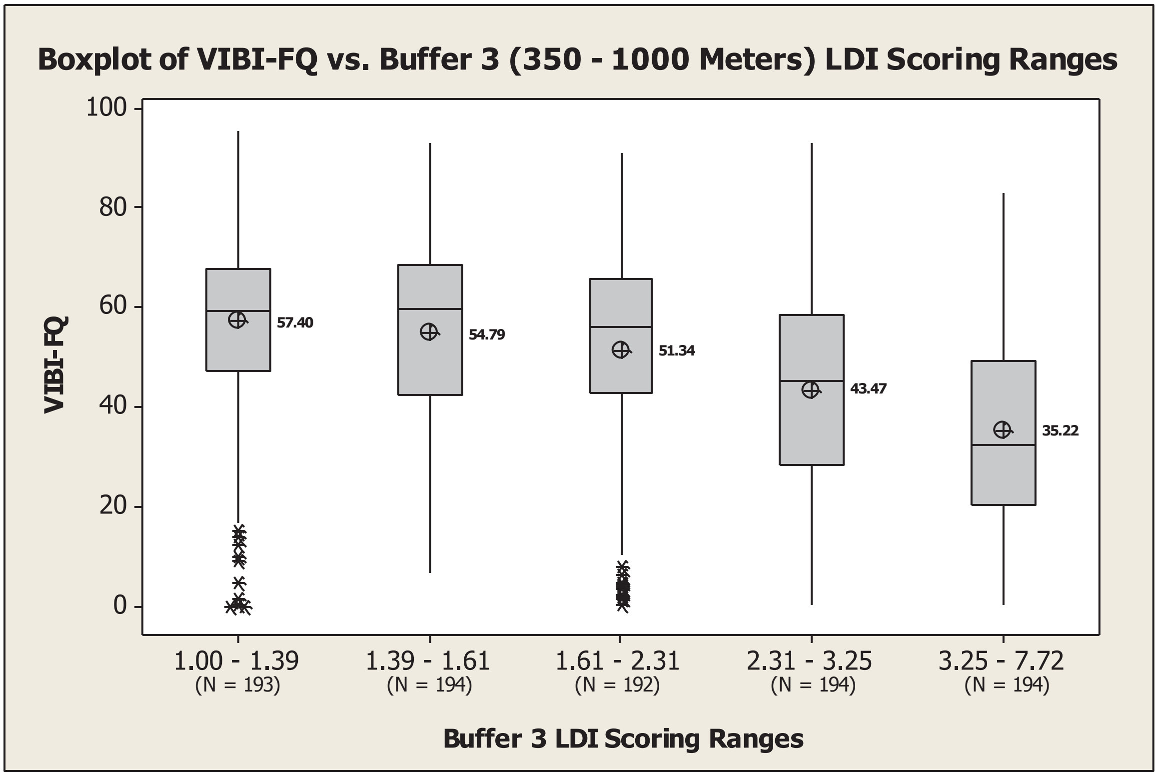
Figure 31. Box and whiskers plot and Minitab output of US VIBI-FQ scores for 967 NWCA wetlands compared with 2011 LDI scores for buffer 1 zone (0 to 100 meters) surrounding each assessment area.



One-way ANOVA: US_VIBI_FQ versus B2_LDI_GP2

```
Source       DF      SS     MS      F      P
B2_LDI_GP2    4   59962  14991  39.62  0.000
Error       962  363945    378
Total       966  423908

S = 19.45   R-Sq = 14.15%   R-Sq(adj) = 13.79%

                           Individual 95% CIs For Mean Based on
                           Pooled StDev
Level    N   Mean  StDev   ---+---------+---------+---------+------
1      193  55.21  17.03                               (---*---)
2      194  55.92  19.29                                (---*---)
3      193  52.30  21.74                           (---*---)
4      193  43.10  19.96              (---*---)
5      194  35.62  18.94   (---*---)
                           ---+---------+---------+---------+------
                           35.0      42.0      49.0      56.0
Pooled StDev = 19.45

Grouping Information Using Tukey Method

B2_LDI_GP2    N   Mean  Grouping
2           194  55.92  A
1           193  55.21  A
3           193  52.30  A
4           193  43.10    B
5           194  35.62      C

Means that do not share a letter are significantly different.
```

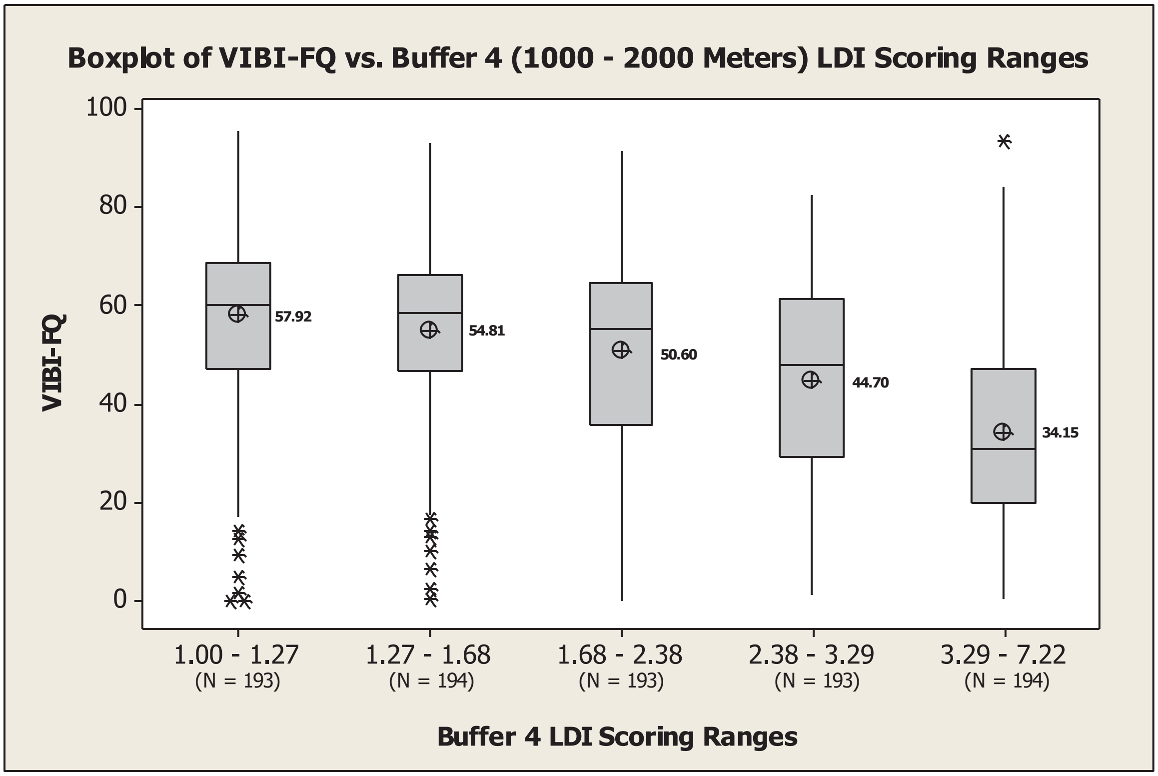
Figure 32. Box and whiskers plot and Minitab output of US VIBI-FQ scores for 967 NWCA wetlands compared with 2011 LDI scores for buffer 2 zone (100 to 350 meters) surrounding each assessment area.



One-way ANOVA: US_VIBI_FQ versus B3_LDI_GP2

```
Source        DF      SS     MS      F      P
B3_LDI_GP3     4   63620  15905  42.47  0.000
Error        962  360288    375
Total        966  423908

S = 19.35   R-Sq = 15.01%   R-Sq(adj) = 14.65%

                           Individual 95% CIs For Mean Based on
                           Pooled StDev
Level    N   Mean  StDev   ----+---------+---------+---------+-----
1      193  57.40  17.74                                (---*---)
2      194  54.79  19.47                            (---*---)
3      192  51.34  19.68                       (---*---)
4      194  43.47  20.08            (---*---)
5      194  35.22  19.70   (---*---)
                           ----+---------+---------+---------+-----
                            35.0      42.0      49.0      56.0
Pooled StDev = 19.35

Grouping Information Using Tukey Method

B3_LDI_GP2    N   Mean  Grouping
1           193  57.40  A
2           194  54.79  A B
3           192  51.34    B
4           194  43.47      C
5           194  35.22        D

Means that do not share a letter are significantly different.
```

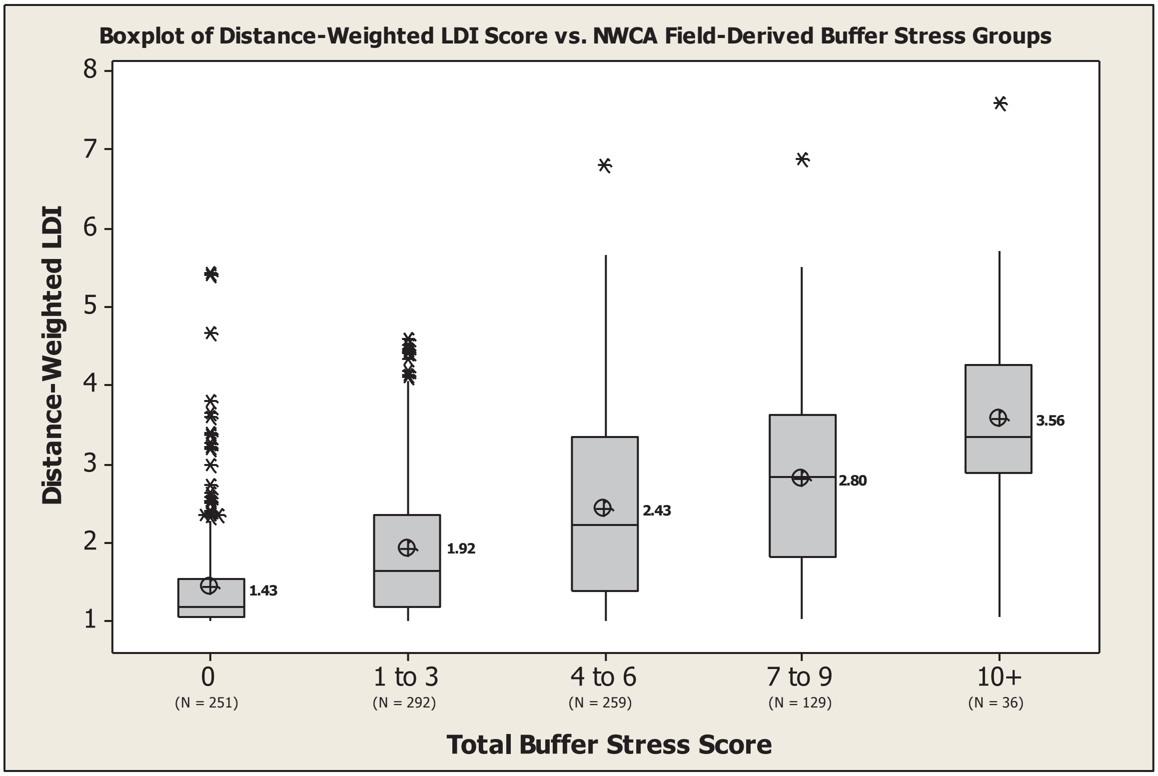
Figure 33. Box and whiskers plot and Minitab output of US VIBI-FQ scores for 967 NWCA wetlands compared with 2011 LDI scores for buffer 3 zone (350 to 1000 meters) surrounding each assessment area.



One-way ANOVA: US_VIBI_FQ versus B4_LDI_GP2

```
Source       DF      SS     MS      F      P
B4_LDI_GP4    4   68434  17109  46.30  0.000
Error       962  355473    370
Total       966  423908

S = 19.22   R-Sq = 16.14%   R-Sq(adj) = 15.79%

                          Individual 95% CIs For Mean Based on Pooled StDev
Level    N   Mean  StDev    -+---------+---------+---------+--------
1      193  57.92  17.84                                (--*---)
2      194  54.80  18.09                            (---*--)
3      193  50.60  20.36                       (--*---)
4      193  44.70  19.75               (---*--)
5      194  34.15  19.94    (---*--)
                            -+---------+---------+---------+--------
                          32.0      40.0      48.0      56.0
Pooled StDev = 19.22

Grouping Information Using Tukey Method

B4_LDI_GP2    N   Mean  Grouping
1           193  57.92  A
2           194  54.80  A B
3           193  50.60    B
4           193  44.70      C
5           194  34.15        D

Means that do not share a letter are significantly different.
```

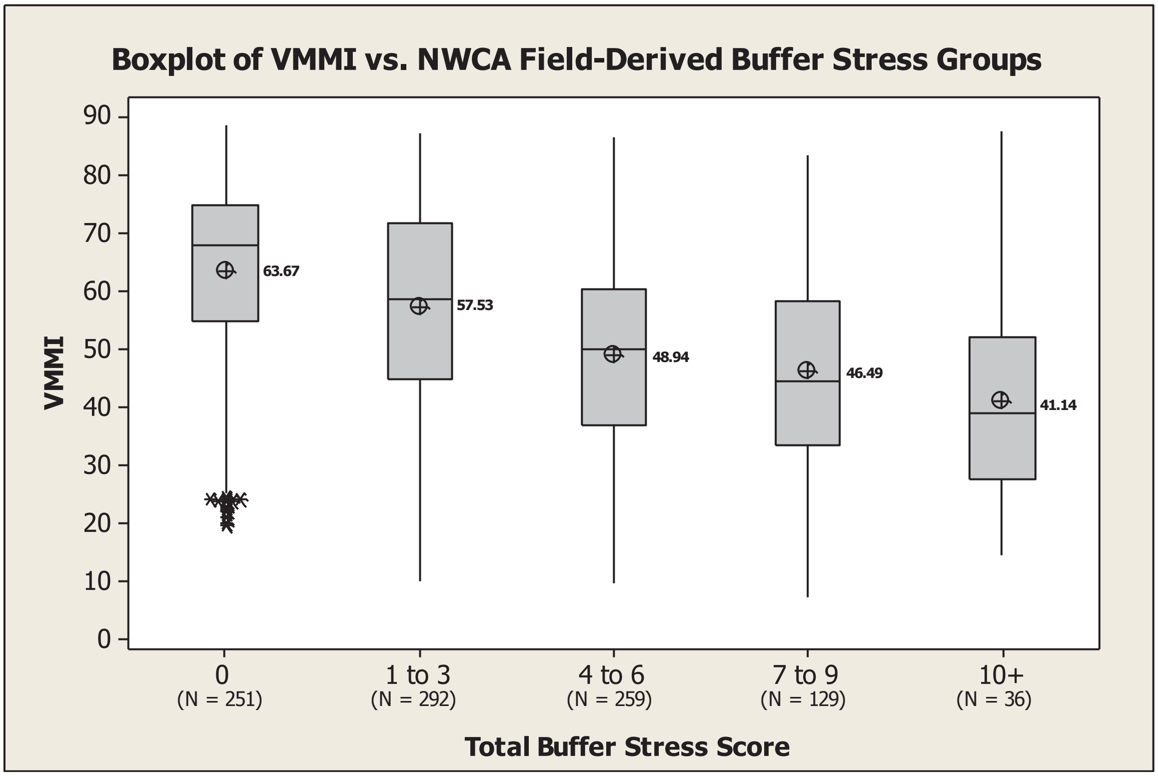
Figure 34. Box and whiskers plot and Minitab output of US VIBI-FQ scores for 967 NWCA wetlands compared with 2011 LDI scores for buffer 3 zone (1000 to 2000 meters) surrounding each assessment area.



One-way ANOVA: TOT_LDI versus STRESSCAT2

```
Source        DF        SS      MS      F      P
STRESSCAT2     4   289.997  72.499  74.78  0.000
Error        962   932.600   0.969
Total        966  1222.597

S = 0.9846   R-Sq = 23.72%   R-Sq(adj) = 23.40%

                            Individual 95% CIs For Mean Based on
                            Pooled StDev
Level    N    Mean   StDev   -+---------+---------+---------+--------
1      251  1.4298  0.6855   (*-)
2      292  1.9157  0.9146          (*-)
3      259  2.4280  1.1531                 (-*)
4      129  2.7998  1.1413                      (-*-)
5       36  3.5563  1.3301                              (----*---)
                             -+---------+---------+---------+--------
                            1.40      2.10      2.80      3.50
Pooled StDev = 0.9846

Grouping Information Using Tukey Method

STRESSCAT2    N    Mean  Grouping
5            36  3.5563  A
4           129  2.7998    B
3           259  2.4280      C
2           292  1.9157        D
1           251  1.4298          E

Means that do not share a letter are significantly different.
```

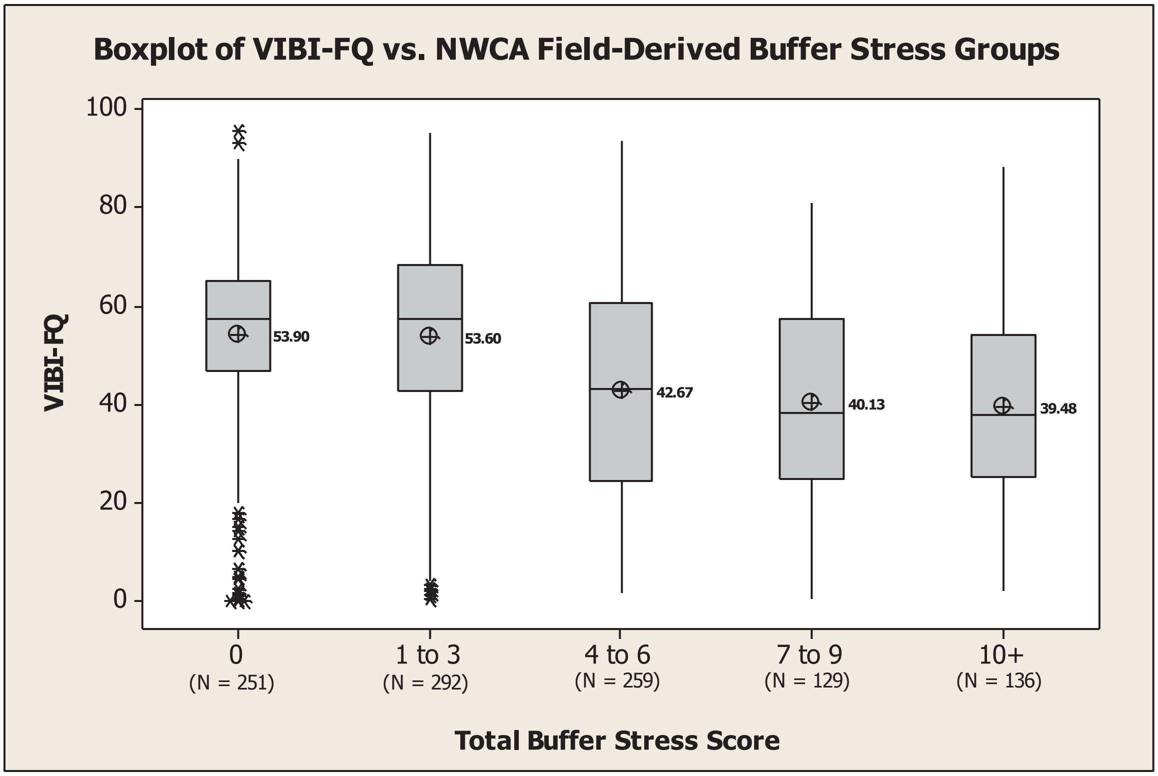
Figure 35. Box and whiskers plot and Minitab output of distance-weighted LDI scores for 967 NWCA wetlands compared with NWCA field-derived buffer stress groups.



One-way ANOVA: VMMI versus STRESSCAT2

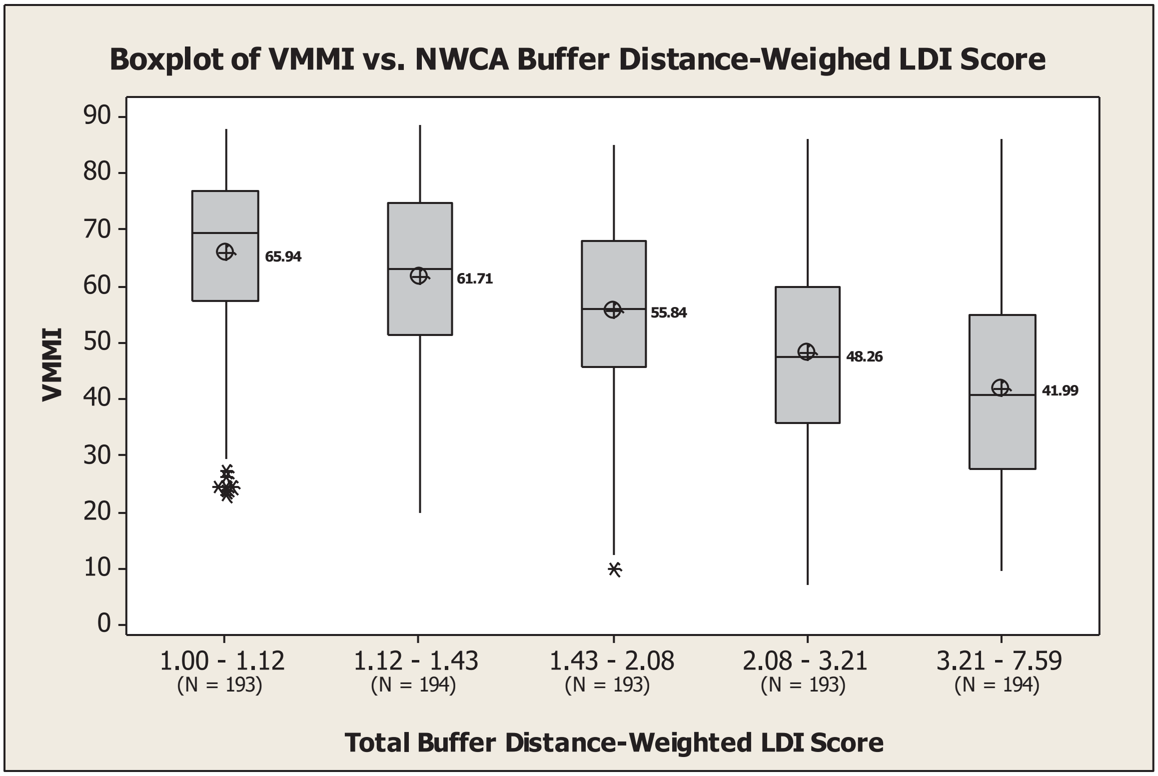
```
Source        DF      SS     MS      F      P
STRESSCAT2     4   46461  11615  40.01  0.000
Error        962  279248    290
Total        966  325709

S = 17.04   R-Sq = 14.26%   R-Sq(adj) = 13.91%

                          Individual 95% CIs For Mean Based on Pooled StDev
Level    N   Mean  StDev  ------+---------+---------+---------+---
1      251  63.67  16.40                                 (--*-)
2      292  57.53  17.71                         (--*-)
3      259  48.94  16.58               (-*--)
4      129  46.49  17.45          (---*---)
5       36  41.14  17.58  (------*------)
                          ------+---------+---------+---------+---
                             40.0      48.0      56.0      64.0
Pooled StDev = 17.04

Grouping Information Using Tukey Method

STRESSCAT2    N   Mean  Grouping
1           251  63.67  A
2           292  57.53    B
3           259  48.94      C
4           129  46.49      C
5            36  41.14      C

Means that do not share a letter are significantly different.
```

Figure 36. Box and whiskers plot and Minitab output of VMMI scores for 967 NWCA wetlands compared with NWCA field-derived buffer stress groups.




```
One-way ANOVA: US_VIBI_FQ versus TOT_LDI_CA

Source        DF      SS     MS      F      P
TOT_LDI_CA     4   70242  17560  47.77  0.000
Error        962  353666    368
Total        966  423908

S = 19.17   R-Sq = 16.57%   R-Sq(adj) = 16.22%

                               Individual 95% CIs For Mean Based on Pooled StDev
Level    N   Mean  StDev  -----+---------+---------+---------+----
1      193  56.93  17.53                                (---*---)
2      194  55.22  19.27                              (---*---)
3      193  52.68  20.10                          (---*---)
4      193  42.90  20.17              (---*---)
5      194  34.44  18.68  (---*---)
                          -----+---------+---------+---------+----
                            35.0      42.0      49.0      56.0
Pooled StDev = 19.17

Grouping Information Using Tukey Method

TOT_LDI_CA    N   Mean  Grouping
1           193  56.93  A
2           194  55.22  A
3           193  52.68  A
4           193  42.90    B
5           194  34.44      C

Means that do not share a letter are significantly different.
```

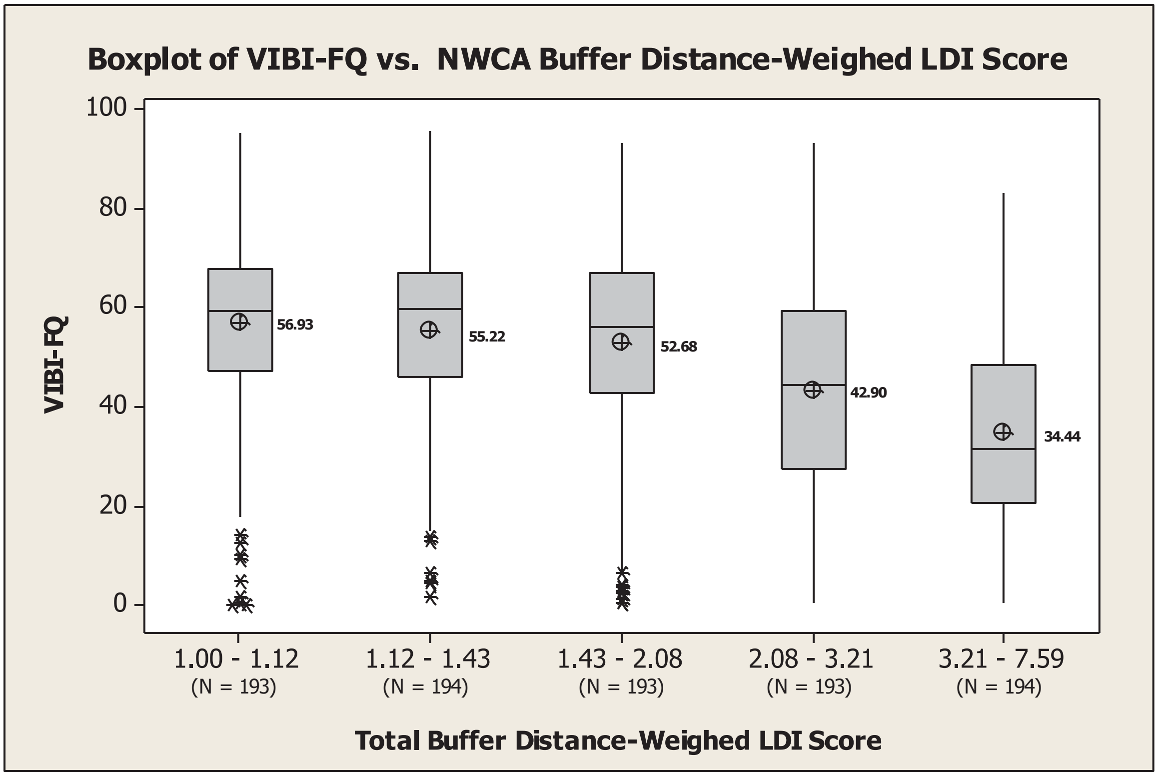
Figure 37. Box and whiskers plot and Minitab output of US VIBI-FQ scores for 967 NWCA wetlands compared with NWCA field-derived buffer stress groups.



One-way ANOVA: VMMI versus TOT_LDI_CA

```
Source        DF      SS     MS      F      P
TOT_LDI_CA     4   73510  18377  70.10  0.000
Error        962  252199    262
Total        966  325709

S = 16.19   R-Sq = 22.57%   R-Sq(adj) = 22.25%

                           Individual 95% CIs For Mean Based on Pooled StDev
Level    N   Mean  StDev     +---------+---------+---------+---------
1      193  65.94  14.63                                 (-*--)
2      194  61.71  15.43                           (--*--)
3      193  55.84  16.54                    (--*--)
4      193  48.26  17.17          (--*--)
5      194  41.99  17.03     (-*--)
                             +---------+---------+---------+---------
                          40.0      48.0      56.0      64.0
Pooled StDev = 16.19

Grouping Information Using Tukey Method

TOT_LDI_CA    N   Mean  Grouping
1           193  65.94  A
2           194  61.71  A
3           193  55.84    B
4           193  48.26      C
5           194  41.99        D

Means that do not share a letter are significantly different.
```

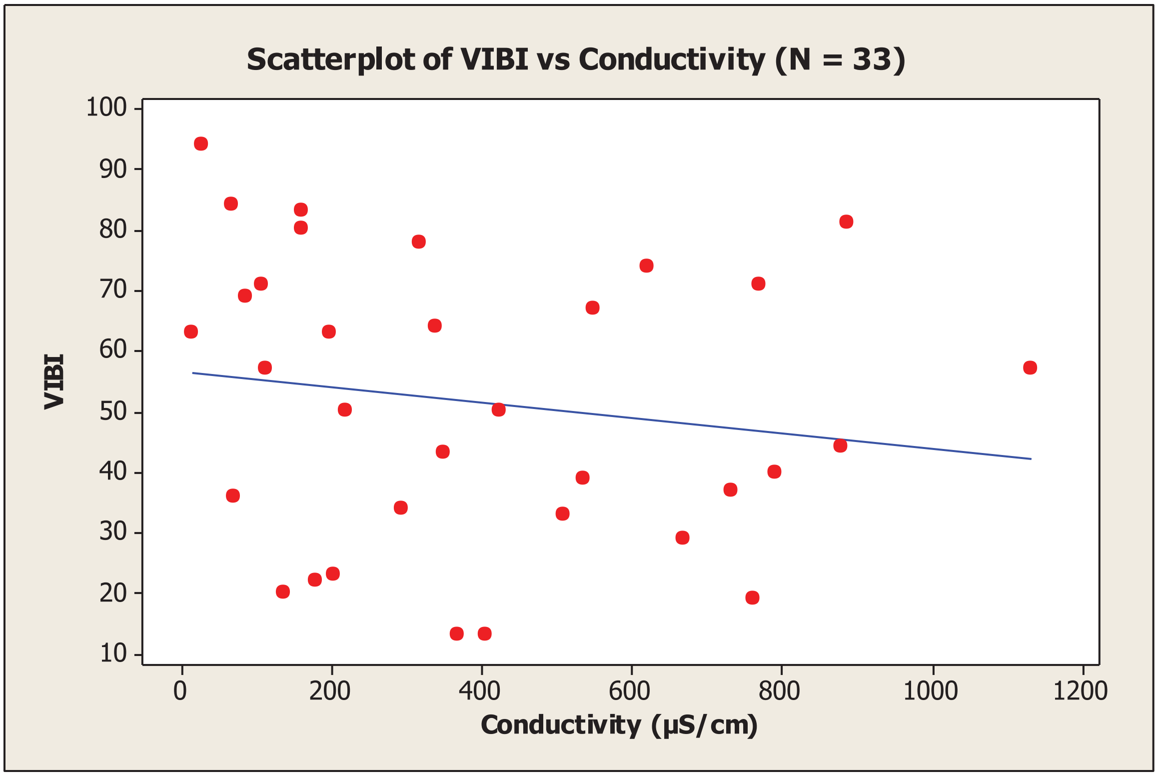
Figure 38. Box and whiskers plot and Minitab output of VMMI scores for 967 NWCA wetlands compared with buffer distance-weighed LDI scoring groups.



One-way ANOVA: US_VIBI_FQ versus TOT_LDI_CA

```
Source        DF      SS     MS      F      P
TOT_LDI_CA     4   70242  17560  47.77  0.000
Error        962  353666    368
Total        966  423908

S = 19.17   R-Sq = 16.57%   R-Sq(adj) = 16.22%

                          Individual 95% CIs For Mean Based on Pooled StDev
Level    N   Mean  StDev  -----+---------+---------+---------+----
1      193  56.93  17.53                                 (---*---)
2      194  55.22  19.27                               (---*---)
3      193  52.68  20.10                           (---*---)
4      193  42.90  20.17              (---*---)
5      194  34.44  18.68  (---*---)
                          -----+---------+---------+---------+----
                            35.0      42.0      49.0      56.0
Pooled StDev = 19.17

Grouping Information Using Tukey Method

TOT_LDI_CA    N   Mean  Grouping
1           193  56.93  A
2           194  55.22  A
3           193  52.68  A
4           193  42.90    B
5           194  34.44      C

Means that do not share a letter are significantly different.
```

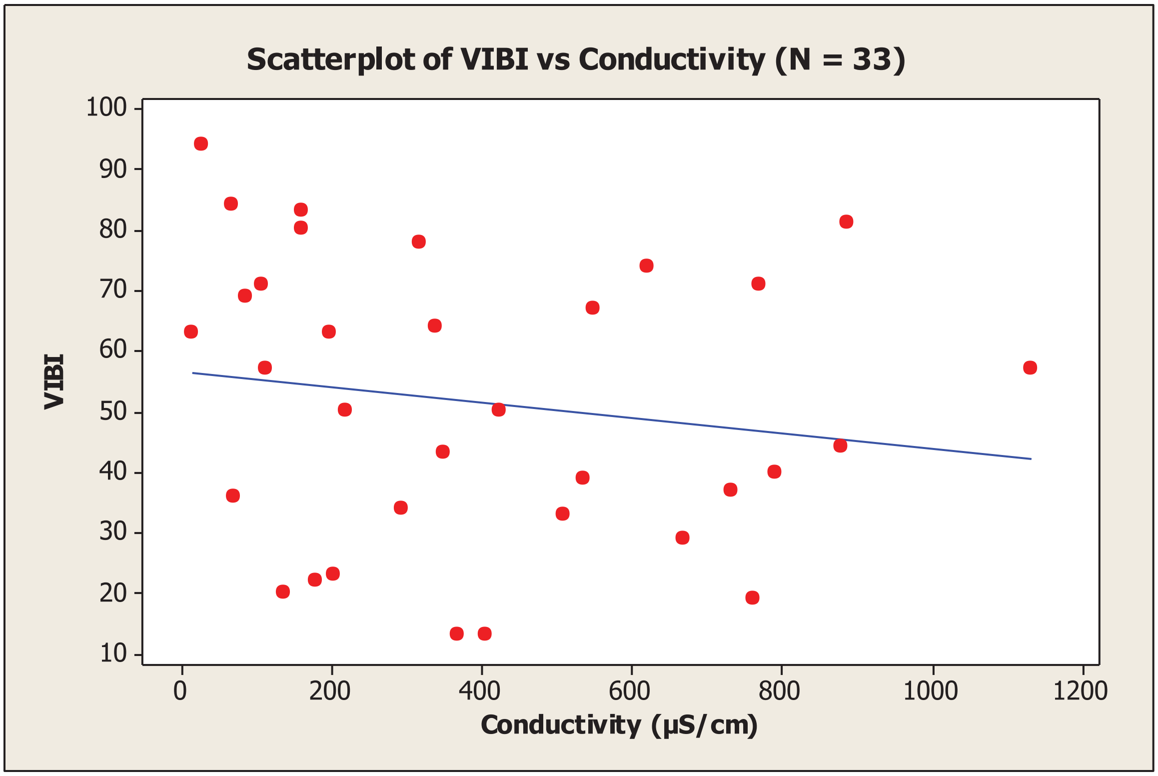
Figure 39. Box and whiskers plot and Minitab output of US VIBI-FQ scores for 967 NWCA wetlands compared with buffer distance-weighed LDI scoring groups.



Regression Analysis: ORAM versus COND

```
The regression equation is
ORAM = 53.4 - 0.0100 COND


Predictor        Coef   SE Coef      T      P
Constant       53.380     4.338  12.30  0.000
COND        -0.010015  0.008788  -1.14  0.263


S = 14.8444   R-Sq = 4.0%   R-Sq(adj) = 0.9%


Analysis of Variance

Source          DF      SS     MS     F      P
Regression       1   286.2  286.2  1.30  0.263
Residual Error  31  6831.0  220.4
Total           32  7117.2
```

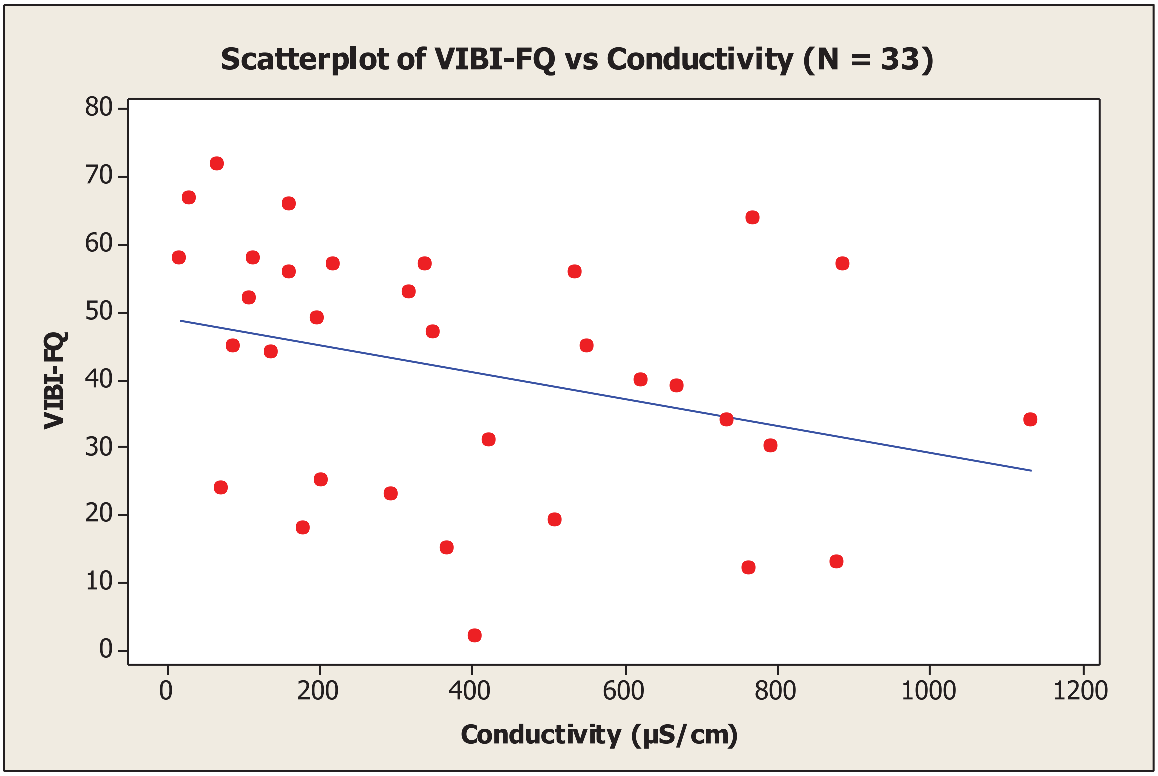
Figure 40. Scatterplot, Fitted line regression plot and Minitab output of ORAM and conductivity water chemistry results for 33 Ohio intensification study wetlands (df = 32, F = 1.30, p = 0.263, R-squared = 4.0 percent).



Regression Analysis: VIBI versus COND

```
The regression equation is
VIBI = 56.5 - 0.0126 COND


Predictor       Coef   SE Coef       T      P
Constant      56.532     6.804    8.31  0.000
COND        -0.01258   0.01378   -0.91  0.369


S = 23.2829   R-Sq = 2.6%   R-Sq(adj) = 0.0%


Analysis of Variance

Source          DF       SS     MS     F      P
Regression       1    451.3  451.3  0.83  0.369
Residual Error  31  16804.9  542.1
Total           32  17256.2
```

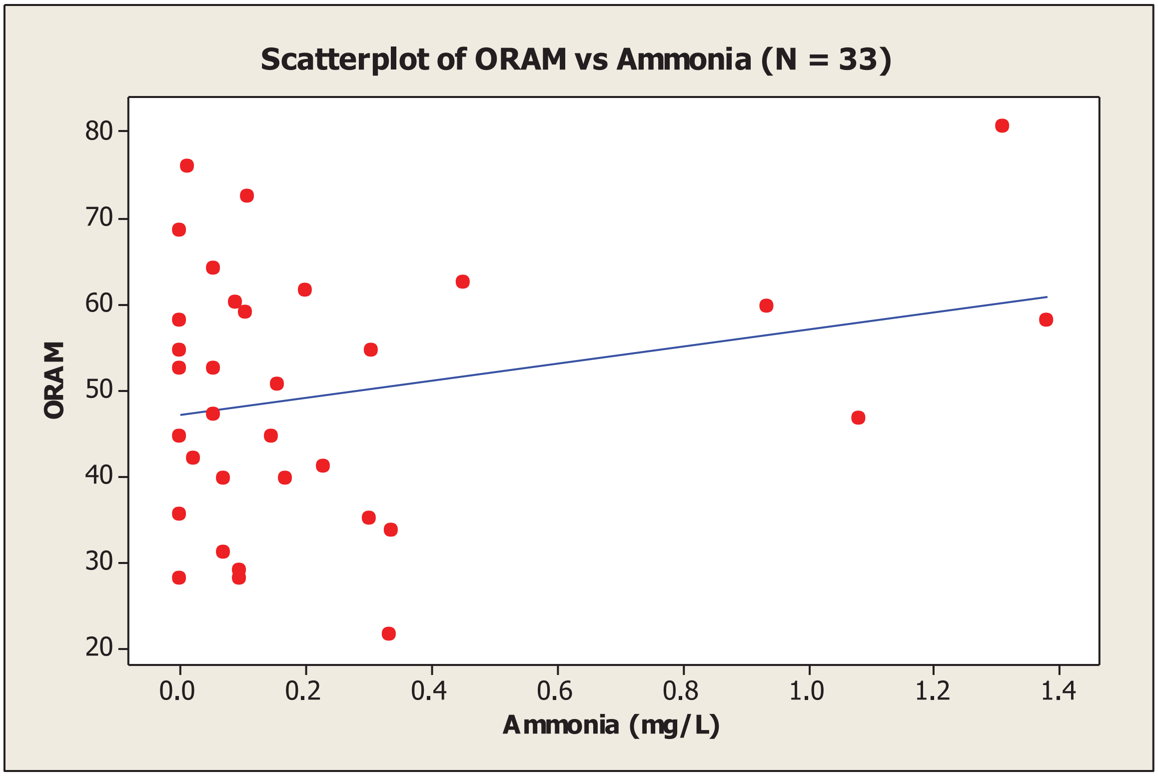
Figure 41. Scatterplot, Fitted line regression plot and Minitab output of VIBI and conductivity water chemistry results for 33 Ohio intensification study wetlands (df = 32, F = 0.83, p = 0.369, R-squared = 2.6 percent).



Regression Analysis: VIBI_FQ versus COND

```
The regression equation is
VIBI_FQ = 49.2 - 0.0199 COND


Predictor       Coef   SE Coef      T      P
Constant      49.168     5.219   9.42  0.000
COND        -0.01991   0.01057  -1.88  0.069


S = 17.8590   R-Sq = 10.3%   R-Sq(adj) = 7.4%


Analysis of Variance

Source          DF       SS      MS     F      P
Regression       1   1131.3  1131.3  3.55  0.069
Residual Error  31   9887.3   318.9
Total           32  11018.5
```

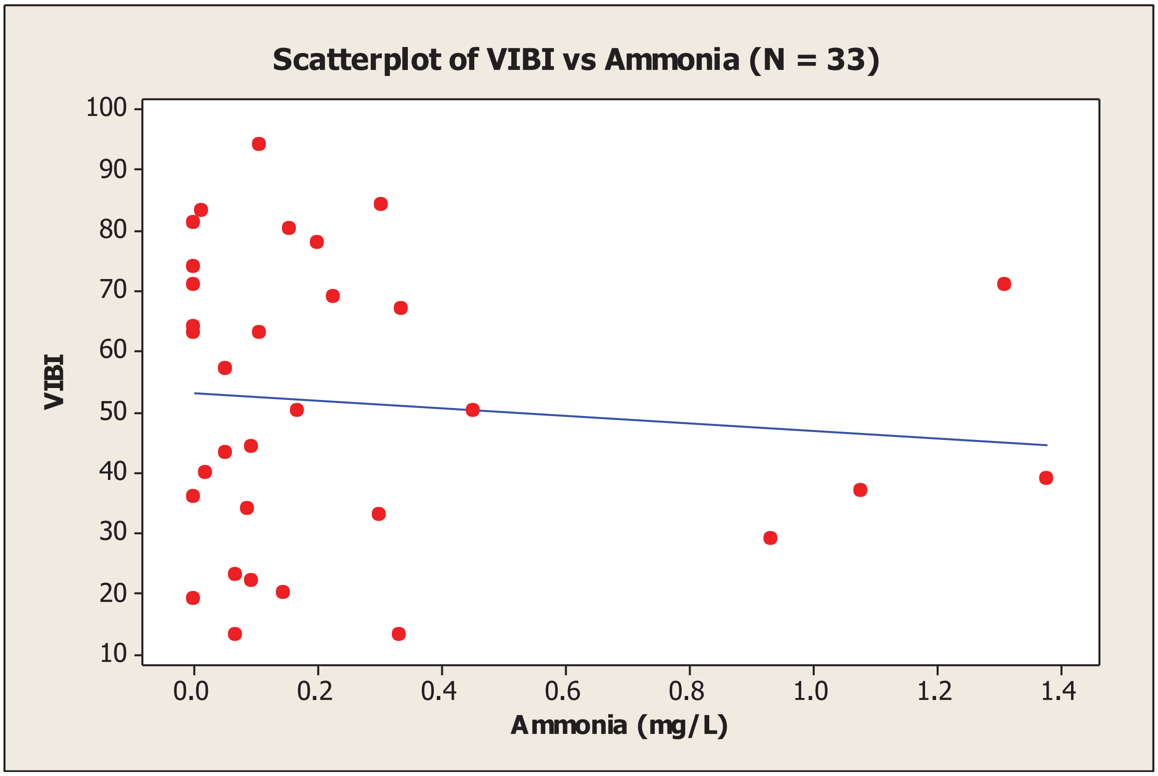
Figure 42. Scatterplot, Fitted line regression plot and Minitab output of VIBI-FQ and conductivity water chemistry results for 33 Ohio intensification study wetlands (df = 32, F = 3.55, p = 0.069, R-squared = 10.3 percent).



Regression Analysis: ORAM versus NH3

```
The regression equation is
ORAM = 46.9 + 10.0 NH3


Predictor     Coef  SE Coef      T      P
Constant    46.929    3.073  15.27  0.000
NH3         10.032    6.920   1.45  0.157


S = 14.6632   R-Sq = 6.3%   R-Sq(adj) = 3.3%


Analysis of Variance

Source          DF      SS     MS     F      P
Regression       1   451.9  451.9  2.10  0.157
Residual Error  31  6665.3  215.0
Total           32  7117.2
```

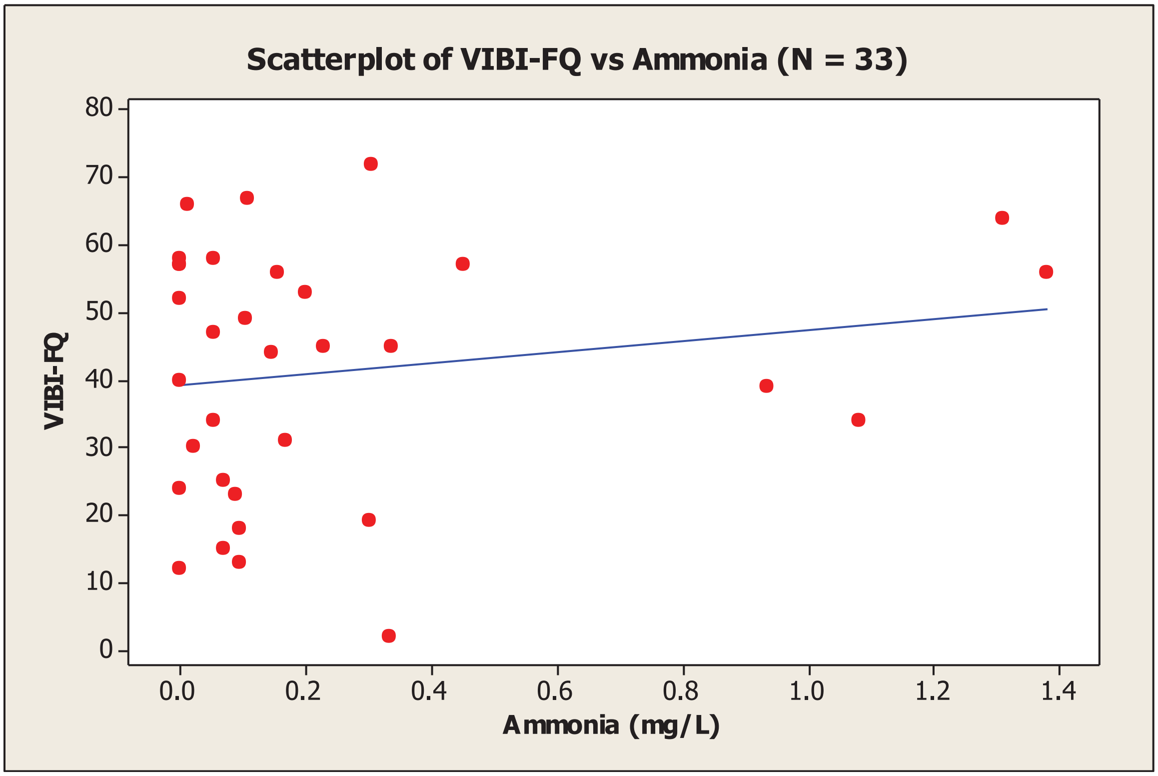
Figure 43. Scatterplot, Fitted line regression plot and Minitab output of ORAM and ammonia water chemistry results for 33 Ohio intensification study wetlands (df = 32, F = 2.10, p = 0.157, R-squared = 6.3 percent).



Regression Analysis: VIBI versus NH3

```
The regression equation is
VIBI = 53.1 - 6.1 NH3


Predictor     Coef  SE Coef      T      P
Constant    53.065    4.920  10.79  0.000
NH3          -6.15    11.08  -0.56  0.583


S = 23.4771   R-Sq = 1.0%   R-Sq(adj) = 0.0%


Analysis of Variance

Source          DF       SS     MS     F      P
Regression       1    169.8  169.8  0.31  0.583
Residual Error  31  17086.4  551.2
Total           32  17256.2
```

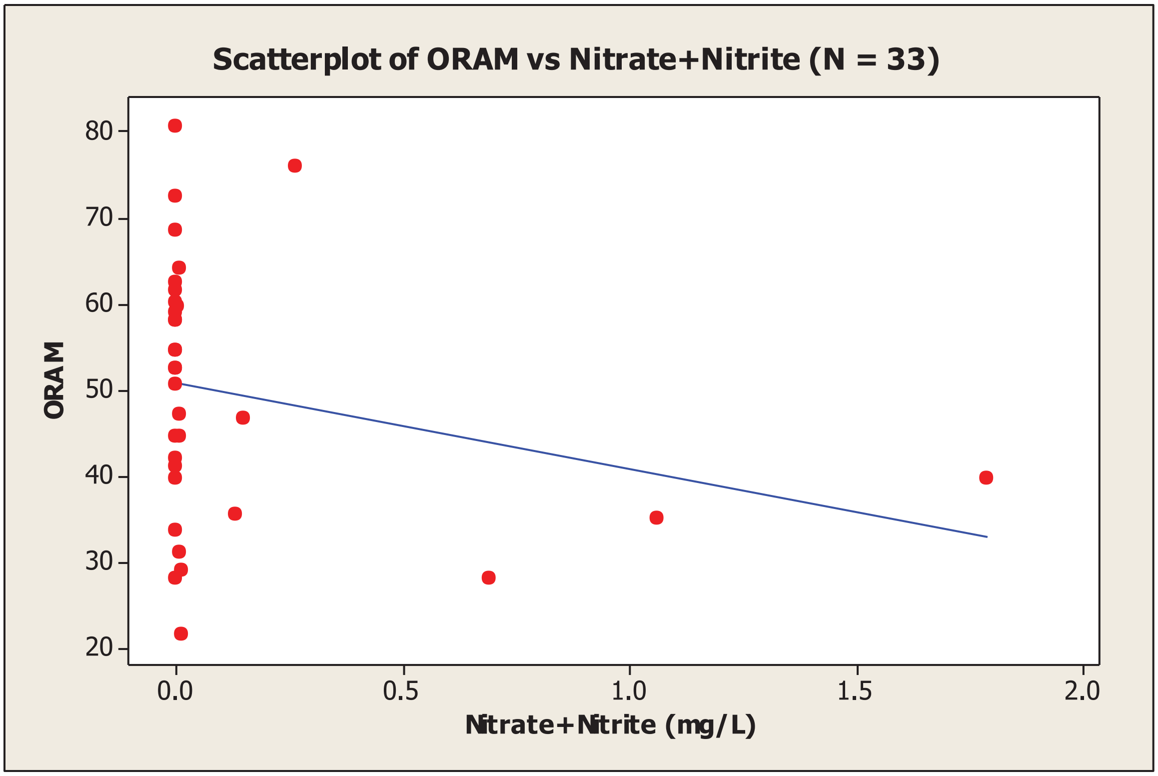
Figure 44. Scatterplot, Fitted line regression plot and Minitab output of VIBI and ammonia water chemistry results for 33 Ohio intensification study wetlands (df = 32, F = 0.31, p = 0.583, R-squared = 1.0 percent).



Regression Analysis: VIBI_FQ versus NH3

```
The regression equation is
VIBI_FQ = 39.2 + 8.26 NH3


Predictor     Coef  SE Coef      T      P
Constant    39.230    3.895  10.07  0.000
NH3          8.263    8.772   0.94  0.353


S = 18.5889   R-Sq = 2.8%   R-Sq(adj) = 0.0%


Analysis of Variance

Source          DF       SS     MS     F      P
Regression       1    306.6  306.6  0.89  0.353
Residual Error  31  10711.9  345.5
Total           32  11018.5
```

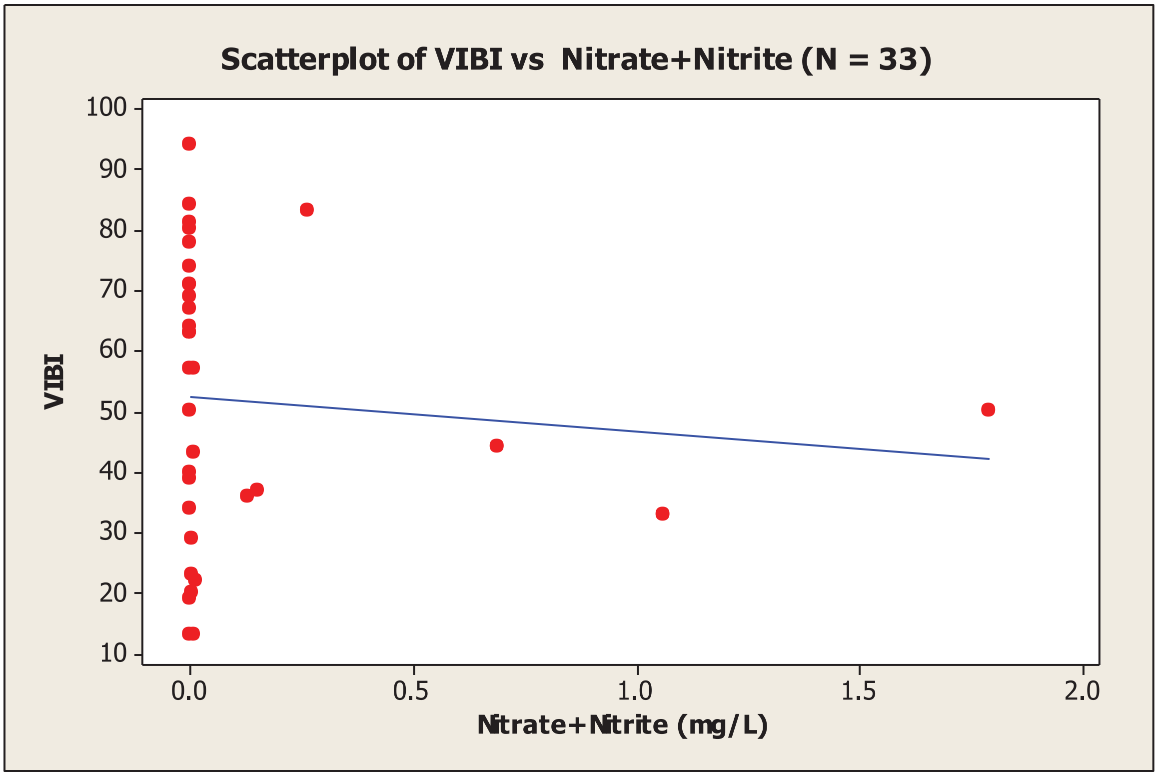
Figure 45. Scatterplot, Fitted line regression plot and Minitab output of VIBI-FQ and ammonia water chemistry results for 33 Ohio intensification study wetlands (df = 32, F = 0.89, p = 0.353, R-squared = 2.8 percent).



Regression Analysis: ORAM versus NO3_NO2

```
The regression equation is
ORAM = 50.7 - 9.92 NO3_NO2


Predictor     Coef  SE Coef      T      P
Constant    50.654    2.703  18.74  0.000
NO3_NO2     -9.920    7.006  -1.42  0.167


S = 14.6848   R-Sq = 6.1%   R-Sq(adj) = 3.0%


Analysis of Variance

Source          DF      SS     MS     F      P
Regression       1   432.3  432.3  2.00  0.167
Residual Error  31  6684.9  215.6
Total           32  7117.2
```

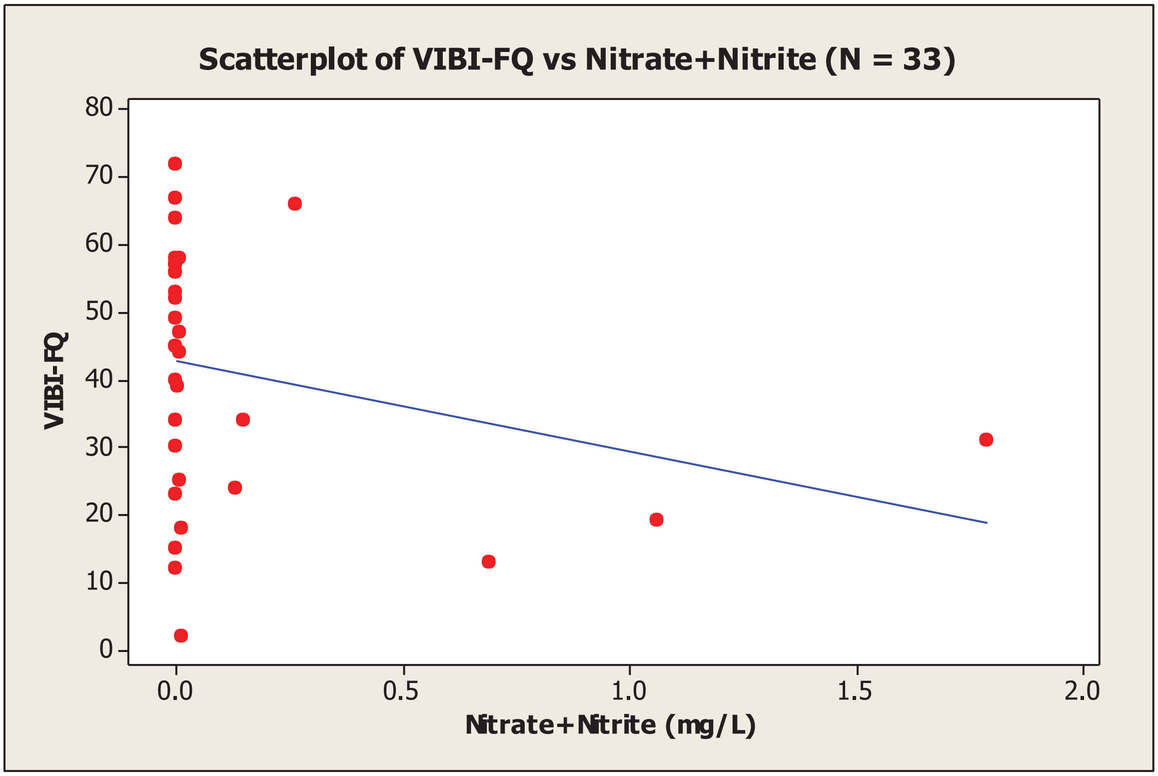
Figure 46. Scatterplot, Fitted line regression plot and Minitab output of ORAM and Nitrate+Nitrite water chemistry results for 33 Ohio intensification study wetlands (df = 32, F = 2.00, p = 0.167, R-squared = 6.1 percent).



Regression Analysis: VIBI versus NO3_NO2

```
The regression equation is
VIBI = 52.3 - 5.7 NO3_NO2


Predictor    Coef  SE Coef      T      P
Constant   52.255    4.325  12.08  0.000
NO3_NO2     -5.66    11.21  -0.50  0.617


S = 23.4971   R-Sq = 0.8%   R-Sq(adj) = 0.0%


Analysis of Variance

Source          DF       SS     MS     F      P
Regression       1    140.6  140.6  0.25  0.617
Residual Error  31  17115.6  552.1
Total           32  17256.2
```

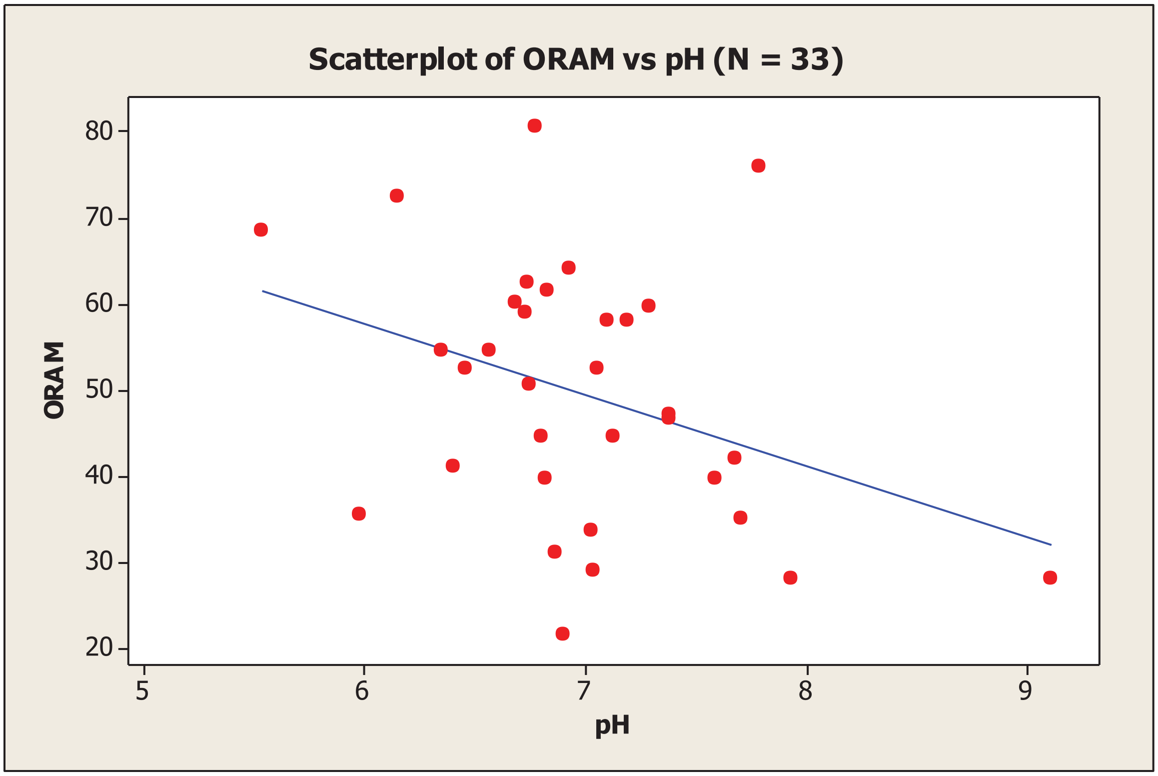
Figure 47. Scatterplot, Fitted line regression plot and Minitab output of VIBI and Nitrate+Nitrite water chemistry results for 33 Ohio intensification study wetlands (df = 32, F = 0.25, p = 0.617, R-squared = 0.8 percent).



Regression Analysis: VIBI_FQ versus NO3_NO2

```
The regression equation is
VIBI_FQ = 43.0 - 13.4 NO3_NO2


Predictor      Coef  SE Coef      T      P
Constant     42.957    3.343  12.85  0.000
NO3_NO2     -13.423    8.665  -1.55  0.132


S = 18.1632   R-Sq = 7.2%   R-Sq(adj) = 4.2%


Analysis of Variance

Source          DF       SS     MS     F      P
Regression       1    791.6  791.6  2.40  0.132
Residual Error  31  10226.9  329.9
Total           32  11018.5
```

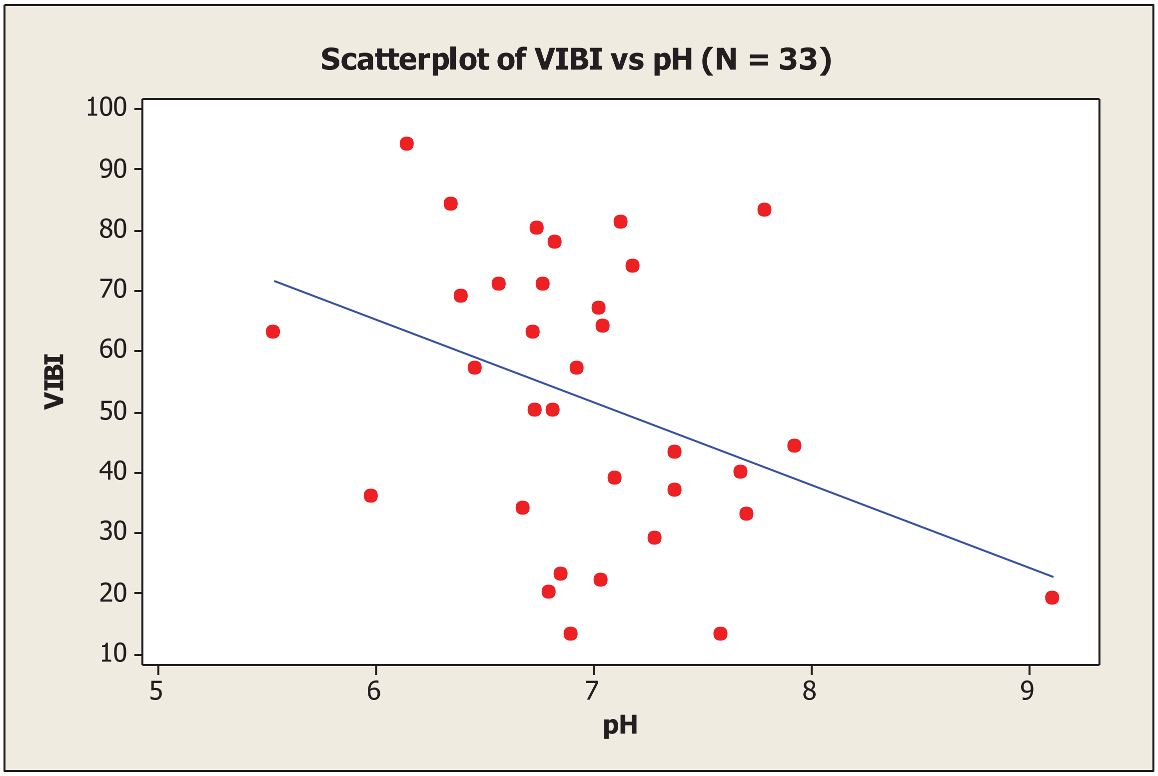
Figure 48. Scatterplot, Fitted line regression plot and Minitab output of VIBI-FQ and Nitrate+Nitrite water chemistry results for 33 Ohio intensification study wetlands (df = 32, F = 2.40, p = 0.132, R-squared = 7.2 percent).



Regression Analysis: ORAM versus pH

```
The regression equation is
ORAM = 107 - 8.30 pH


Predictor    Coef   SE Coef      T      P
Constant   107.41     27.14   3.96  0.000
pH         -8.298     3.867  -2.15  0.040


S = 14.1382   R-Sq = 12.9%   R-Sq(adj) = 10.1%


Analysis of Variance

Source          DF      SS     MS     F      P
Regression       1   920.7  920.7  4.61  0.040
Residual Error  31  6196.6  199.9
Total           32  7117.2
```

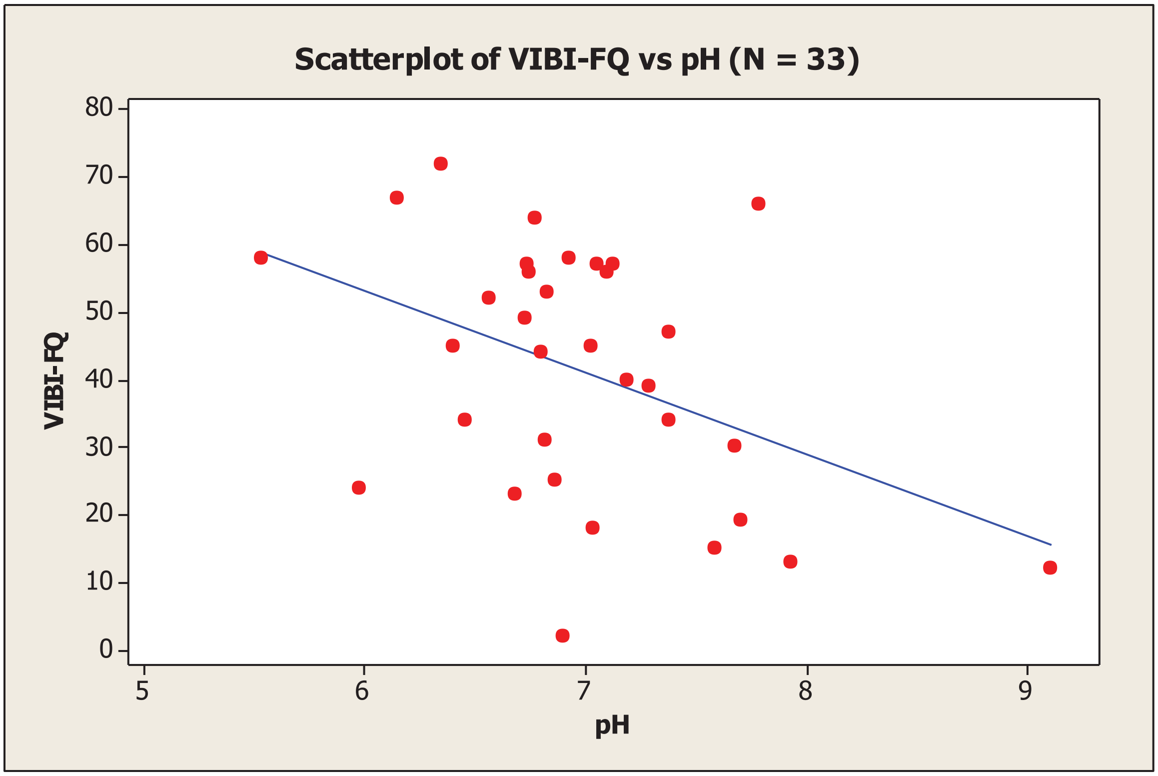
Figure 49. Scatterplot, Fitted line regression plot and Minitab output of ORAM and pH water chemistry results for 33 Ohio intensification study wetlands (df = 32, F = 4.61, p = 0.040, R-squared = 12.9 percent).



Regression Analysis: VIBI versus pH

```
The regression equation is
VIBI = 147 - 13.6 pH


Predictor      Coef  SE Coef      T      P
Constant     146.81    41.90   3.50  0.001
pH          -13.629    5.970  -2.28  0.029


S = 21.8298   R-Sq = 14.4%   R-Sq(adj) = 11.6%


Analysis of Variance

Source          DF       SS      MS     F      P
Regression       1   2483.5  2483.5  5.21  0.029
Residual Error  31  14772.7   476.5
Total           32  17256.2
```

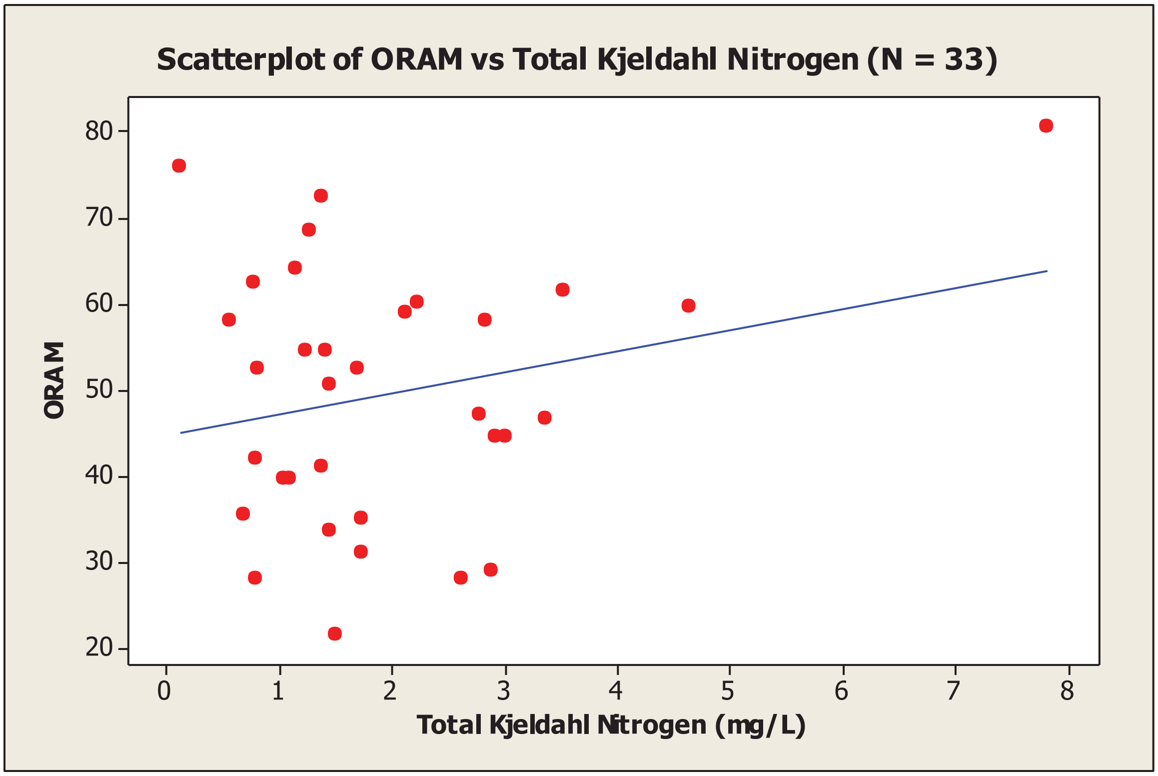
Figure 50. Scatterplot, Fitted line regression plot and Minitab output of VIBI and pH water chemistry results for 33 Ohio intensification study wetlands (df = 32, F = 5.21, p = 0.029, R-squared = 14.4 percent).



Regression Analysis: VIBI_FQ versus pH

```
The regression equation is
VIBI_FQ = 126 - 12.1 pH


Predictor      Coef  SE Coef      T      P
Constant     126.03    32.80   3.84  0.001
pH          -12.127    4.673  -2.59  0.014


S = 17.0883   R-Sq = 17.8%   R-Sq(adj) = 15.2%


Analysis of Variance

Source          DF      SS      MS     F      P
Regression       1  1966.2  1966.2  6.73  0.014
Residual Error  31  9052.4   292.0
```

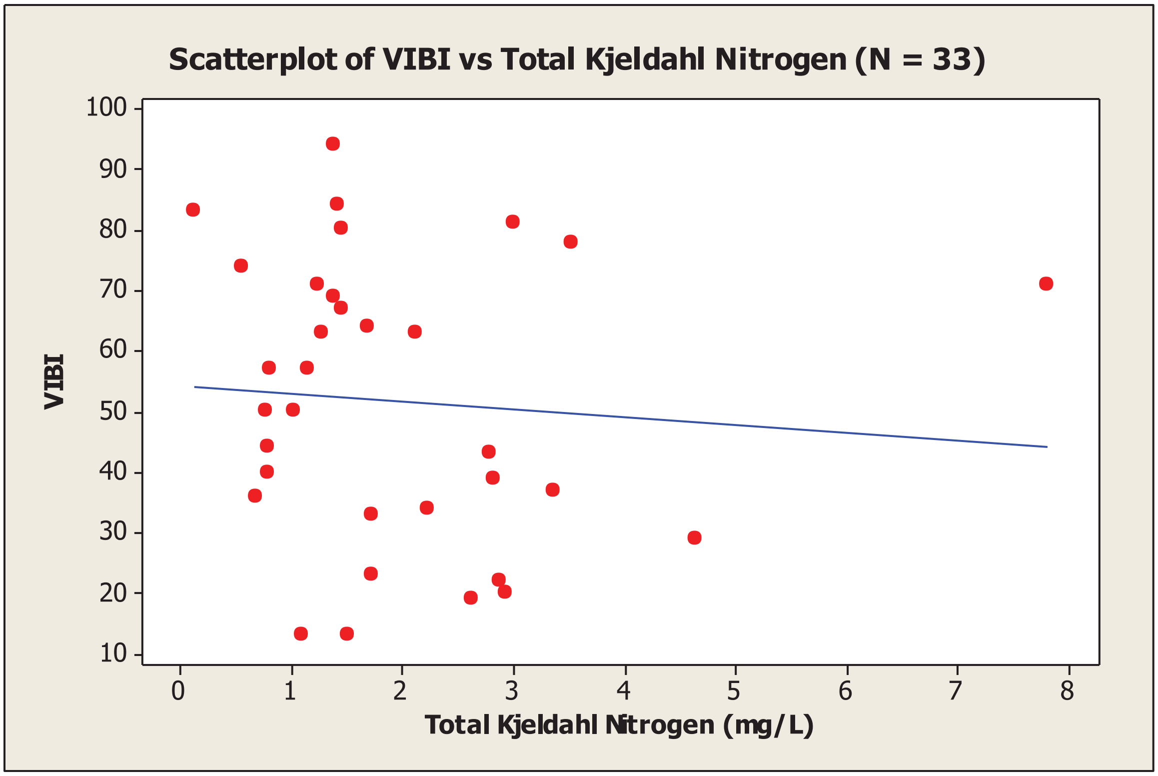
Figure 51. Scatterplot, Fitted line regression plot and Minitab output of VIBI-FQ and pH water chemistry results for 33 Ohio intensification study wetlands (df = 32, F = 6.73, p = 0.014, R-squared = 17.8 percent).



Regression Analysis: ORAM versus TOT_KLD_NI

```
The regression equation is
ORAM = 44.6 + 2.44 TOT_KLD_NI


Predictor      Coef  SE Coef      T      P
Constant     44.617    4.332  10.30  0.000
TOT_KLD_NI    2.444    1.781   1.37  0.180


S = 14.7122   R-Sq = 5.7%   R-Sq(adj) = 2.7%


Analysis of Variance

Source          DF      SS     MS     F      P
Regression       1   407.3  407.3  1.88  0.180
Residual Error  31  6710.0  216.5
Total           32  7117.2
```

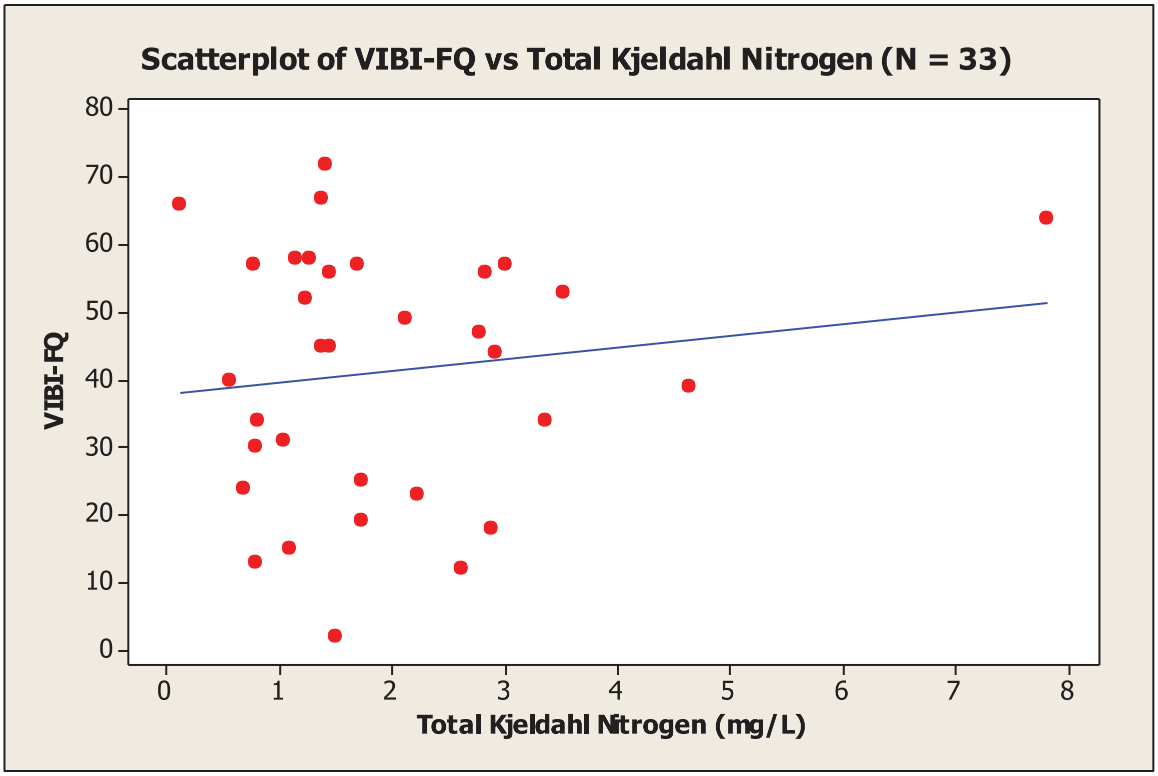
Figure 52. Scatterplot, Fitted line regression plot and Minitab output of ORAM and total kjeldahl nitrogen water chemistry results for 33 Ohio intensification study wetlands (df = 32, F = 1.88, p = 0.18, R-squared = 5.7 percent).



Regression Analysis: VIBI versus TOT_KLD_NI

```
The regression equation is
VIBI = 54.1 - 1.29 TOT_KLD_NI


Predictor      Coef  SE Coef      T      P
Constant     54.072    6.924   7.81  0.000
TOT_KLD_NI   -1.288    2.847  -0.45  0.654


S = 23.5160   R-Sq = 0.7%   R-Sq(adj) = 0.0%


Analysis of Variance

Source          DF       SS     MS     F      P
Regression       1    113.2  113.2  0.20  0.654
Residual Error  31  17143.0  553.0
```

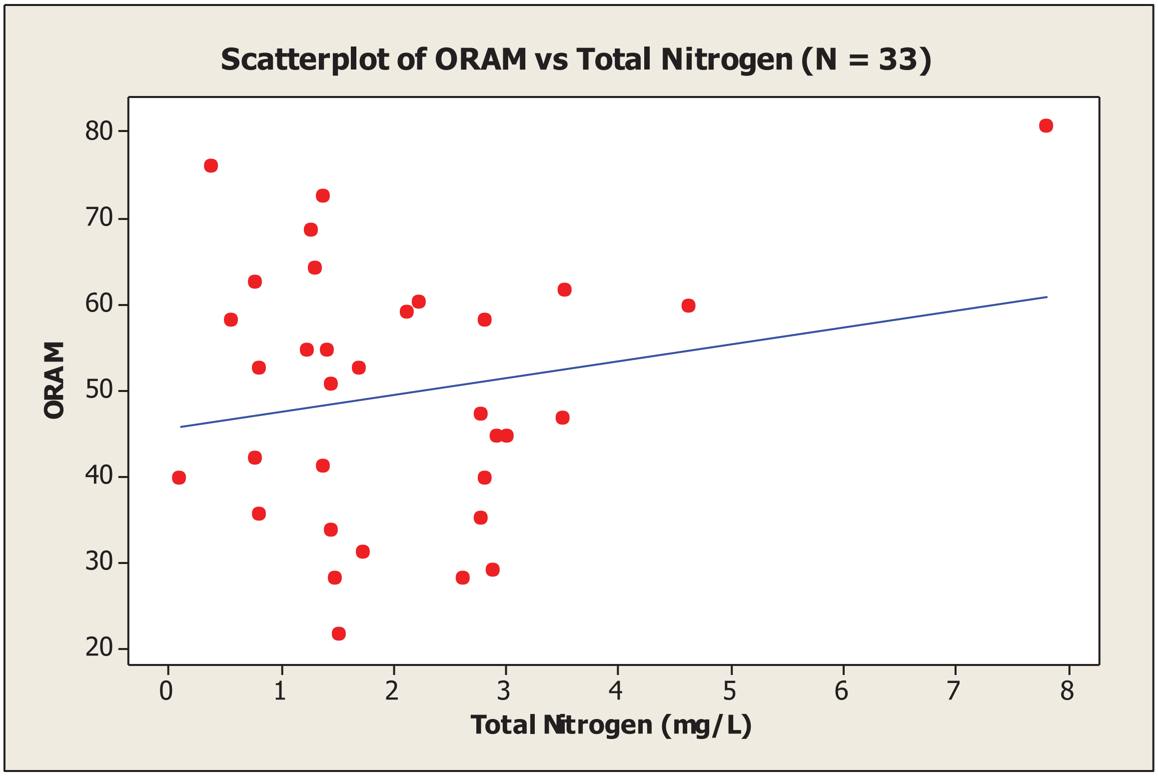
Figure 53. Scatterplot, Fitted line regression plot and Minitab output of VIBI and total kjeldahl nitrogen water chemistry results for 33 Ohio intensification study wetlands (df = 32, F = 0.20, p = 0.654, R-squared = 0.7 percent).



Regression Analysis: VIBI_FQ versus TOT_KLD_NI

```
The regression equation is
VIBI_FQ = 37.8 + 1.75 TOT_KLD_NI


Predictor      Coef  SE Coef     T      P
Constant     37.832    5.498  6.88  0.000
TOT_KLD_NI    1.754    2.261  0.78  0.444


S = 18.6726   R-Sq = 1.9%   R-Sq(adj) = 0.0%


Analysis of Variance

Source          DF       SS     MS     F      P
Regression       1    209.9  209.9  0.60  0.444
Residual Error  31  10808.6  348.7
```

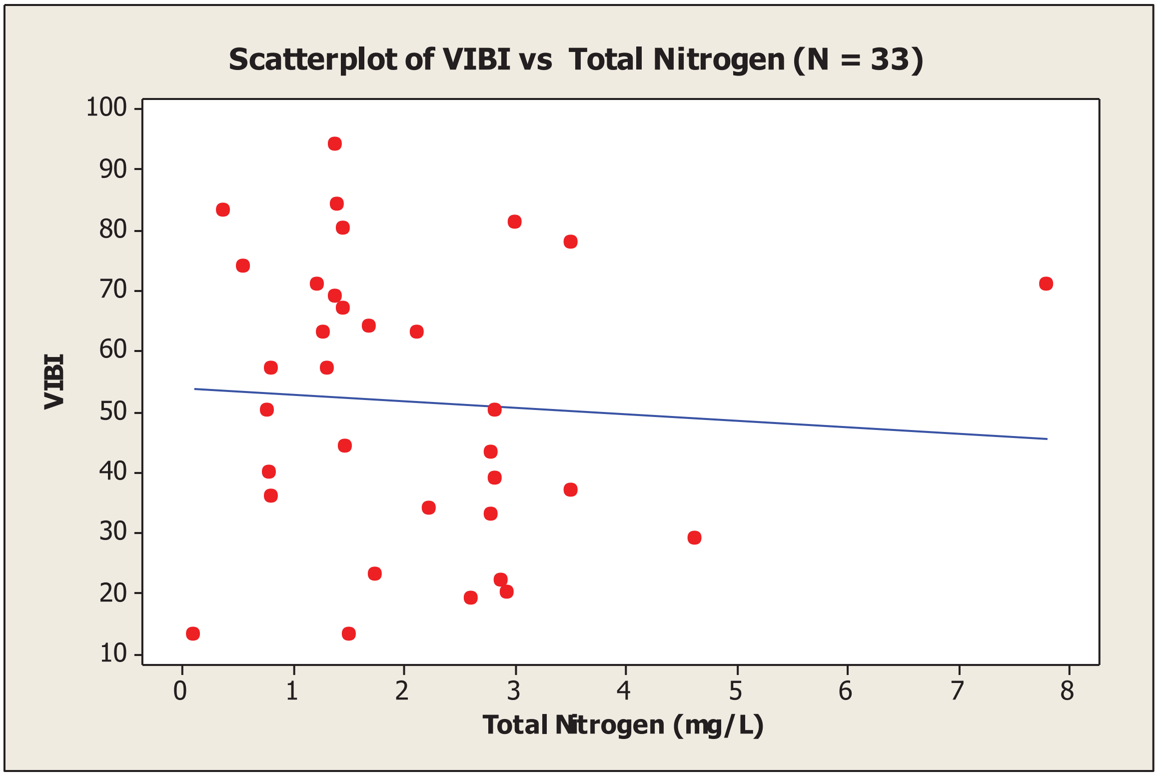
Figure 54. Scatterplot, Fitted line regression plot and Minitab output of VIB-FQI and total kjeldahl nitrogen water chemistry results for 33 Ohio intensification study wetlands (df = 32, F = 0.60, p = 0.444, R-squared = 1.9 percent).



Regression Analysis: ORAM versus TOT_NIT

```
The regression equation is
ORAM = 45.4 + 1.96 TOT_NIT


Predictor     Coef   SE Coef      T      P
Constant    45.369     4.506  10.07  0.000
TOT_NIT      1.960     1.790   1.10  0.282


S = 14.8672   R-Sq = 3.7%   R-Sq(adj) = 0.6%


Analysis of Variance

Source          DF      SS     MS     F      P
Regression       1   265.2  265.2  1.20  0.282
Residual Error  31  6852.1  221.0
Total           32  7117.2
```

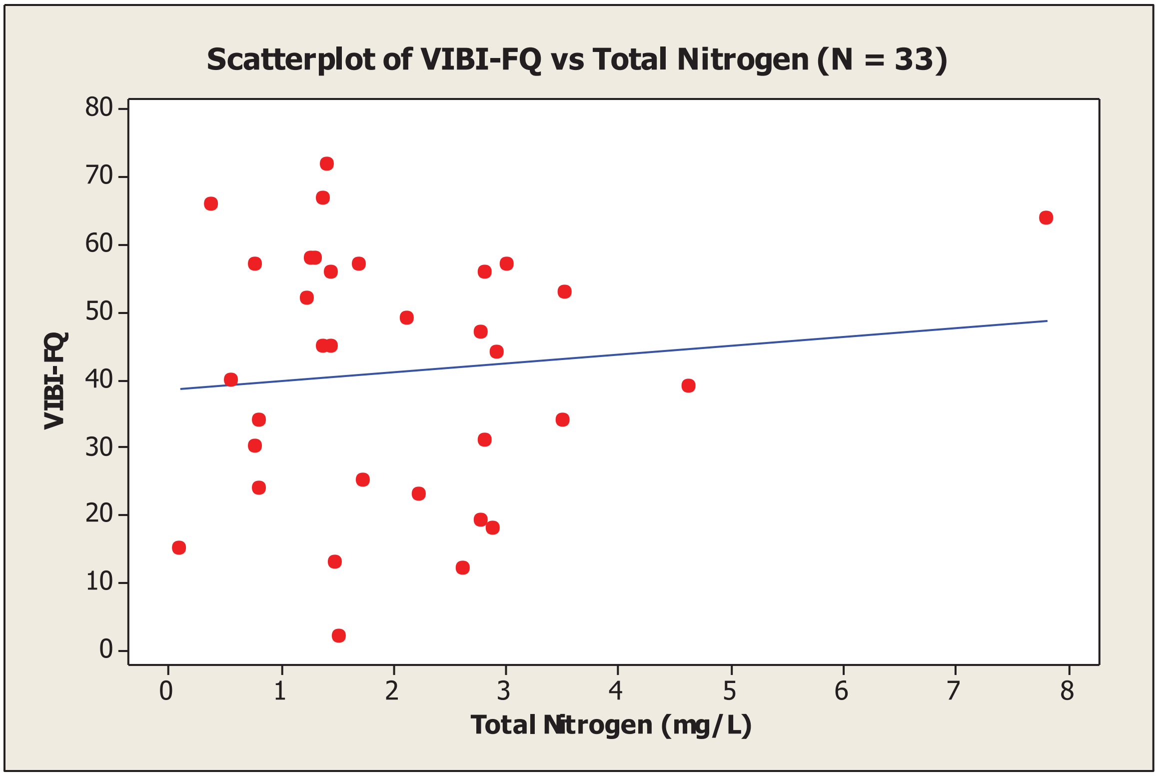
Figure 55. Scatterplot, Fitted line regression plot and Minitab output of ORAM and total nitrogen water chemistry results for 33 Ohio intensification study wetlands (df = 32, F = 1.20, p = 0.282, R-squared = 3.7 percent).



Regression Analysis: VIBI versus TOT_NIT

```
The regression equation is
VIBI = 53.7 - 1.06 TOT_NIT


Predictor      Coef   SE Coef       T       P
Constant     53.735     7.134    7.53   0.000
TOT_NIT      -1.062     2.834   -0.37   0.710


S = 23.5401   R-Sq = 0.5%   R-Sq(adj) = 0.0%


Analysis of Variance

Source          DF       SS     MS     F       P
Regression       1     77.9   77.9  0.14   0.710
Residual Error  31  17178.3  554.1
Total           32  17256.2
```

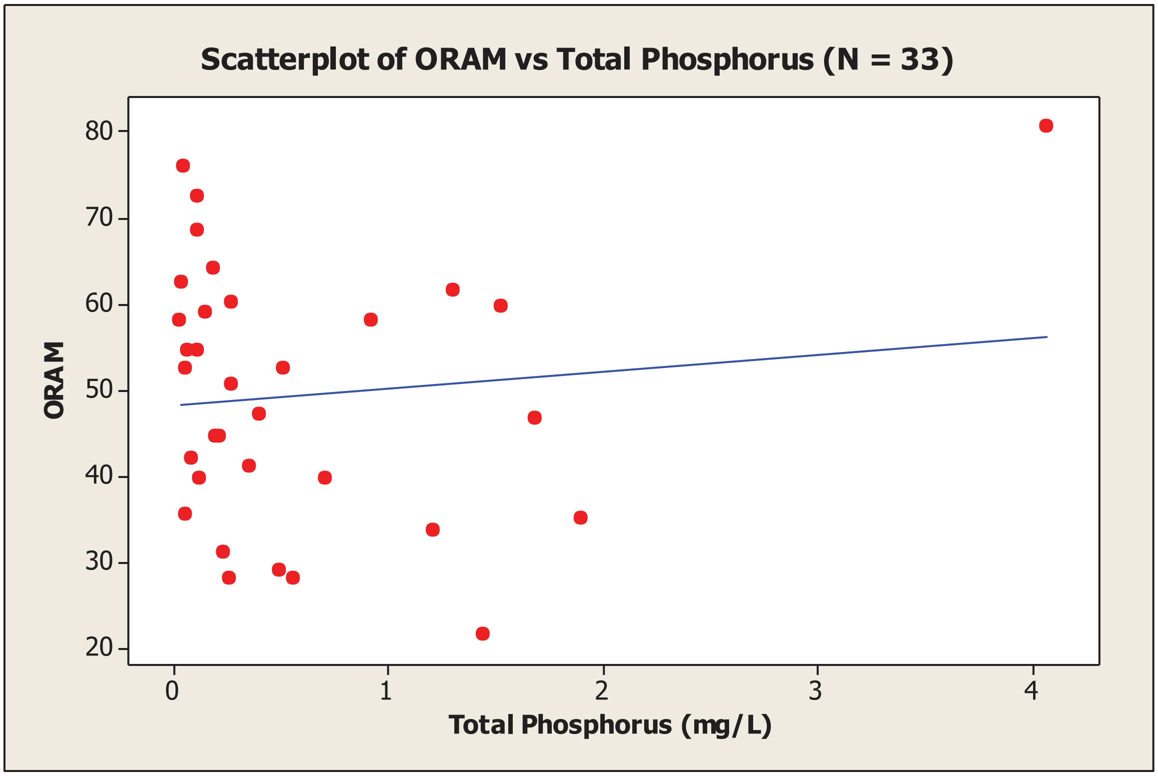
Figure 56. Scatterplot, Fitted line regression plot and Minitab output of VIBI and total nitrogen water chemistry results for 33 Ohio intensification study wetlands (df = 32, F = 0.14, p = 0.710, R-squared = 0.5 percent).



Regression Analysis: VIBI_FQ versus TOT_NIT

```
The regression equation is
VIBI_FQ = 38.6 + 1.30 TOT_NIT


Predictor     Coef  SE Coef     T      P
Constant    38.598    5.684  6.79  0.000
TOT_NIT      1.298    2.258  0.57  0.569


S = 18.7533   R-Sq = 1.1%   R-Sq(adj) = 0.0%


Analysis of Variance

Source          DF       SS     MS     F      P
Regression       1    116.3  116.3  0.33  0.569
Residual Error  31  10902.3  351.7
Total           32  11018.5
```

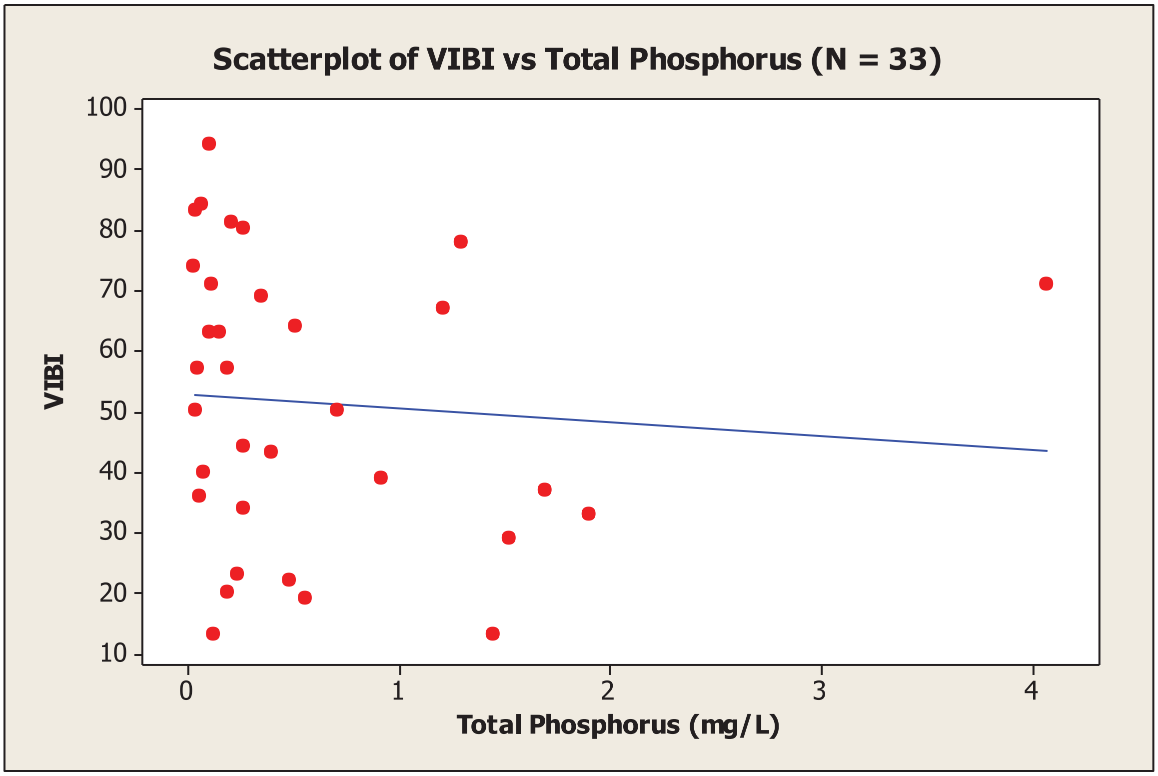
Figure 57. Scatterplot, Fitted line regression plot and Minitab output of VIBI-FQ and total nitrogen water chemistry results for 33 Ohio intensification study wetlands (df = 32, F = 0.33, p = 0.569, R-squared = 1.1 percent).



Regression Analysis: ORAM versus TOT_PHOS

```
The regression equation is
ORAM = 48.2 + 1.95 TOT_PHOS


Predictor     Coef  SE Coef      T      P
Constant    48.248    3.253  14.83  0.000
TOT_PHOS     1.947    3.226   0.60  0.551


S = 15.0640   R-Sq = 1.2%   R-Sq(adj) = 0.0%


Analysis of Variance

Source          DF      SS     MS     F      P
Regression       1    82.6   82.6  0.36  0.551
Residual Error  31  7034.6  226.9
Total           32  7117.2
```

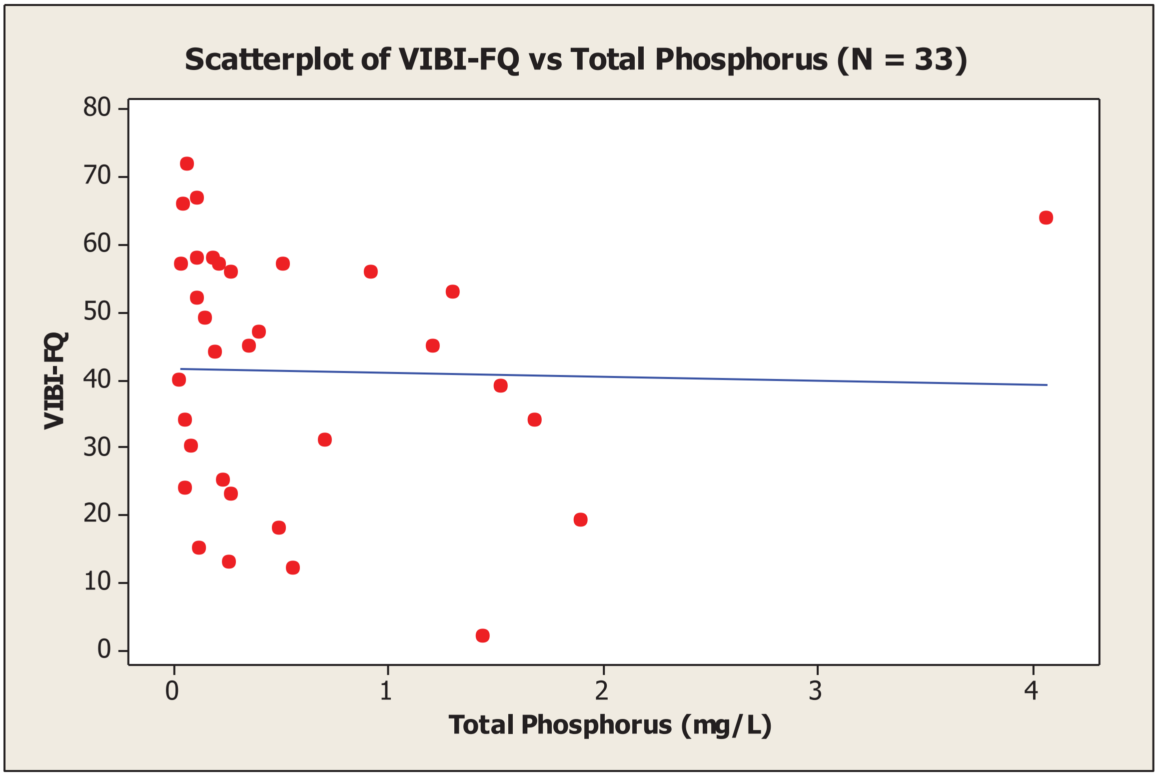
Figure 58. Scatterplot, Fitted line regression plot and Minitab output of ORAM and total phosphorus water chemistry results for 33 Ohio intensification study wetlands (df = 32, F = 0.36, p = 0.551, R-squared = 1.2 percent).



Regression Analysis: VIBI versus TOT_PHOS

```
The regression equation is
VIBI = 52.9 - 2.34 TOT_PHOS


Predictor    Coef  SE Coef      T      P
Constant   52.944    5.077  10.43  0.000
TOT_PHOS   -2.343    5.036  -0.47  0.645


S = 23.5115   R-Sq = 0.7%   R-Sq(adj) = 0.0%


Analysis of Variance

Source          DF       SS     MS     F      P
Regression       1    119.7  119.7  0.22  0.645
Residual Error  31  17136.5  552.8
```

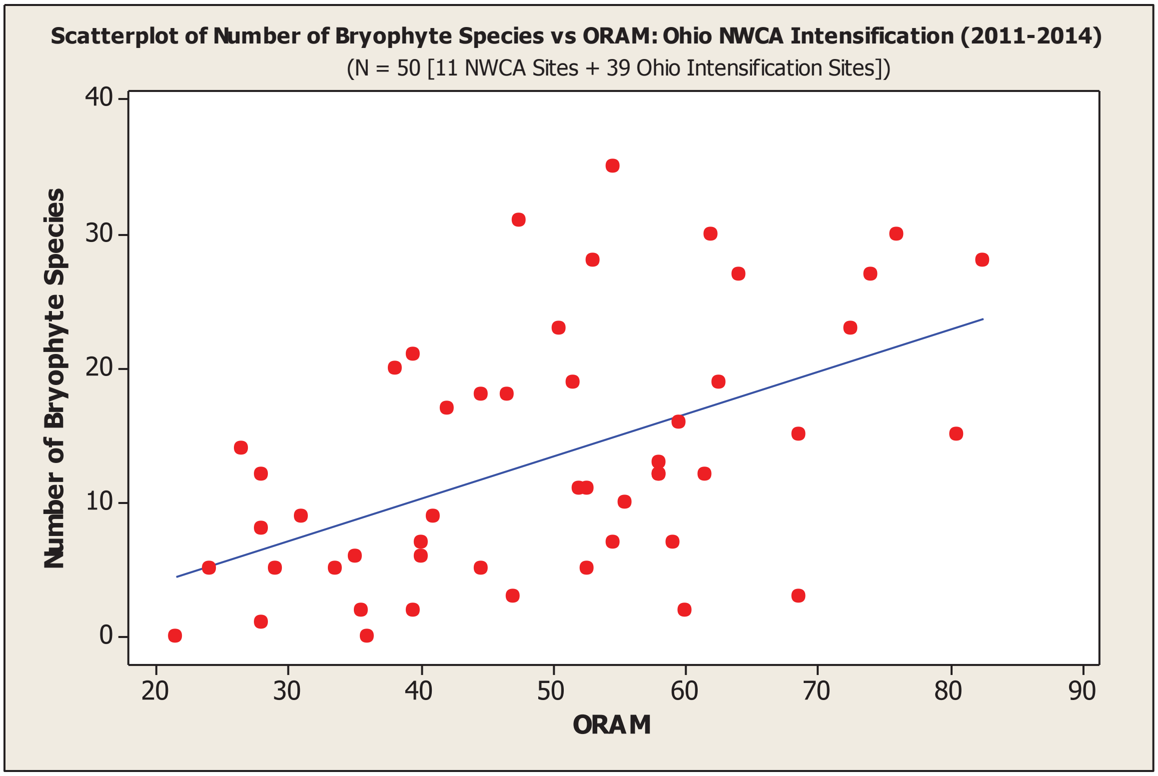
Figure 59. Scatterplot, Fitted line regression plot and Minitab output of VIBI and total phosphorus water chemistry results for 33 Ohio intensification study wetlands (df = 32, F = 0.22, p = 0.645, R-squared = 0.7 percent).



Regression Analysis: VIBI_FQ versus TOT_PHOS

```
The regression equation is
VIBI_FQ = 41.6 - 0.58 TOT_PHOS


Predictor     Coef  SE Coef      T      P
Constant    41.620    4.070  10.23  0.000
TOT_PHOS    -0.582    4.036  -0.14  0.886


S = 18.8467   R-Sq = 0.1%   R-Sq(adj) = 0.0%


Analysis of Variance

Source          DF       SS     MS     F      P
Regression       1      7.4    7.4  0.02  0.886
Residual Error  31  11011.2  355.2
Total           32  11018.5
```

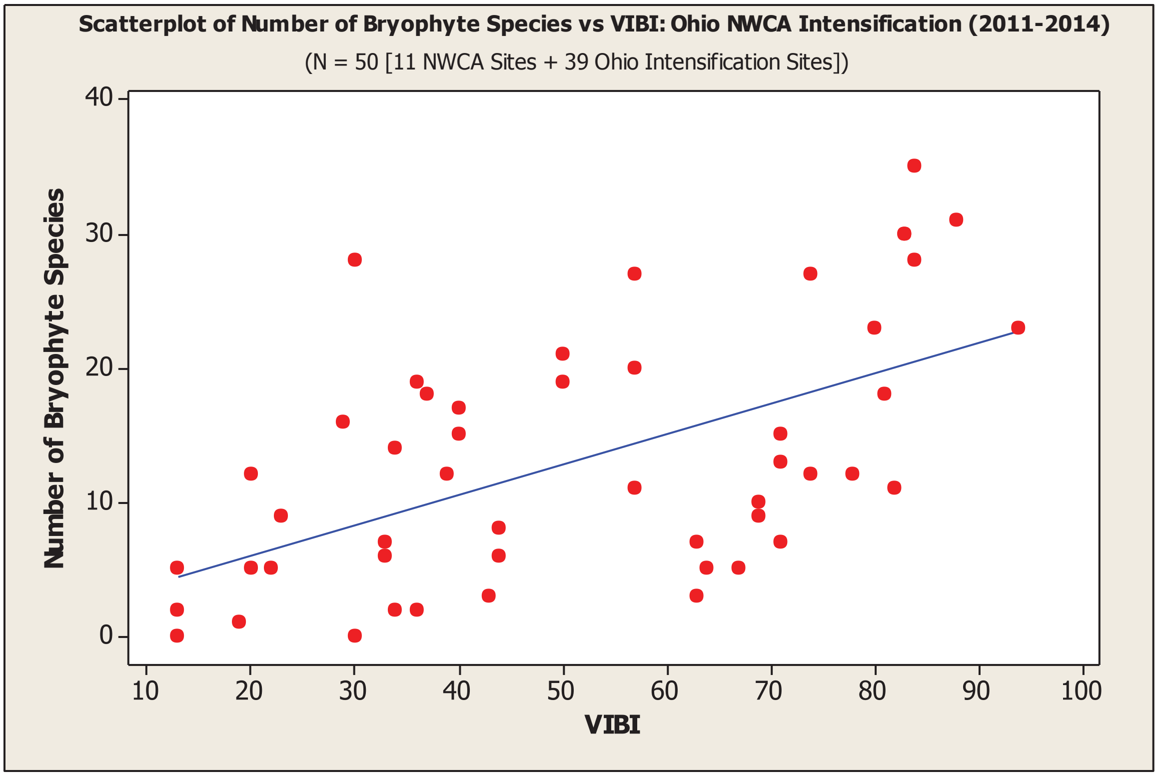
Figure 60. Scatterplot, Fitted line regression plot and Minitab output of VIBI-FQ and total phosphorus water chemistry results for 33 Ohio intensification study wetlands (df = 32, F = 0.02, p = 0.886, R-squared = 0.1 percent).



Regression Analysis: BRY_SPE versus ORAM

```
The regression equation is
BRY_SPE = - 2.25 + 0.315 ORAM


Predictor      Coef  SE Coef      T      P
Constant     -2.252    3.912  -0.58  0.568
ORAM        0.31474  0.07575   4.15  0.000


S = 8.15676   R-Sq = 26.5%   R-Sq(adj) = 24.9%


Analysis of Variance

Source          DF      SS      MS      F      P
Regression       1  1148.5  1148.5  17.26  0.000
Residual Error  48  3193.6    66.5
Total           49  4342.1
```

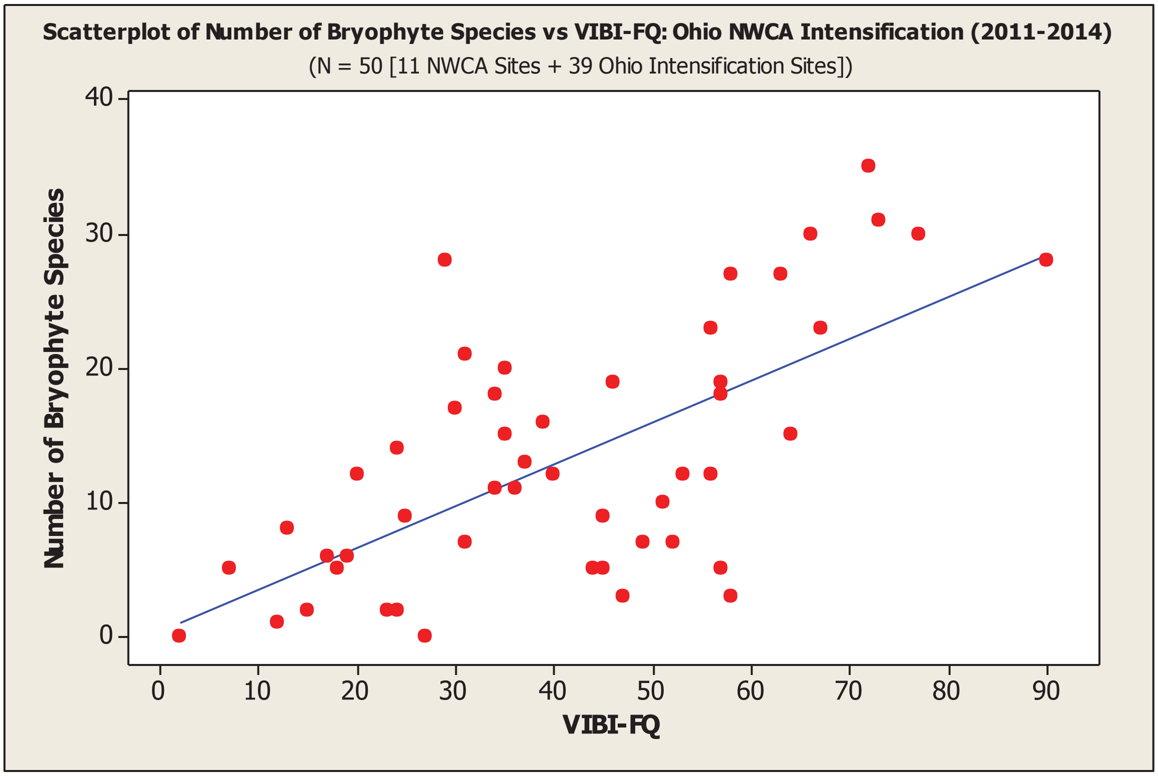
Figure 61. Scatterplot, Fitted line regression plot and Minitab output of number of bryophyte species and ORAM results for 50 Ohio intensification study wetlands (df = 49, F = 17.26, p < 0.001, R-squared = 26.5 percent).



Regression Analysis: BRY_SPE versus VIBI

```
The regression equation is
BRY_SPE = 1.60 + 0.226 VIBI


Predictor       Coef  SE Coef     T      P
Constant       1.603    2.699  0.59  0.555
VIBI         0.22551  0.04752  4.75  0.000


S = 7.84698   R-Sq = 31.9%   R-Sq(adj) = 30.5%


Analysis of Variance

Source          DF      SS      MS      F      P
Regression       1  1386.5  1386.5  22.52  0.000
Residual Error  48  2955.6    61.6
Total           49  4342.1
```

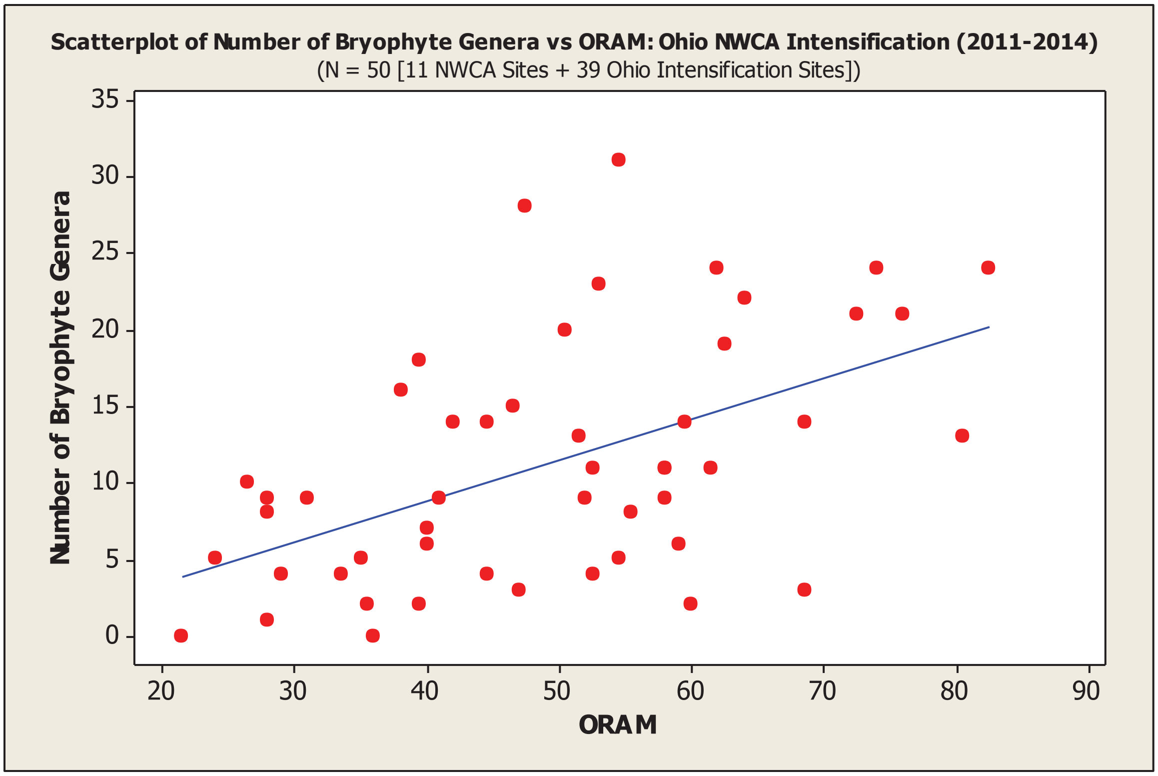
Figure 62. Scatterplot, Fitted line regression plot and Minitab output of number of bryophyte species and VIBI results for 50 Ohio intensification study wetlands (df = 49, F = 22.52, p < 0.001, R-squared = 31.9 percent).



Regression Analysis: BRY_SPE versus VIBI_FQ

```
The regression equation is
BRY_SPE = 0.48 + 0.311 VIBI_FQ


Predictor      Coef  SE Coef     T      P
Constant      0.484    2.356  0.21  0.838
VIBI_FQ     0.31059  0.05159  6.02  0.000


S = 7.17947   R-Sq = 43.0%   R-Sq(adj) = 41.8%


Analysis of Variance

Source          DF      SS      MS      F      P
Regression       1  1867.9  1867.9  36.24  0.000
Residual Error  48  2474.1    51.5
Total           49  4342.1
```

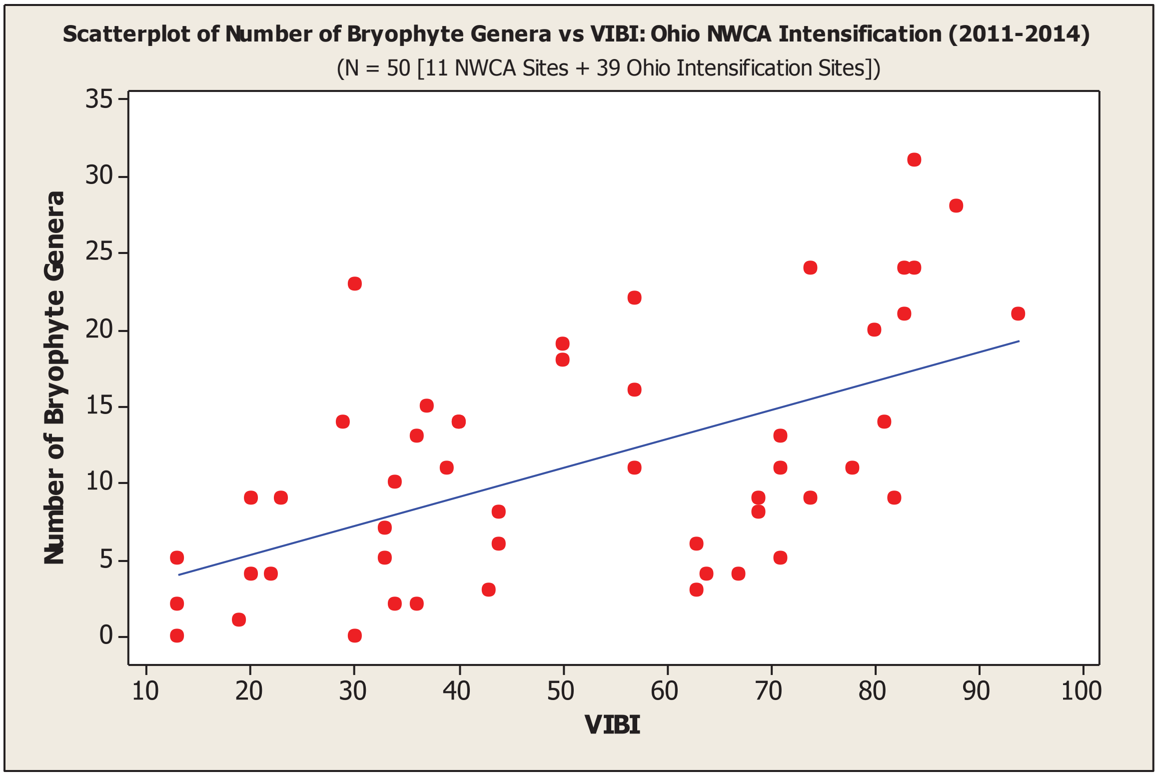
Figure 63. Scatterplot, Fitted line regression plot and Minitab output of number of bryophyte species and VIBI-FQ results for 50 Ohio intensification study wetlands (df = 49, F = 36.24, p < 0.001, R-squared = 43.0 percent).



Regression Analysis: BRY_GEN versus ORAM

```
The regression equation is
BRY_GEN = - 1.82 + 0.266 ORAM


Predictor      Coef  SE Coef      T      P
Constant     -1.819    3.273  -0.56  0.581
ORAM        0.26625  0.06337   4.20  0.000


S = 6.82368   R-Sq = 26.9%   R-Sq(adj) = 25.4%


Analysis of Variance

Source          DF       SS      MS      F      P
Regression       1   821.88  821.88  17.65  0.000
Residual Error  48  2235.00   46.56
Total           49  3056.88
```

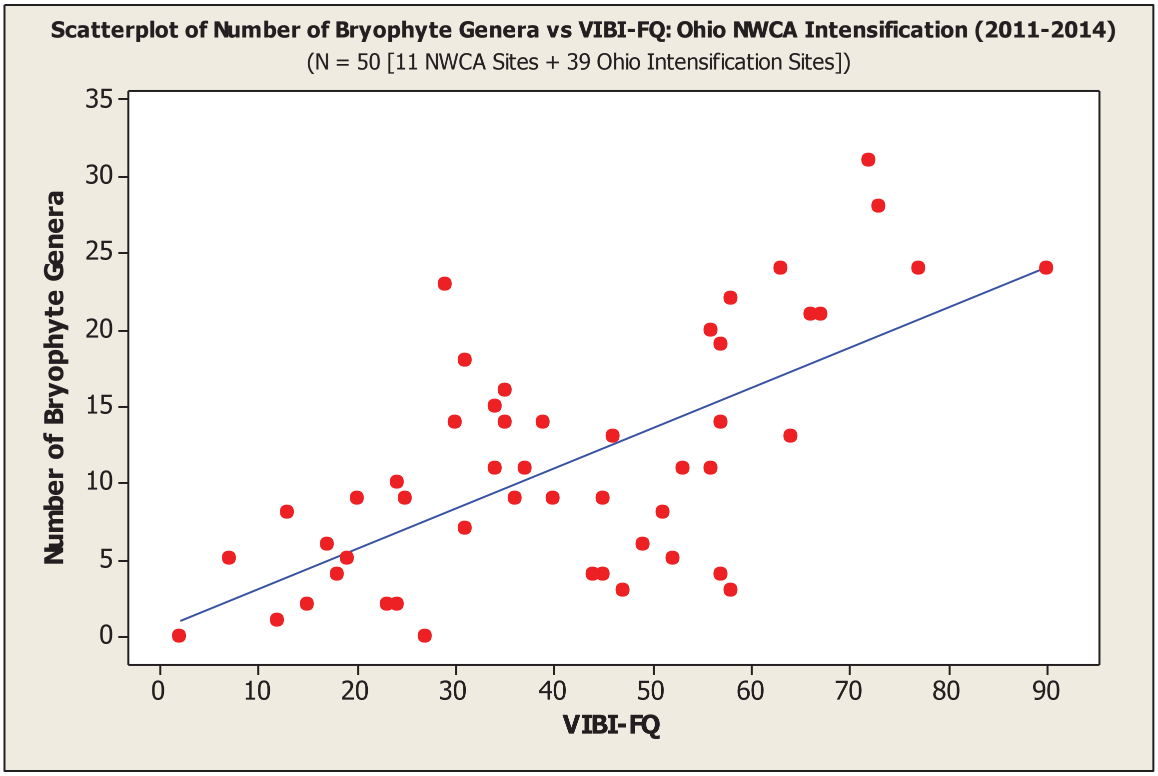
Figure 64. Scatterplot, Fitted line regression plot and Minitab output of number of bryophyte genera and ORAM results for 50 Ohio intensification study wetlands (df = 49, F = 17.65, p < 0.001, R-squared = 26.9 percent).



Regression Analysis: BRY_GEN versus VIBI

```
The regression equation is
BRY_GEN = 1.49 + 0.190 VIBI


Predictor      Coef  SE Coef     T      P
Constant      1.486    2.261  0.66  0.514
VIBI        0.18991  0.03981  4.77  0.000


S = 6.57267   R-Sq = 32.2%   R-Sq(adj) = 30.8%


Analysis of Variance

Source          DF       SS      MS      F      P
Regression       1   983.28  983.28  22.76  0.000
Residual Error  48  2073.60   43.20
Total           49  3056.88
```

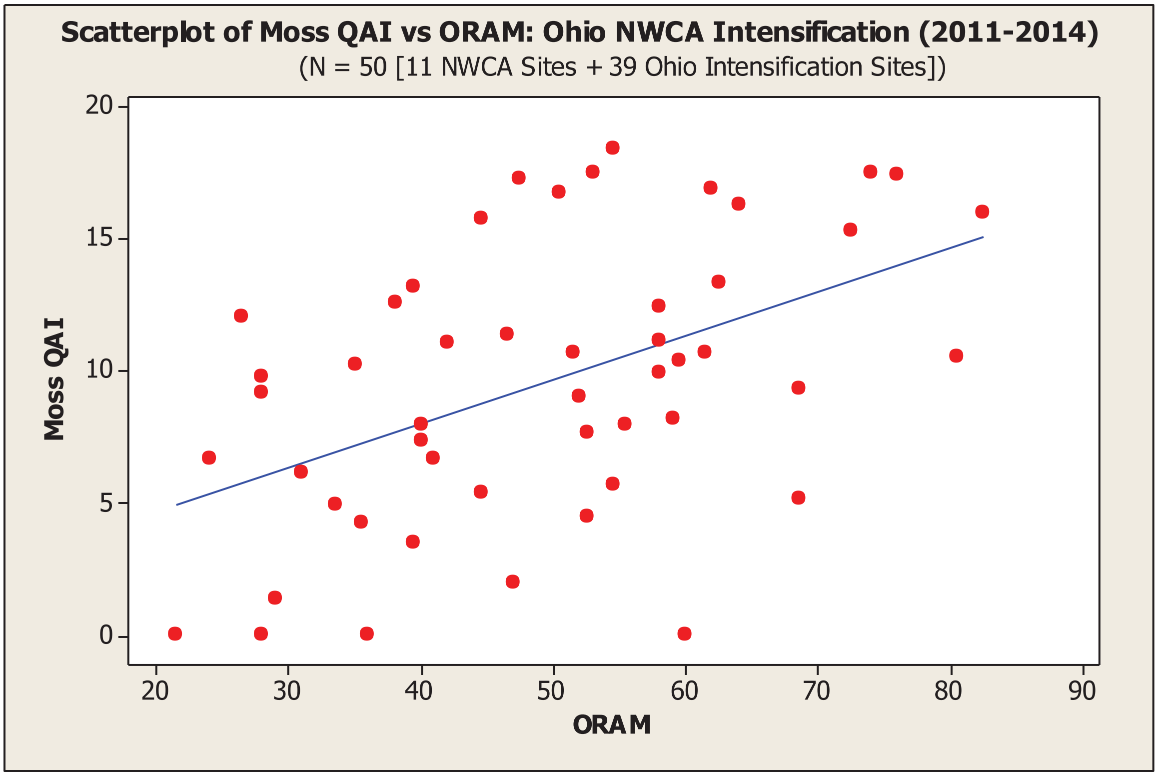
Figure 65. Scatterplot, Fitted line regression plot and Minitab output of number of bryophyte genera and VIBI results for 50 Ohio intensification study wetlands (df = 49, F = 22.76, p < 0.001, R-squared = 32.2 percent).



Regression Analysis: BRY_GEN versus VIBI_FQ

```
The regression equation is
BRY_GEN = 0.55 + 0.262 VIBI_FQ


Predictor      Coef  SE Coef     T      P
Constant      0.546    1.971  0.28  0.783
VIBI_FQ     0.26151  0.04318  6.06  0.000


S = 6.00810   R-Sq = 43.3%   R-Sq(adj) = 42.1%


Analysis of Variance

Source          DF      SS      MS      F      P
Regression       1  1324.2  1324.2  36.68  0.000
Residual Error  48  1732.7    36.1
Total           49  3056.9
```

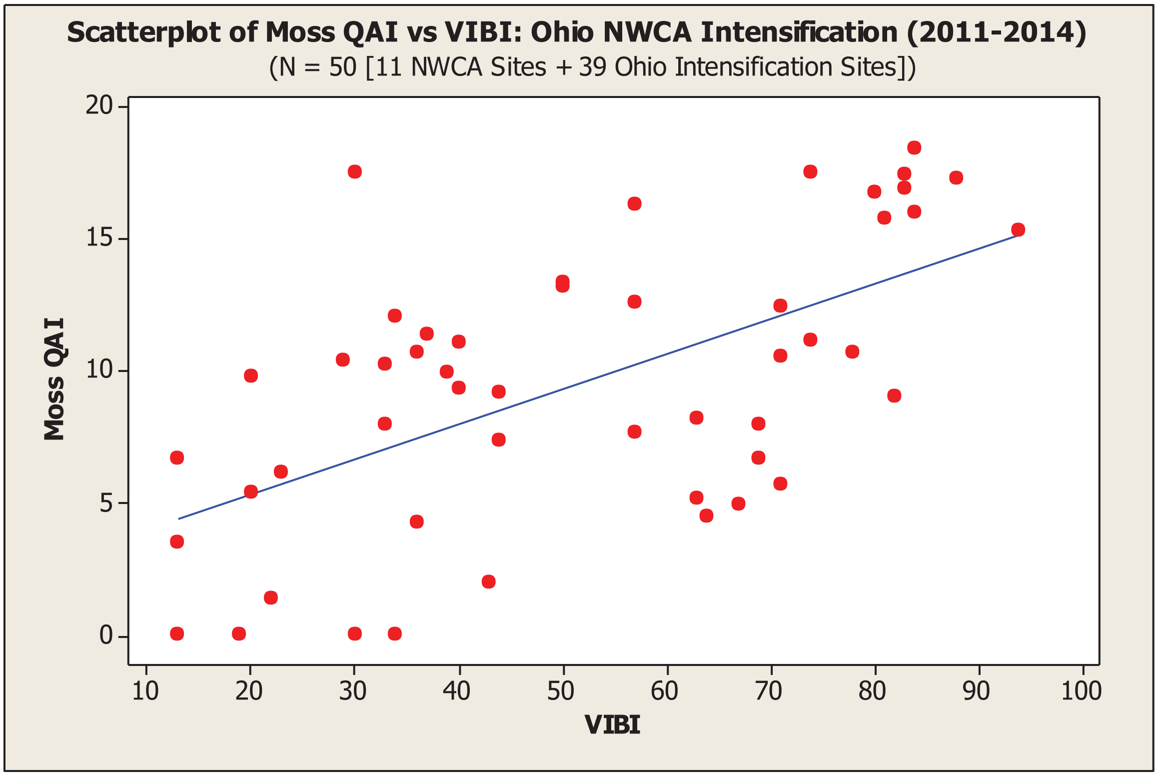
Figure 66. Scatterplot, Fitted line regression plot and Minitab output of number of bryophyte genera and VIBI-FQ results for 50 Ohio intensification study wetlands (df = 49, F = 36.68, p < 0.001, R-squared = 43.3 percent).



Regression Analysis: MQAI versus ORAM

```
The regression equation is
MQAI = 1.36 + 0.166 ORAM


Predictor      Coef   SE Coef     T      P
Constant      1.363     2.221  0.61  0.542
ORAM        0.16597   0.04301  3.86  0.000


S = 4.63140   R-Sq = 23.7%   R-Sq(adj) = 22.1%


Analysis of Variance

Source          DF       SS      MS      F      P
Regression       1   319.39  319.39  14.89  0.000
Residual Error  48  1029.59   21.45
Total           49  1348.98
```

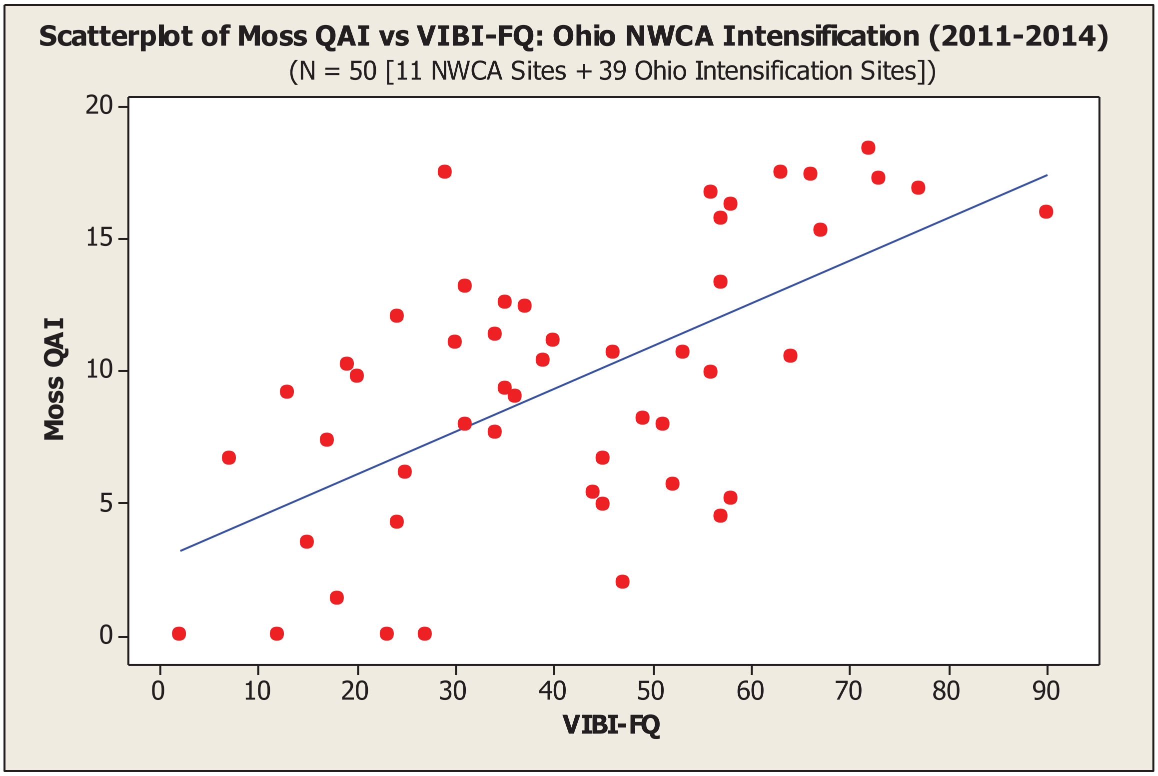
Figure 67. Scatterplot, Fitted line regression plot and Minitab output of number of Moss QAI and ORAM results for 50 Ohio intensification study wetlands (df = 49, F = 14.89, p < 0.001, R-squared = 23.7 percent).



Regression Analysis: MQAI versus VIBI

```
The regression equation is
MQAI = 2.69 + 0.133 VIBI


Predictor      Coef  SE Coef     T      P
Constant      2.692    1.465  1.84  0.072
VIBI        0.13252  0.02579  5.14  0.000


S = 4.25780   R-Sq = 35.5%   R-Sq(adj) = 34.1%


Analysis of Variance

Source          DF       SS      MS      F      P
Regression       1   478.80  478.80  26.41  0.000
Residual Error  48   870.19   18.13
Total           49  1348.98
```

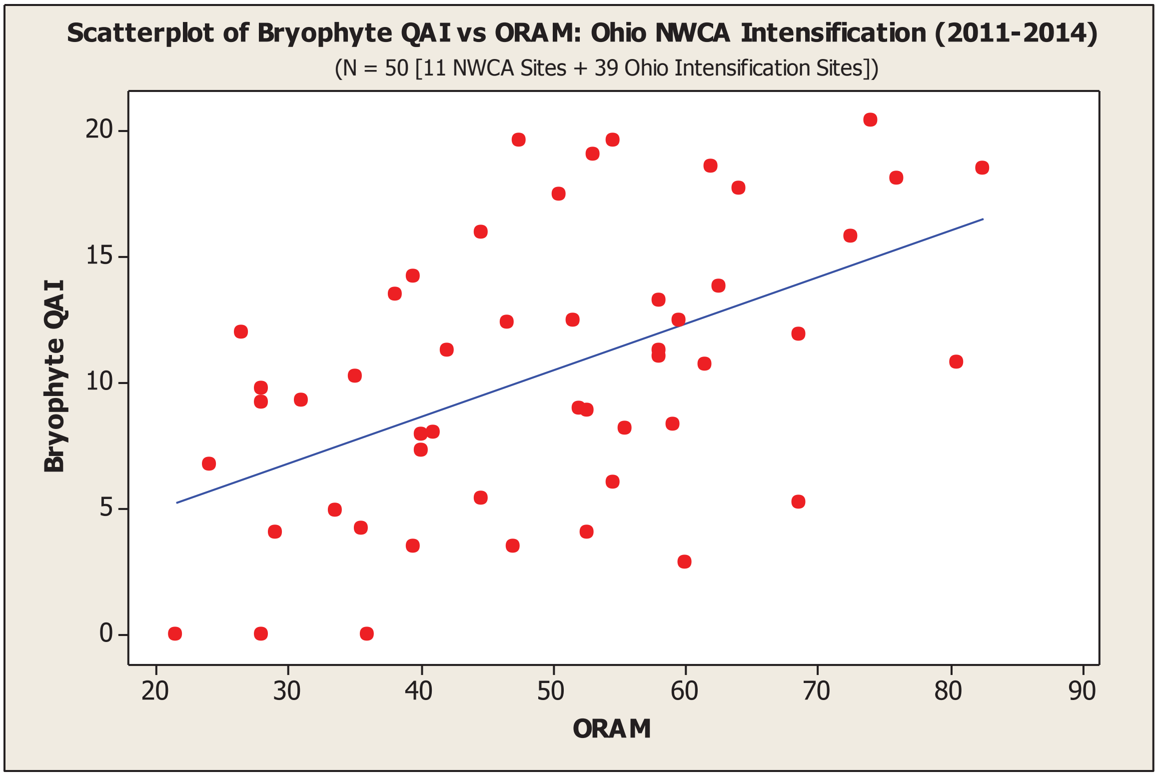
Figure 68. Scatterplot, Fitted line regression plot and Minitab output of number of Moss QAI and VIBI results for 50 Ohio intensification study wetlands (df = 49, F = 26.41, p < 0.001, R-squared = 35.5 percent).



Regression Analysis: MQAI versus VIBI_FQ

```
The regression equation is
MQAI = 2.92 + 0.161 VIBI_FQ


Predictor      Coef  SE Coef     T      P
Constant      2.916    1.378  2.12  0.040
VIBI_FQ     0.16112  0.03018  5.34  0.000


S = 4.19902   R-Sq = 37.3%   R-Sq(adj) = 36.0%


Analysis of Variance

Source          DF       SS      MS      F      P
Regression       1   502.66  502.66  28.51  0.000
Residual Error  48   846.33   17.63
Total           49  1348.98
```

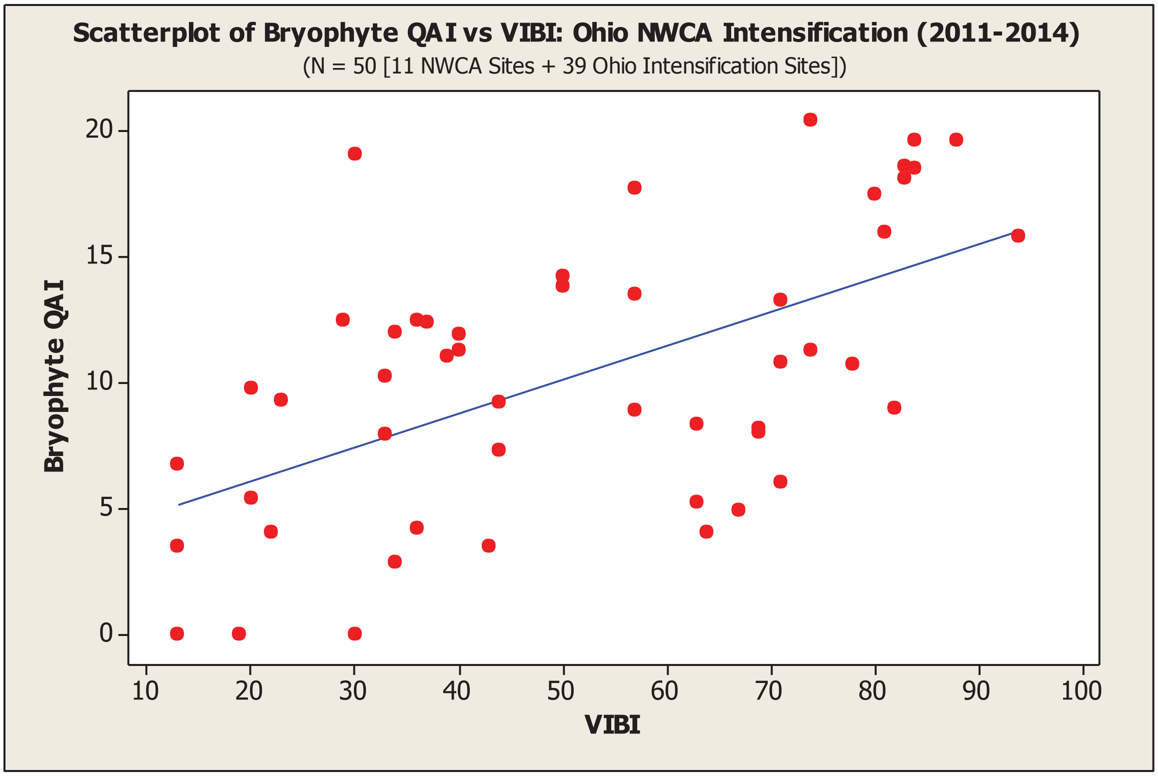
Figure 69. Scatterplot, Fitted line regression plot and Minitab output of number of Moss QAI and VIBI-FQ results for 50 Ohio intensification study wetlands (df = 49, F = 28.51, p < 0.001, R-squared = 37.3 percent).



Regression Analysis: BryoQAI versus ORAM

```
The regression equation is
BryoQAI = 1.19 + 0.186 ORAM


Predictor      Coef  SE Coef     T      P
Constant      1.194    2.313  0.52  0.608
ORAM        0.18590  0.04478  4.15  0.000


S = 4.82136   R-Sq = 26.4%   R-Sq(adj) = 24.9%


Analysis of Variance

Source          DF       SS      MS      F      P
Regression       1   400.67  400.67  17.24  0.000
Residual Error  48  1115.78   23.25
Total           49  1516.45
```

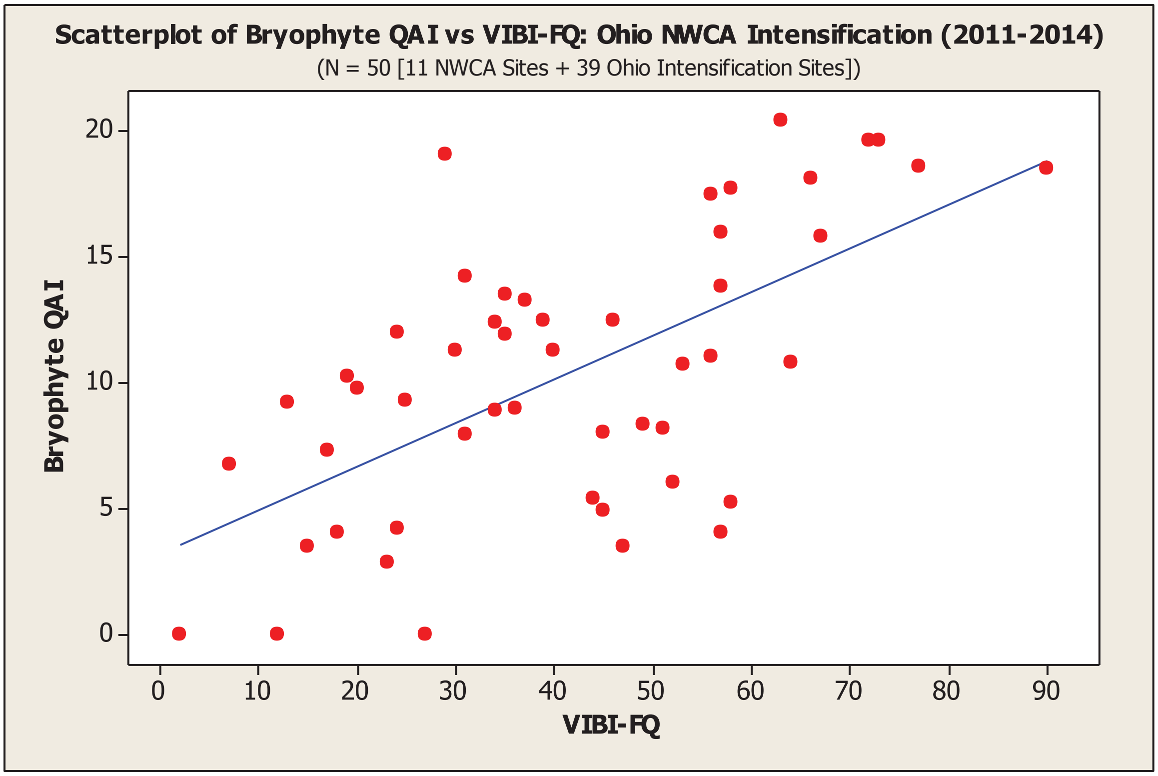
Figure 70. Scatterplot, Fitted line regression plot and Minitab output of number of Bryophyte QAI and ORAM results for 50 Ohio intensification study wetlands (df = 49, F = 17.24, p < 0.001, R-squared = 26.4 percent).



Regression Analysis: BryoQAI versus VIBI

```
The regression equation is
BryoQAI = 3.39 + 0.135 VIBI


Predictor      Coef  SE Coef     T      P
Constant      3.395    1.587  2.14  0.038
VIBI        0.13467  0.02795  4.82  0.000


S = 4.61426   R-Sq = 32.6%   R-Sq(adj) = 31.2%


Analysis of Variance

Source          DF       SS      MS      F      P
Regression       1   494.46  494.46  23.22  0.000
Residual Error  48  1021.99   21.29
Total           49  1516.45
```

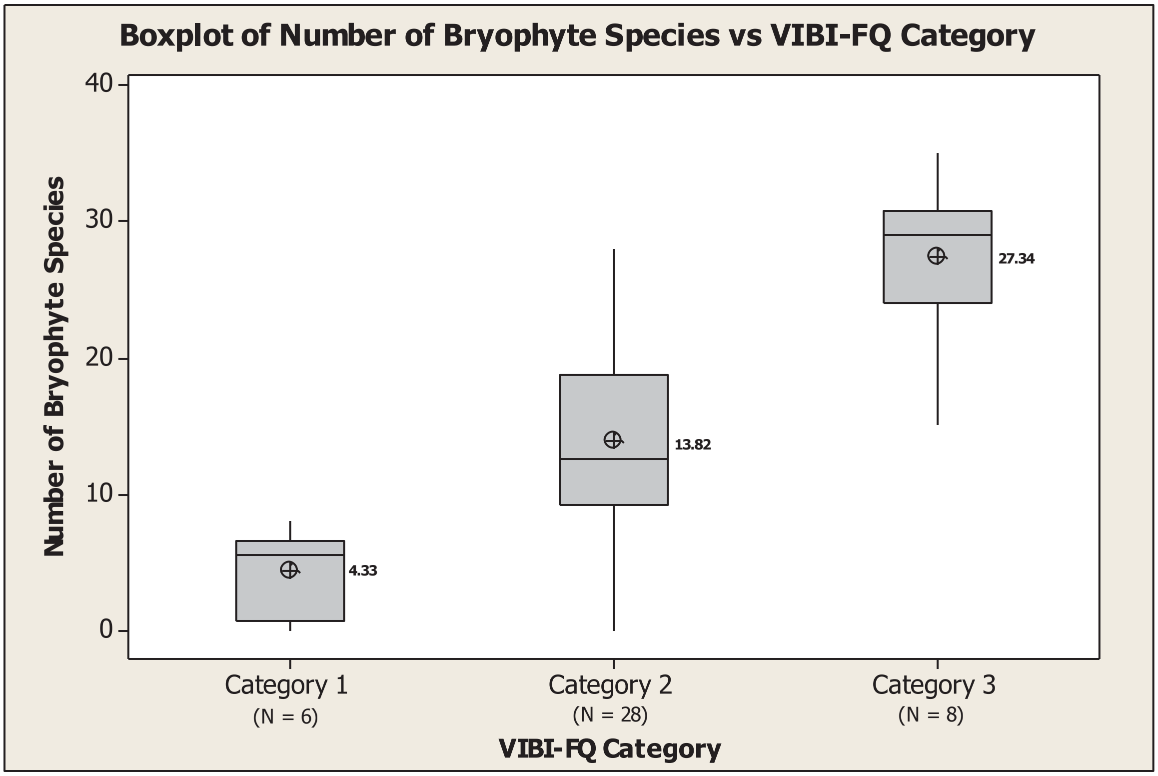
Figure 71. Scatterplot, Fitted line regression plot and Minitab output of number of Bryophyte QAI and VIBI results for 50 Ohio intensification study wetlands (df = 49, F = 23.22, p < 0.001, R-squared = 32.6 percent).



Regression Analysis: BryoQAI versus VIBI_FQ

```
The regression equation is
BryoQAI = 3.22 + 0.174 VIBI_FQ


Predictor      Coef  SE Coef     T      P
Constant      3.218    1.447  2.22  0.031
VIBI_FQ     0.17354  0.03169  5.48  0.000


S = 4.40938   R-Sq = 38.5%   R-Sq(adj) = 37.2%


Analysis of Variance

Source          DF       SS      MS      F      P
Regression       1   583.20  583.20  30.00  0.000
Residual Error  48   933.25   19.44
Total           49  1516.45
```

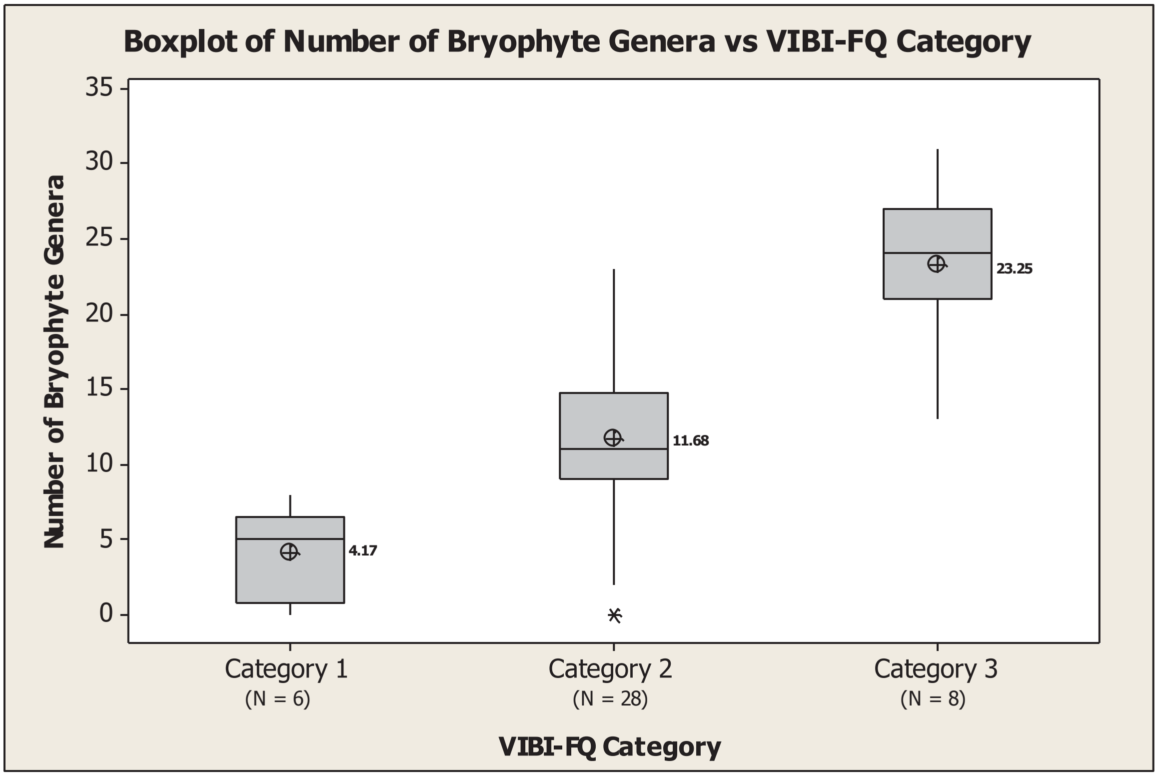
Figure 72. Scatterplot, Fitted line regression plot and Minitab output of number of Bryophyte QAI and VIBI-FQ results for 50 Ohio intensification study wetlands (df = 49, F = 30.00, p < 0.001, R-squared = 38.5 percent).



One-way ANOVA: BRY_SPE versus VIBIFQCAT2

```
Source      DF      SS     MS      F      P
VIBIFQCAT2   2  1946.6  973.3  24.44  0.000
Error       39  1553.3   39.8
Total       41  3499.9

S = 6.311   R-Sq = 55.62%   R-Sq(adj) = 53.34%

Level                  N    Mean  StDev
Category 1             6   4.333  3.141
Category 2            28  13.821  6.794
Category 3             8  27.375  6.070

                      Individual 95% CIs For Mean Based on Pooled StDev
Level                 -+---------+---------+---------+--------
Category 1            (----*-----)
Category 2                        (--*-)
Category 3                                    (---*----)
                      -+---------+---------+---------+--------
                       0        10        20        30
Pooled StDev = 6.311

Grouping Information Using Tukey Method

VIBIFQCAT2             N    Mean  Grouping
Category 3             8  27.375  A
Category 2            28  13.821    B
Category 1             6   4.333      C

Means that do not share a letter are significantly different.
```

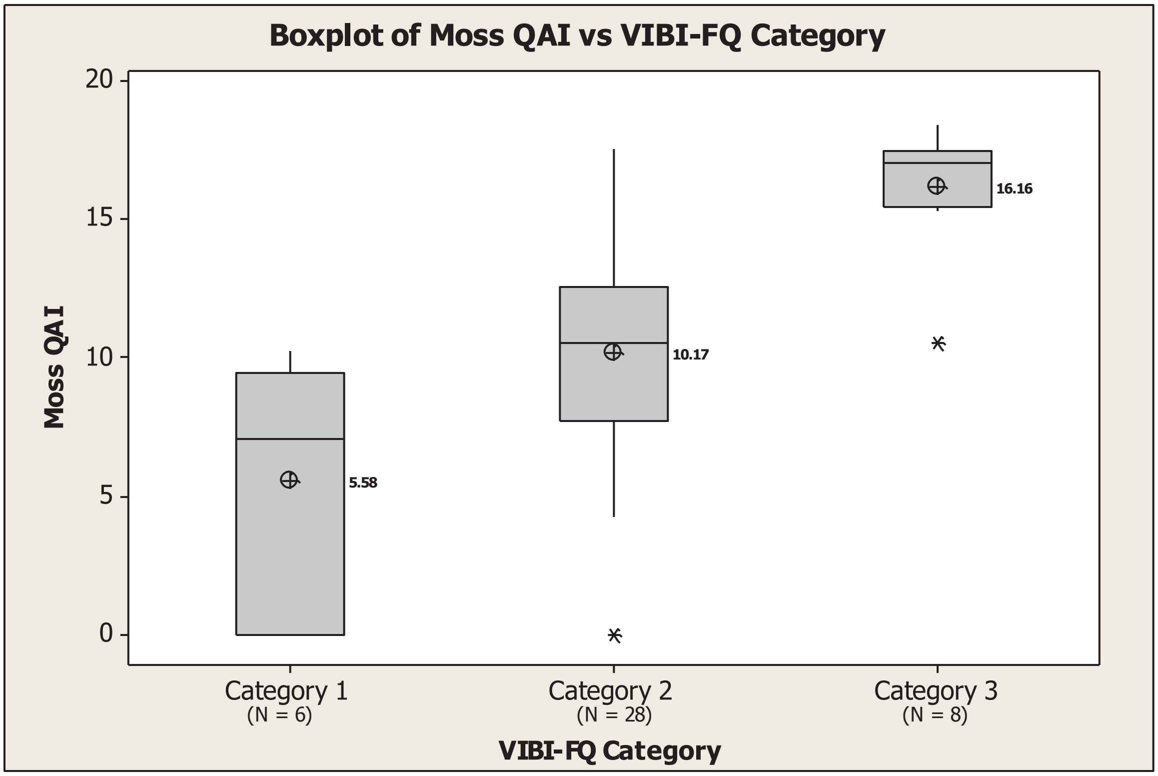
Figure 73. Box and whiskers plot and Minitab output of number of bryophyte species for 42 Ohio intensification study wetlands, broken down by proposed VIBI-FQ categories. Eight sites having either extremely recent or ongoing habitat disturbances were excluded from this comparison.



One-way ANOVA: BRY_GEN versus VIBIFQCAT2

```
Source      DF      SS     MS      F      P
VIBIFQCAT2   2  1356.0  678.0  23.90  0.000
Error       39  1106.4   28.4
Total       41  2462.5

S = 5.326   R-Sq = 55.07%   R-Sq(adj) = 52.76%

Level               N    Mean  StDev
Category 1          6   4.167  3.061
Category 2         28  11.679  5.644
Category 3          8  23.250  5.339

                      Individual 95% CIs For Mean Based on Pooled StDev
Level                 +---------+---------+---------+---------
Category 1            (-----*-----)
Category 2                          (--*--)
Category 3                                        (----*-----)
                      +---------+---------+---------+---------
                    0.0       7.0      14.0      21.0
Pooled StDev = 5.326

Grouping Information Using Tukey Method

VIBIFQCAT2          N    Mean  Grouping
Category 3          8  23.250  A
Category 2         28  11.679    B
Category 1          6   4.167      C

Means that do not share a letter are significantly different.
```

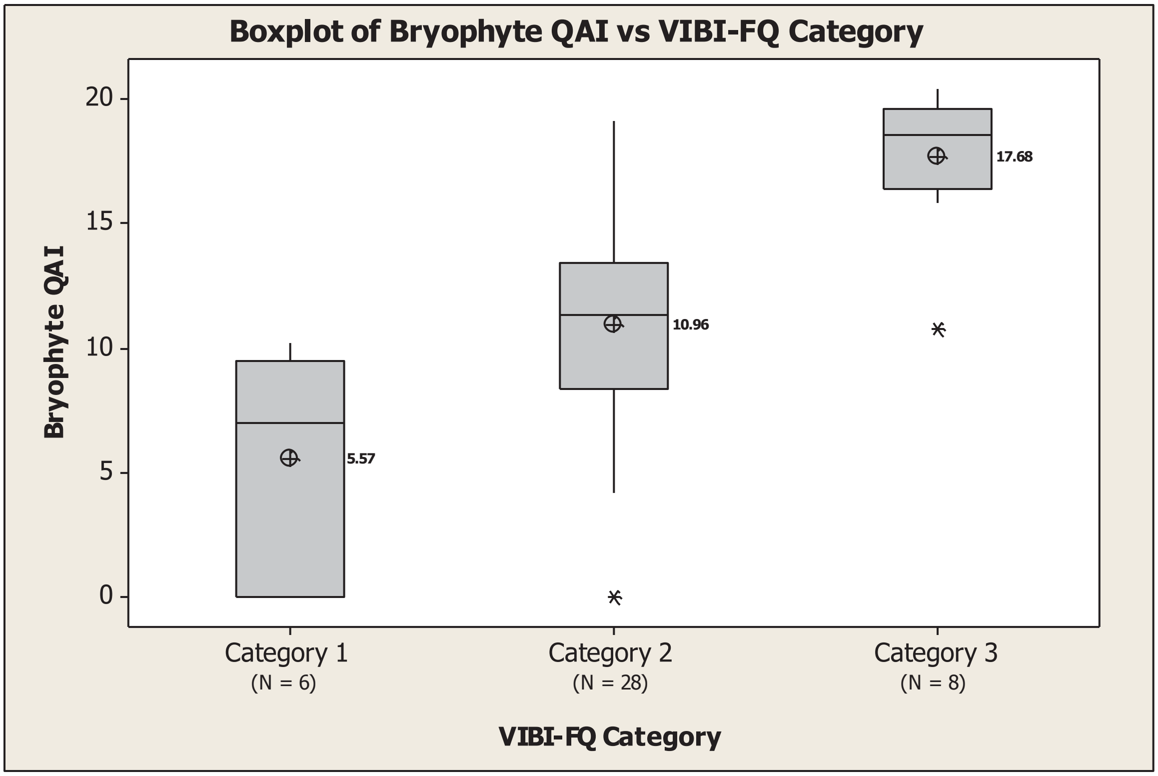
Figure 74. Box and whiskers plot and Minitab output of number of bryophyte genera for 42 Ohio intensification study wetlands, broken down by proposed VIBI-FQ categories. Eight sites having either extremely recent or ongoing habitat disturbances were excluded from this comparison.



One-way ANOVA: MQAI versus VIBIFQCAT2

```
Source       DF     SS     MS      F      P
VIBIFQCAT2    2  403.9  201.9  13.59  0.000
Error        39  579.4   14.9
Total        41  983.3

S = 3.854   R-Sq = 41.07%   R-Sq(adj) = 38.05%

Level                N    Mean  StDev
Category 1           6   5.577  4.498
Category 2          28  10.170  4.017
Category 3           8  16.161  2.468

                      Individual 95% CIs For Mean Based on Pooled StDev
Level                 -----+---------+---------+---------+----
Category 1            (-----*------)
Category 2                        (--*--)
Category 3                                  (----*-----)
                      -----+---------+---------+---------+----
                         5.0      10.0      15.0      20.0
Pooled StDev = 3.854

Grouping Information Using Tukey Method

VIBIFQCAT2           N    Mean  Grouping
Category 3           8  16.161  A
Category 2          28  10.170    B
Category 1           6   5.577      C

Means that do not share a letter are significantly different.
```

Figure 75. Box and whiskers plot and Minitab output of number of Moss QAI scores for 42 Ohio intensification study wetlands, broken down by proposed VIBI-FQ categories. Eight sites having either extremely recent or ongoing habitat disturbances were excluded from this comparison.



One-way ANOVA: BryoQAI versus VIBIFQCAT2

```
Source      DF      SS     MS      F      P
VIBIFQCAT2   2   524.4  262.2  15.66  0.000
Error       39   652.8   16.7
Total       41  1177.1

S = 4.091   R-Sq = 44.55%   R-Sq(adj) = 41.70%

Level                N    Mean  StDev
Category 1           6   5.567  4.493
Category 2          28  10.961  4.236
Category 3           8  17.675  3.101

                    Individual 95% CIs For Mean Based on Pooled StDev
Level               ------+---------+---------+---------+---
Category 1          (------*------)
Category 2                         (--*--)
Category 3                                   (-----*-----)
                    ------+---------+---------+---------+---
                        5.0      10.0      15.0      20.0
Pooled StDev = 4.091

Grouping Information Using Tukey Method

VIBIFQCAT2           N    Mean  Grouping
Category 3           8  17.675  A
Category 2          28  10.961    B
Category 1           6   5.567      C

Means that do not share a letter are significantly different.
```

Figure 76. Box and whiskers plot and Minitab output of number of Bryophyte QAI scores for 42 Ohio intensification study wetlands, broken down by proposed VIBI-FQ categories. Eight sites having either extremely recent or ongoing habitat disturbances were excluded from this comparison.

Top Soil Layer Mehlich Phosphorus and Wetland VIBI-FQ Scores

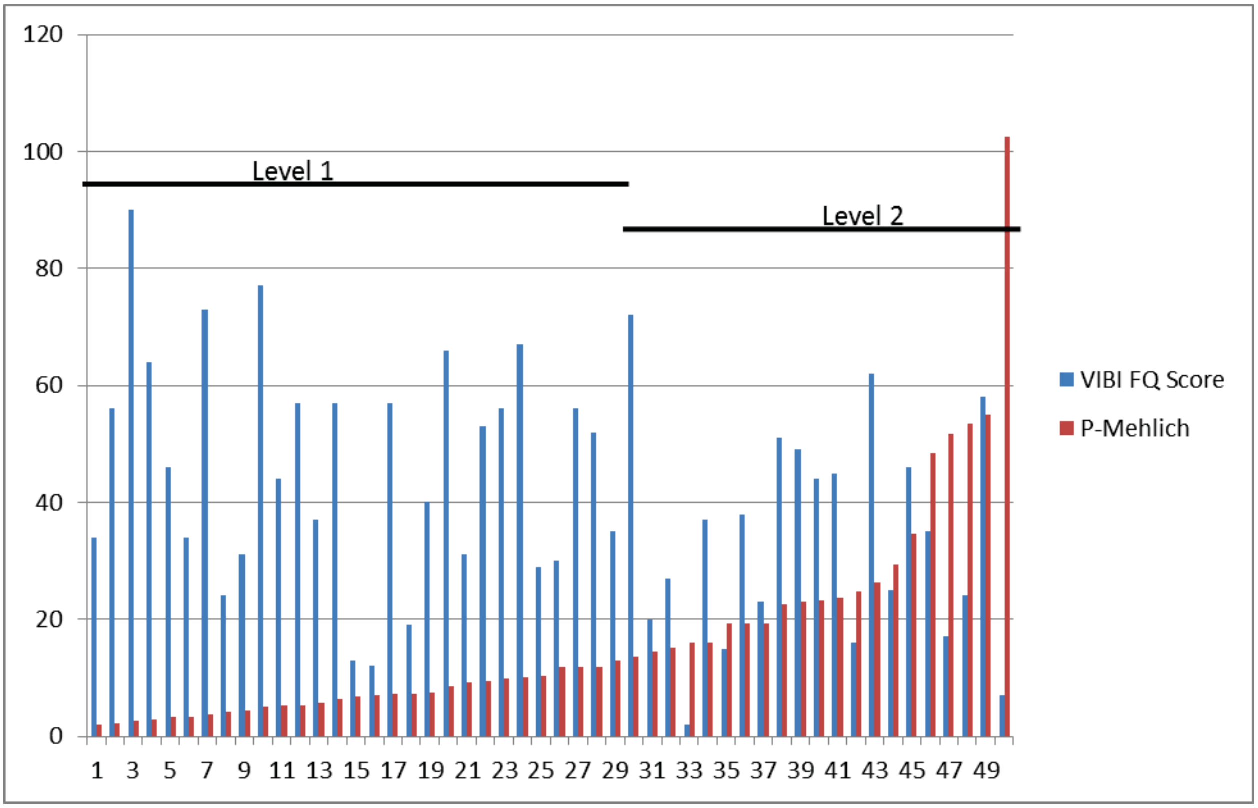
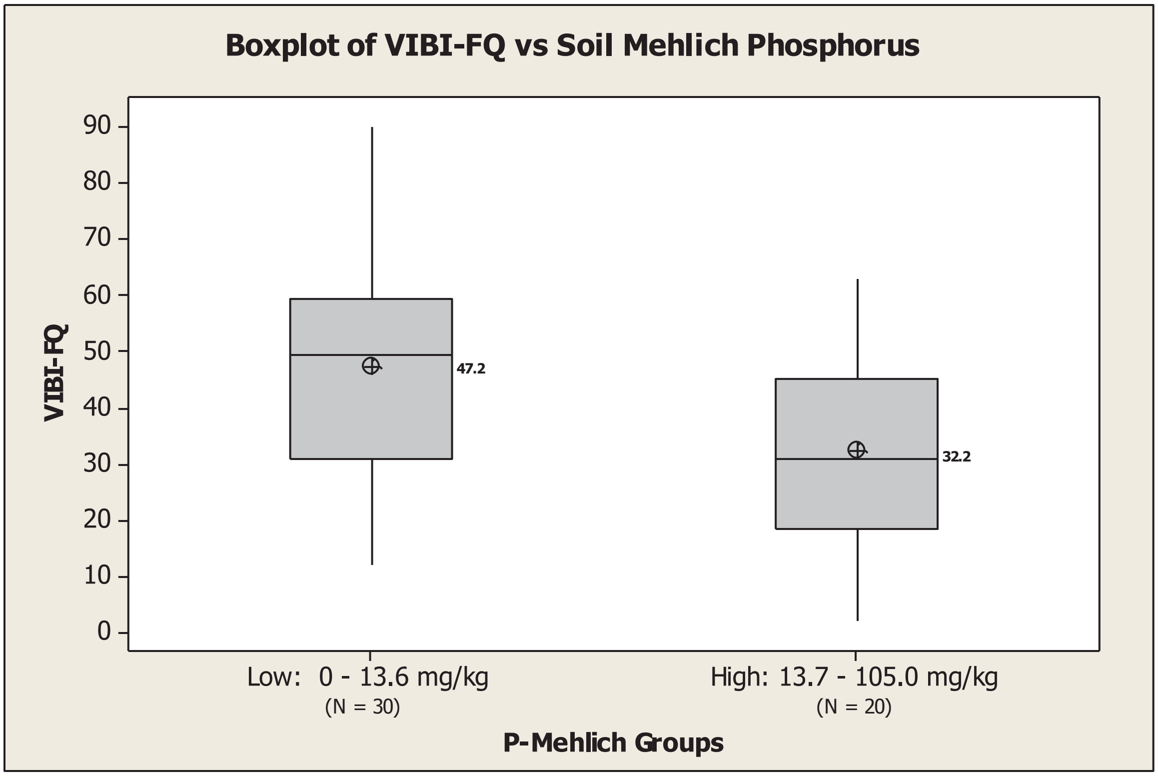


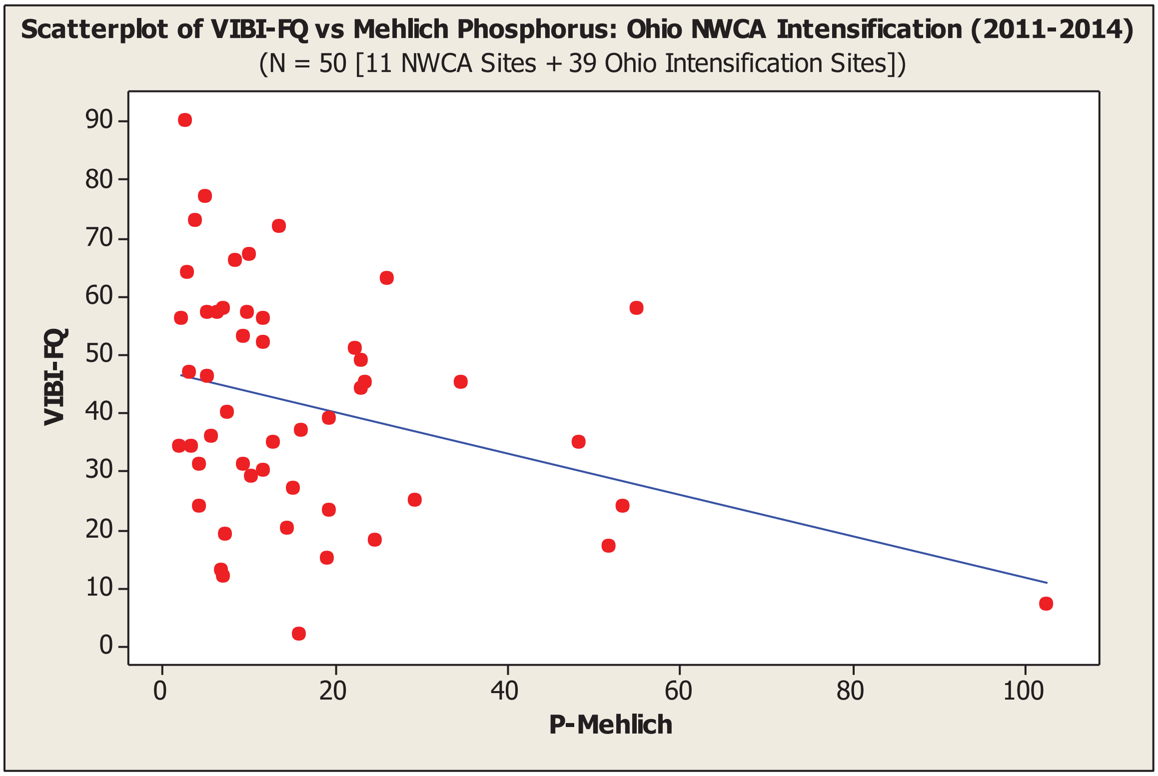
Figure 77. Mehlich Phosphorus values from the top soil layer and VIBI-FQ scores for all 50 Ohio NWCA intensification wetlands. Sorted from smallest to largest P-Mehlich values.



One-way ANOVA: VIBI_FQ versus Pmehl_Cat2

```
Source      DF     SS    MS     F      P
Pmehl_Cat2   1   2700  2700  7.78  0.008
Error       48  16664   347
Total       49  19364

S = 18.63   R-Sq = 13.94%   R-Sq(adj) = 12.15%

                         Individual 95% CIs For Mean Based on Pooled StDev
Level   N   Mean  StDev     +---------+---------+---------+---------
1      30  47.20  19.67                         (--------*--------)
2      20  32.20  16.94     (---------*----------)
                            +---------+---------+---------+---------
                         24.0      32.0      40.0      48.0
Pooled StDev = 18.63

Grouping Information Using Tukey Method

Pmehl_Cat2   N   Mean  Grouping
1           30  47.20  A
2           20  32.20    B

Means that do not share a letter are significantly different.
```

Figure 78. Box and whiskers plot and Minitab output of VIBI-FQ scores compared to low and high Mehlich Phosphorus levels for all 50 Ohio NWCA intensification wetlands.



Regression Analysis: VIBI_FQ versus Pmehl

```
The regression equation is
VIBI_FQ = 47.2 - 0.354 Pmehl


Predictor      Coef  SE Coef      T      P
Constant     47.224    3.684  12.82  0.000
Pmehl       -0.3543   0.1483  -2.39  0.021


S = 18.9884   R-Sq = 10.6%   R-Sq(adj) = 8.8%


Analysis of Variance

Source          DF       SS      MS     F      P
Regression       1   2057.1  2057.1  5.71  0.021
Residual Error  48  17306.9   360.6
Total           49  19364.0
```

Figure 79. Scatterplot, Fitted line regression plot and Minitab output of number of VIBI-FQ and P-Mehlich results for 50 Ohio intensification study wetlands (df = 49, F = 5.71, p = 0.021, R-squared = 10.6 percent).

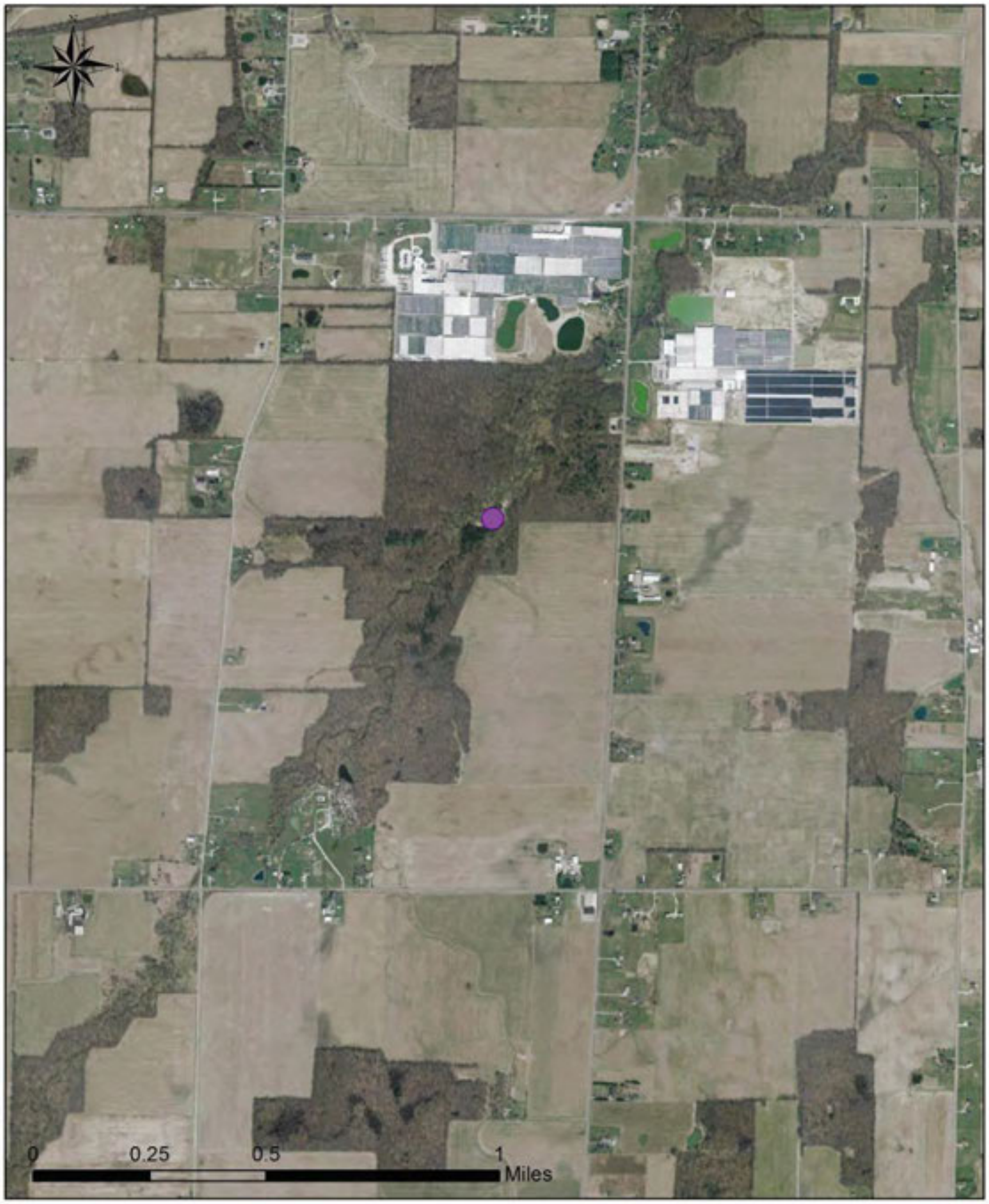


Figure 80. Kipton Reservation (Lorain County; NWCA-3104), displayed on 2006-2007 Ohio Statewide Imagery Program Orthophotography. The purple dot represents the NWCA intensification site assessment center point.

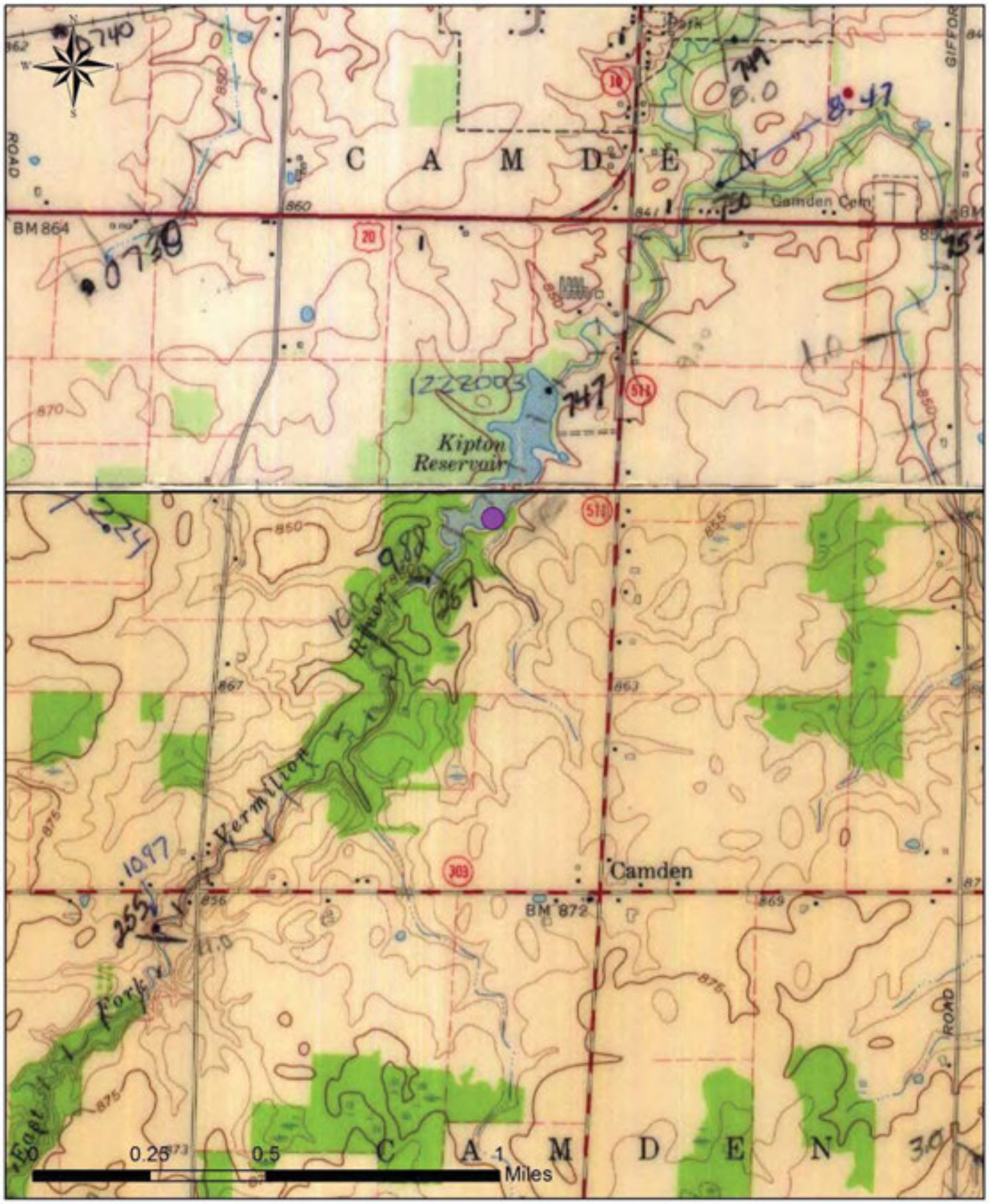


Figure 81. Kipton Reservation (Lorain County; NWCA-3104), displayed on historic (~1950s – 1960s) USGS 7.5 minute topographic mapping. The purple dot represents the NWCA intensification site assessment center point.

Figure 82. Mosquito Creek Wildlife Area (Trumbull County; NWCA-3142), displayed on 2006-2007 Ohio Statewide Imagery Program Orthophotography. The purple dot represents the NWCA intensification site assessment center point.

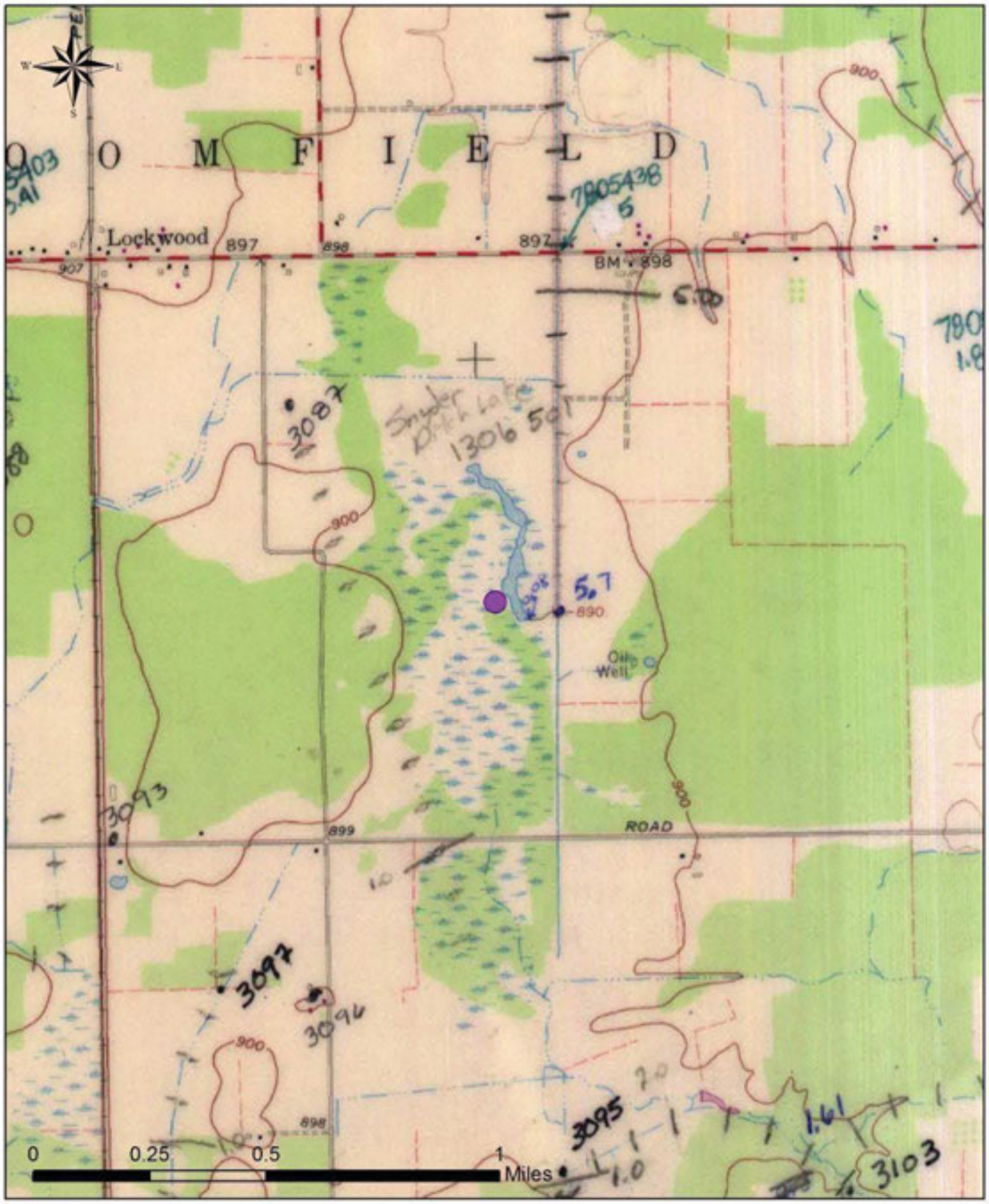


Figure 83. Mosquito Creek Wildlife Area (Trumbull County; NWCA-3142), displayed on historic (~1950s – 1960s) USGS 7.5 minute topographic mapping. The purple dot represents the NWCA intensification site assessment center point.

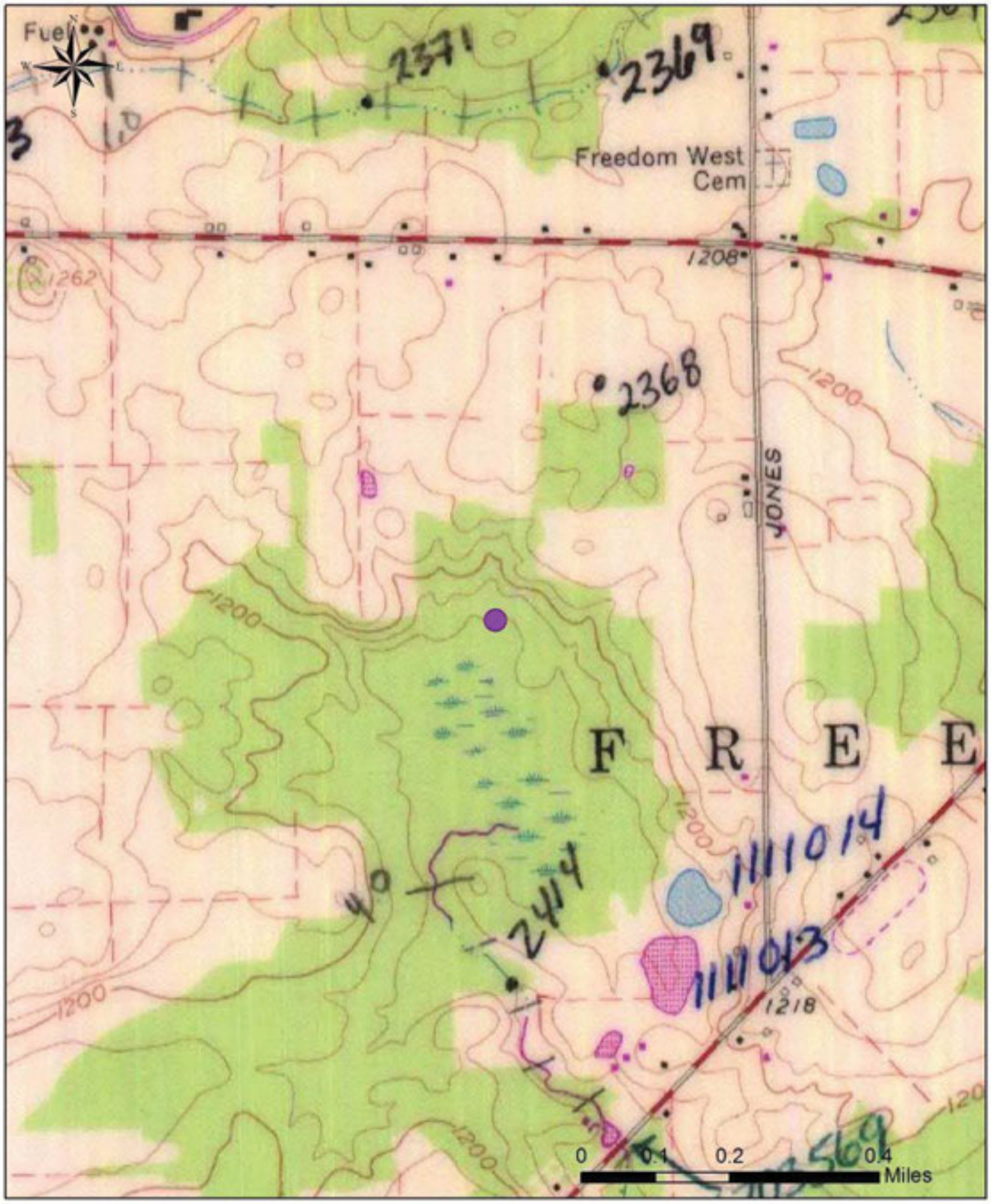


Figure 84. Portage County wetland site (NWCA-3070) displayed on historic (~1950s – 1960s) USGS 7.5 minute topographic mapping. The purple dot represents the NWCA intensification site assessment center point.

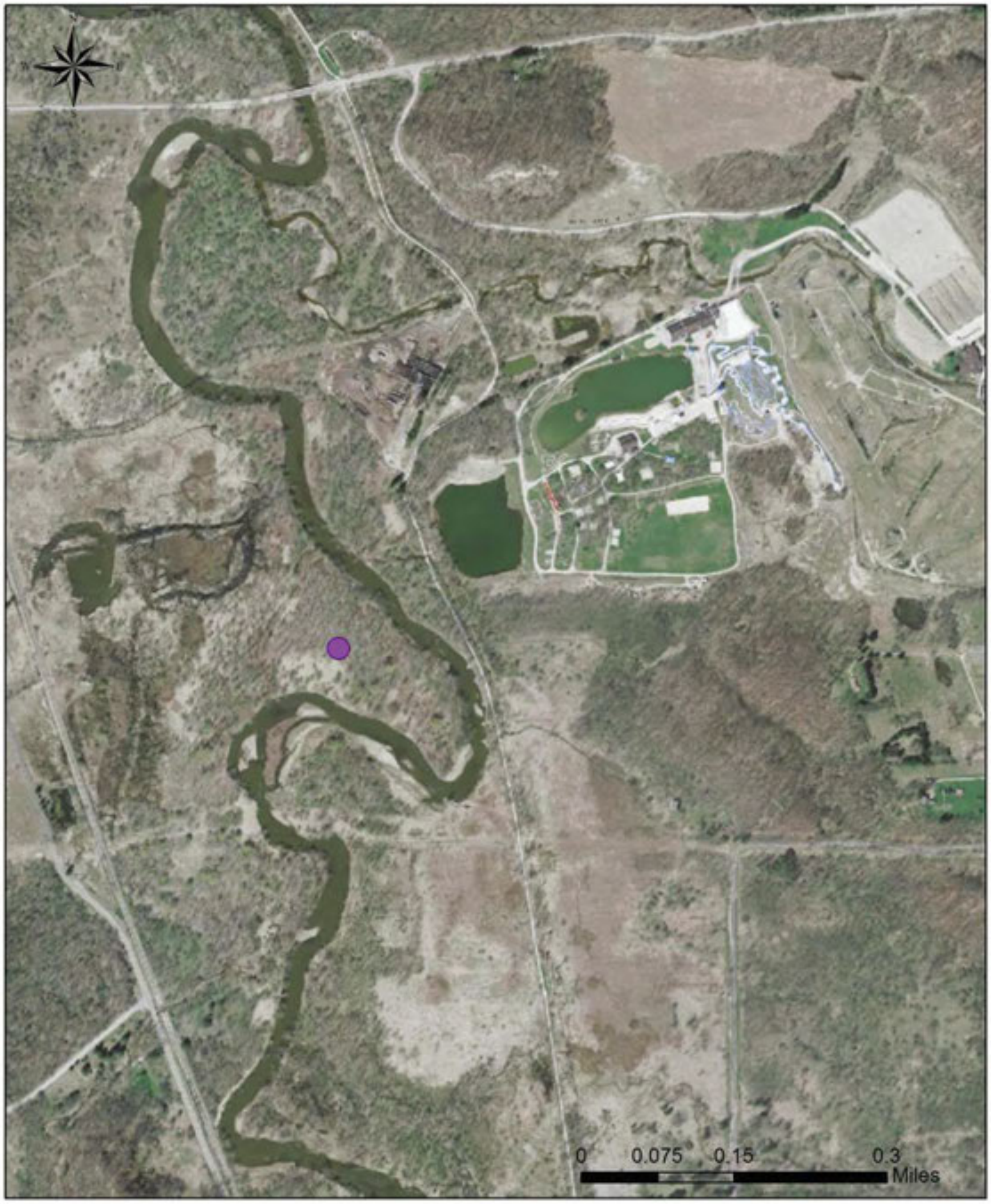


Figure 85. Brecksville Reservation (Cuyahoga County; NWCA-3081), displayed on 2006-2007 Ohio Statewide Imagery Program Orthophotography. The purple dot represents the NWCA intensification site assessment center point.

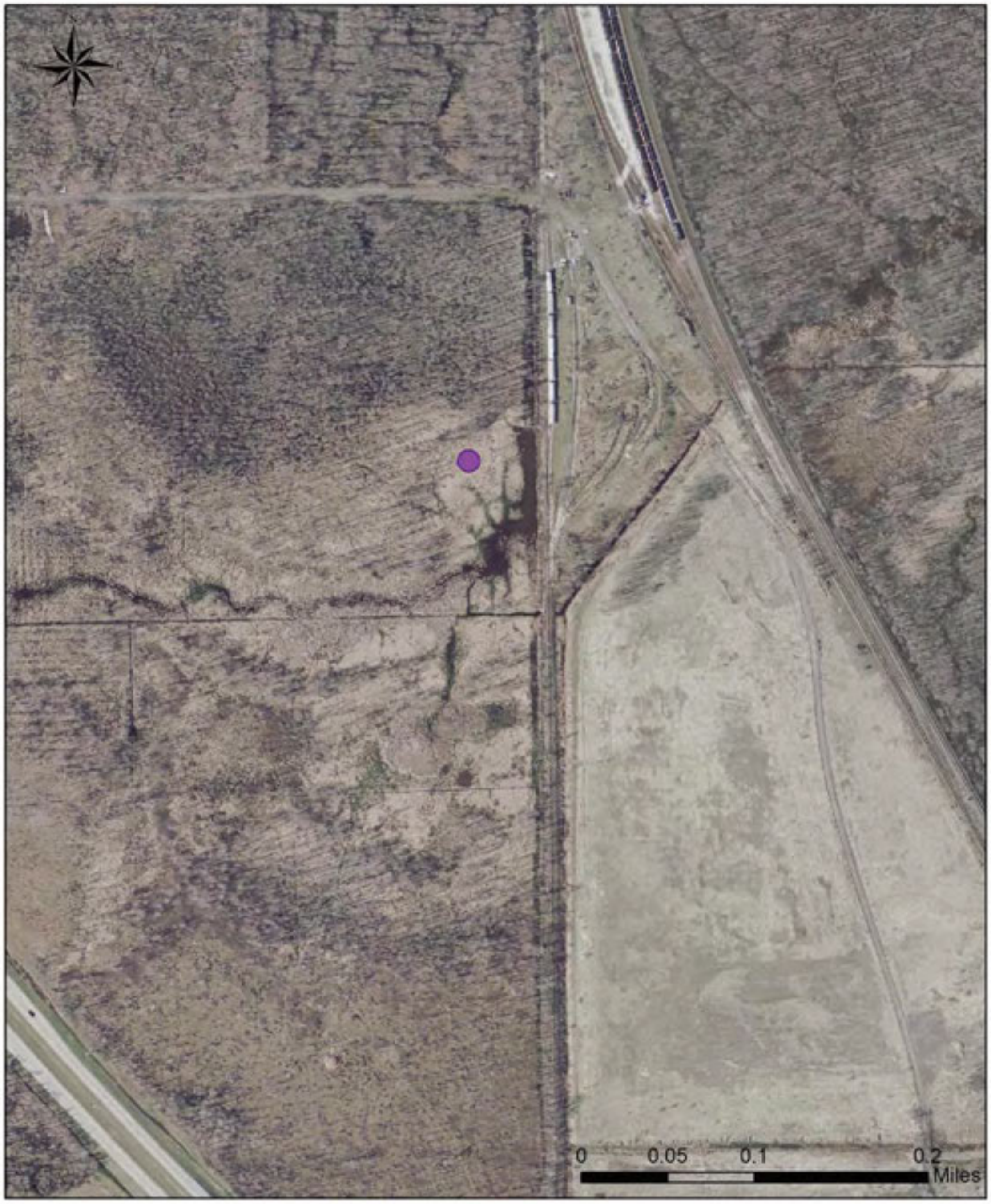
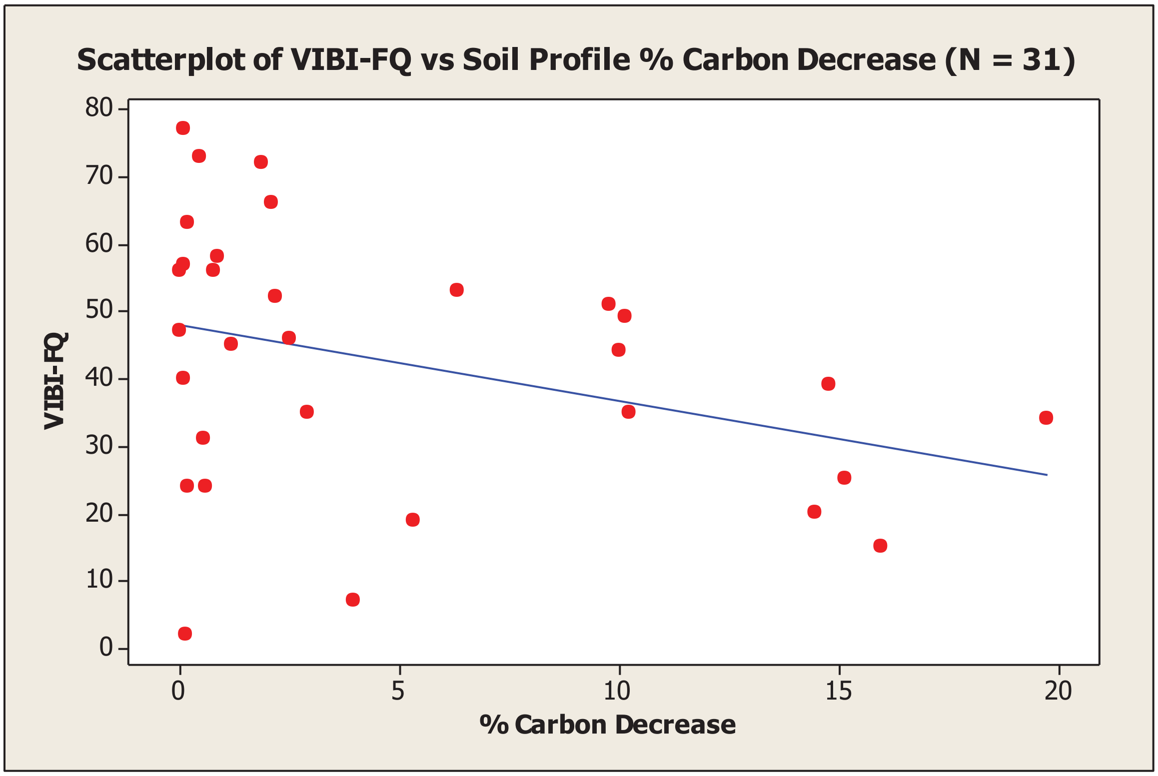


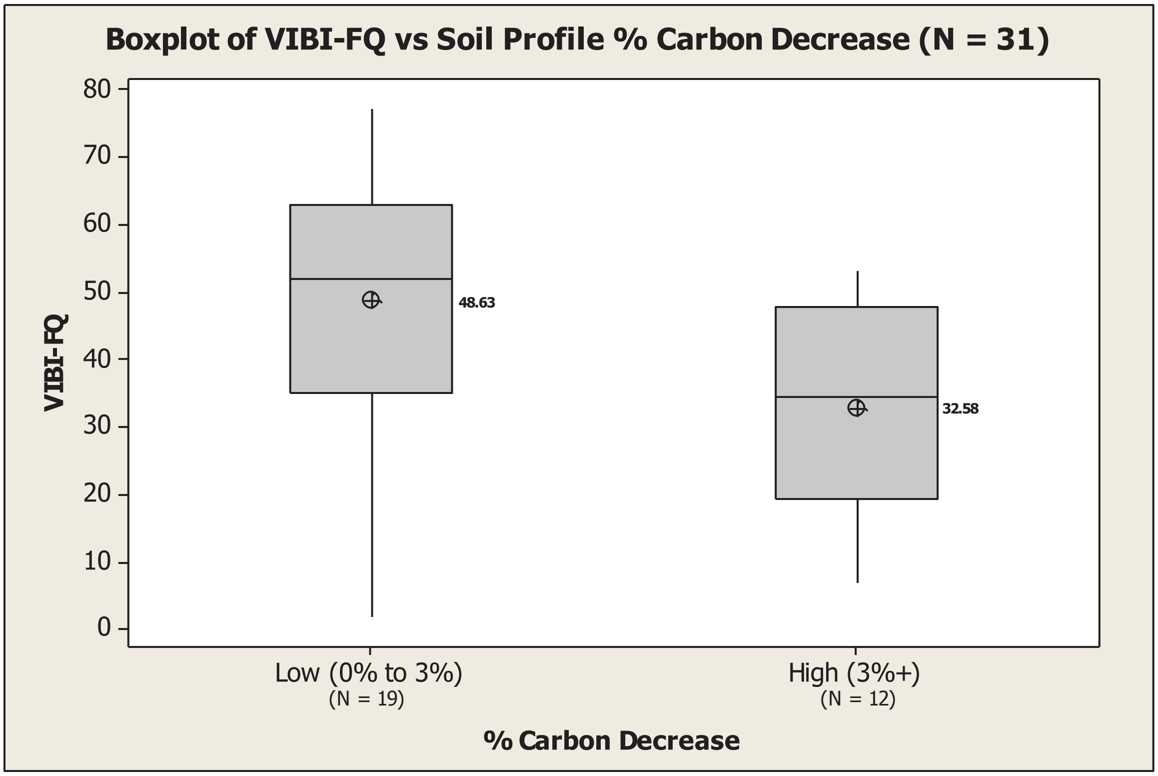
Figure 86. Ashtabula County wetland site (NWCA-3138) displayed on 2006-2007 Ohio Statewide Imagery Program Orthophotography. The purple dot represents the NWCA intensification site assessment center point.



Regression Analysis: VIBI_FQ versus Cdec

```
The regression equation is
VIBI_FQ = 48.0 - 1.14 Cdec


Predictor      Coef  SE Coef      T      P
Constant     48.011    4.311  11.14  0.000
Cdec        -1.1355   0.5630  -2.02  0.053


S = 18.3835   R-Sq = 12.3%   R-Sq(adj) = 9.3%


Analysis of Variance

Source          DF       SS      MS     F      P
Regression       1   1374.9  1374.9  4.07  0.053
Residual Error  29   9800.6   338.0
Total           30  11175.5
```

Figure 87. Scatterplot, Fitted line regression plot and Minitab output of number of VIBI-FQ and soil profile percent carbon decrease for 31 Ohio intensification study wetlands (df = 30, F = 4.07, p = 0.053, R-squared = 12.3 percent).



One-way ANOVA: VIBI_FQ versus CDEC_TYPE

```
Source     DF     SS    MS     F      P
CDEC_TYPE   1   1894  1894  5.92  0.021
Error      29   9281   320
Total      30  11176

S = 17.89   R-Sq = 16.95%   R-Sq(adj) = 14.09%


                              Individual 95% CIs For Mean Based on
                              Pooled StDev
Level         N   Mean  StDev  --------+---------+---------+---------+-
1-Low        19  48.63  19.31                   (--------*-------)
2-High       12  32.58  15.28  (----------*---------)
                              --------+---------+---------+---------+-
                                     30        40        50        60

Pooled StDev = 17.89


Grouping Information Using Tukey Method

CDEC_TYPE  N  Mean Grouping
1-Low    19 48.63 A
2-High   12 32.58  B

Means that do not share a letter are significantly different.
```

Figure 88. Box and whiskers plot and Minitab output of VIBI-FQ scores compared to low and high soil profile percent carbon decrease levels for 31 Ohio NWCA intensification wetlands.

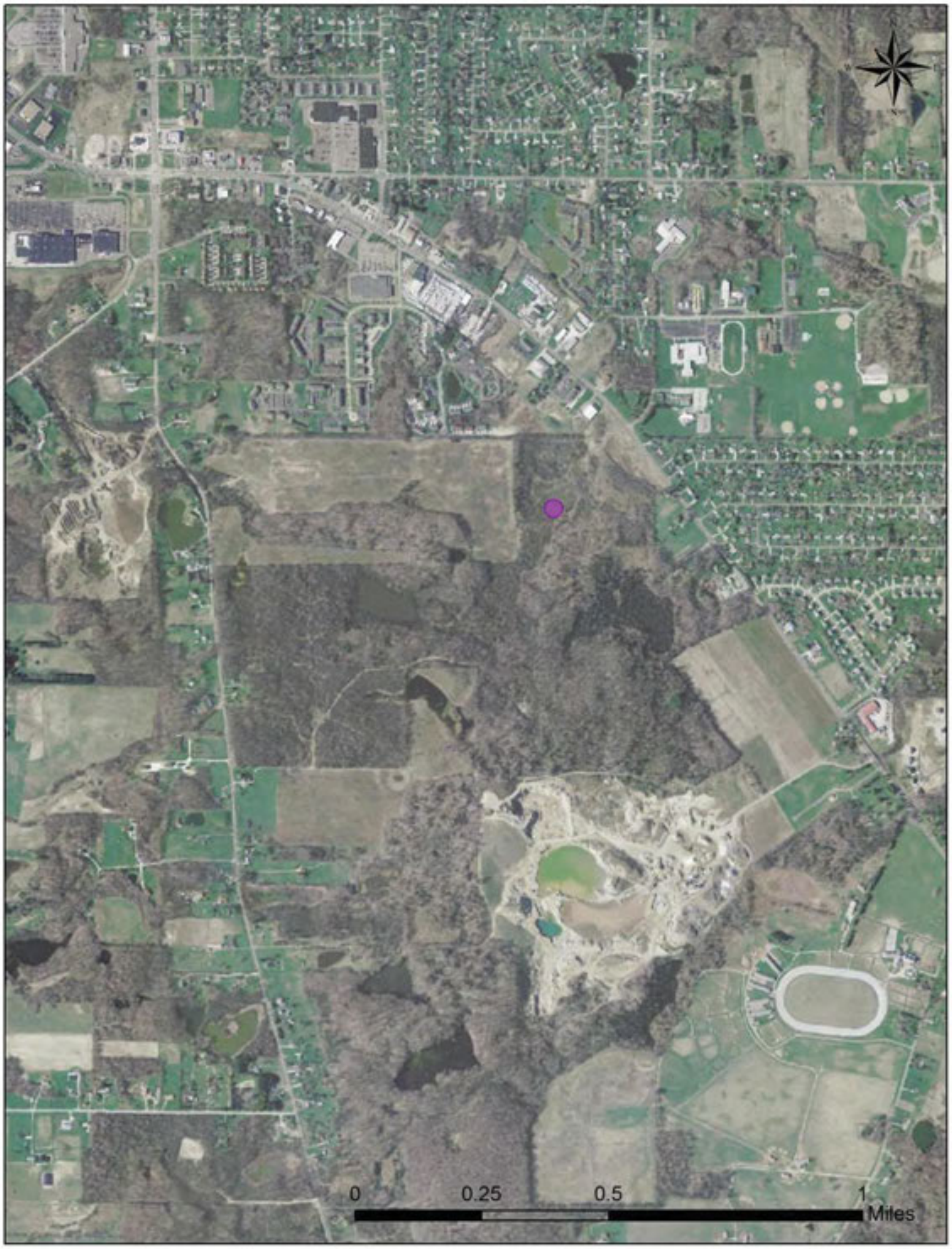
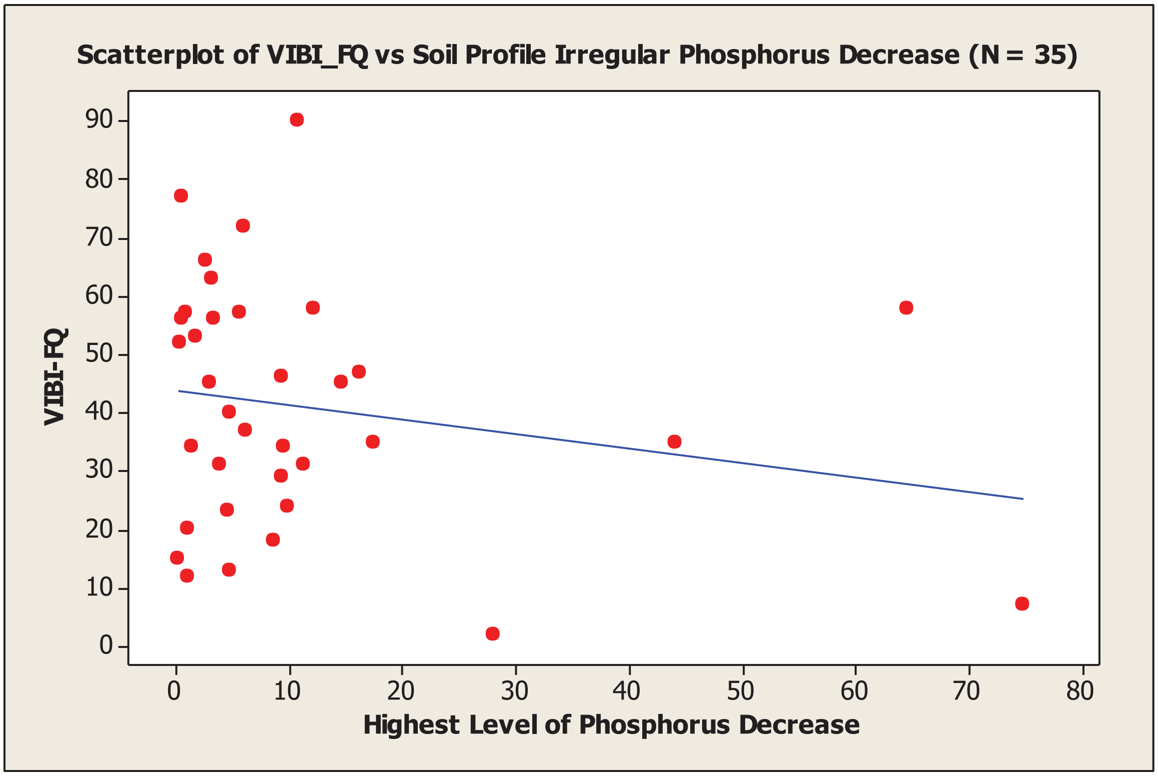


Figure 89. City of Streetsboro wetland site (Portage County; NWCA-3118) having a significant percent carbon decrease in the soil profile displayed on 2006-2007 Ohio Statewide Imagery Program Orthophotography. The purple dot represents the NWCA intensification site assessment center point.

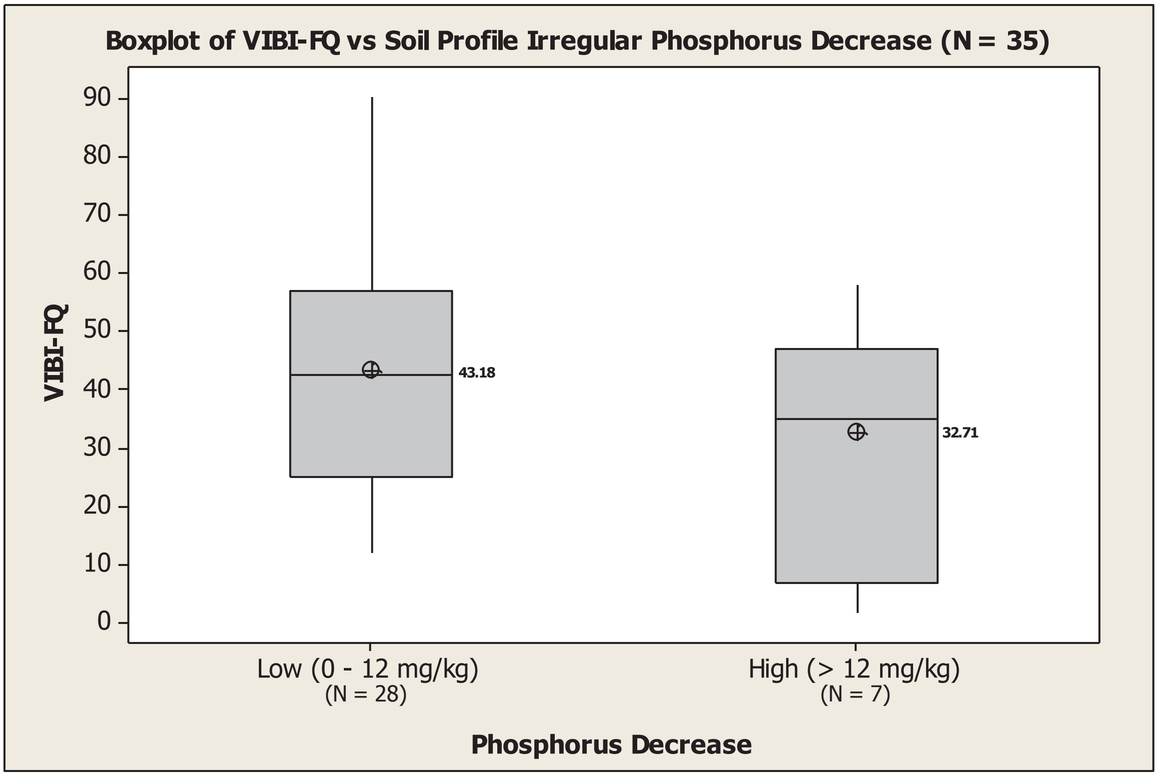
Figure 90. Portage County wetland site (NWCA-3058) having a significant percent carbon decrease in the soil profile displayed on 2006-2007 Ohio Statewide Imagery Program Orthophotography. The purple dot represents the NWCA intensification site assessment center point.



Regression Analysis: VIBI_FQ versus Pdec

```
The regression equation is
VIBI_FQ = 43.9 - 0.252 Pdec


Predictor      Coef  SE Coef      T      P
Constant     43.934    4.220  10.41  0.000
Pdec        -0.2519   0.2088  -1.21  0.236


S = 20.6948   R-Sq = 4.2%   R-Sq(adj) = 1.3%


Analysis of Variance

Source           DF       SS     MS     F      P
Regression        1    623.7  623.7  1.46  0.236
Residual Error   33  14133.1  428.3
Total            34  14756.7
```

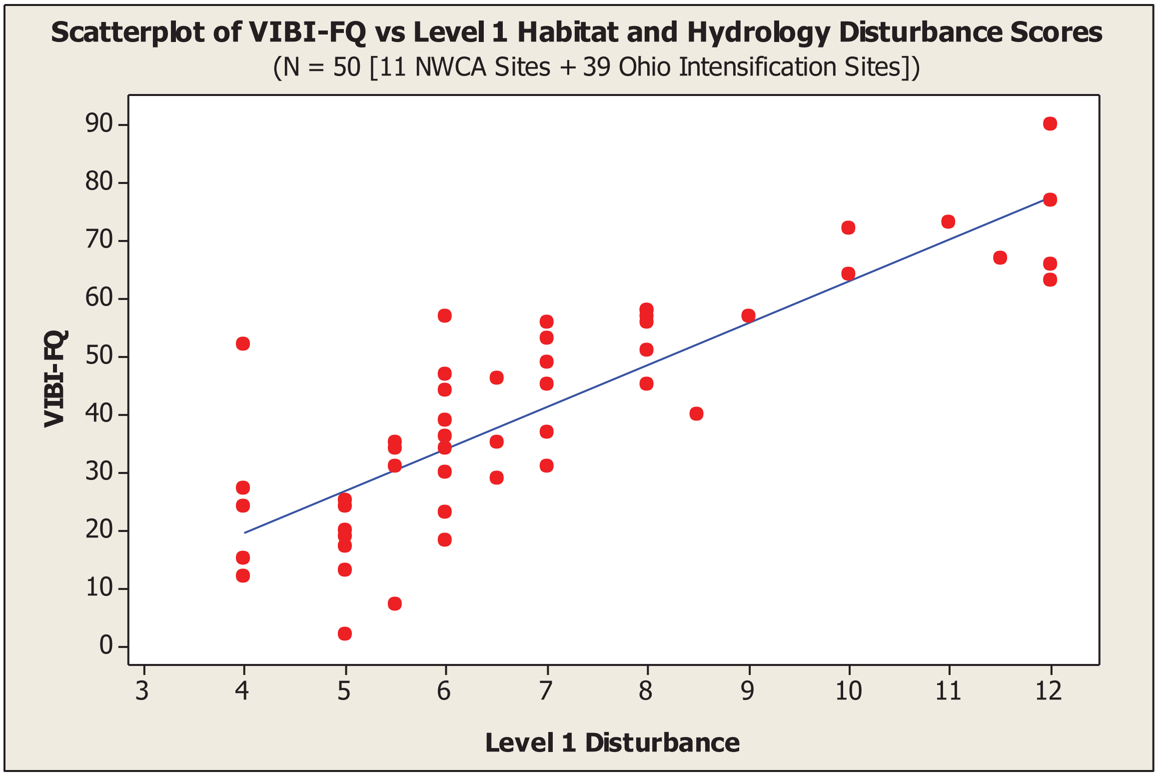
Figure 91. Scatterplot, Fitted line regression plot and Minitab output of number of VIBI-FQ and soil profile phosphorus decrease for 35 Ohio intensification study wetlands (df = 34, F = 1.46, p = 0.236, R-squared = 4.2 percent).



One-way ANOVA: VIBI_FQ versus Pdec_CAT

```
Source     DF     SS   MS     F      P
Pdec_CAT    1    613  613  1.43  0.240
Error      33  14144  429
Total      34  14757

S = 20.70   R-Sq = 4.16%   R-Sq(adj) = 1.25%

                           Individual 95% CIs For Mean Based on
                           Pooled StDev
Level    N   Mean  StDev  ---+---------+---------+---------+------
1       28  43.18  20.67                    (-------*-------)
2        7  32.71  20.85  (---------------*---------------)
                          ---+---------+---------+---------+------
                            20        30        40        50

Pooled StDev = 20.70

Grouping Information Using Tukey Method

Pdec_CAT   N   Mean  Grouping
1         28  43.18  A
2          7  32.71  A

Means that do not share a letter are significantly different.
```

Figure 92. Box and whiskers plot and Minitab output of VIBI-FQ scores compared to low and high soil profile phosphorus decrease levels for 31 Ohio NWCA intensification wetlands.



Regression Analysis: VIBI_FQ versus Soil_Dist2

```
The regression equation is
VIBI_FQ = - 9.25 + 7.24 Soil_Dist2


Predictor      Coef  SE Coef      T      P
Constant     -9.246    5.032  -1.84  0.072
Soil_Dist2   7.2377   0.6863  10.55  0.000


S = 11.0286   R-Sq = 69.8%   R-Sq(adj) = 69.2%


Analysis of Variance

Source          DF     SS     MS       F      P
Regression       1  13526  13526  111.20  0.000
Residual Error  48   5838    122
Total           49  19364
```

Figure 93. Scatterplot, Fitted line regression plot and Minitab output of number of VIBI-FQ and Level 1 disturbance scores for 50 Ohio intensification study wetlands (df = 49, F = 111.20, p < 0.001, R-squared = 69.8 percent).

Table 1. All Ohio NWCA intensification site summary data, including ORAM, VIBI and VIBI-FQ assessment values for each.

Site Code	Ohio County	Plant Community	HGM Class	Survey Date	ORAM	VIBI	VIBI-FQ	VIBI Category	ORAM Category	VIBI-FQ Category
OH-3022	Perry	Emergent	Riverine - Mainstem	6/8/2011	52.5	57	34	Cat 3	Cat 2B	Cat 2A
OH-3019	Richland	Shrub	Depression - Surface Water	6/15/2011	64.0	57	58	Cat 2B	Cat 3	Cat 2B
OH-3025	Marion	Emergent	Riverine - Mainstem	6/22/2011	40.0	44	17	Cat 2A	Cat 2A	Cat 1
OH-3020	Medina	Emergent	Riverine - Headwater	6/29/2011	21.5	13	2	Cat 1	Cat 1	Cat 1
OH-3031	Wayne	Forest	Impoundment - Human	7/6/2011	59.5	29	39	Cat 1	Cat 2B	Cat 2B
OH-3014	Jefferson	Emergent	Slope - Riverine	7/11/2011	76.0	83	66	Cat 3	Cat 3	Cat 3
OH-3006	Ottawa	Emergent	Coastal - Restricted	7/13/2011	47.0	43	47	Cat 1	Cat 2A	Cat 2B
OH-3050	Clinton	Forest	Depression - Surface Water	7/27/2011	74.0	74	63	Cat 3	Cat 3	Cat 3
OH-3057	Wayne	Forest	Depression - Surface Water	8/1/2011	58.0	39	56	Cat 1	Cat 2B	Cat 2B
OH-3030	Ottawa	Emergent	Coastal - Restricted	8/3/2011	29.0	22	18	Cat 1	Cat 1	Cat 1
OH-3005	Fairfield	Emergent	Depression - Surface Water	8/8/2011	31.0	23	25	Cat 1	Cat 2A	Cat 2A
OH-3003	Tuscarawas	Emergent	Impoundment - Human	8/10/2011	42.0	40	30	Cat 2A	Cat 2A	Cat 2A
OH-3004	Stark	Shrub	Depression - Surface Water	8/30/2011	44.5	20	44	Cat 1	Cat 2A	Cat 2B
OH-3080	Pickaway	Emergent	Depression - Surface Water	9/7/2011	54.5	71	52	Cat 3	Cat 2B	Cat 2B
OH-3100	Sandusky	Emergent	Depression - Surface Water	6/21/2012	52.0	82	36	Cat 3	Cat 2B	Cat 2A
OH-3090	Ashtabula	Emergent	Riverine - Mainstem	6/25/2012	58.0	71	37	Cat 2B	Cat 2B	Cat 2A
OH-3072	Ottawa	Emergent	Coastal - Restricted	6/27/2012	52.5	64	57	Cat 3	Cat 2B	Cat 2B
OH-3045	Allen	Emergent	Riverine - Mainstem	7/2/2012	33.5	67	45	Cat 3	Cat 2A	Cat 2B
OH-3063	Marion	Emergent	Impoundment - Human	7/9/2012	36.0	30	27	Cat 2A	Cat 2A	Cat 2A
OH-3081	Cuyahoga	Forest	Riverine - Mainstem	7/11/2012	40.0	33	31	Cat 2A	Cat 2A	Cat 2A
OH-3046	Portage	Emergent	Riverine - Headwater	7/16/2012	80.5	71	64	Cat 3	Cat 3	Cat 3
OH-3106	Geauga	Forest	Riverine - Mainstem	7/18/2012	68.5	40	35	Cat 2A	Cat 3	Cat 2A
OH-3104	Lorain	Emergent	Riverine - Mainstem	7/23/2012	24.0	13	7	Cat 1	Cat 1	Cat 1
OH-3066	Trumbull	Forest	Depression - Ground Water	7/25/2012	82.5	84	90	Cat 3	Cat 3	Cat 3
OH-3068	Huron	Emergent	Depression - Surface Water	7/30/2012	38.0	57	35	Cat 2B	Cat 2A	Cat 2A
OH-3083	Mercer	Emergent	Depression - Surface Water	8/1/2012	28.0	19	12	Cat 1	Cat 1	Cat 1
OH-3132	Huron	Forest	Depression - Surface Water	8/6/2012	46.5	37	34	Cat 2A	Cat 2B	Cat 2A
OH-3044	Trumbull	Emergent	Riverine - Mainstem	8/8/2012	55.5	69	51	Cat 2B	Cat 2B	Cat 2B
OH-3062	Geauga	Forest	Riverine - Headwater	8/22/2012	50.5	80	56	Cat 3	Cat 2B	Cat 2B
OH-3097	Stark	Shrub	Depression - Surface Water	9/5/2012	51.5	36	46	Cat 2A	Cat 2B	Cat 2B
OH-3073	Tuscarawas	Emergent	Riverine - Mainstem	6/18/2013	26.5	34	24	Cat 2A	Cat 1	Cat 2A
OH-3094	Ashtabula	Emergent	Riverine - Headwater	6/25/2013	72.5	94	67	Cat 3	Cat 3	Cat 3
OH-3085	Gallia	Forest	Riverine - Headwater	7/1/2013	62.5	50	57	Cat 2B	Cat 2B	Cat 2B
OH-3107	Morrow	Forest	Depression - Surface Water	7/3/2013	62.0	83	77	Cat 3	Cat 3	Cat 3
OH-3105	Columbiana	Emergent	Riverine - Headwater	7/8/2013	28.0	44	13	Cat 2A	Cat 1	Cat 1
OH-3075	Ashland	Emergent	Riverine - Headwater	7/16/2013	35.0	33	19	Cat 2A	Cat 2A	Cat 1
OH-3058	Portage	Emergent	Depression - Surface Water	7/22/2013	61.5	78	53	Cat 3	Cat 3	Cat 2B
OH-3118	Portage	Shrub	Depression - Surface Water	7/24/2013	28.0	20	20	Cat 1	Cat 1	Cat 2A
OH-3099	Ashtabula	Forest	Riverine - Headwater	7/29/2013	54.5	84	72	Cat 3	Cat 2B	Cat 3
OH-3048	Belmont	Emergent	Riverine - Headwater	8/12/2013	58.0	74	40	Cat 3	Cat 2B	Cat 2B
OH-3054	Medina	Forest	Depression - Surface Water	8/14/2013	53.0	30	29	Cat 2A	Cat 2B	Cat 2A
OH-3082	Trumbull	Forest	Depression - Surface Water	8/19/2013	47.5	88	73	Cat 3	Cat 2B	Cat 3
OH-3086	Trumbull	Emergent	Impoundment - Human	8/26/2013	41.0	69	45	Cat 3	Cat 2A	Cat 2B
OH-3070	Portage	Emergent	Depression - Surface Water	9/4/2013	39.5	50	31	Cat 2A	Cat 2A	Cat 2A
OH-3138	Ashtabula	Emergent	Impoundment - Human	9/9/2013	35.5	36	24	Cat 2A	Cat 2A	Cat 2A
OH-3139	Wayne	Emergent	Riverine - Mainstem	6/18/2014	39.5	13	15	Cat 1	Cat 2A	Cat 1
OH-3142	Trumbull	Emergent	Depression - Surface Water	6/25/2014	68.5	63	58	Cat 2B	Cat 3	Cat 2B
OH-3049	Portage	Emergent	Depression - Surface Water	6/30/2014	59.0	63	49	Cat 2B	Cat 2B	Cat 2B
OH-3143	Lucas	Emergent	Coastal - Restricted	7/2/2014	60.0	34	23	Cat 2A	Cat 3	Cat 2A
OH-3136	Erie	Shrub	Depression - Ground Water	7/9/2014	44.5	81	57	Cat 3	Cat 2A	Cat 2B

Table 2. U.S. EPA Vegetation Multi-Metric Index (VMMI) scores, including individual parameters, for Ohio NWCA intensification sites.

Site Code	FQAI	Native Species Importance Value	Relative Cover of Native Monocots	Number of Tolerant Species (CofC ≤ 4)	VMMI	VMMI Quality Ranking
OH-3022	19.55	67.16	26.13	45	26.63	Poor
OH-3019	19.27	90.28	43.51	25	50.54	Good
OH-3025	15.38	47.19	2.2	29	15.22	Poor
OH-3020	7.56	31.44	8.19	5	24.27	Poor
OH-3031	17.39	80.42	37.39	21	45.59	Poor
OH-3014	26.22	96.82	46.47	50	50.34	Fair
OH-3006	13.50	75.27	69.36	9	55.74	Good
OH-3050	20.98	99.3	5.29	17	51.33	Good
OH-3057	23.95	94.25	7.96	15	53.33	Poor
OH-3030	14.09	48.11	5.24	16	23.51	Poor
OH-3005	8.32	89.21	86.25	6	64.04	Good
OH-3003	16.93	68.42	1.75	35	22.12	Poor
OH-3004	13.00	100	43.01	4	62.95	Good
OH-3080	20.41	95.52	44.43	44	44.65	Good
OH-3100	15.26	84.16	33.41	45	32.71	Fair
OH-3090	18.51	89.96	26.69	44	36.19	Poor
OH-3072	18.77	86.89	22.78	13	50.91	Good
OH-3045	19.76	74.46	17.16	30	34.07	Fair
OH-3063	8.73	86.52	86.98	15	57.71	Good
OH-3081	16.5	58.83	4.73	56	15.1	Poor
OH-3046	19.75	95.68	38.0	31	48.21	Fair
OH-3106	14.71	93.29	3.17	23	39.39	Poor
OH-3104	9.2	44.49	0.7	23	12.50	Poor
OH-3066	35.5	97.43	10.7	26	57.70	Fair
OH-3068	16.96	81.35	4.84	40	25.60	Fair
OH-3083	9.1	65.93	18.59	27	24.05	Poor
OH-3132	16.57	83.96	5.0	54	26.51	Poor
OH-3044	21.67	83.18	41.57	35	42.51	Fair
OH-3062	24.98	83.7	16.11	53	35.83	Poor
OH-3097	16.71	84.85	21.48	22	42.41	Poor
OH-3073	15.72	50.99	1.31	26	18.85	Poor
OH-3094	24.69	92.24	38.65	26	53.86	Fair
OH-3085	20.93	84.42	3.11	46	29.68	Poor
OH-3107	27.61	95.19	31.2	46	46.86	Poor
OH-3105	13.02	48.31	4.58	31	13.21	Poor
OH-3075	13.61	78.3	61.94	24	45.95	Fair
OH-3058	19.76	89.79	28.47	20	50.05	Fair
OH-3118	9.38	89.97	16.01	21	38.17	Poor
OH-3099	28.58	87.26	11.34	57	39.07	Poor
OH-3048	19.25	94.81	40.22	38	43.61	Fair
OH-3054	14.91	88.77	8.68	40	28.28	Poor
OH-3082	25.6	89.56	17.06	40	39.19	Poor
OH-3086	16.97	87.83	42.96	24	48.11	Fair
OH-3070	17.96	57.66	18.46	32	24.18	Poor
OH-3138	13.97	91.13	70.81	19	57.35	Fair
OH-3139	6.05	90.38	3.43	6	42.64	Fair
OH-3142	15.77	100	1.7	8	52.25	Fair
OH-3049	15.78	97.25	65.71	20	59.62	Fair
OH-3143	14.9	50.53	14.43	19	25.67	Fair
OH-3136	26.3	73.48	8.13	50	30.27	Poor

Table 3. ORAM, VIBI, VIBI-FQ, and VMMI scores for all Ohio NWCA intensification wetlands, broken down by approximate ecological condition ranges. For Ohio assessments, these ranges correspond to Ohio's wetland anti-degradation categories (Category 1 = "Poor," Low Category 2 = "Fair," High Category 2 = "Good," and Category 3 = "Excellent).

Wetland Condition	**ORAM**	**VIBI**	**VIBI-FQ**	**VMMI**
"Poor"	7 (14%)	11 (22%)	8 (16%)	25 (50%)
"Fair"	15 (30%)	14 (28%)	16 (32%)	17 (34%)
"Good"	17 (34%)	7 (14%)	16 (32%)	8 (16%)
"Excellent"	11 (22%)	18 (36%)	8 (16%)	

Table 4. 2011 National Land Cover Dataset (NLCD) Land Use Categories (Jin et.al., 2013) and corresponding Landscape Development Intensity (LDI) Coefficients (*derived from* Brown and Vivas, 2005).

Land Use Category	LDI Coefficient
11 (Open Water)	1.00
21 (Developed, Open Space)	6.92
22 (Developed, Low Intensity)	7.47
23 (Developed, Medium Intensity)	7.55
24 (Developed, High Intensity)	9.42
31 (Barren Land)	8.32
41 (Deciduous Forest)	1.00
42 (Evergreen Forest)	1.00
43 (Mixed Forest)	1.00
52 (Shrub/Scrub)	2.02
71 (Grassland/Herbaceous)	3.41
81 (Pasture/Hay)	3.74
82 (Cultivated Crops)	4.54
90 (Woody Wetlands)	1.00
95 (Emergent Herbaceous Wetlands)	1.00

Table 5. Ohio NWCA intensification site buffer zone current and historic landscape development intensity values derived from 2011 NLCD data and USGS GIS layer of historic land uses.

Site Code	2011 LDI (0 to 100M)	2011 LDI (100 to 350M)	2011 LDI (350 to 1000M)	2011 LDI (1000 to 2000M)	Historic LDI (0 to 100M)	Historic LDI (100 to 350M)	Historic LDI (350 to 1000M)	Historic LDI (1000 to 2000M)
OH-3022	2.03	1.50	1.63	2.05	1.00	1.00	1.18	1.74
OH-3019	1.39	3.22	3.40	4.07	1.00	2.10	3.46	4.22
OH-3025	4.87	4.13	4.24	4.26	4.54	4.54	4.22	4.52
OH-3020	4.54	4.45	3.73	3.89	4.54	5.92	4.36	4.93
OH-3031	1.12	1.81	2.03	3.26	1.00	2.48	2.86	4.16
OH-3014	1.00	1.00	1.34	1.43	1.00	1.00	1.33	1.67
OH-3006	1.00	1.19	1.90	2.53	3.15	2.36	3.10	3.23
OH-3050	1.10	2.27	3.27	3.45	1.00	2.32	3.78	4.65
OH-3057	1.00	1.88	2.30	3.00	1.06	2.07	2.72	4.17
OH-3030	1.28	1.64	2.70	3.04	1.62	3.33	3.53	3.54
OH-3005	2.97	3.92	4.74	4.77	4.54	4.54	4.54	4.75
OH-3003	1.70	1.76	2.17	2.71	1.00	1.23	2.46	2.73
OH-3004	3.42	6.88	7.16	6.26	8.93	8.59	7.60	6.63
OH-3080	3.28	2.97	3.80	3.82	4.54	4.54	4.54	4.21
OH-3100	1.00	1.32	1.21	1.13	4.03	2.61	2.81	2.90
OH-3090	4.16	3.25	2.36	2.64	4.54	4.54	4.44	3.49
OH-3072	1.00	1.13	2.35	2.58	4.54	4.23	3.89	3.01
OH-3045	5.68	6.42	5.61	5.12	5.44	6.98	5.39	5.03
OH-3063	1.12	2.38	3.45	4.15	4.54	4.54	4.54	4.48
OH-3081	1.00	1.52	2.41	1.86	4.54	4.00	3.32	2.40
OH-3046	1.17	1.04	2.27	4.09	1.00	1.00	2.23	3.52
OH-3106	2.42	3.34	2.59	2.71	2.96	2.91	2.48	2.72
OH-3104	1.04	1.90	4.67	4.32	1.62	2.47	4.35	4.58
OH-3066	1.34	1.52	1.83	2.89	3.32	2.77	3.25	3.73
OH-3068	1.00	1.11	1.46	3.20	4.54	3.62	3.00	3.63
OH-3083	3.94	4.71	4.50	3.65	4.54	4.54	4.33	3.67
OH-3132	1.00	1.01	2.35	3.20	1.00	1.28	3.09	4.10
OH-3044	3.48	2.26	2.70	3.52	1.00	2.29	3.33	4.25
OH-3062	1.00	1.77	3.17	3.51	1.06	2.13	3.49	4.04
OH-3097	4.41	5.05	4.80	4.38	4.54	4.54	4.88	5.22
OH-3073	2.31	3.22	3.83	3.17	1.00	3.03	4.35	3.56
OH-3094	1.60	1.37	1.86	2.62	1.00	1.21	2.42	3.60
OH-3085	1.00	1.71	2.07	1.84	1.00	1.00	1.25	1.73
OH-3107	1.00	2.91	3.82	3.79	4.54	4.54	4.29	4.22
OH-3105	1.32	2.29	3.41	3.20	4.54	4.54	4.80	4.23
OH-3075	2.69	3.00	2.68	2.95	4.54	4.54	4.54	4.26
OH-3058	1.17	2.57	4.30	3.65	4.54	4.54	4.96	4.63
OH-3118	1.51	3.15	4.86	4.52	3.42	4.32	4.97	5.04
OH-3099	1.89	2.84	3.40	3.13	1.30	3.75	4.71	4.76
OH-3048	1.00	1.08	1.49	1.57	1.00	1.00	1.93	2.20
OH-3054	1.75	2.30	3.22	4.03	4.22	3.36	3.99	4.55
OH-3082	2.57	3.46	5.78	3.34	7.43	5.67	6.22	4.01
OH-3086	1.06	1.48	3.27	2.99	1.00	2.17	4.77	4.58
OH-3070	1.06	2.60	3.20	3.56	2.48	3.13	3.71	4.51
OH-3138	3.00	2.61	2.56	2.75	1.00	1.01	3.43	4.22
OH-3139	1.28	1.50	2.46	3.43	4.54	4.54	4.54	4.27
OH-3142	1.00	1.11	1.22	2.13	1.11	1.63	1.98	3.38
OH-3049	1.19	2.47	2.59	2.74	4.54	4.19	3.64	3.76
OH-3143	1.00	1.14	2.37	2.57	2.24	2.21	2.85	2.75
OH-3136	2.01	2.20	2.32	3.09	4.54	4.21	4.31	3.87

Table 6. “Historic” National Land Cover Dataset (NLCD) Land Use Categories (Price et. al., 2006) and corresponding Landscape Development Intensity (LDI) Coefficients (*derived from* Brown and Vivas, 2005). Only land use categories present with Ohio NWCA intensification buffer zones were assigned an LDI coefficient.

Land Use Category	LDI Coefficient
11 (Residential)	7.55
12 (Commercial and Services)	9.42
13 (Industrial)	9.42
14 (Transportation, Communication, Utilities)	9.42
15 (Industrial and Commercial Complexes)	9.42
16 (Mixed Urban or Built-up Land)	9.42
17 (Other Urban or Built-up Land)	9.42
21 (Cropland and Pasture)	4.54
41 (Deciduous Forest Land)	1.00
42 (Evergreen Forest Land)	1.00
43 (Mixed Forest Land)	1.00
51 (Streams and Canals)	1.00
52 (Lakes)	1.00
53 (Reservoirs)	1.00
54 (Bays and Estuaries)	1.00
61 (Forested Wetland)	1.00
62 (Non-forested Wetland)	1.00
75 (Strip Mines, Quarries, Gravel Pits)	8.32
76 (Transitional Areas)	8.32

Table 7. Ohio NWCA intensification site water chemistry data.

Site Code	Conductivity (umhos/cm)	Ammonnia (mg/L)	Nitrate + Nitrite (mg/L)	pH	Total Kjeldahl nitrogen (mg/L)	Total Nitrogen (mg/L)	Total Phosphorus (mg/L)
OH-3022	1133.0	0.053	0.000	6.46	0.806	0.806	0.051
OH-3019	113.0	0.053	0.009	6.93	1.151	1.316	0.189
OH-3025	N/A	N/A	N/A	N/A	N/A	N/A	N/A
OH-3020	404.4	0.335	0.011	6.90	1.508	1.519	1.448
OH-3031	667.9	0.934	0.005	7.29	4.630	4.635	1.528
OH-3014	161.6	0.013	0.263	7.79	0.117	0.380	0.042
OH-3006	349.2	0.053	0.007	7.38	2.778	2.785	0.403
OH-3050	N/A	N/A	N/A	N/A	N/A	N/A	N/A
OH-3057	535.0	1.380	*<0.1	7.10	2.820	2.820	0.918
OH-3030	178.5	0.096	0.013	7.04	2.877	2.890	0.489
OH-3005	203.2	0.070	0.006	6.86	1.732	1.738	0.236
OH-3003	792.0	0.021	0.000	7.68	0.783	0.783	0.079
OH-3004	138.0	0.146	0.006	6.80	2.924	2.930	0.192
OH-3080	107.0	*<0.5	*<0.1	6.57	1.230	1.230	0.112
OH-3100	N/A	N/A	N/A	N/A	N/A	N/A	N/A
OH-3090	N/A	N/A	N/A	N/A	N/A	N/A	N/A
OH-3072	339.0	*<0.5	*<0.1	7.05	1.690	1.690	0.514
OH-3045	550.0	0.336	*<0.1	7.03	1.450	1.450	1.210
OH-3063	N/A	N/A	N/A	N/A	N/A	N/A	N/A
OH-3081	N/A	N/A	N/A	N/A	N/A	N/A	N/A
OH-3046	769.0	1.310	*<0.1	6.77	7.810	7.810	4.070
OH-3106	N/A	N/A	N/A	N/A	N/A	N/A	N/A
OH-3104	N/A	N/A	N/A	N/A	N/A	N/A	N/A
OH-3066	N/A	N/A	N/A	N/A	N/A	N/A	N/A
OH-3068	N/A	N/A	N/A	N/A	N/A	N/A	N/A
OH-3083	763.0	*<0.5	*<0.1	9.11	2.620	2.620	0.561
OH-3132	734.0	1.080	0.150	7.38	3.360	3.510	1.690
OH-3044	N/A	N/A	N/A	N/A	N/A	N/A	N/A
OH-3062	161.0	0.155	*<0.1	6.75	1.450	1.450	0.267
OH-3097	N/A	N/A	N/A	N/A	N/A	N/A	N/A
OH-3073	N/A	N/A	N/A	N/A	N/A	N/A	N/A
OH-3094	29.0	0.107	*<0.1	6.15	1.380	1.380	0.107
OH-3085	218.0	0.452	*<0.1	6.74	0.770	0.770	0.039
OH-3107	N/A	N/A	N/A	N/A	N/A	N/A	N/A
OH-3105	880.0	0.094	0.690	7.93	0.790	1.480	0.264
OH-3075	510.0	0.302	1.060	7.71	1.730	2.790	1.900
OH-3058	318.0	0.201	*<0.1	6.83	3.520	3.520	1.300
OH-3118	N/A	N/A	N/A	N/A	N/A	N/A	N/A
OH-3099	67.0	0.305	*<0.1	6.35	1.410	1.410	0.068
OH-3048	621.0	*<0.5	*<0.1	7.19	0.560	0.560	0.028
OH-3054	N/A	N/A	N/A	N/A	N/A	N/A	N/A
OH-3082	N/A	N/A	N/A	N/A	N/A	N/A	N/A
OH-3086	87.0	0.228	*<0.1	6.40	1.380	1.380	0.356
OH-3070	423.0	0.169	1.790	6.82	1.030	2.820	0.709
OH-3138	71.0	*<0.5	0.130	5.98	0.680	0.810	0.058
OH-3139	368.0	0.070	*<0.1	7.59	1.100	0.100	0.123
OH-3142	15.0	*<0.5	*<0.1	5.53	1.270	1.270	0.107
OH-3049	197.0	0.106	*<0.1	6.73	2.120	2.120	0.152
OH-3143	295.0	0.088	*<0.1	6.68	2.230	2.230	0.269
OH-3136	888.0	*<0.5	*<0.1	7.13	3.010	3.010	0.212

***Below detection limit.**

Table 8. Ohio NWCA intensification site bryophyte parameters, including those derived from cover data for sites surveyed between 2012 and 2014.

Site Code	# Bryophyte Genera	# Bryophyte Species	Moss QAI	Bryophyte QAI	Mean CofC for Dominant Species	Highest Cof C for Dominant Species	Total Number of Substrates Having Dominant Species	Mean CofC for Non-Dominant Species	Highest Cof C for Non-Dominant Species	Total Number of Non-Dominant Species
OH-3022	11	11	7.67	8.9	N/A	N/A	N/A	N/A	N/A	N/A
OH-3019	22	27	16.26	17.7	N/A	N/A	N/A	N/A	N/A	N/A
OH-3025	6	6	7.35	7.3	N/A	N/A	N/A	N/A	N/A	N/A
OH-3020	0	0	0.00	0	N/A	N/A	N/A	N/A	N/A	N/A
OH-3031	14	16	10.39	12.5	N/A	N/A	N/A	N/A	N/A	N/A
OH-3014	21	30	17.45	18.1	N/A	N/A	N/A	N/A	N/A	N/A
OH-3006	3	3	2.00	3.5	N/A	N/A	N/A	N/A	N/A	N/A
OH-3050	24	27	17.46	20.4	N/A	N/A	N/A	N/A	N/A	N/A
OH-3057	11	12	9.95	11	N/A	N/A	N/A	N/A	N/A	N/A
OH-3030	4	5	1.41	4	N/A	N/A	N/A	N/A	N/A	N/A
OH-3005	9	9	6.12	9.3	N/A	N/A	N/A	N/A	N/A	N/A
OH-3003	14	17	11.10	11.3	N/A	N/A	N/A	N/A	N/A	N/A
OH-3004	4	5	5.37	5.4	N/A	N/A	N/A	N/A	N/A	N/A
OH-3080	5	7	5.72	6	N/A	N/A	N/A	N/A	N/A	N/A
OH-3100	9	11	9.05	9	2.00	2	1	2.00	2	2
OH-3090	11	13	12.41	13.3	3.60	6	2	3.60	6	8
OH-3072	4	5	4.50	4	2.50	3	4	2.50	3	5
OH-3045	4	5	4.92	4.9	2.50	3	2	2.50	3	2
OH-3063	0	0	0.00	0	0.00	0	0	0.00	0	0
OH-3081	7	7	7.94	7.9	2.50	3	1	2.50	3	2
OH-3046	13	15	10.54	10.8	2.25	3	3	2.25	3	7
OH-3106	14	15	9.35	11.9	2.80	4	5	2.80	4	7
OH-3104	5	5	6.71	6.7	3.33	4	1	3.33	4	3
OH-3066	24	28	15.99	18.5	3.40	5	6	3.40	5	11
OH-3068	16	20	12.61	13.5	3.00	5	3	3.00	5	10
OH-3083	1	1	0.00	0	3.00	3	1	3.00	3	0
OH-3132	15	18	11.36	12.4	2.71	4	4	2.71	4	14
OH-3044	8	10	8.00	8.2	2.50	3	2	2.50	3	4
OH-3062	20	23	16.77	17.5	3.33	4	5	3.33	4	6
OH-3097	13	19	10.69	12.5	2.33	3	2	2.33	3	7
OH-3073	10	14	12.03	12	2.57	4	1	2.57	4	7
OH-3094	21	23	15.28	15.8	3.67	6	3	3.67	6	11
OH-3085	19	19	13.34	13.8	2.80	3	7	2.80	3	15
OH-3107	24	30	16.87	18.6	3.00	6	11	3.00	6	42
OH-3105	8	8	9.19	9.2	2.75	4	2	2.75	4	5
OH-3075	5	6	10.21	10.2	3.67	7	1	3.67	7	3
OH-3058	11	12	10.68	10.7	2.83	4	3	2.83	4	7
OH-3118	9	12	9.81	9.8	2.75	5	4	2.75	5	11
OH-3099	31	35	18.44	19.6	3.35	6	5	3.35	6	29
OH-3048	9	12	11.16	11.3	3.25	6	2	3.25	6	5
OH-3054	23	28	17.52	19.1	3.63	6	8	3.63	6	34
OH-3082	28	31	17.26	19.6	3.42	7	9	3.42	7	32
OH-3086	9	9	6.72	8	2.33	3	1	2.33	3	6
OH-3070	18	21	13.20	14.2	3.06	5	5	3.06	5	27
OH-3138	2	2	4.24	4.2	3.00	3	1	0.00	0	0
OH-3139	2	2	3.54	3.5	2.50	3	2	2.50	3	3
OH-3142	3	3	5.20	5.2	4.00	4	1	4.00	4	1
OH-3049	6	7	8.16	8.3	3.29	6	2	3.29	6	7
OH-3143	2	2	0.00	2.8	3.00	3	1	3.00	3	2
OH-3136	14	18	15.75	16.0	4.17	8	4	4.17	8	18

Table 9. R-squared values for Ohio NWCA intensification site bryophyte parameters (number of species, number of genera, Moss QAI, and Bryophyte QAI) compared to ORAM, VIBI, and VIBI-FQ assessments for entire dataset of 50 sites and for a subset of 42 sites in which those subjected to recent, catastrophic habitat disturbance excluded.

Comparison	**R-squared (all 50 Ohio NWCA intensification sites)**	**R-squared (42 Ohio NWCA intensification sites not subjected to recent, catastrophic habitat disturbance)**
Number of Bryophyte species vs. ORAM scores	26.50	***37.70***
Number of Bryophyte species vs. VIBI scores	31.90	31.70
Number of Bryophyte species vs. VIBI-FQ scores	43.00	***54.50***
Number of Bryophyte genera vs. ORAM scores	26.90	***38.00***
Number of Bryophyte genera vs. VIBI scores	32.20	31.80
Number of Bryophyte genera vs. VIBI-FQ scores	43.30	***54.90***
Moss QAI vs. ORAM scores	23.70	***34.40***
Moss QAI vs. VIBI scores	35.50	34.70
Moss QAI vs. VIBI-FQ scores	37.30	***46.40***
Bryophyte QAI vs. ORAM scores	26.40	***37.30***
Bryophyte QAI vs. VIBI scores	32.60	31.70
Bryophyte QAI vs. VIBI-FQ scores	38.50	***48.50***

Table 10. Ohio NWCA intensification site bryophyte parameters derived from cover data and grouped based on sites having low (0 to 10), moderate (11 to 21), or high (21+) numbers of species.

Total Number of Bryophyte Species	Number of Sites	Mean C of C value for Dominant Species	Highest C of C value for Dominant Species	Total Substrates Having Dominants	Mean C of C value for Non-Dominant Species	Highest C of C value for Non-Dominant Species	Total Non-Dominants recorded per site
Low (0 to 10)	14	3.0	3.6	1.6	1.6	2.0	1.9
Moderate (11 to 21)	18	2.8	4.6	3.5	2.9	4.5	10.9
High (21+)	10	3.4	5.7	6.7	3.4	5.6	25.1

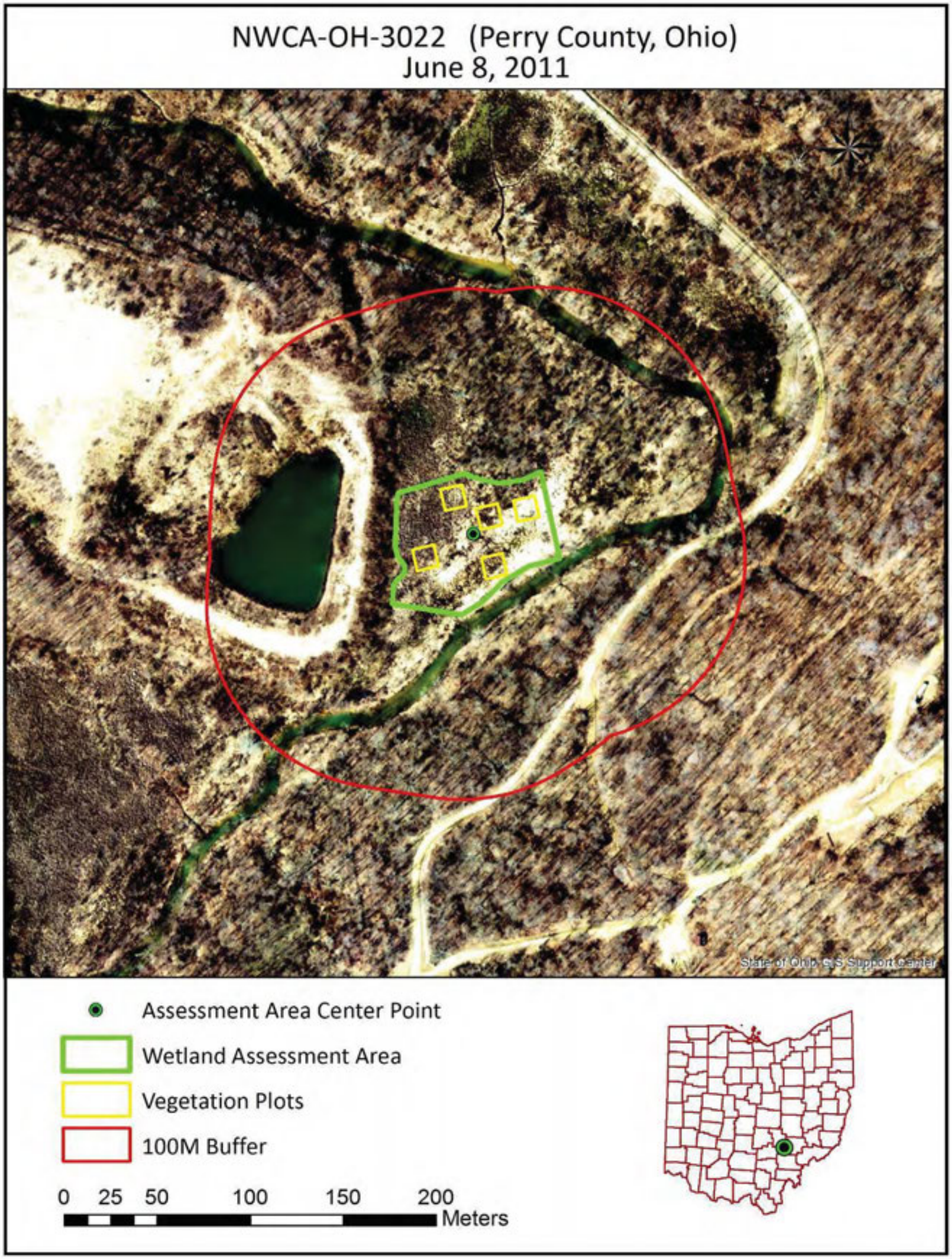
Table 11. Proposed framework for assigning habitat and hydrology disturbance scores to wetlands, using a visual interpretation of current and historic GIS data layers.

Habitat Disturbance			Hydrology Disturbance		
Level 1	***Level 2***	***Level 3***	***Level 1***	***Level 2***	***Level 3***
• Narrow buffers with intensive agriculture or development beyond buffer.	• Streams run through with largely agriculture or developed watershed, otherwise moderate buffer.	• Well buffered.	• In impoundment - old hydrology completely overwhelmed.	• Streams runs through with largely agriculture or developed watershed.	• Watershed well protected.
• Clear conduits for runoff from intensive agriculture or development.		• Outside development and/or agricultural pressures moderate to low.	• Storm water or tile water directly deposited into wetland.	• Moderate buffer but with intensive agriculture and/or development outside buffer.	• Soil relatively undisturbed and wetland is well buffered.
• Direct influence by mining, without buffer or obvious protections.		• No obvious conduit for nutrients into wetland.	• Mining nearby without protection to wetland.	• Conduit points from agricultural development through buffer.	• No recent change in hydrology.
			• Stream - if applicable - highly modified.	• Recent change in hydrology, including beaver dams.	
			• Hydrology flashy or unstable.	• Water table significantly lowered by development.	
			• Wetland being drained.		
			• Substantial development surrounding wetland (indicating potential for significant water table lowering, storm water inputs, etc.).		

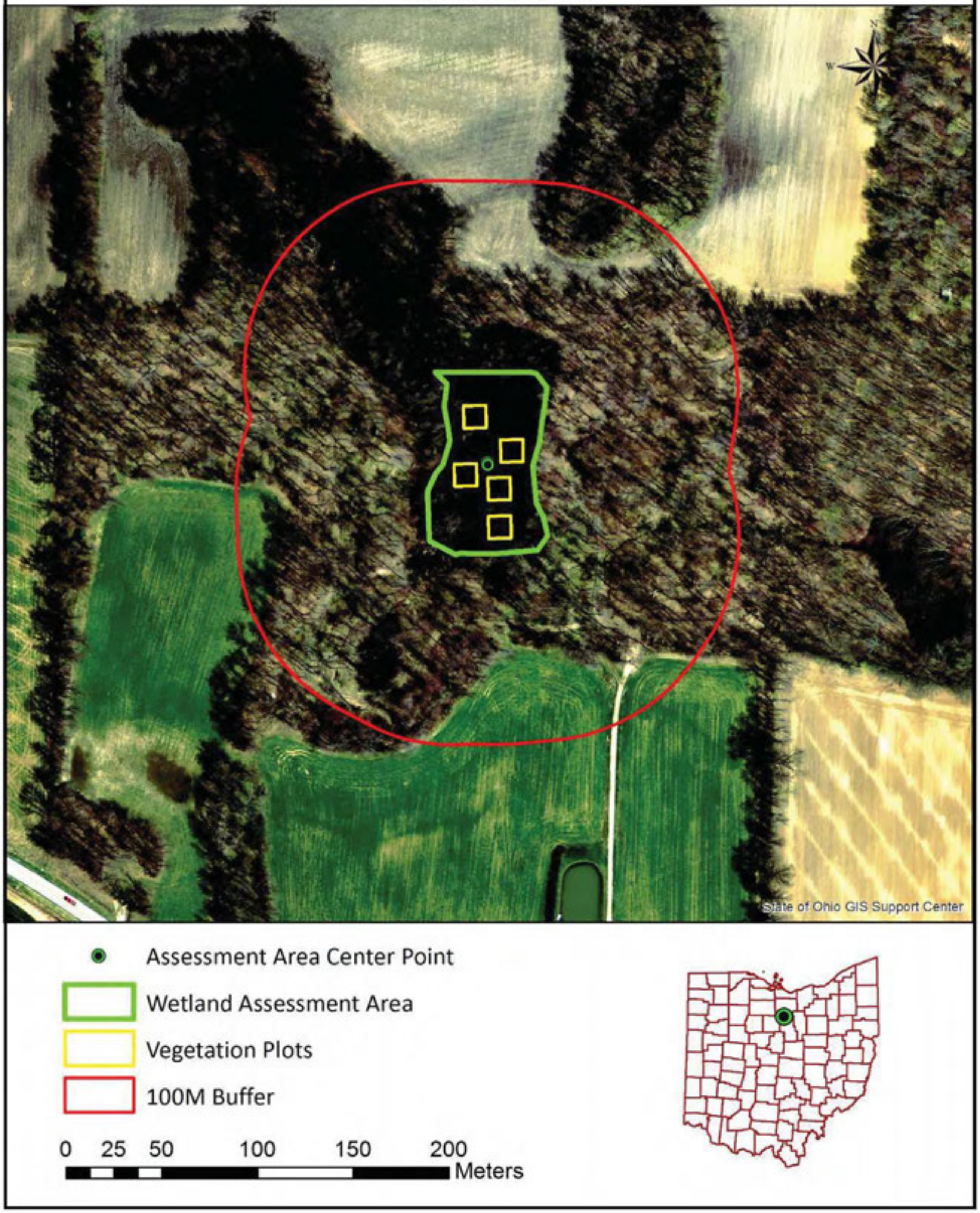
Table 12. Level 1 disturbance scores for 50 Ohio NWCA intensification wetlands.

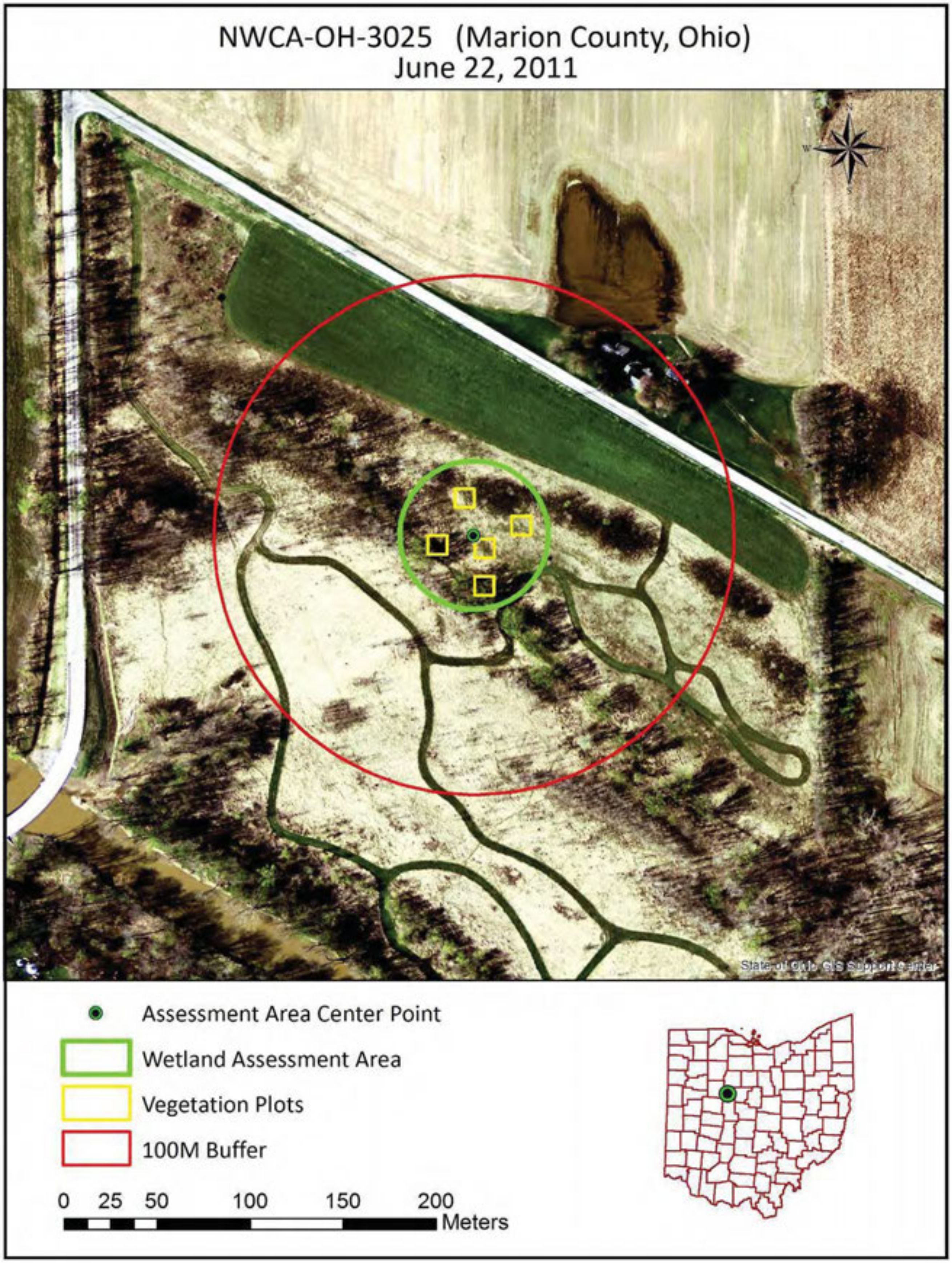
Site Code	Historical Disturbance	Present Disturbance	Historical Hydrology	Present Hydrology	Total Disturbance
OH-3003	1	2	1	2	6
OH-3004	2	1	2	1	6
OH-3005	1	1	2	1	5
OH-3006	1.5	1.5	1.5	1.5	6
OH-3014	3	3	3	3	12
OH-3019	2	2	2	2	8
OH-3020	1	1	1.5	1.5	5
OH-3022	1	2	1	2	6
OH-3025	1	1	1.5	1.5	5
OH-3030	1.5	1.5	1.5	1.5	6
OH-3031	1	1	2	2	6
OH-3044	2	2	2	2	8
OH-3045	2	2	2	2	8
OH-3046	3	3	2	2	10
OH-3048	1	3	1.5	3	8.5
OH-3049	1	2	2	2	7
OH-3050	3	3	3	3	12
OH-3054	1	2	1.5	2	6.5
OH-3057	2	2	2	1	7
OH-3058	1	2	2	2	7
OH-3062	2	2	2	2	8
OH-3063	1	1	1	1	4
OH-3066	3	3	3	3	12
OH-3068	1.5	2	1	1	5.5
OH-3070	1.5	1.5	2	2	7
OH-3072	1.5	1.5	1.5	1.5	6
OH-3073	1	1	1.5	1.5	5
OH-3075	1	1	1.5	1.5	5
OH-3080	NA	2	NA	2	4
OH-3081	1	2	1	1.5	5.5
OH-3082	3	2.5	3	2.5	11
OH-3083	1	1	1	1	4
OH-3085	1	3	1	3	8
OH-3086	2	2	1.5	1.5	7
OH-3090	2	2	1.5	1.5	7
OH-3094	3	3	3	2.5	11.5
OH-3097	1	2	1.5	2	6.5
OH-3099	2	2	3	3	10
OH-3100	1.5	1.5	1.5	1.5	6
OH-3104	1	2	1	1.5	5.5
OH-3105	1	1.5	1	1.5	5
OH-3106	1	2	1.5	2	6.5
OH-3107	3	3	3	3	12
OH-3118	1.5	1.5	1	1	5
OH-3132	1	2	1	1.5	5.5
OH-3136	1	2	3	3	9
OH-3138	1	1	1	1	4
OH-3139	1	1	1	1	4
OH-3142	2	2	3	1	8
OH-3143	1.5	1.5	1.5	1.5	6

Appendix I. Site maps for all 50 wetlands included in the Ohio NWCA intensification study.

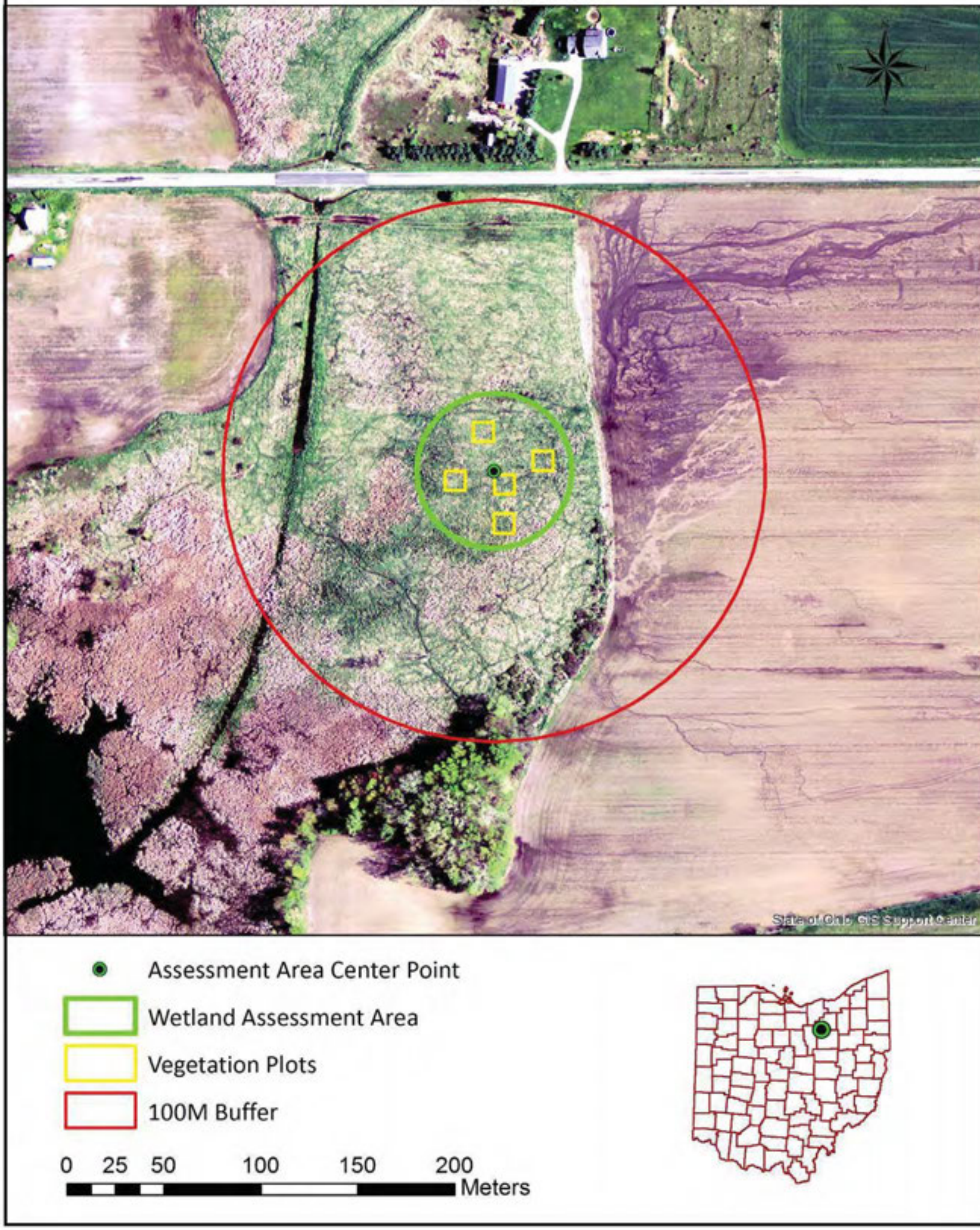


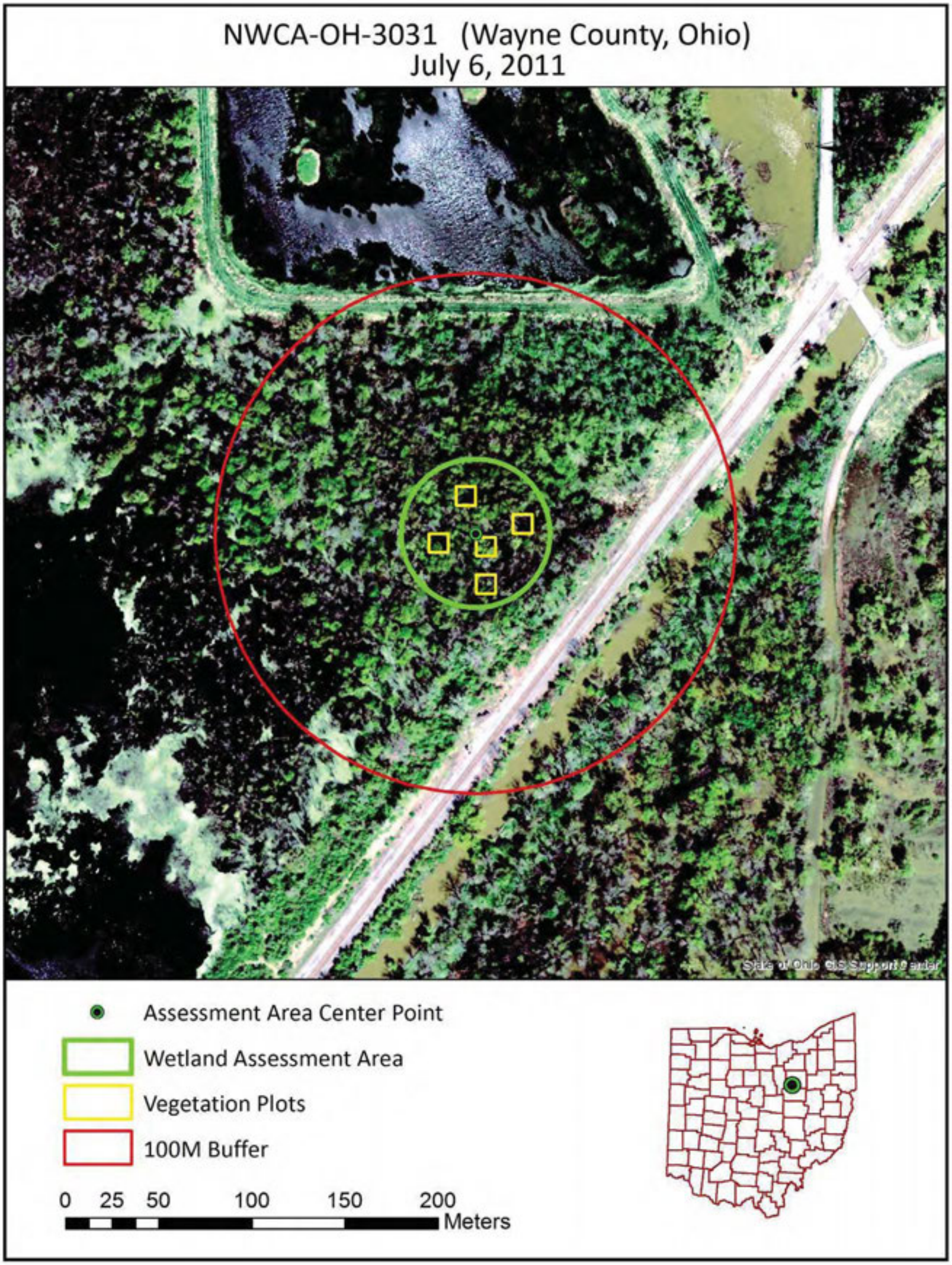
NWCA-OH-3019 (Richland County, Ohio)
June 15, 2011



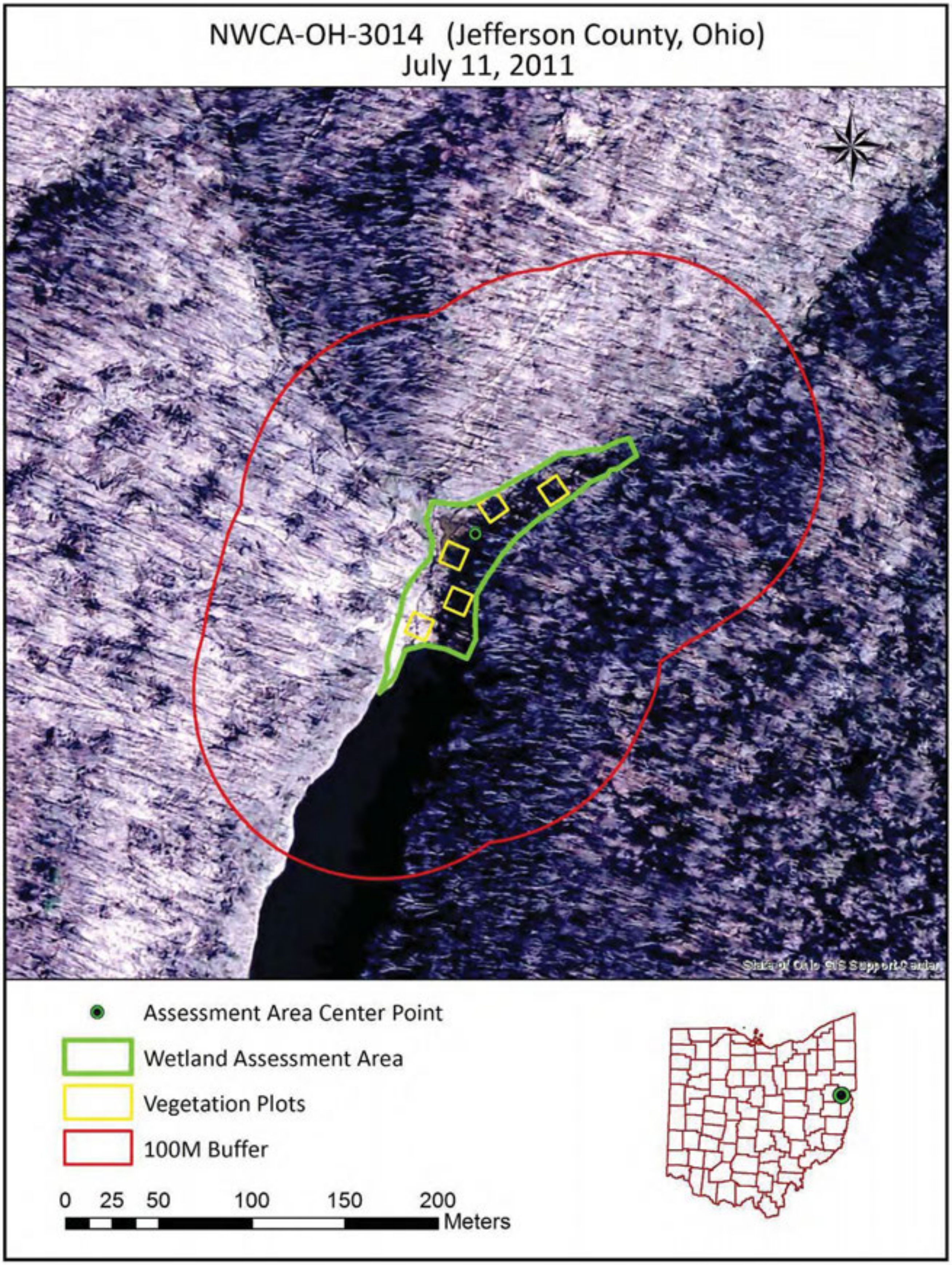

NWCA-OH-3025 (Marion County, Ohio)
June 22, 2011
State of Ohio GIS Support Center
Assessment Area Center Point
Wetland Assessment Area
Vegetation Plots
100M Buffer
0 25 50 100 150 200
Meters

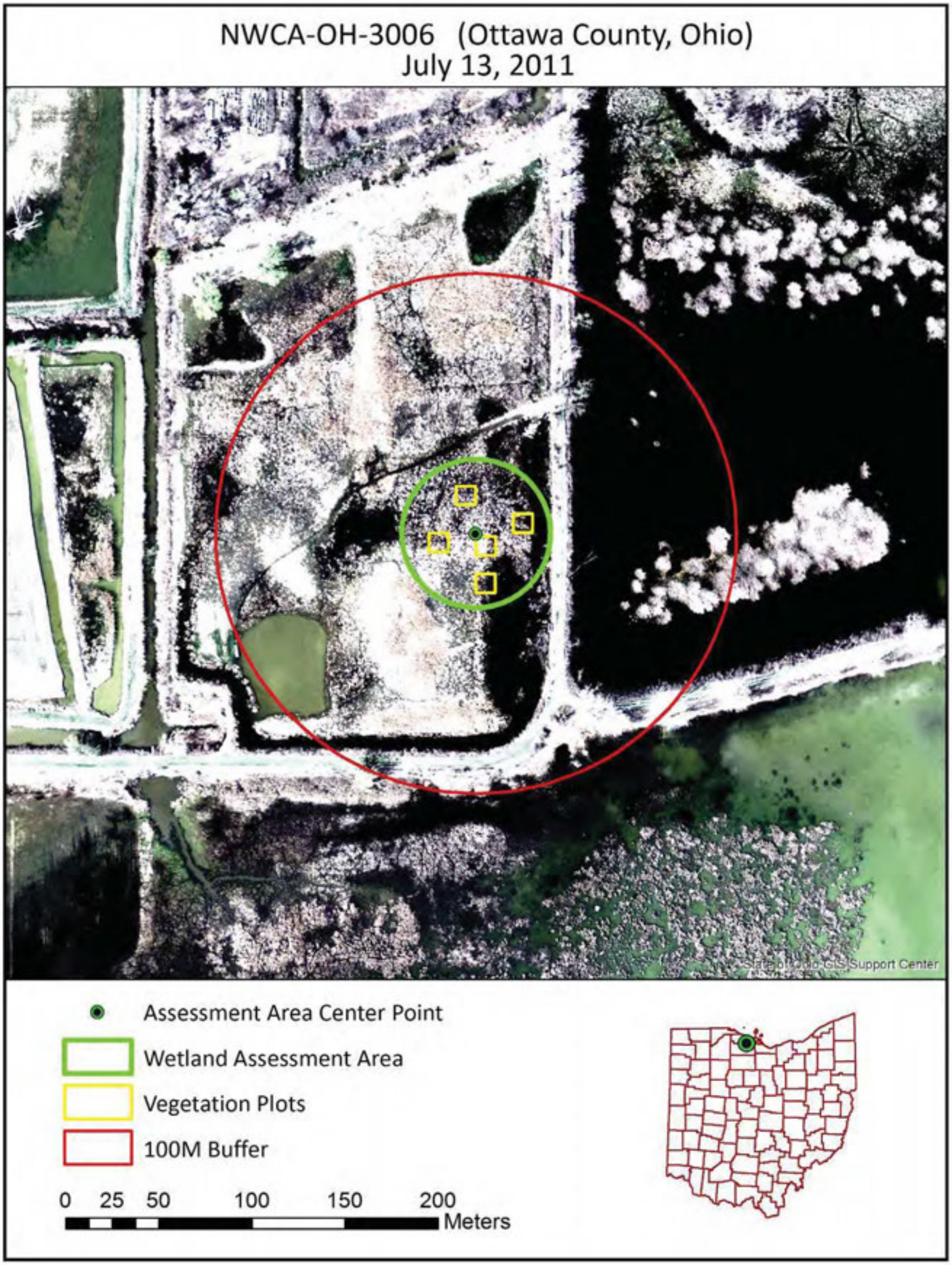
NWCA-OH-3020 (Medina County, Ohio)
June 29, 2011

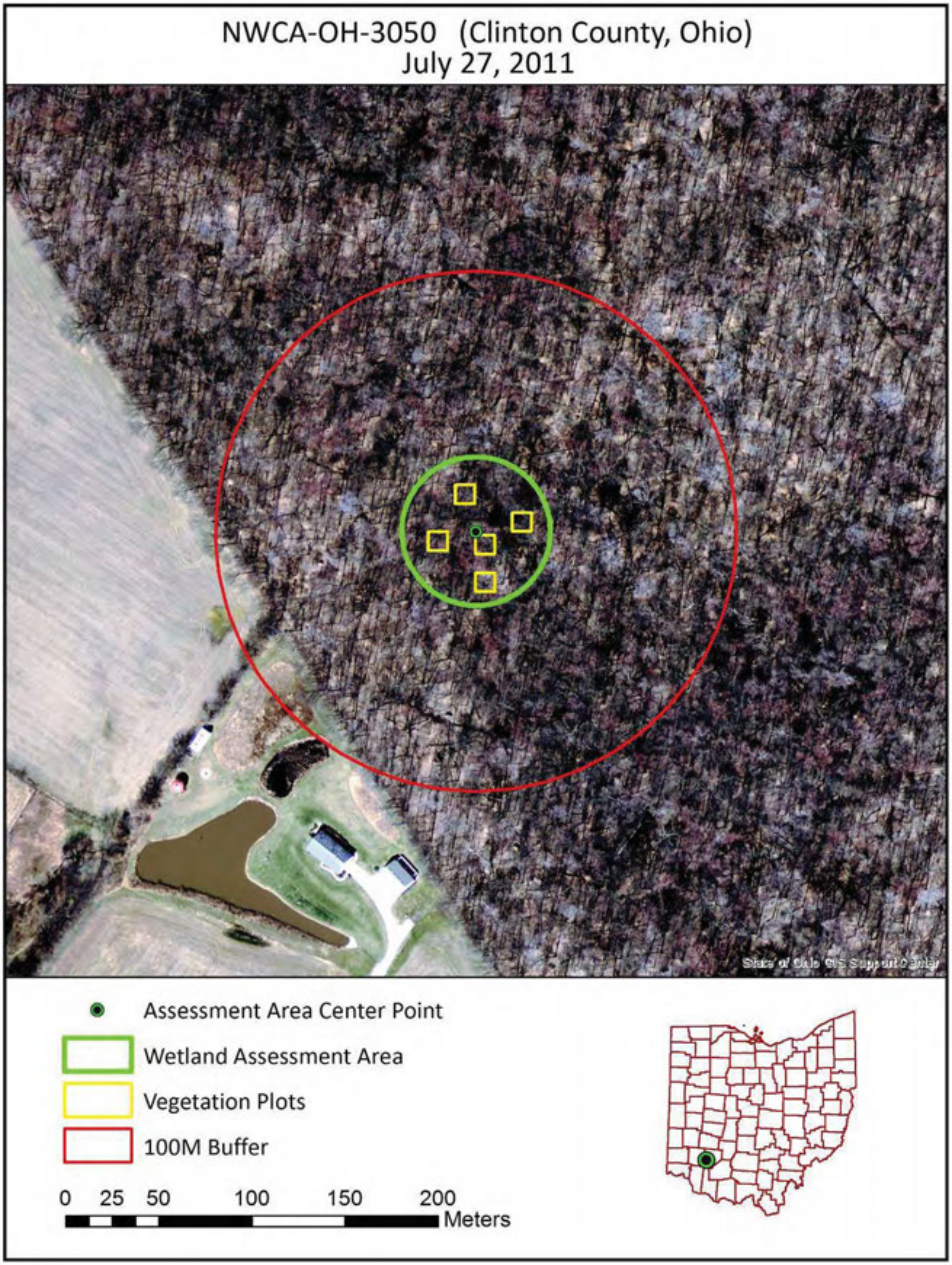




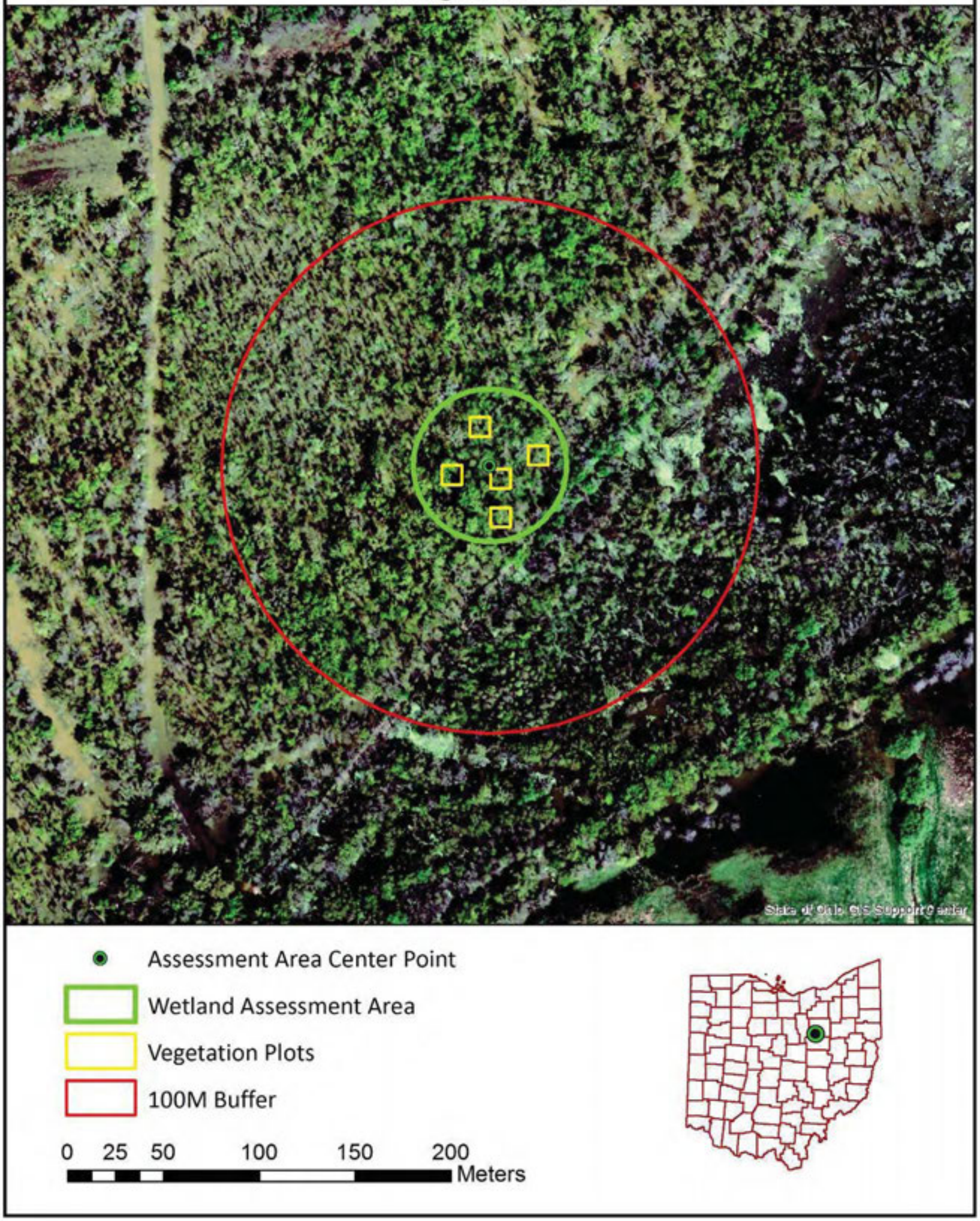
NWCA-OH-3031 (Wayne County, Ohio)
July 6, 2011
State of Ohio GIS Support Center
Assessment Area Center Point
Wetland Assessment Area
Vegetation Plots
100M Buffer
0 25 50 100 150 200
Meters


NWCA-OH-3014 (Jefferson County, Ohio)
July 11, 2011
Assessment Area Center Point
Wetland Assessment Area
Vegetation Plots
100M Buffer
0 25 50 100 150 200
Meters

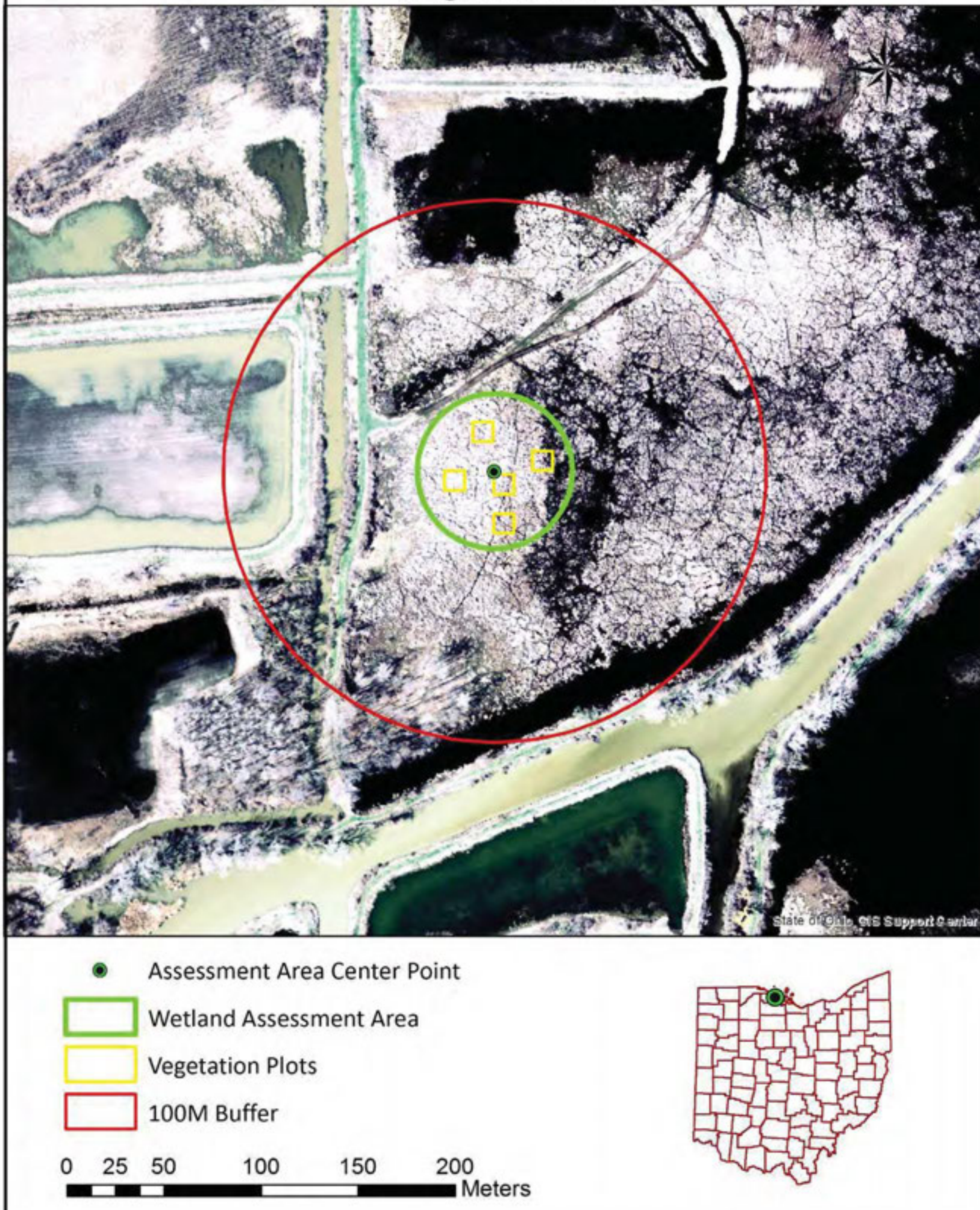

NWCA-OH-3006 (Ottawa County, Ohio)
July 13, 2011
State of Ohio GIS Support Center
Assessment Area Center Point
Wetland Assessment Area
Vegetation Plots
100M Buffer
0 25 50 100 150 200
Meters


NWCA-OH-3050 (Clinton County, Ohio)
July 27, 2011
State of Ohio GIS Support Center
Assessment Area Center Point
Wetland Assessment Area
Vegetation Plots
100M Buffer
0 25 50 100 150 200
Meters

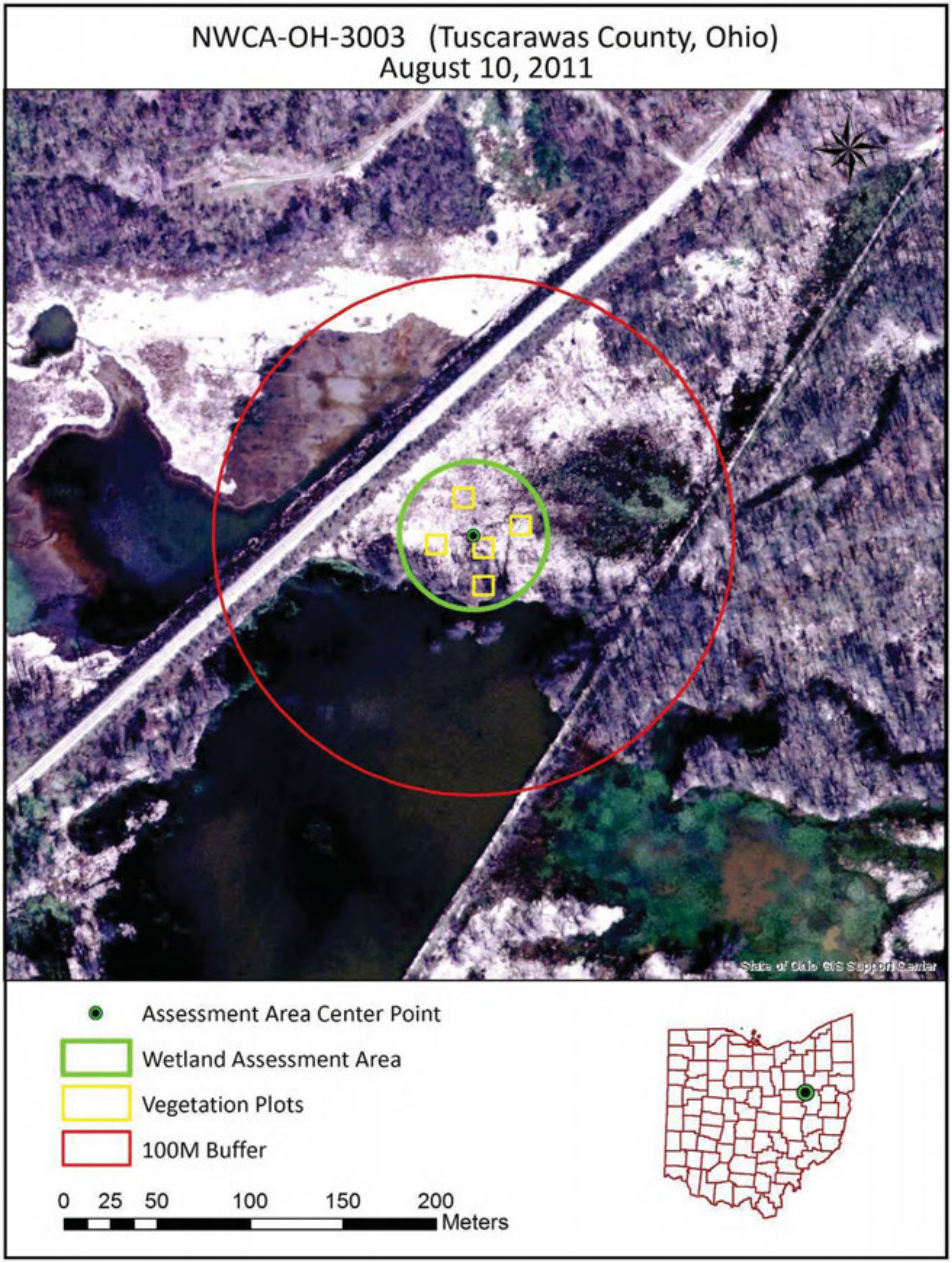
NWCA-OH-3057 (Wayne County, Ohio)
August 1, 2011

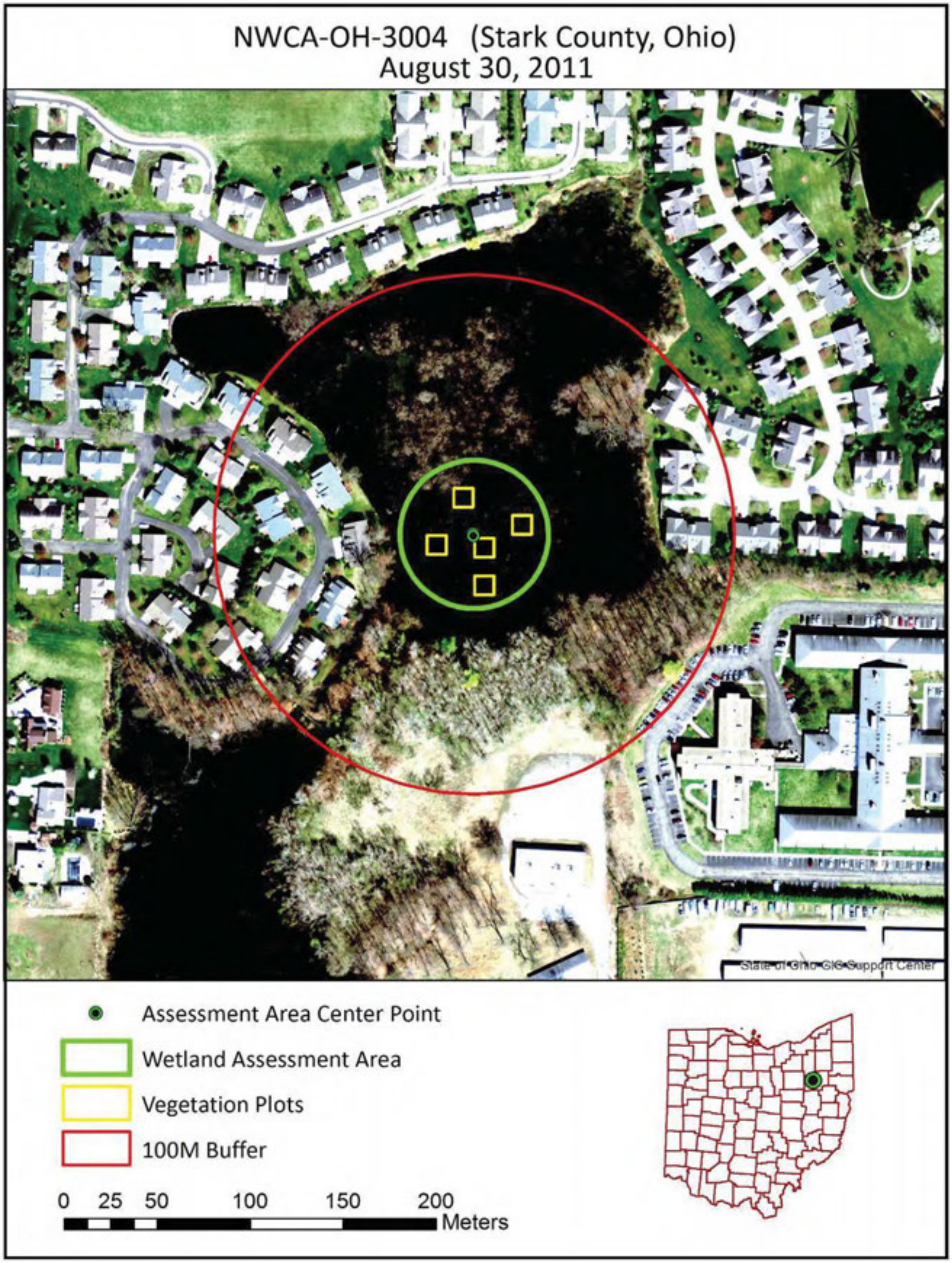


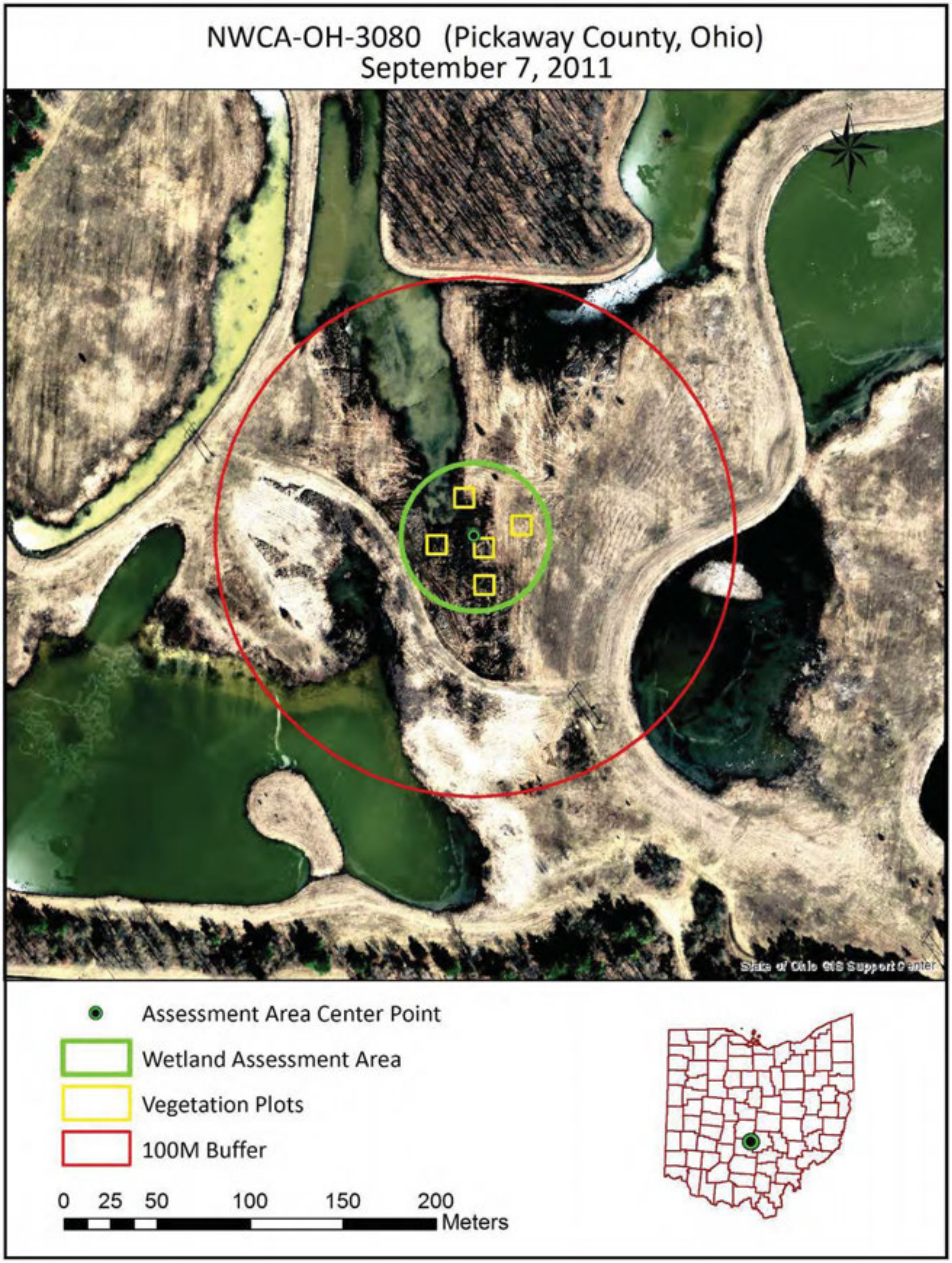
NWCA-OH-3030 (Ottawa County, Ohio)
August 3, 2011




NWCA-OH-3005 (Fairfield County, Ohio)
August 8, 2011
State of Ohio GIS Support Center
Assessment Area Center Point
Wetland Assessment Area
Vegetation Plots
100M Buffer
0 25 50 100 150 200
Meters


NWCA-OH-3003 (Tuscarawas County, Ohio)
August 10, 2011
State of Ohio GIS Support Center
Assessment Area Center Point
Wetland Assessment Area
Vegetation Plots
100M Buffer
0 25 50 100 150 200
Meters


NWCA-OH-3004 (Stark County, Ohio)
August 30, 2011
State of Ohio GIS Support Center
Assessment Area Center Point
Wetland Assessment Area
Vegetation Plots
100M Buffer
0 25 50 100 150 200
Meters


NWCA-OH-3080 (Pickaway County, Ohio)
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Wetland Assessment Area
Vegetation Plots
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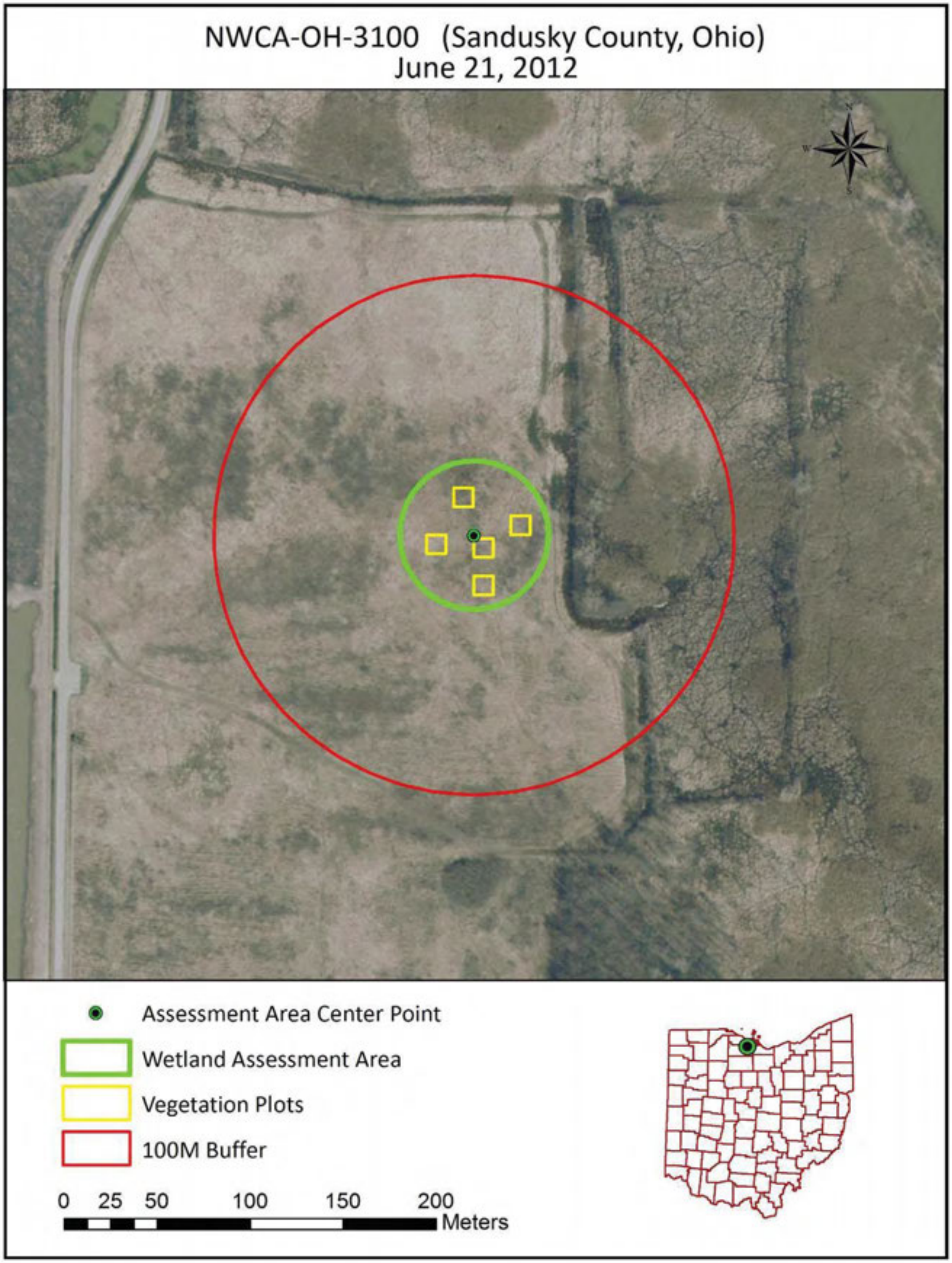
Meters


NWCA-OH-3100 (Sandusky County, Ohio)
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Wetland Assessment Area
Vegetation Plots
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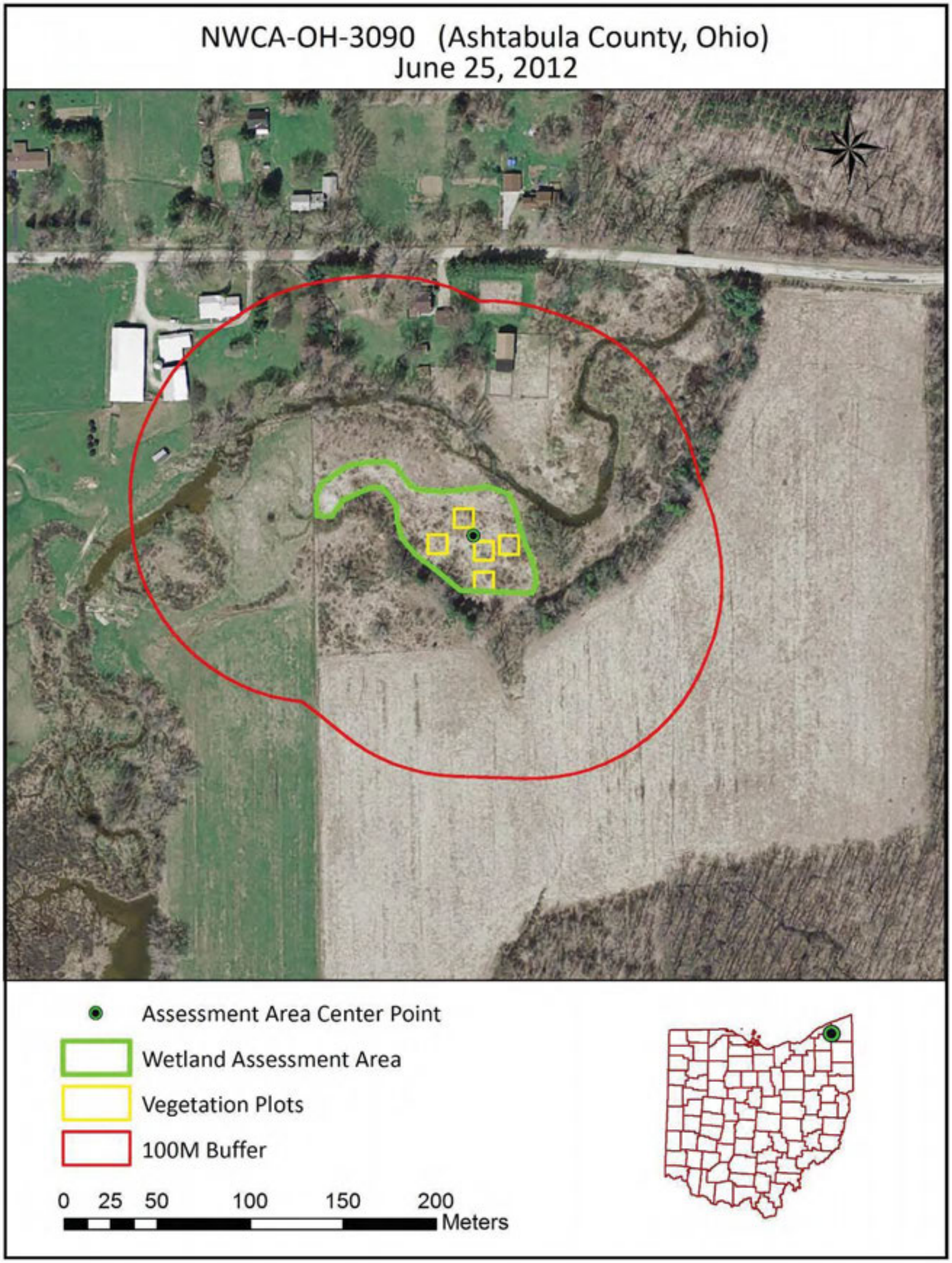
Meters


NWCA-OH-3090 (Ashtabula County, Ohio)
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Wetland Assessment Area
Vegetation Plots
100M Buffer
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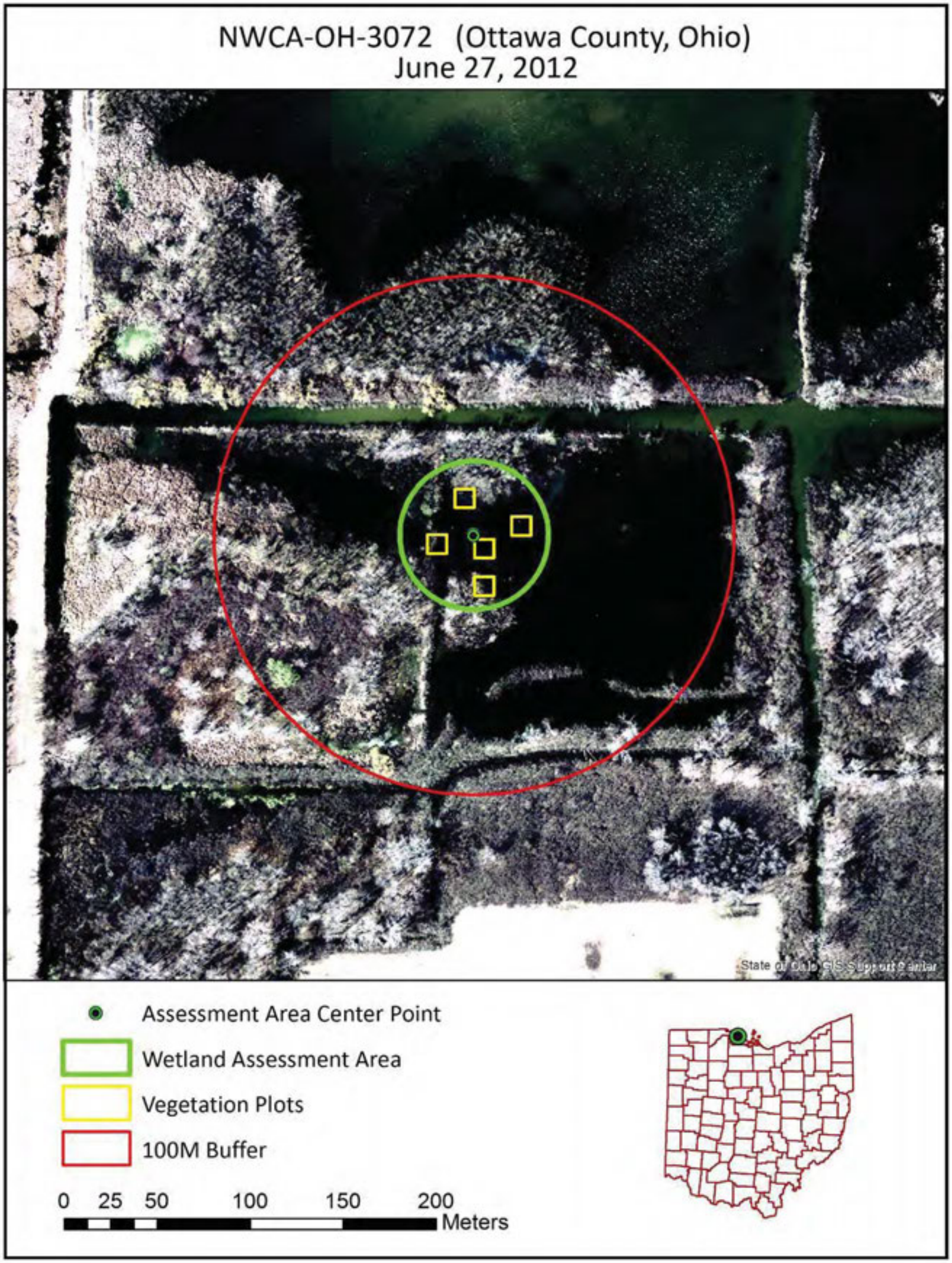
Meters


NWCA-OH-3072 (Ottawa County, Ohio)
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Vegetation Plots
100M Buffer
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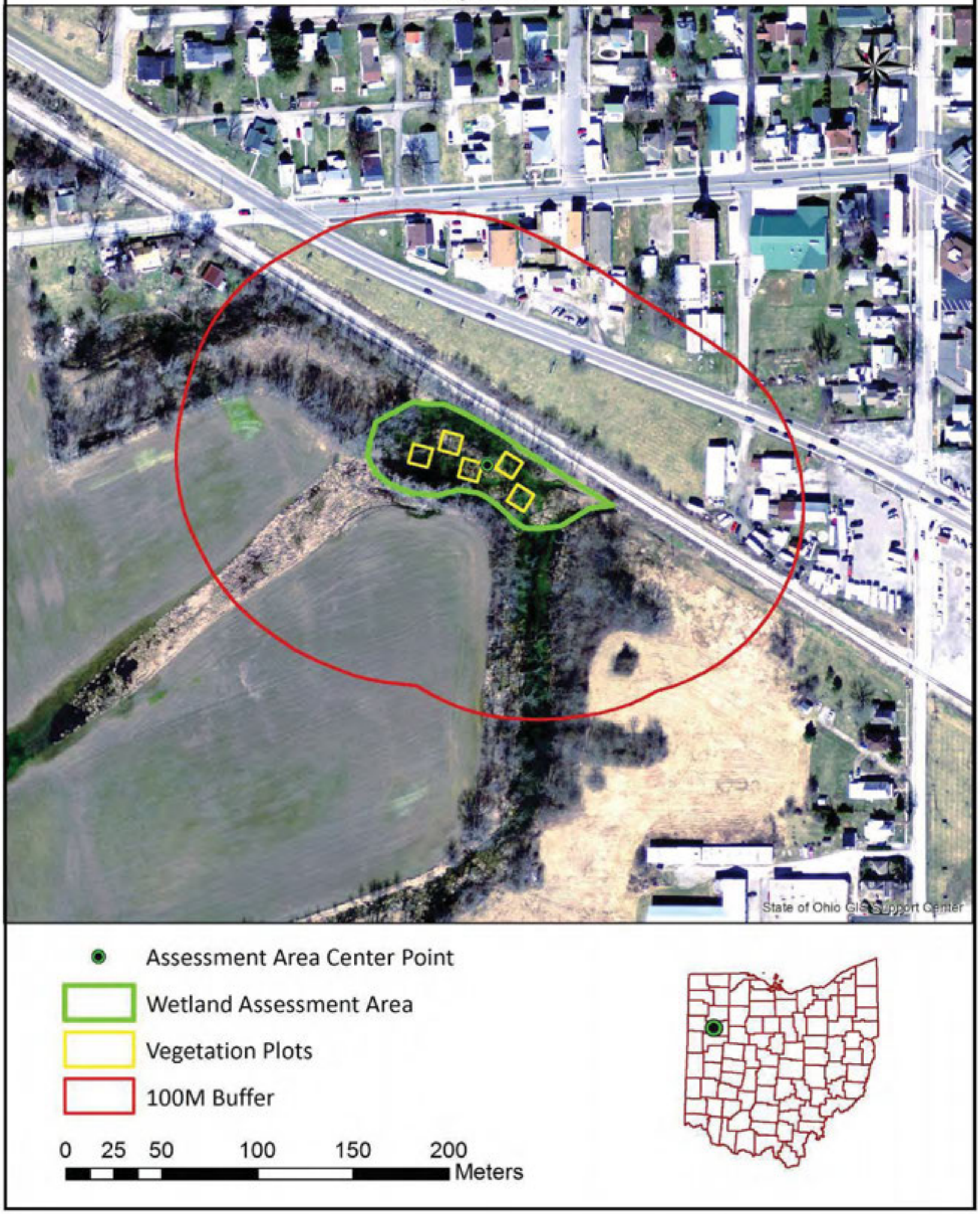
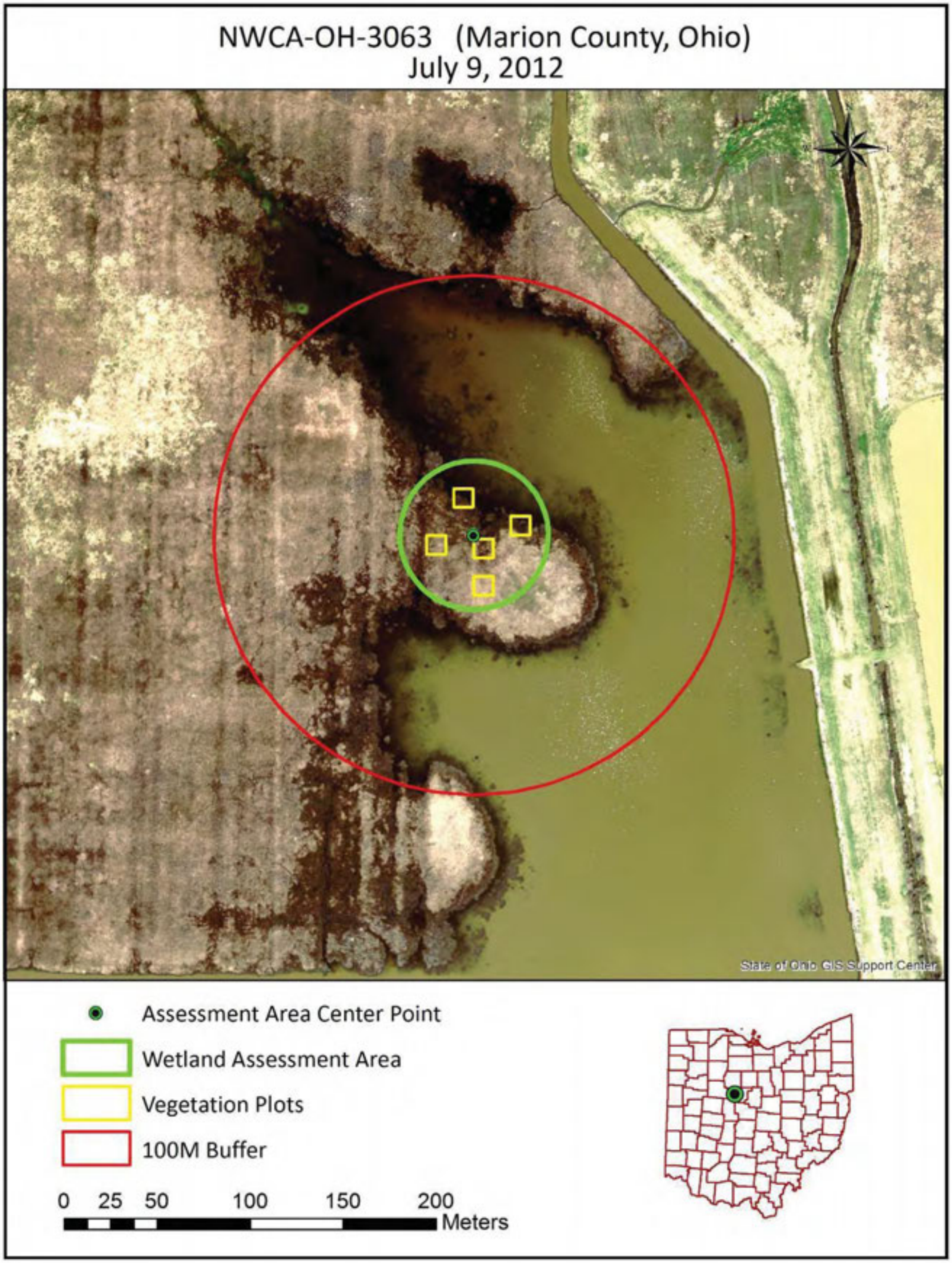
Meters

NWCA-OH-3045 (Allen County, Ohio)
July 2, 2012




NWCA-OH-3063 (Marion County, Ohio)
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Assessment Area Center Point
Wetland Assessment Area
Vegetation Plots
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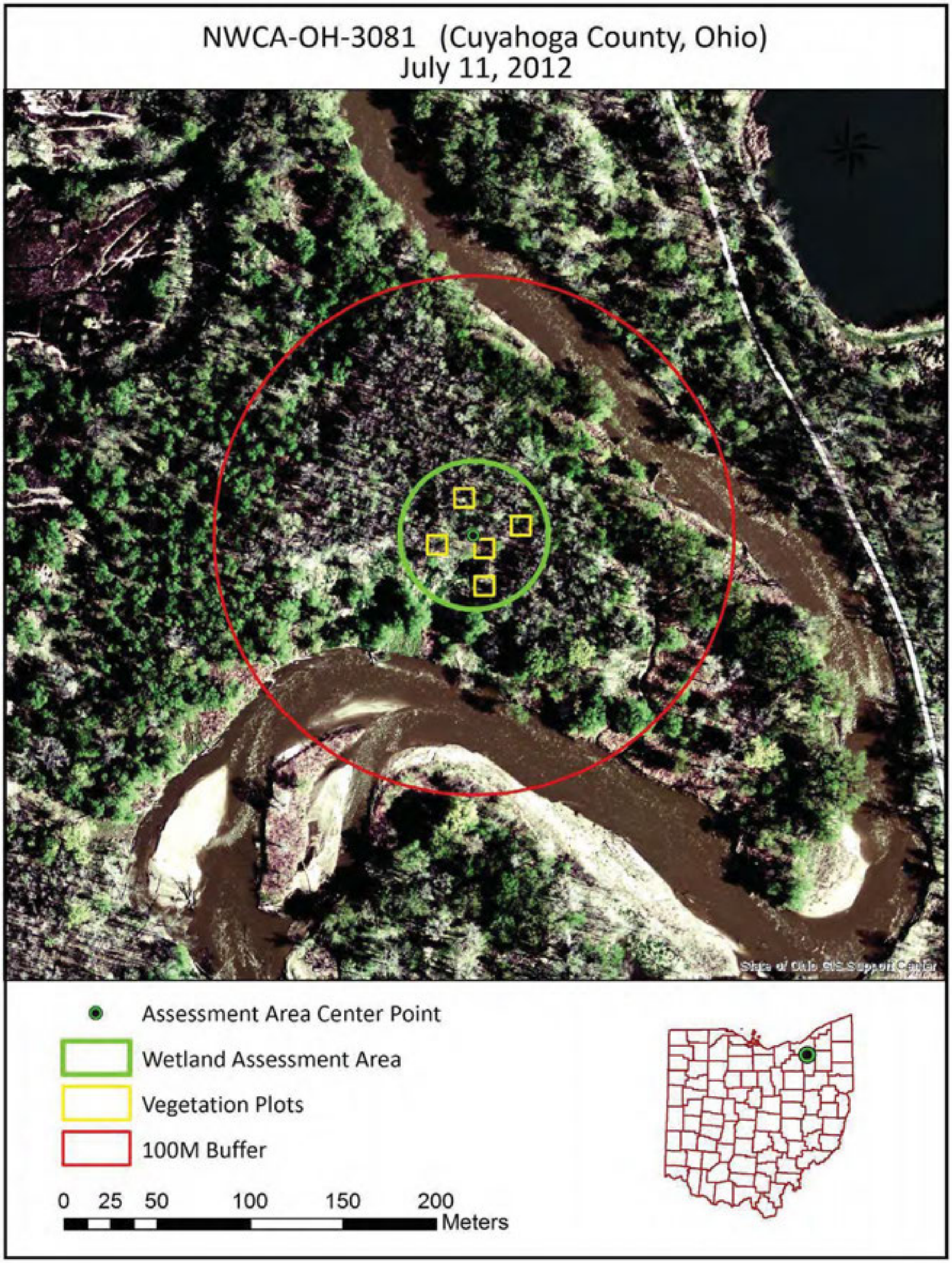
Meters


NWCA-OH-3081 (Cuyahoga County, Ohio)
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Assessment Area Center Point
Wetland Assessment Area
Vegetation Plots
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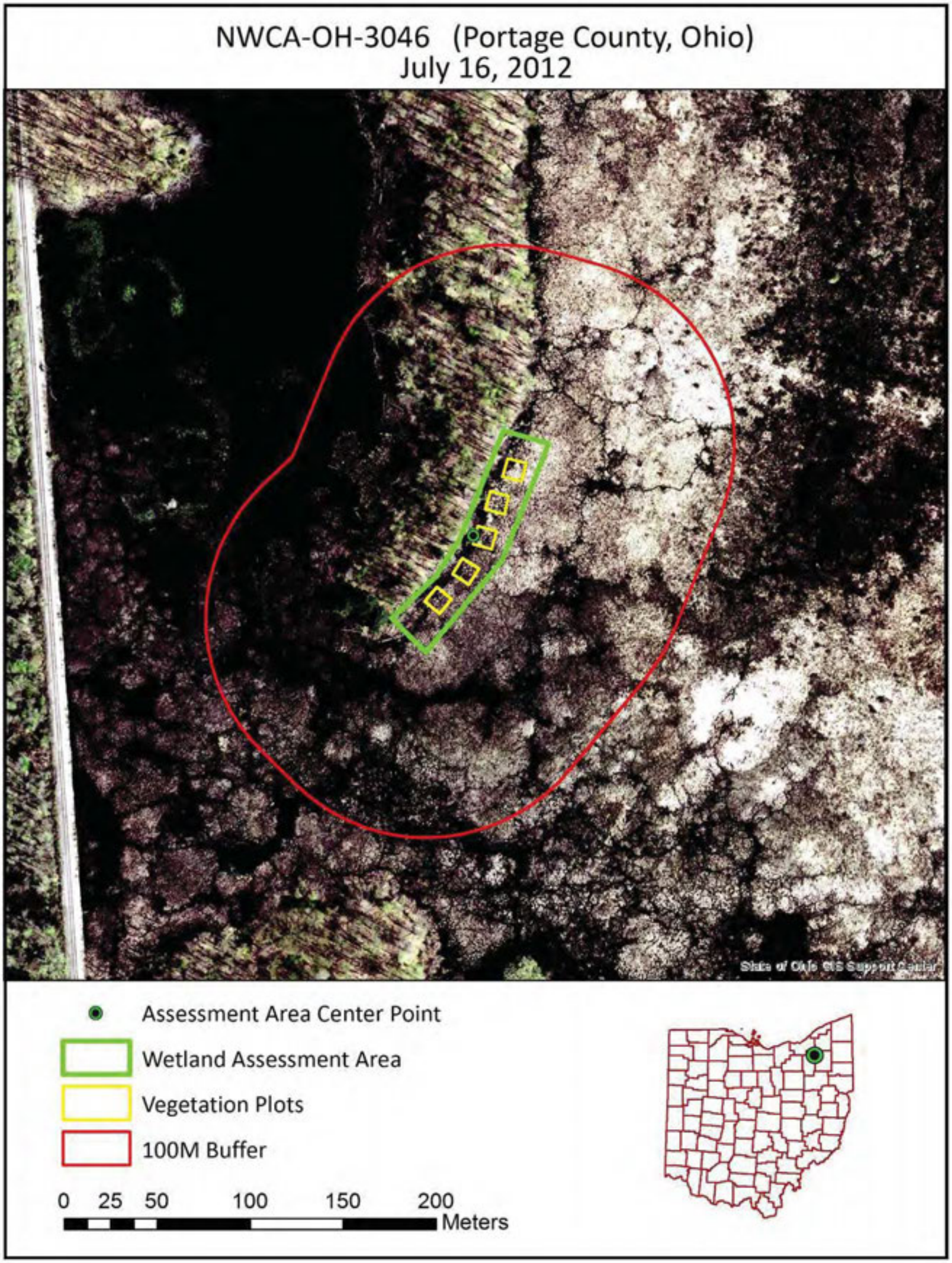
Meters


NWCA-OH-3046 (Portage County, Ohio)
July 16, 2012
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Assessment Area Center Point
Wetland Assessment Area
Vegetation Plots
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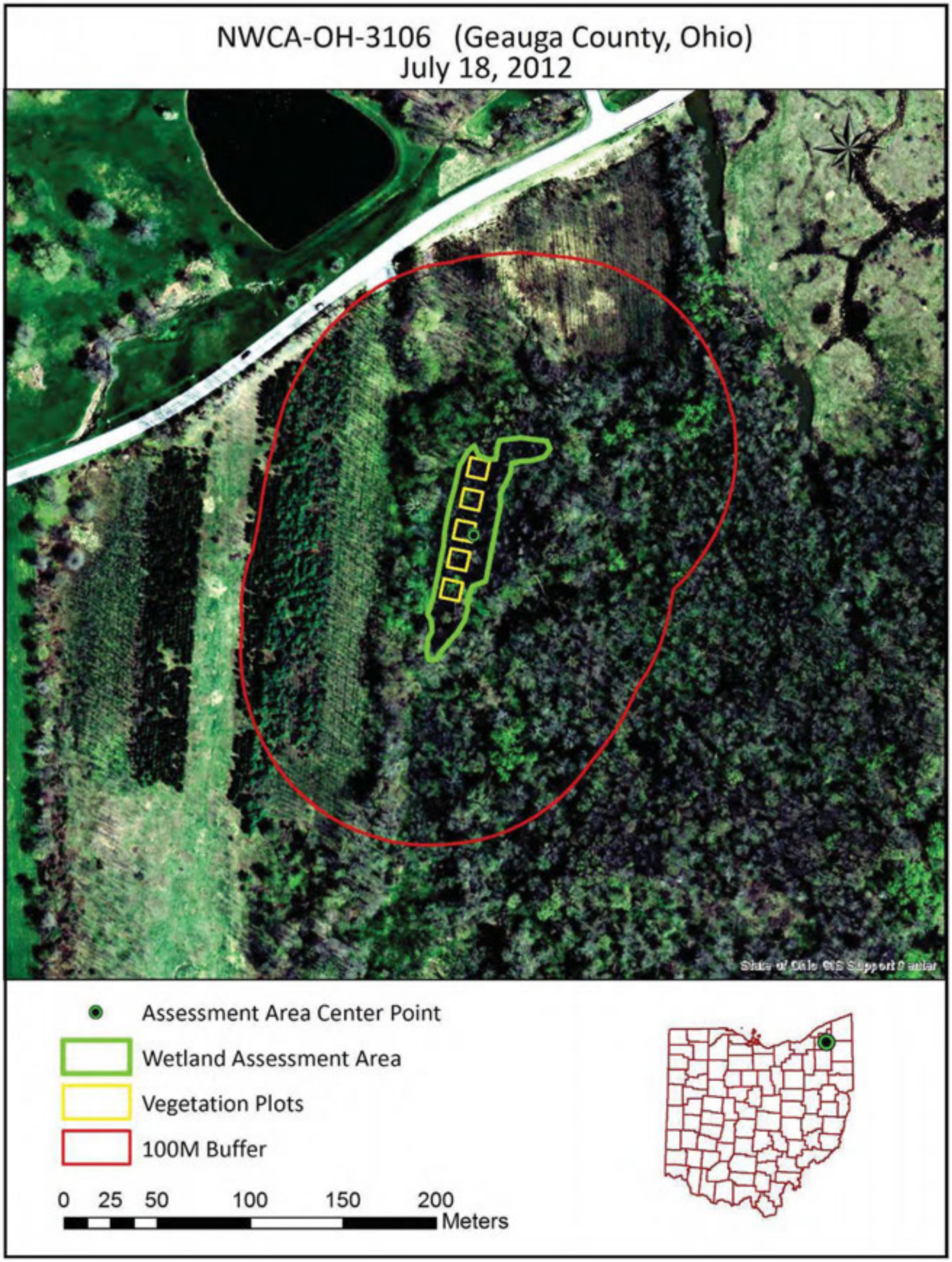
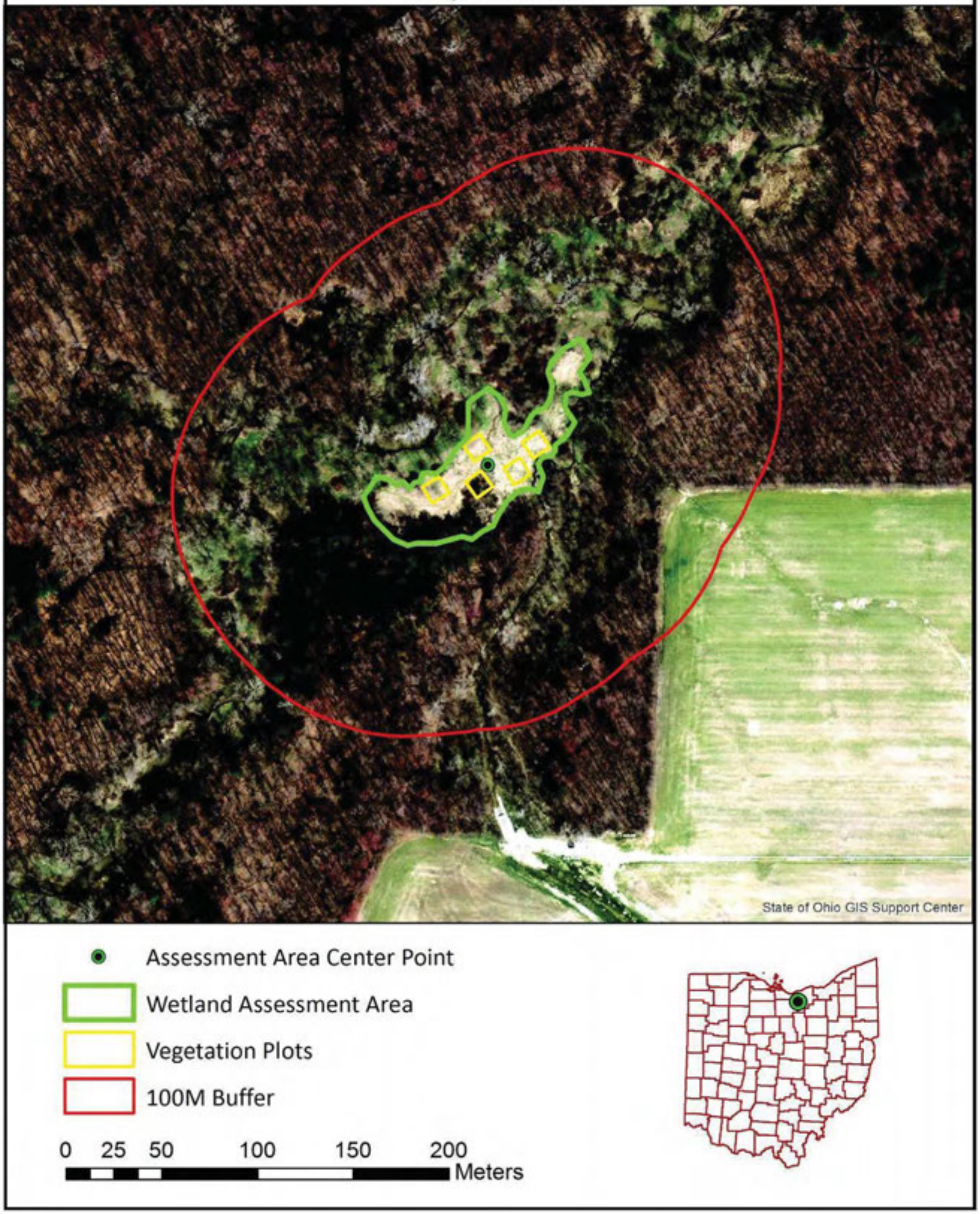
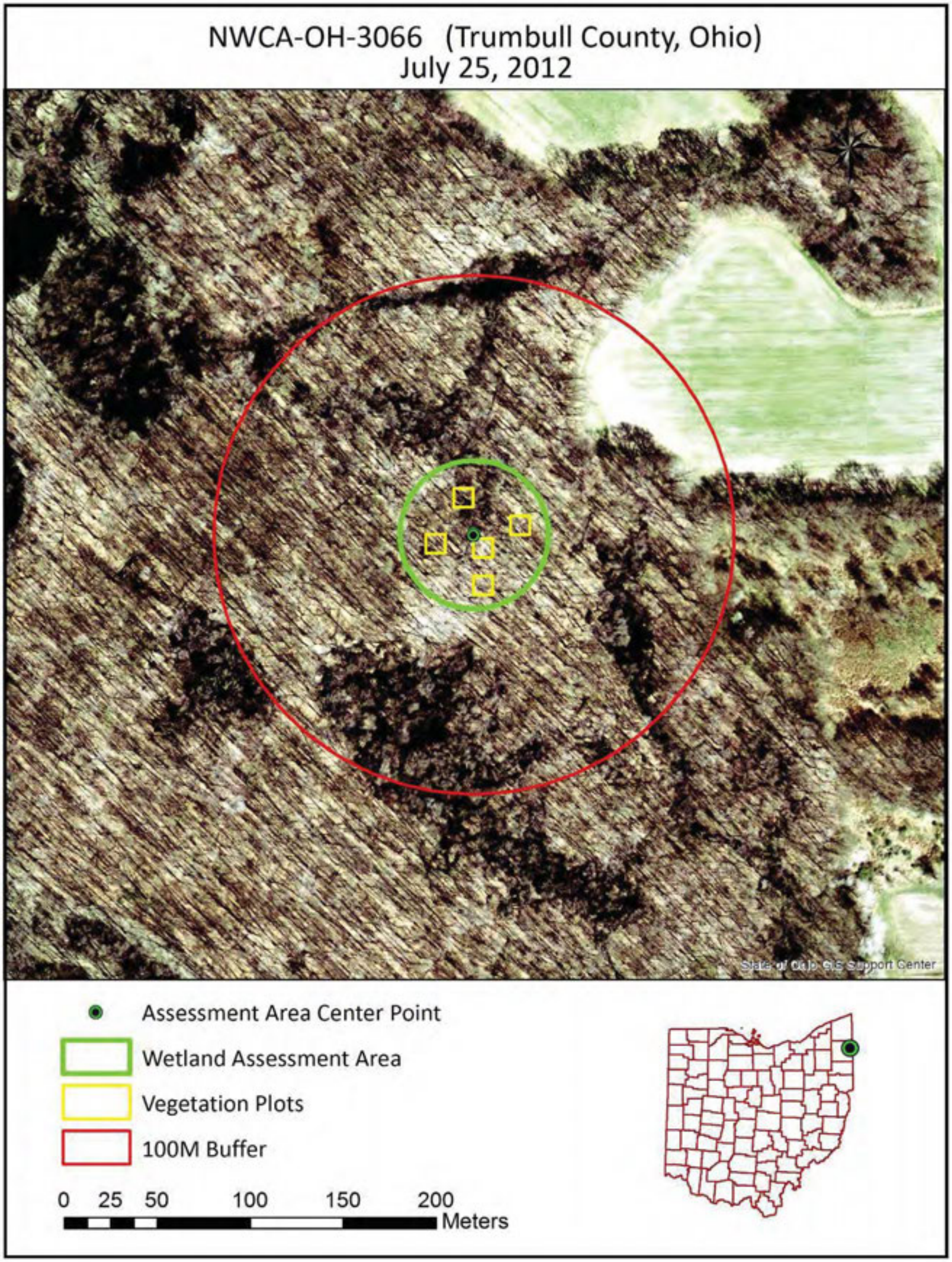
Meters


NWCA-OH-3106 (Geauga County, Ohio)
July 18, 2012
State of Ohio GIS Support Center
Assessment Area Center Point
Wetland Assessment Area
Vegetation Plots
100M Buffer
0 25 50 100 150 200
Meters

NWCA-OH-3104 (Lorain County, Ohio)
July 23, 2012




NWCA-OH-3066 (Trumbull County, Ohio)
July 25, 2012
State of Ohio GIS Support Center
Assessment Area Center Point
Wetland Assessment Area
Vegetation Plots
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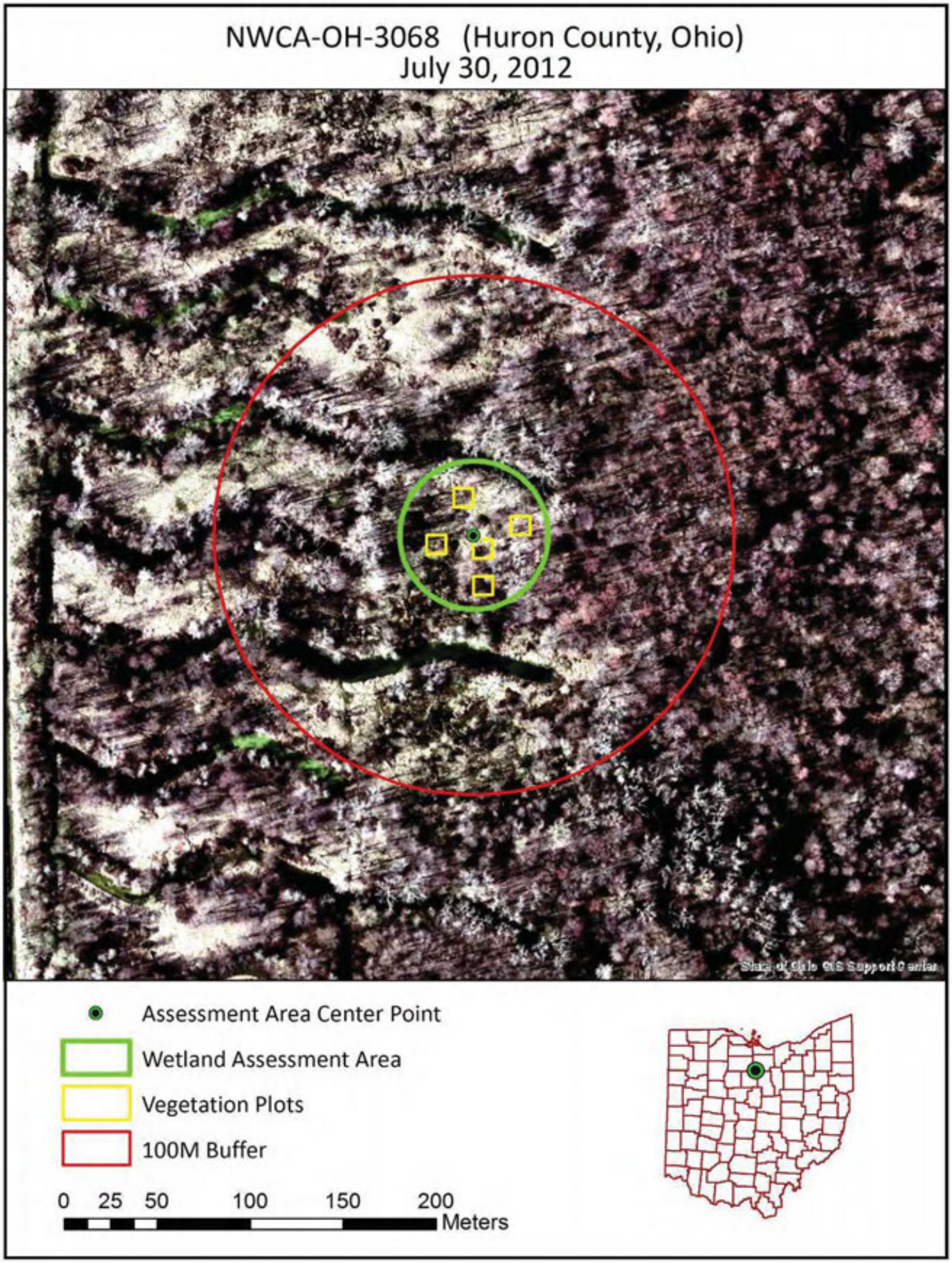
Meters


NWCA-OH-3068 (Huron County, Ohio)
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State of Ohio GIS Support Center
Assessment Area Center Point
Wetland Assessment Area
Vegetation Plots
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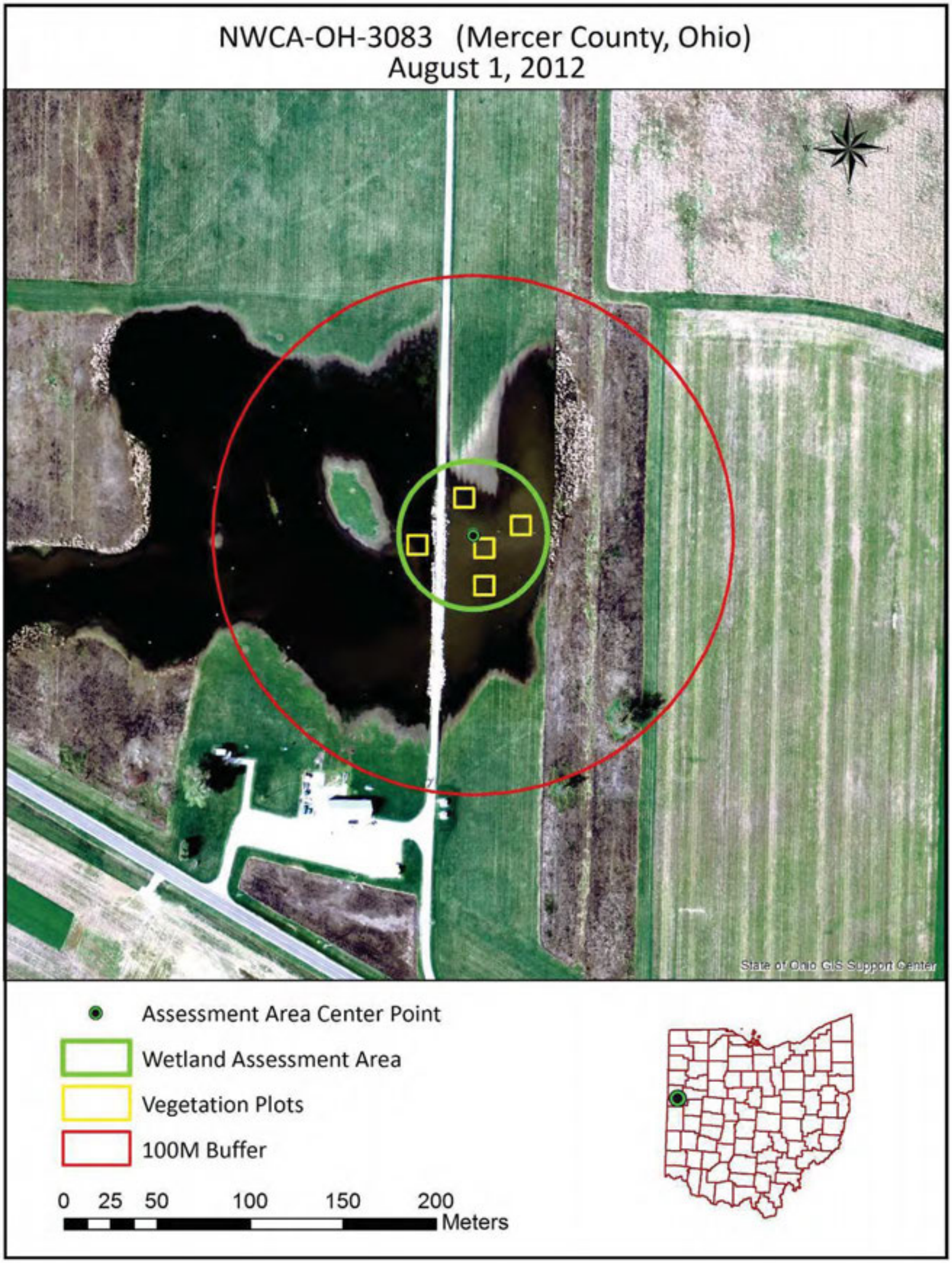
Meters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August 1, 2012
State of Ohio GIS Support Center
Assessment Area Center Point
Wetland Assessment Area
Vegetation Plots
100M Buffer
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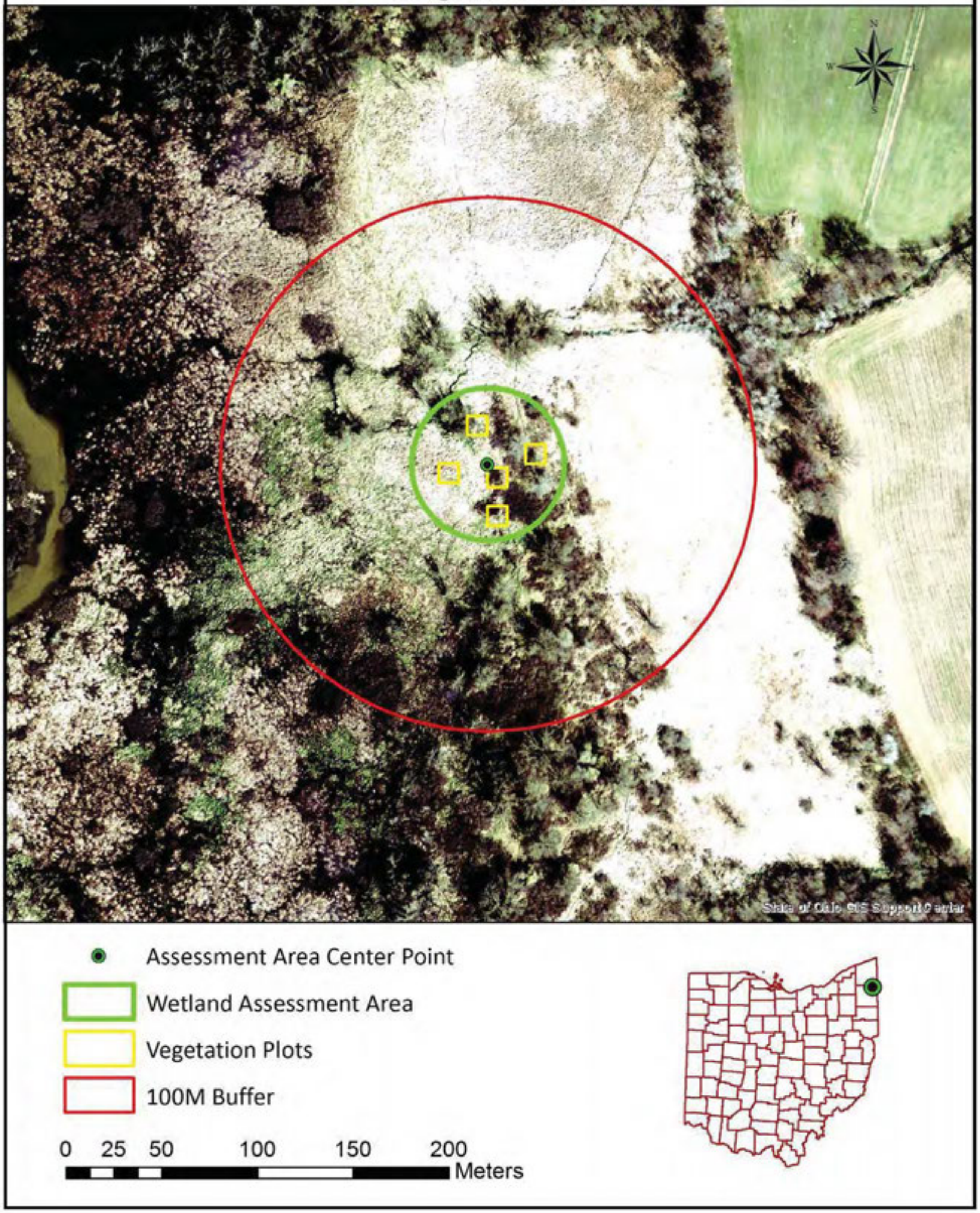
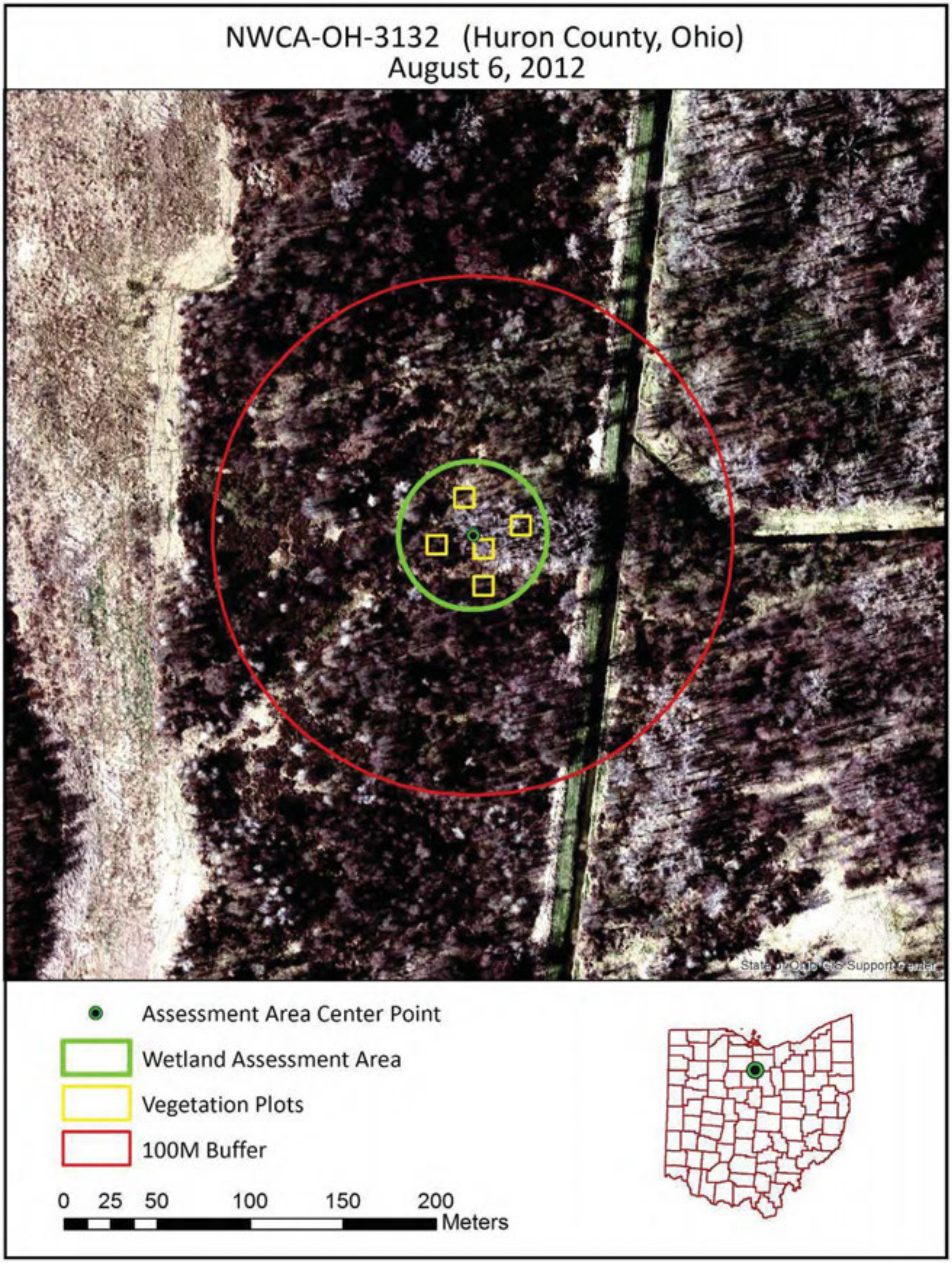
Meters

NWCA-OH-3044 (Trumbull County, Ohio)
August 8, 2012




NWCA-OH-3132 (Huron County, Ohio)
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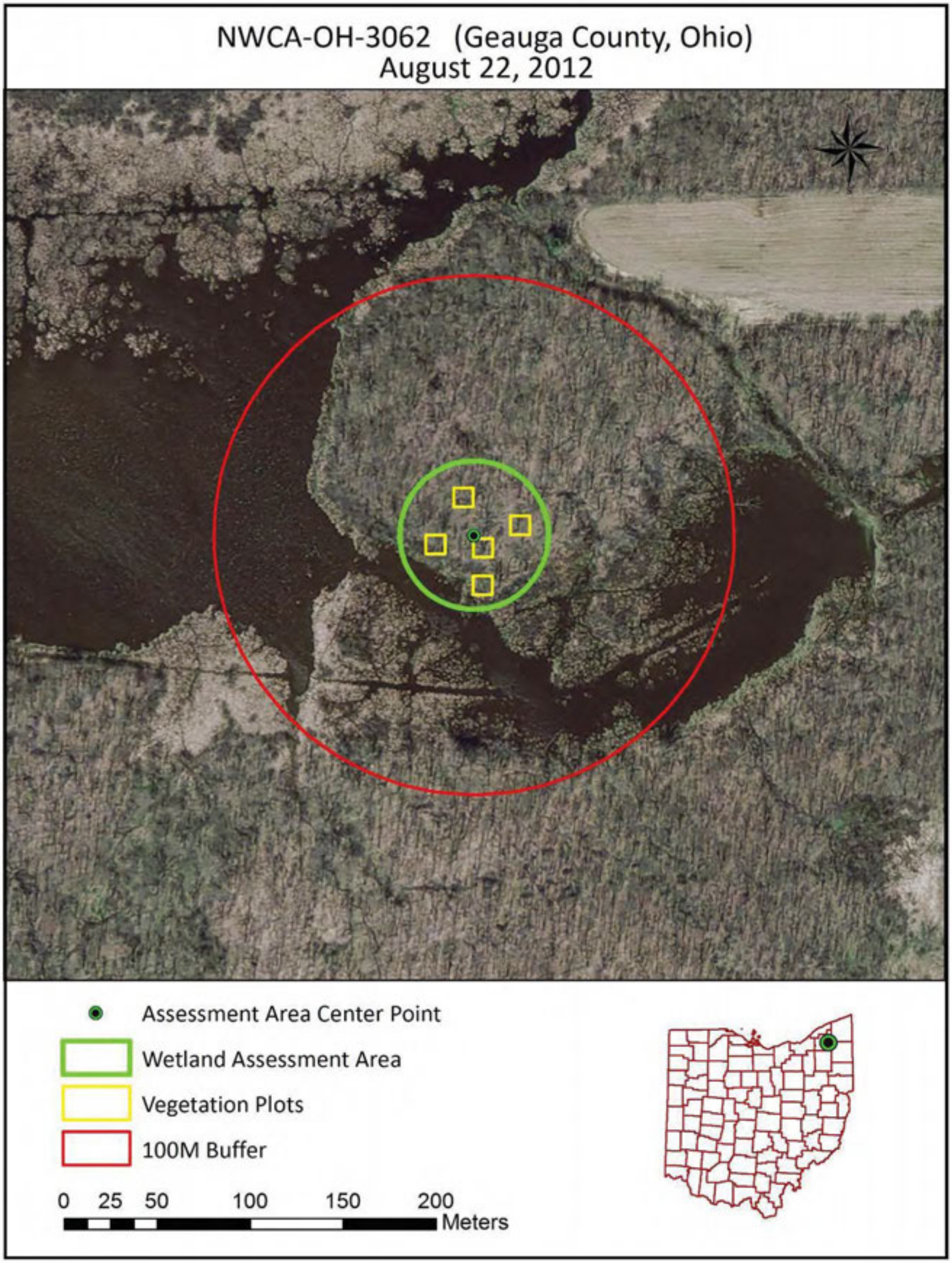
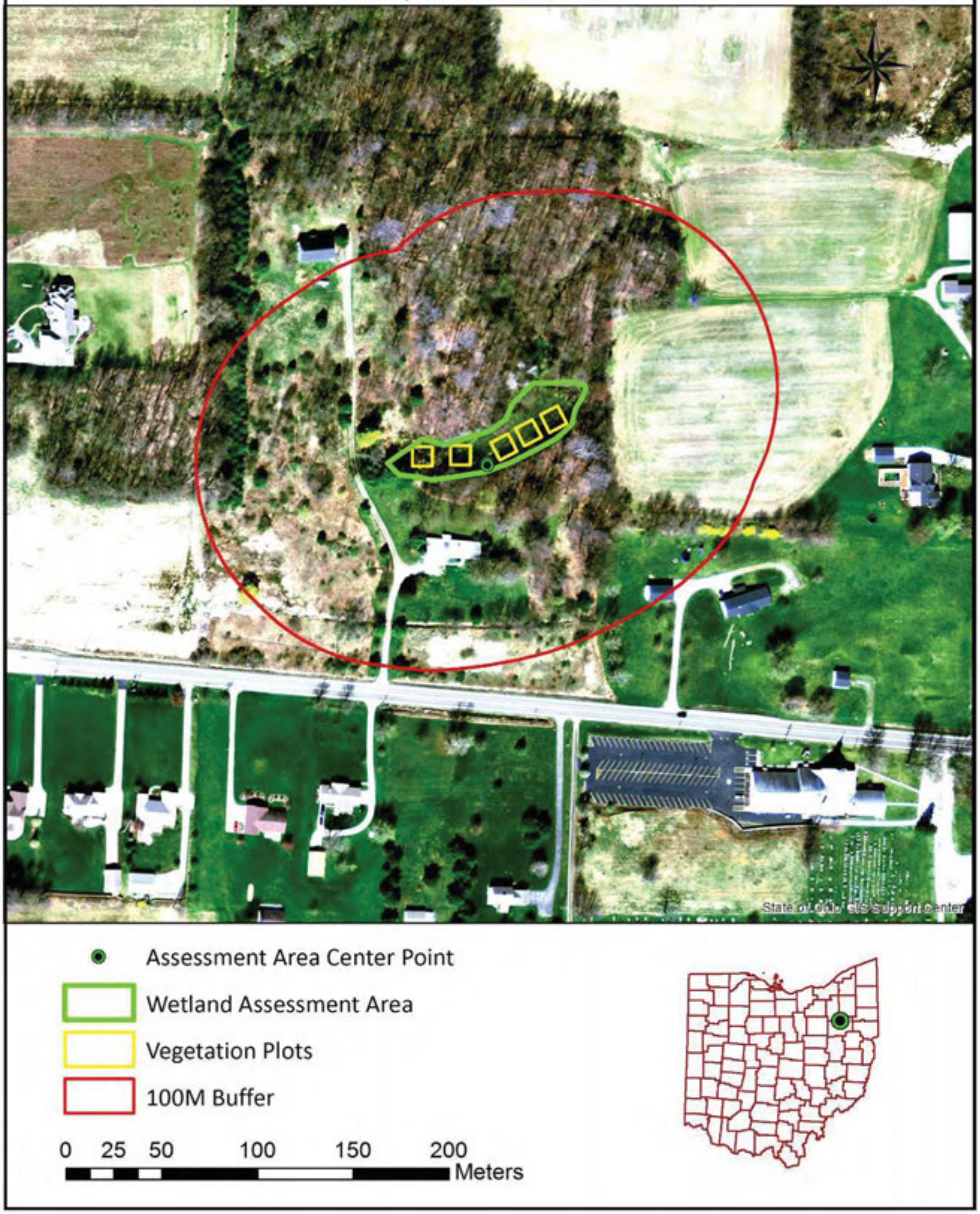
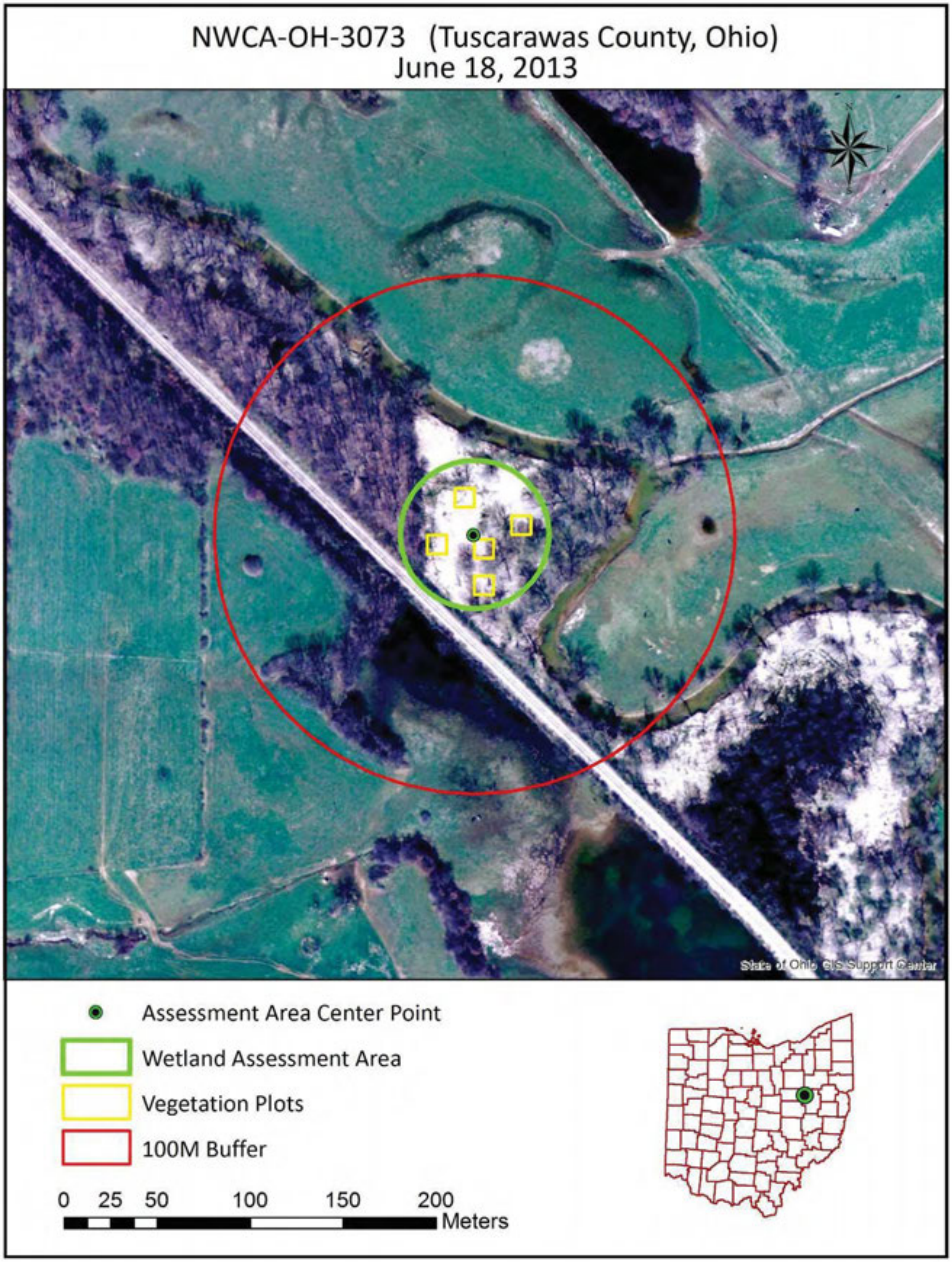
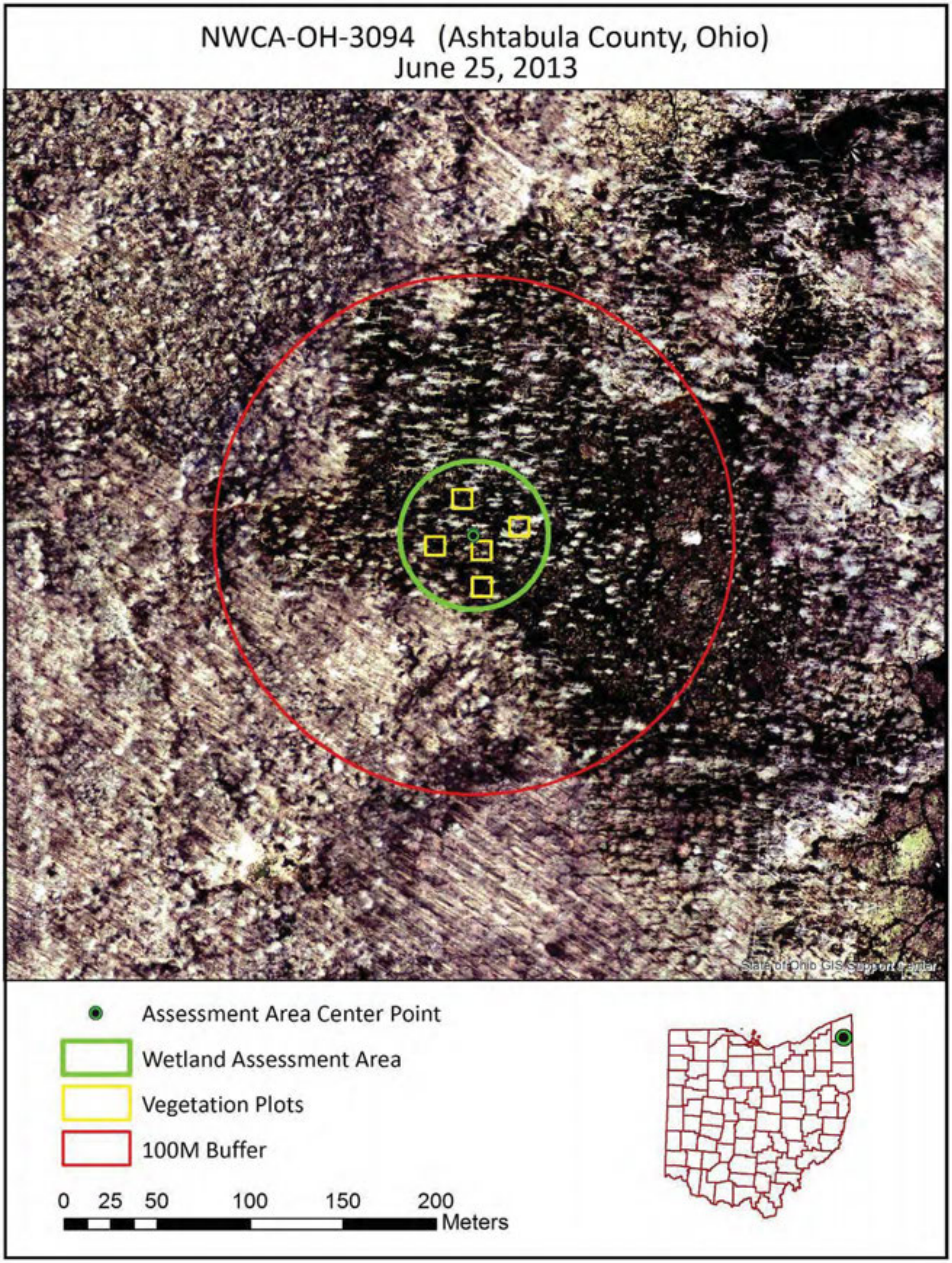
State of Ohio GIS Support Center
Assessment Area Center Point
Wetland Assessment Area
Vegetation Plots
100M Buffer
0 25 50 100 150 200
Meters


NWCA-OH-3062 (Geauga County, Ohio)
August 22, 2012
Assessment Area Center Point
Wetland Assessment Area
Vegetation Plots
100M Buffer
0 25 50 100 150 200
Meters

NWCA-OH-3097 (Stark County, Ohio)
September 5, 2012




NWCA-OH-3073 (Tuscarawas County, Ohio)
June 18, 2013
State of Ohio GIS Support Center
Assessment Area Center Point
Wetland Assessment Area
Vegetation Plots
100M Buffer
0 25 50 100 150 200
Meters


NWCA-OH-3094 (Ashtabula County, Ohio)
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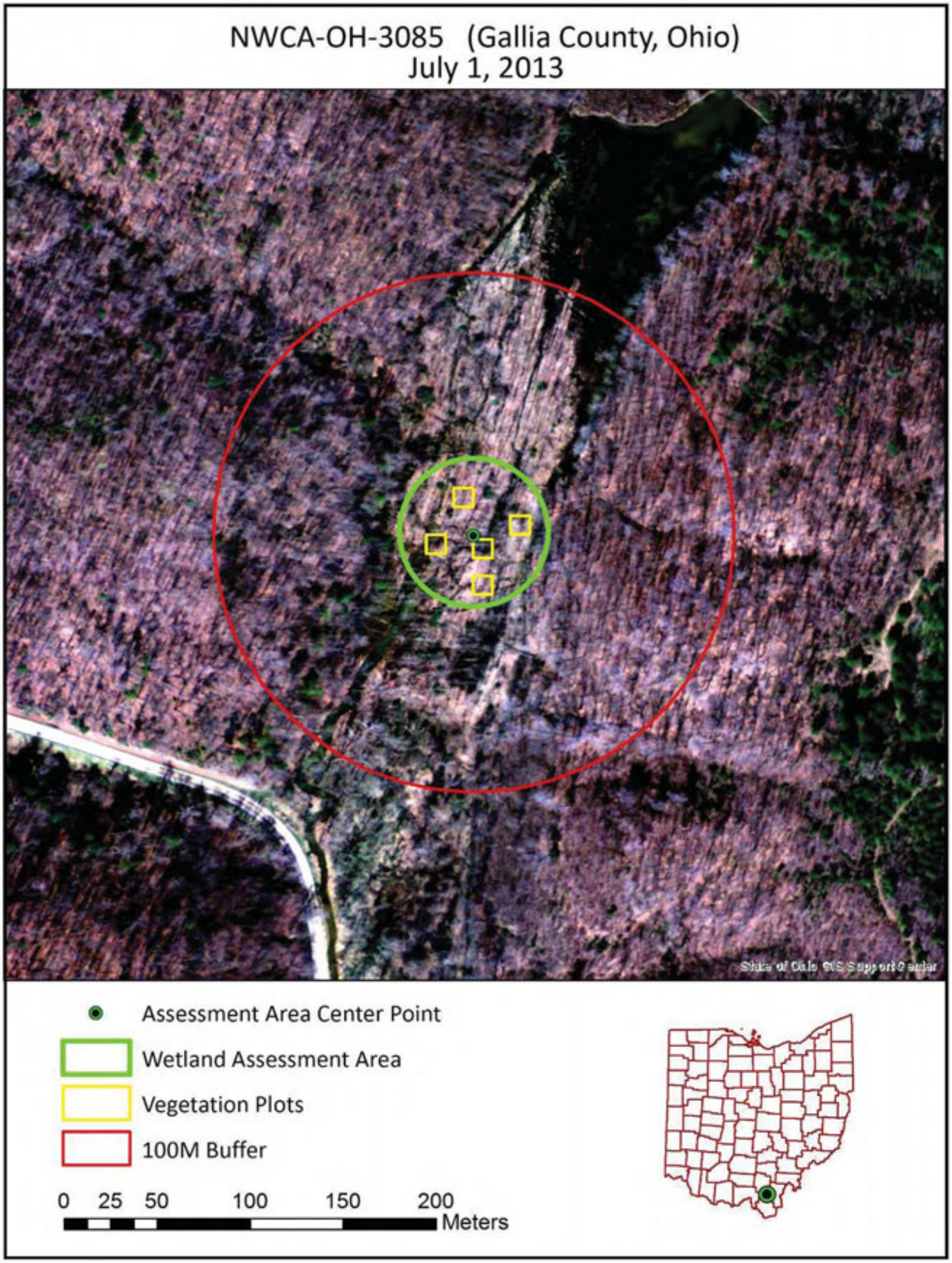
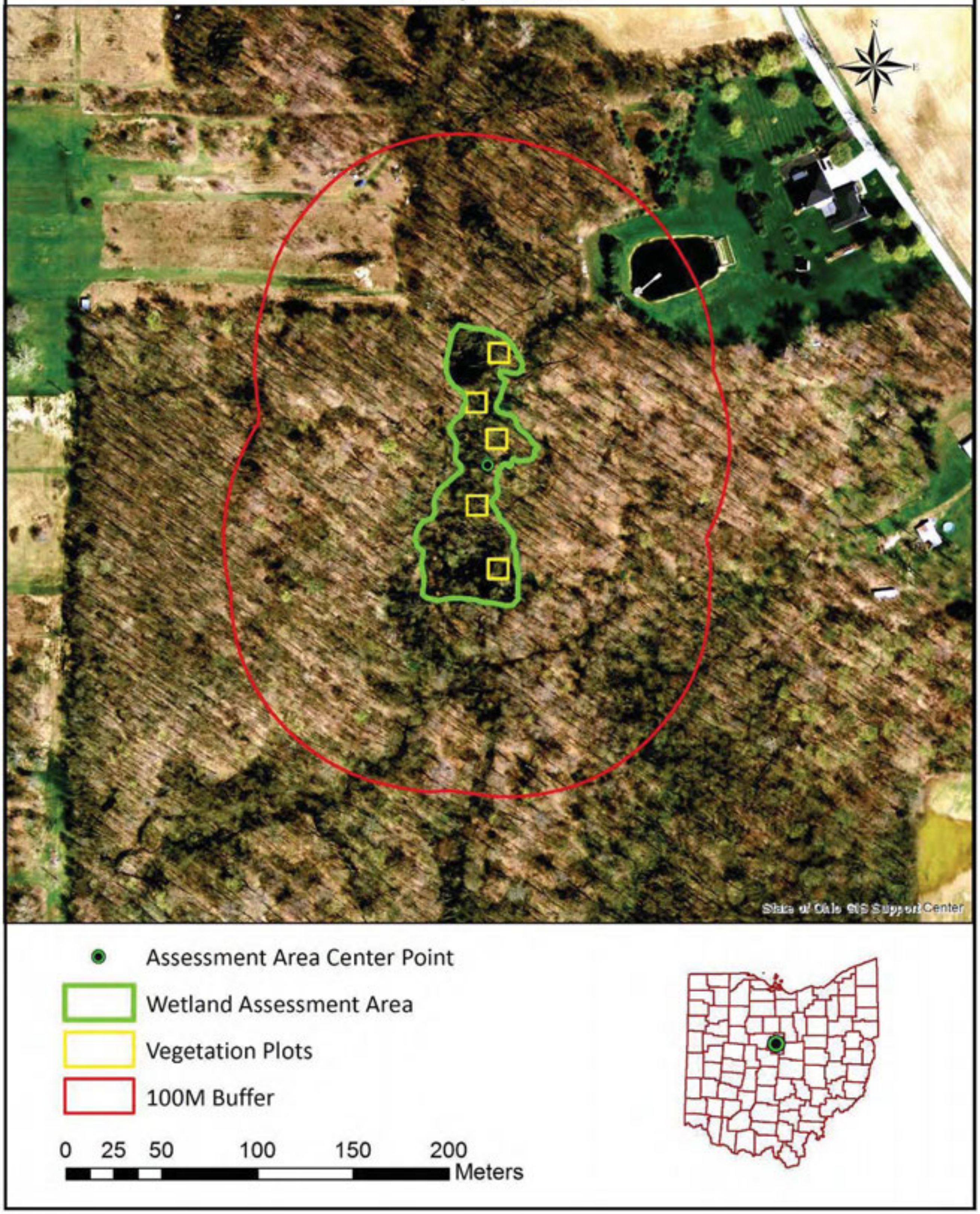
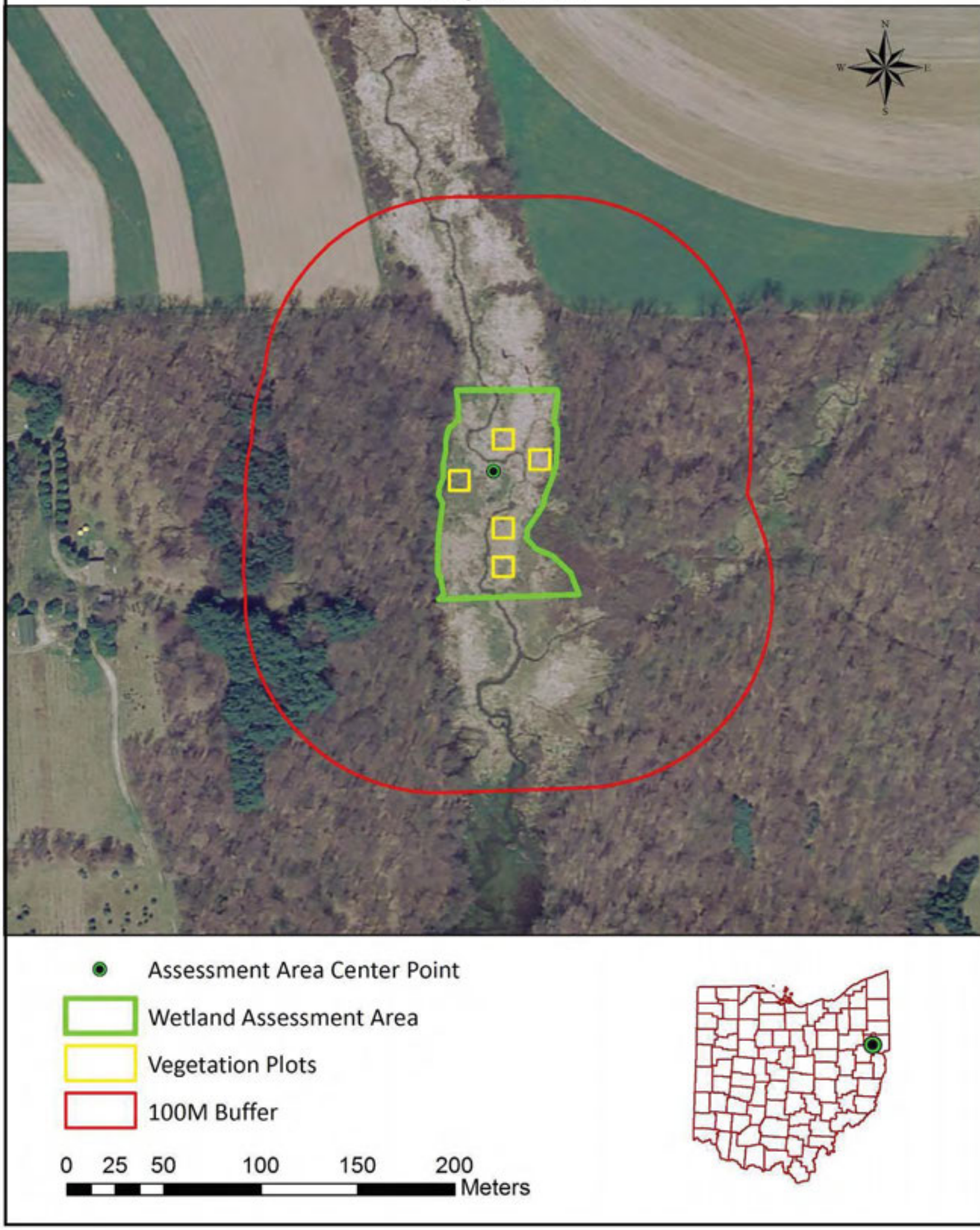
State of Ohio GIS Support Center
Assessment Area Center Point
Wetland Assessment Area
Vegetation Plots
100M Buffer
0 25 50 100 150 200
Meters

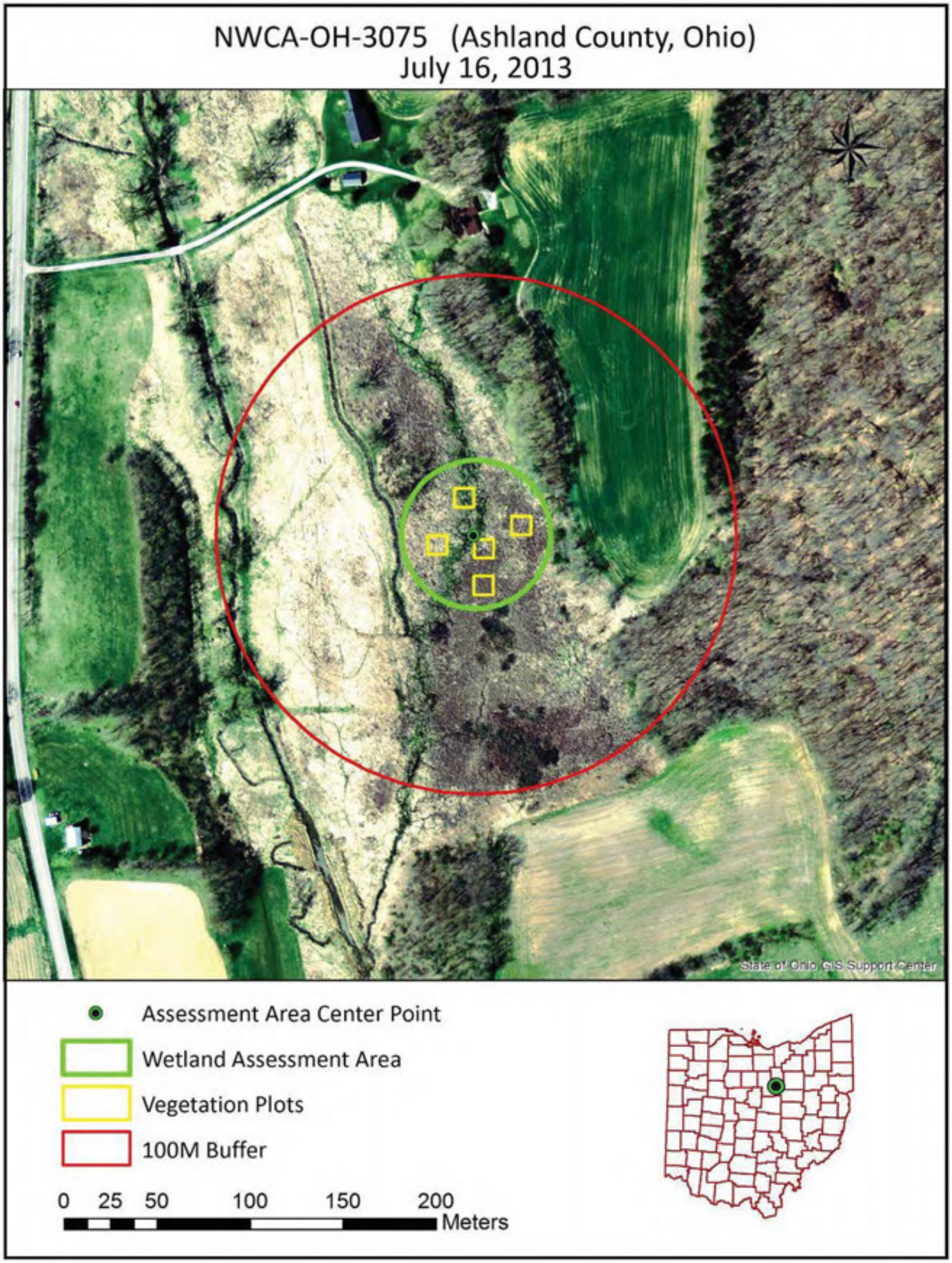

NWCA-OH-3085 (Gallia County, Ohio)
July 1, 2013
State of Ohio GIS Support Center
Assessment Area Center Point
Wetland Assessment Area
Vegetation Plots
100M Buffer
0 25 50 100 150 200
Meters

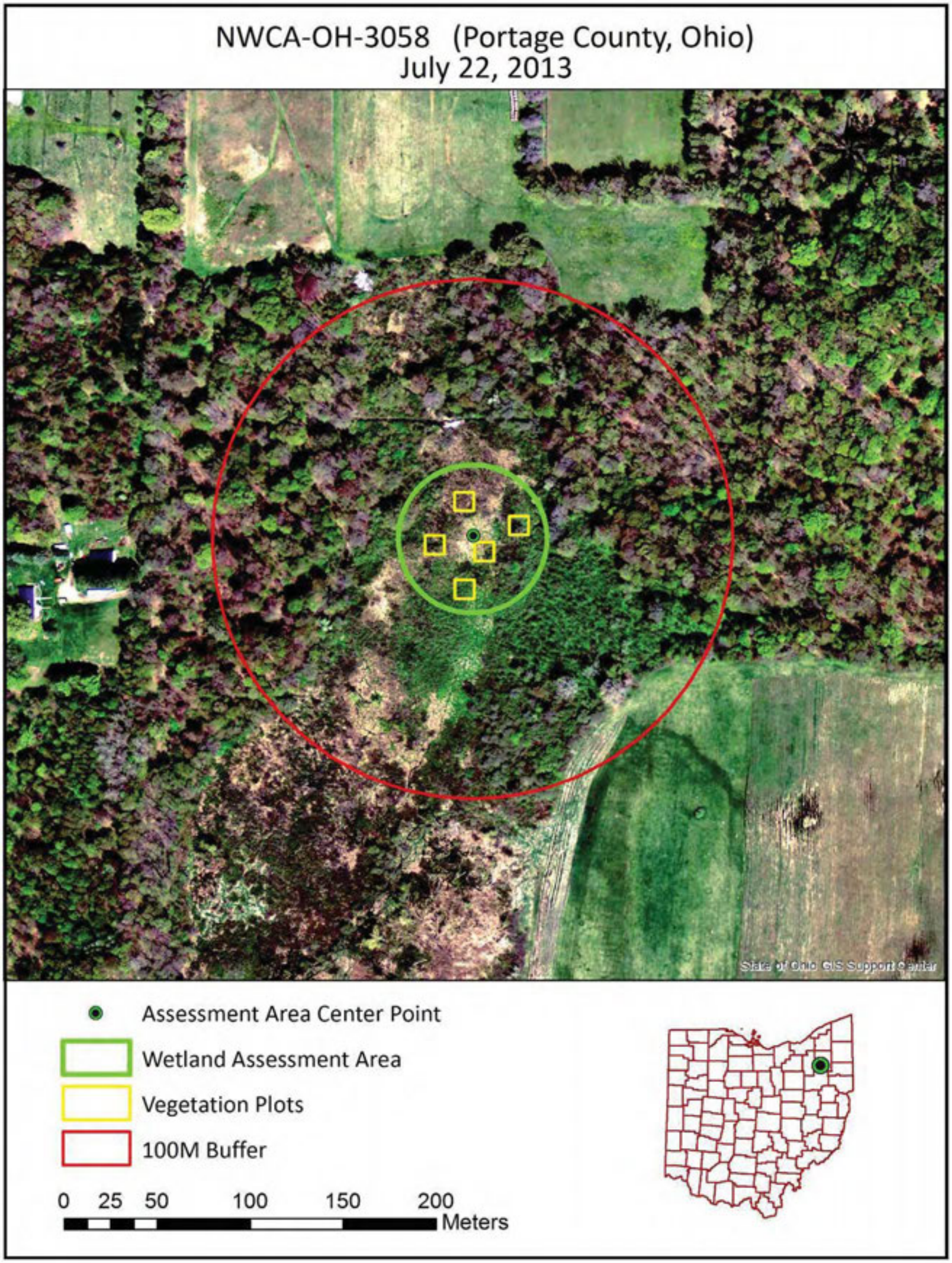
NWCA-OH-3107 (Morrow County, Ohio)
July 3, 2013

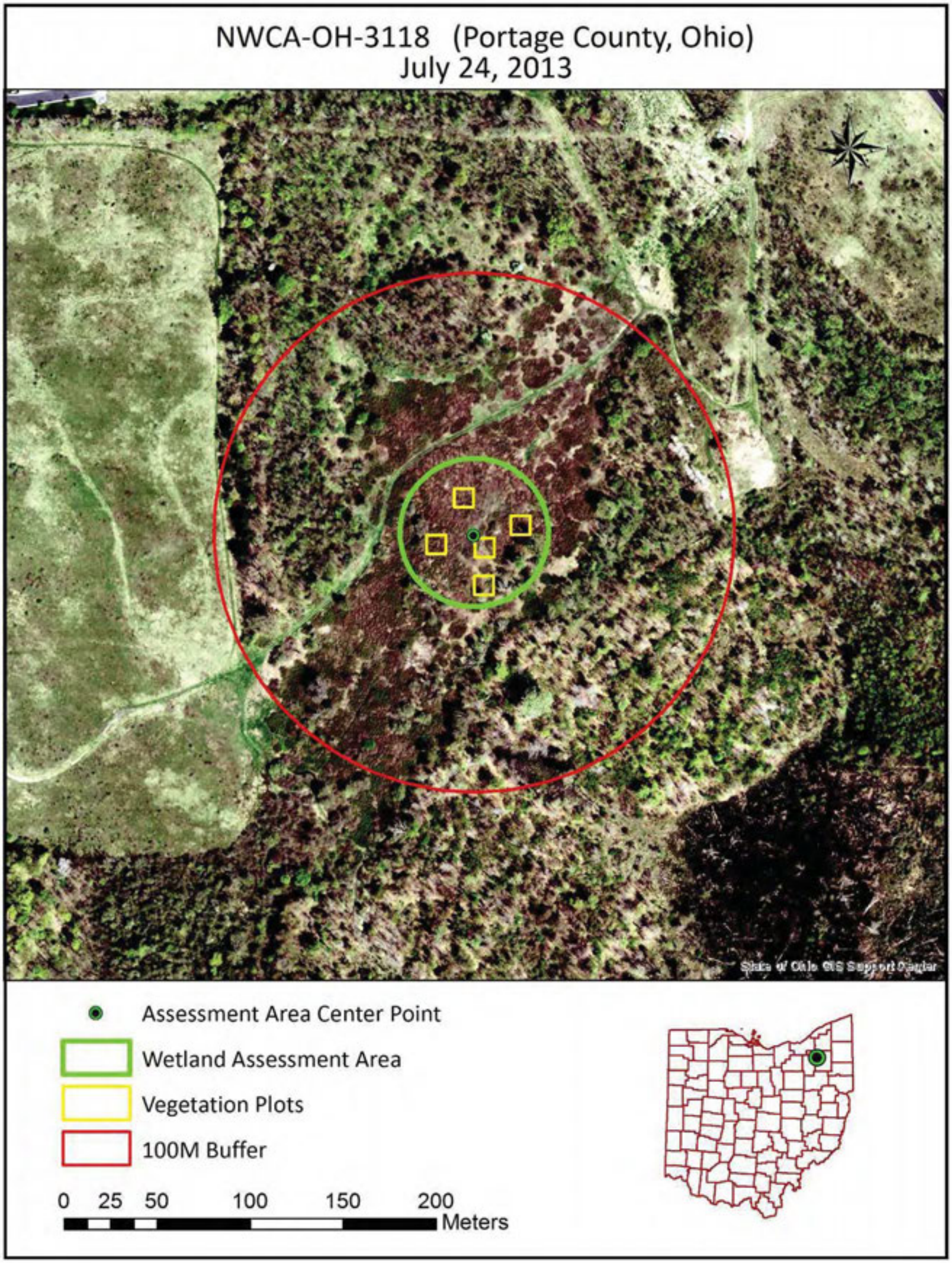


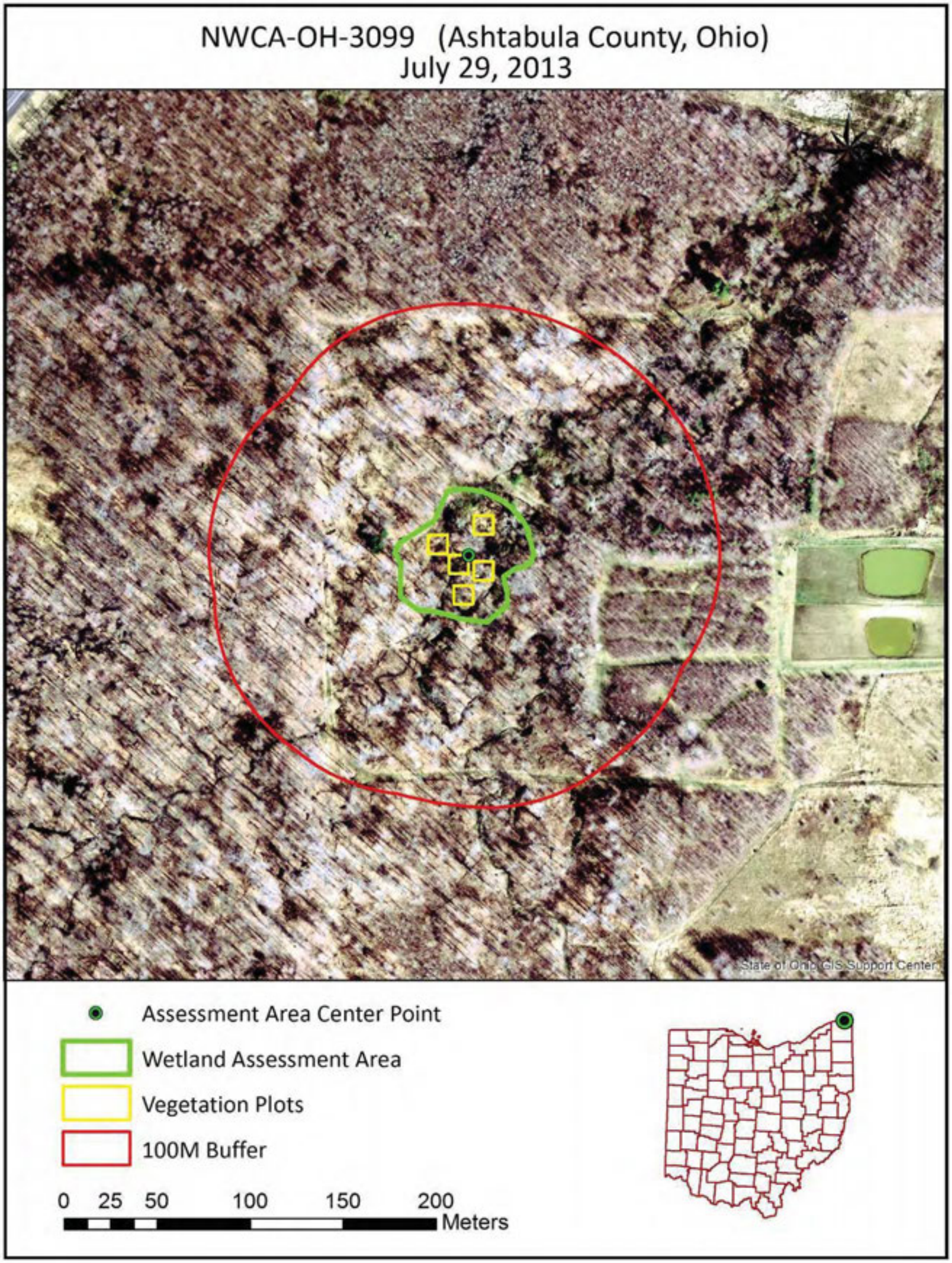
NWCA-OH-3105 (Columbiana County, Ohio)
July 8, 2013



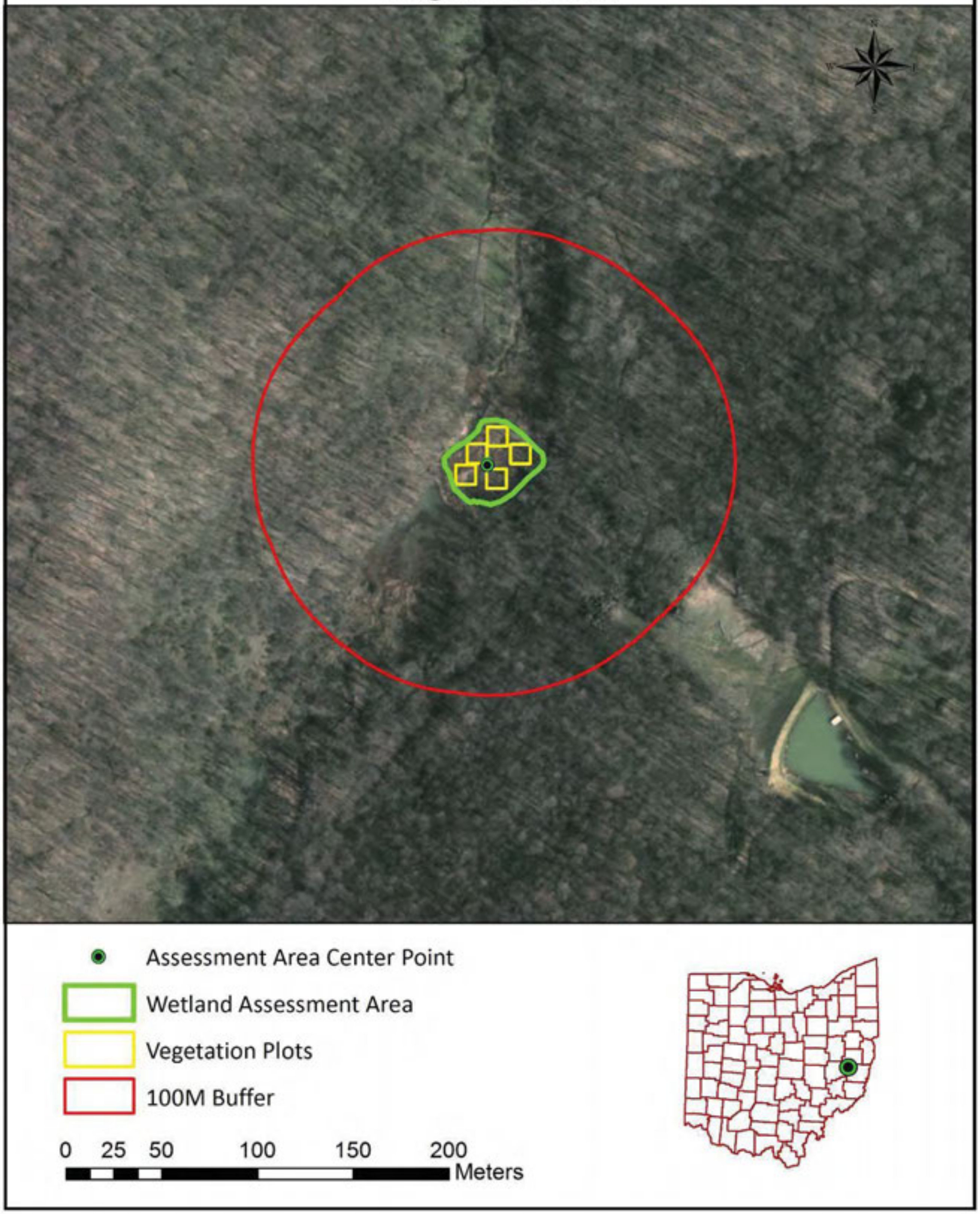

NWCA-OH-3075 (Ashland County, Ohio)
July 16, 2013
State of Ohio GIS Support Center
Assessment Area Center Point
Wetland Assessment Area
Vegetation Plots
100M Buffer
0 25 50 100 150 200
Meters


NWCA-OH-3058 (Portage County, Ohio)
July 22, 2013
State of Ohio GIS Support Center
Assessment Area Center Point
Wetland Assessment Area
Vegetation Plots
100M Buffer
0 25 50 100 150 200
Meters

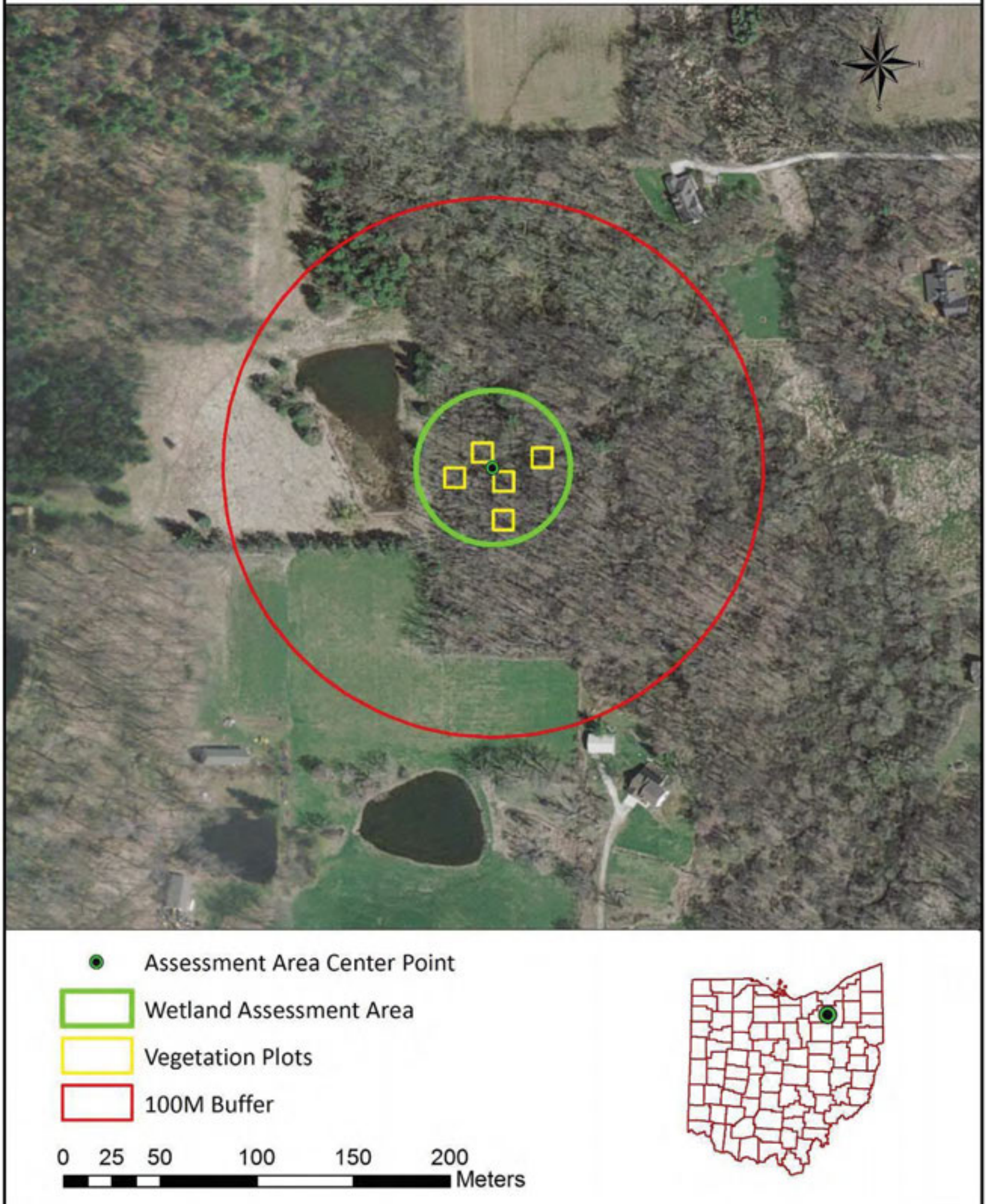

NWCA-OH-3118 (Portage County, Ohio)
July 24, 2013
State of Ohio GIS Support Center
Assessment Area Center Point
Wetland Assessment Area
Vegetation Plots
100M Buffer
0 25 50 100 150 200
Meters

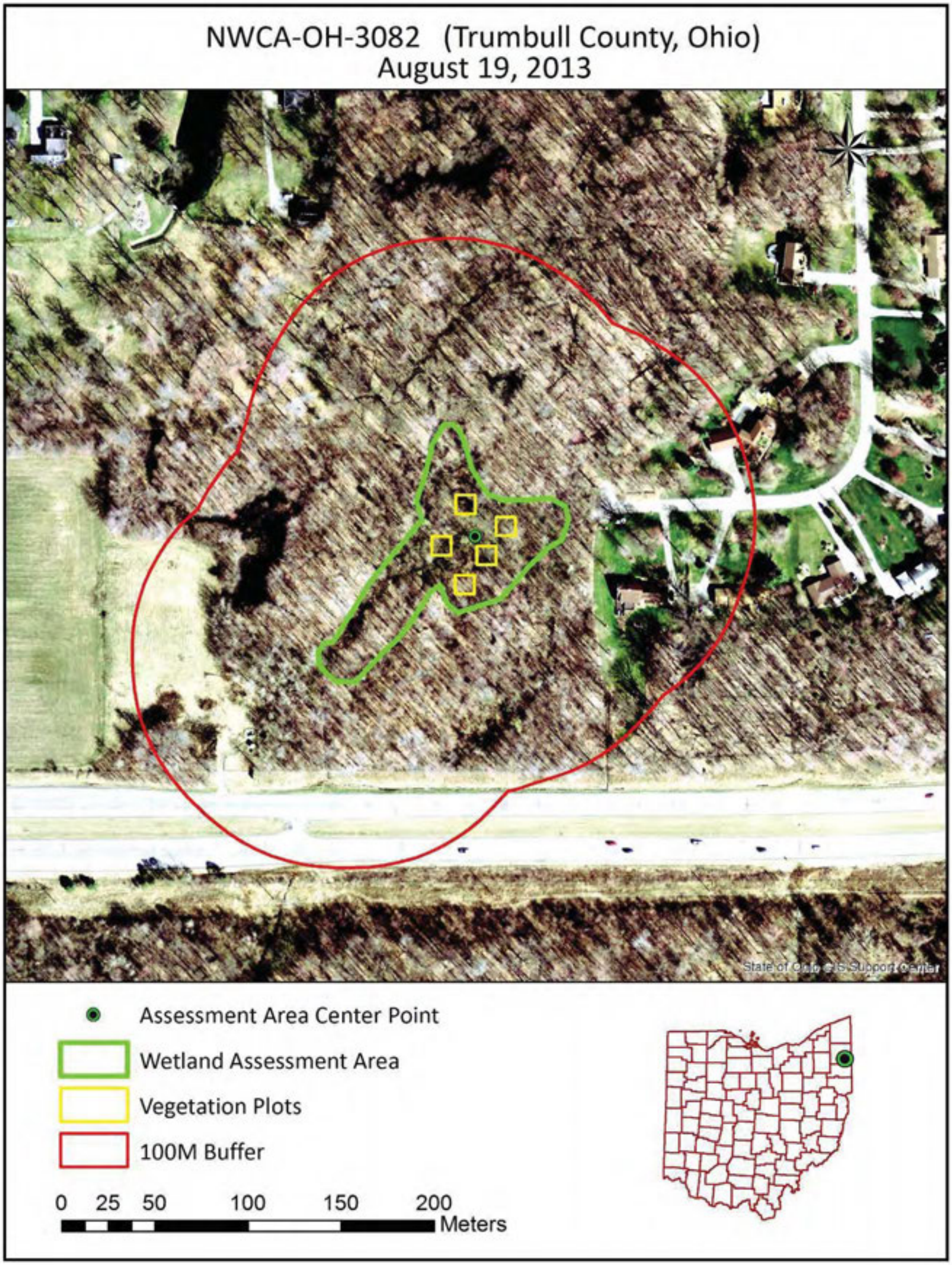

NWCA-OH-3099 (Ashtabula County, Ohio)
July 29, 2013
State of Ohio GIS Support Center
Assessment Area Center Point
Wetland Assessment Area
Vegetation Plots
100M Buffer
0 25 50 100 150 200
Meters

NWCA-OH-3048 (Belmont County, Ohio)
August 12, 2013



NWCA-OH-3054 (Medina County, Ohio)
August 14, 2013




NWCA-OH-3082 (Trumbull County, Ohio)
August 19, 2013
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Wetland Assessment Area
Vegetation Plots
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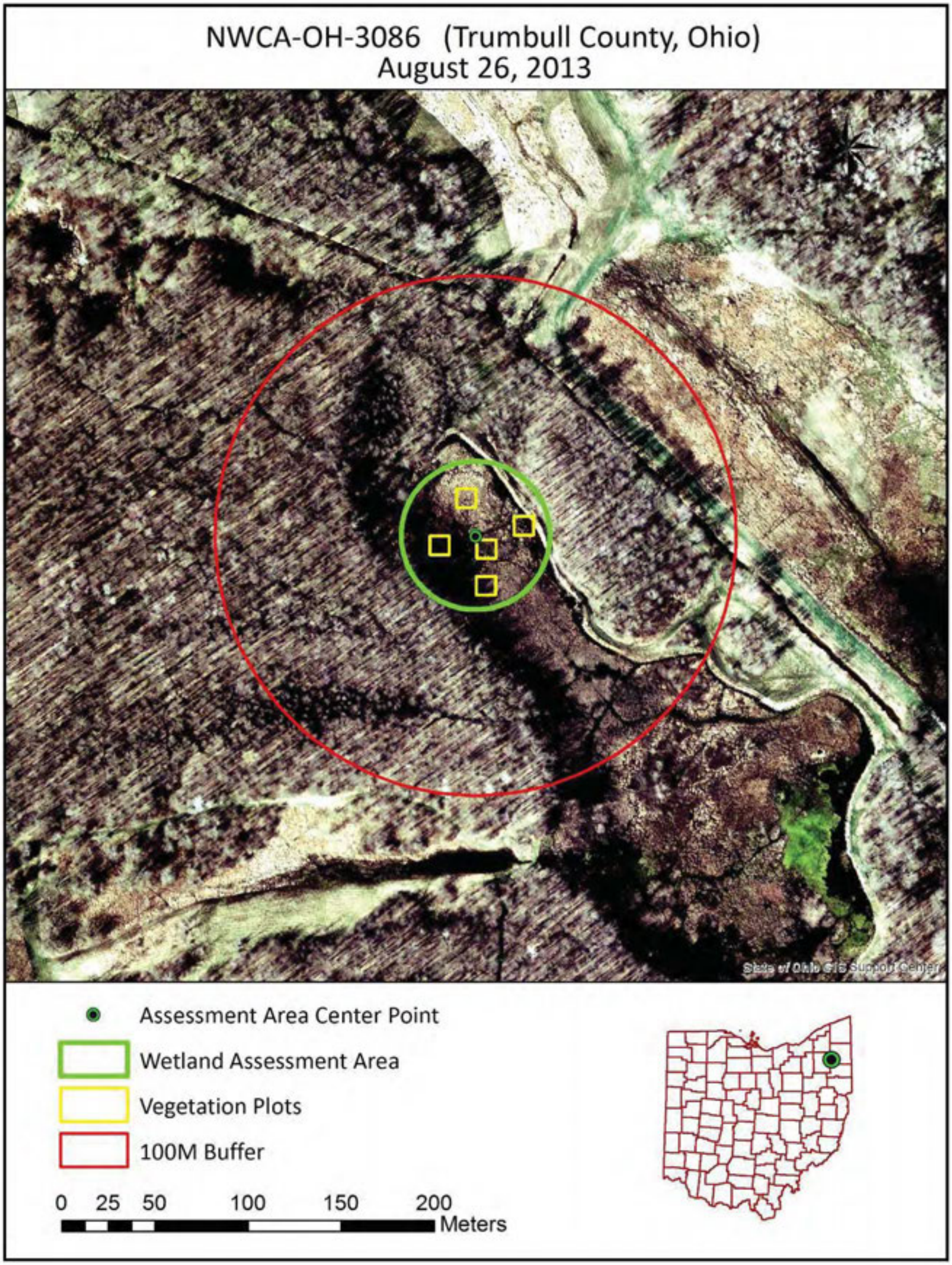
Meters


NWCA-OH-3086 (Trumbull County, Ohio)
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Assessment Area Center Point
Wetland Assessment Area
Vegetation Plots
100M Buffer
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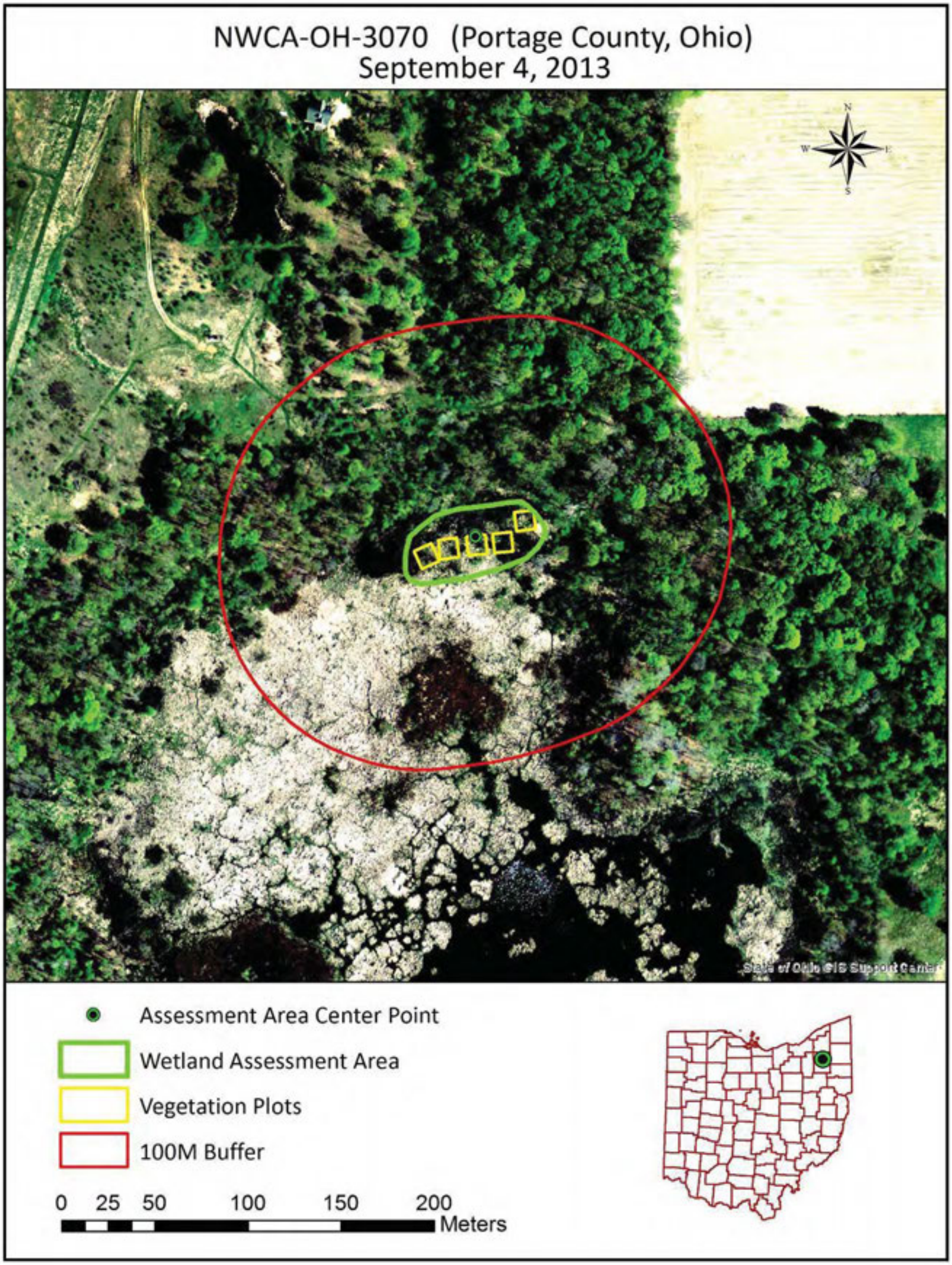
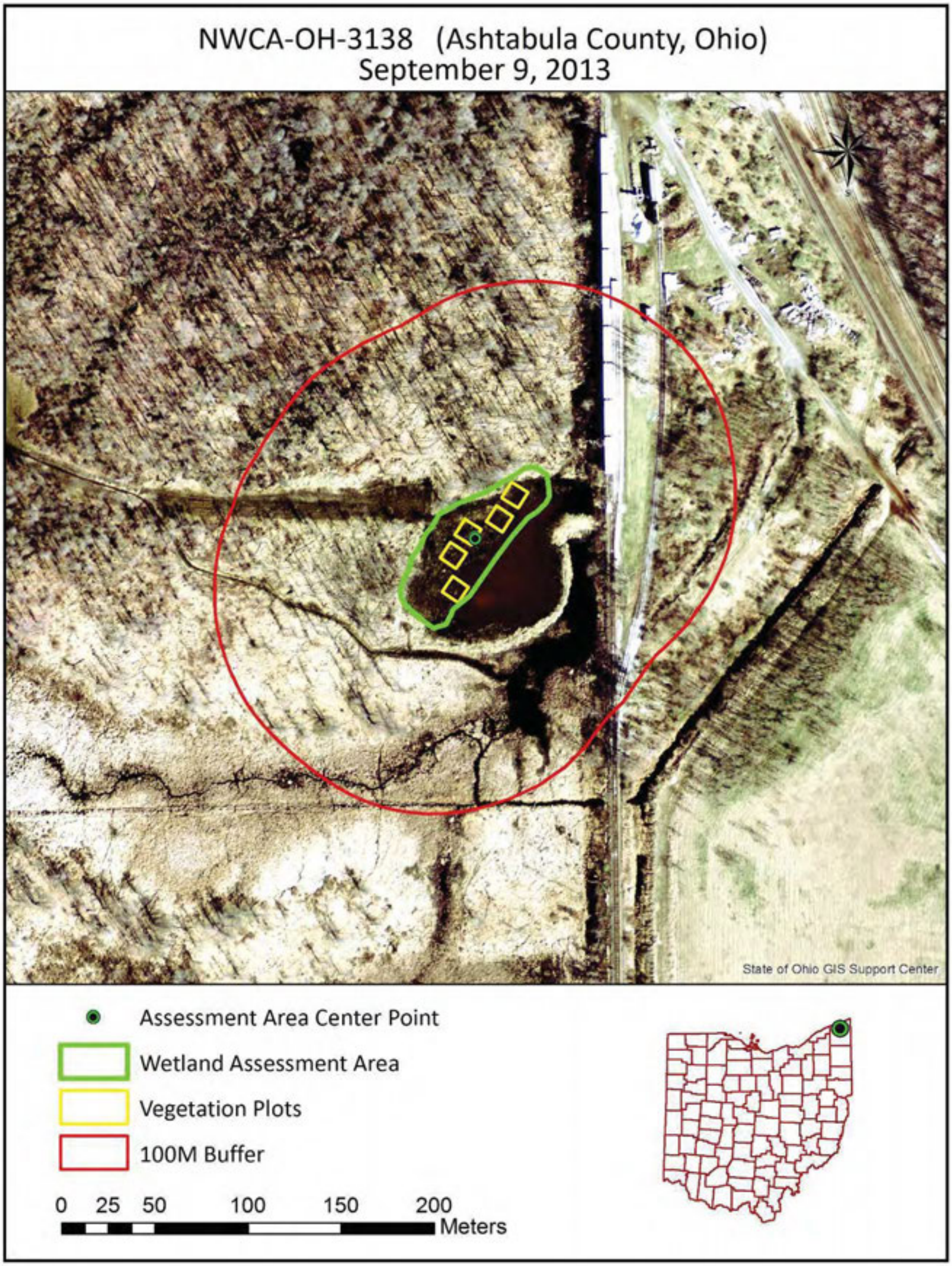
Meters


NWCA-OH-3070 (Portage County, Ohio)
September 4, 2013
State of Ohio GIS Support Center
Assessment Area Center Point
Wetland Assessment Area
Vegetation Plots
100M Buffer
0 25 50 100 150 200
Meters


NWCA-OH-3138 (Ashtabula County, Ohio)
September 9, 2013
State of Ohio GIS Support Center
Assessment Area Center Point
Wetland Assessment Area
Vegetation Plots
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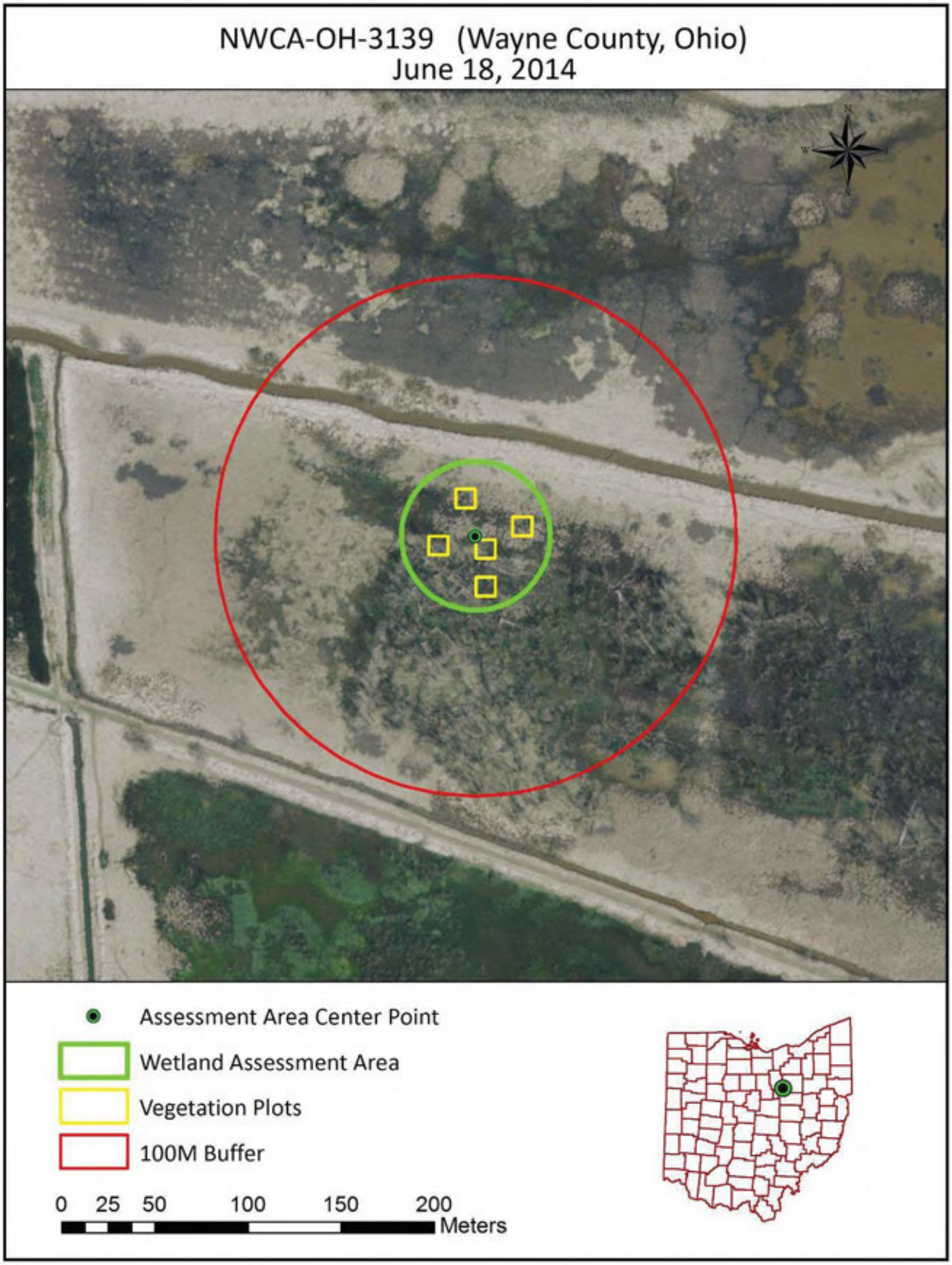
Meters


NWCA-OH-3139 (Wayne County, Ohio)
June 18, 2014
Assessment Area Center Point
Wetland Assessment Area
Vegetation Plots
100M Buffer
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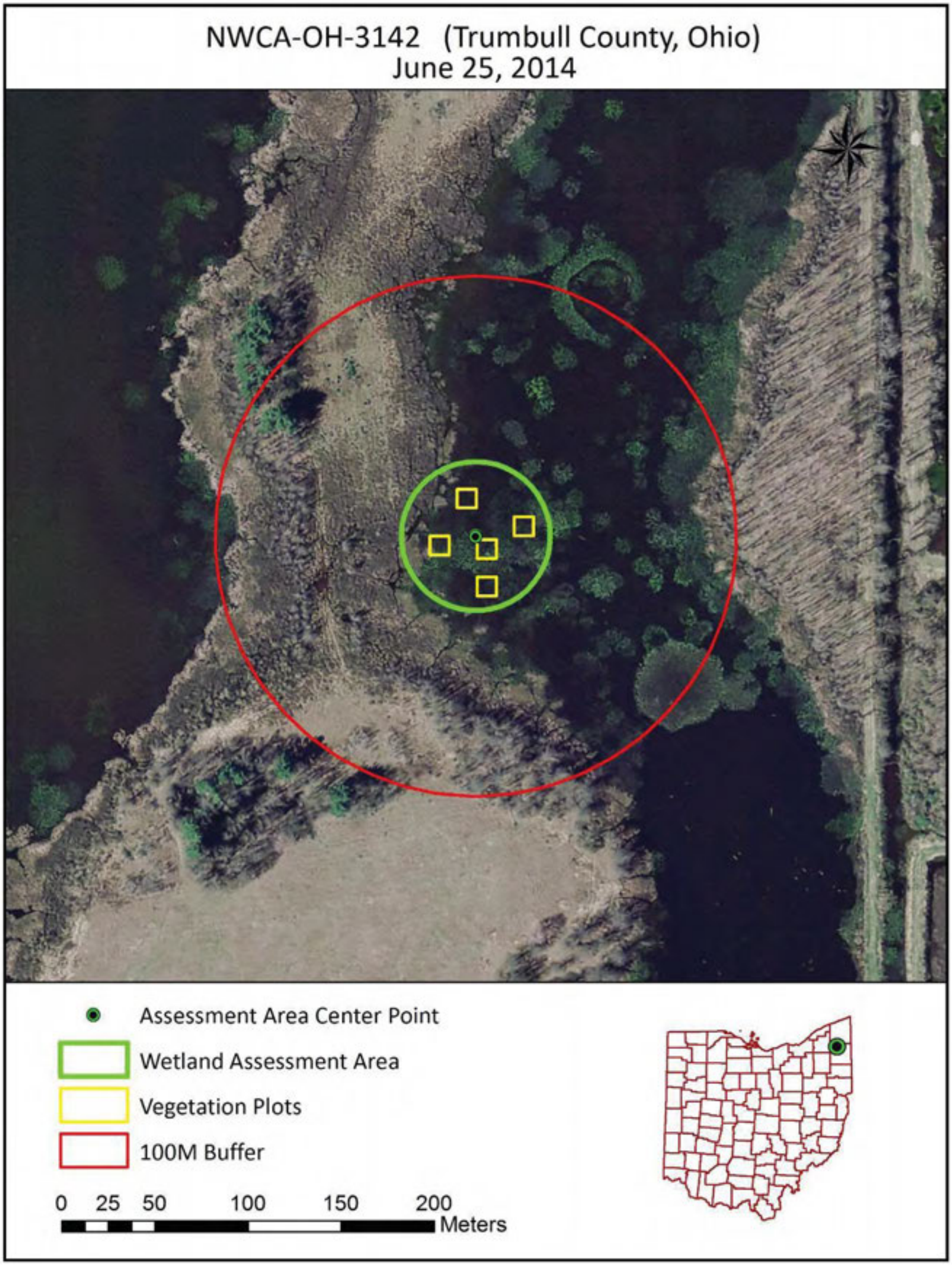
Meters


NWCA-OH-3142 (Trumbull County, Ohio)
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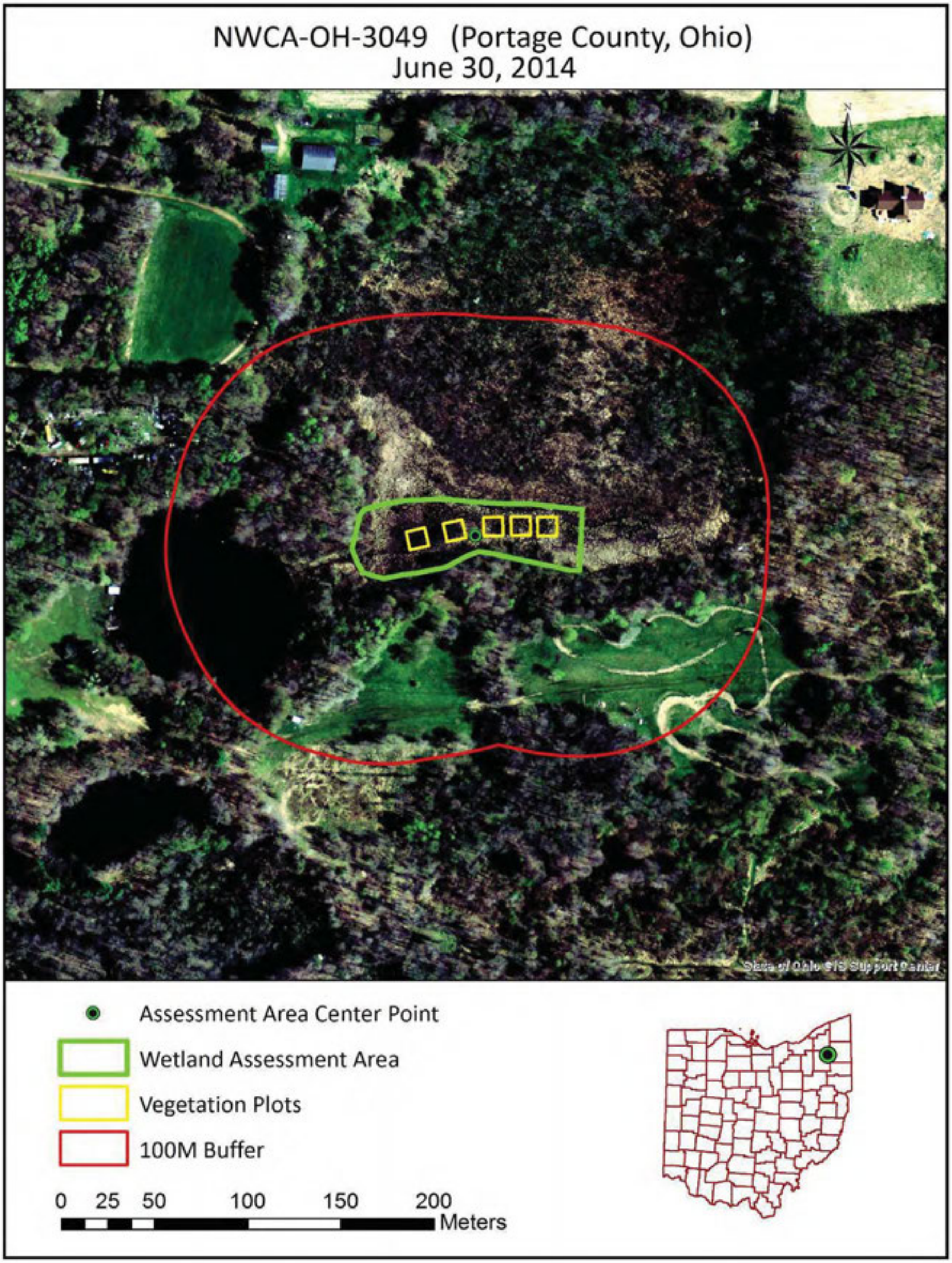
NWCA-OH-3049 (Portage County, Ohio)
June 30, 2014
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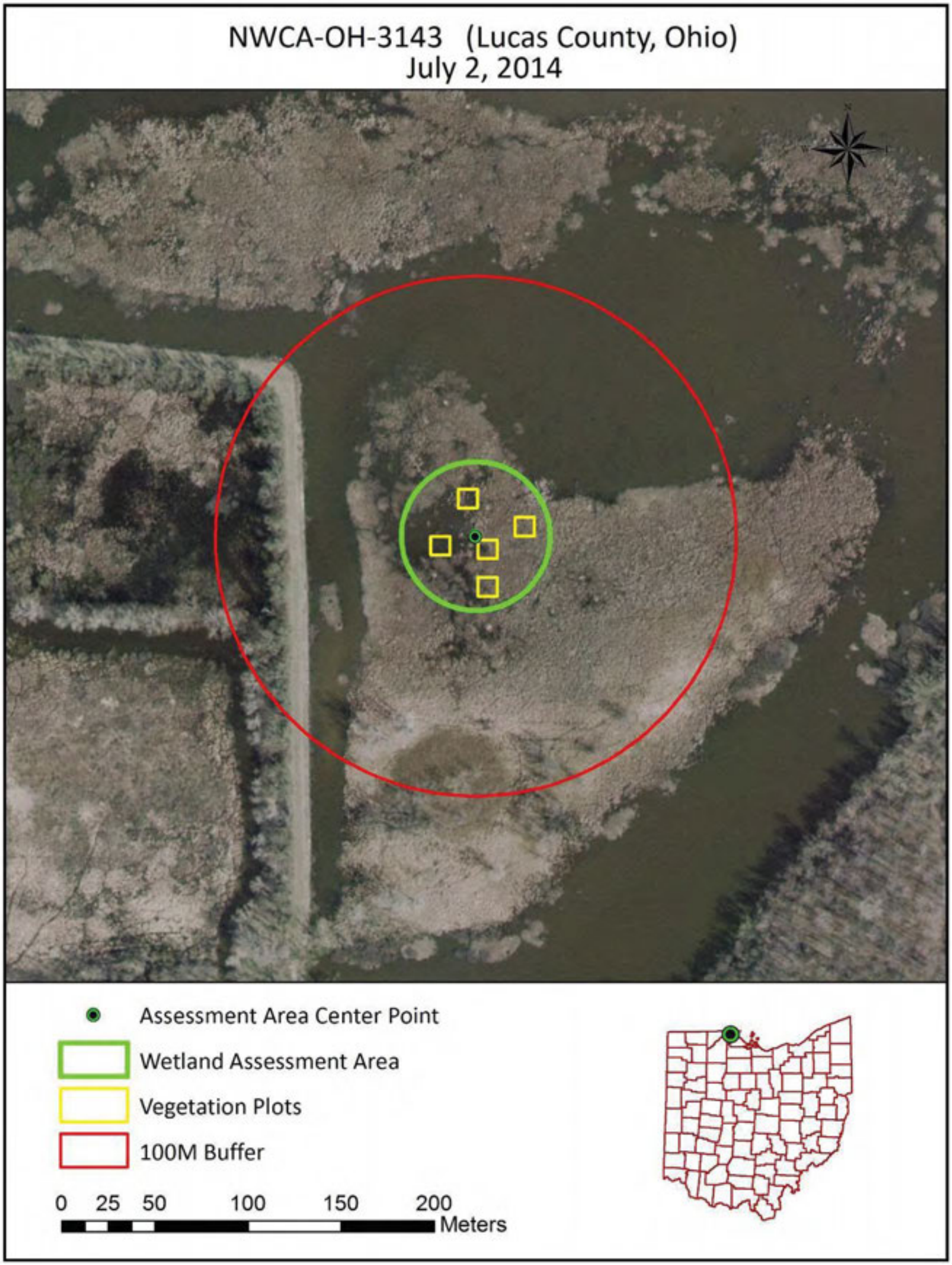
State of Ohio GIS Support Center
Assessment Area Center Point
Wetland Assessment Area
Vegetation Plots
100M Buffer
0 25 50 100 150 200
Meters


NWCA-OH-3143 (Lucas County, Ohio)
July 2, 2014
Assessment Area Center Point
Wetland Assessment Area
Vegetation Plots
100M Buffer
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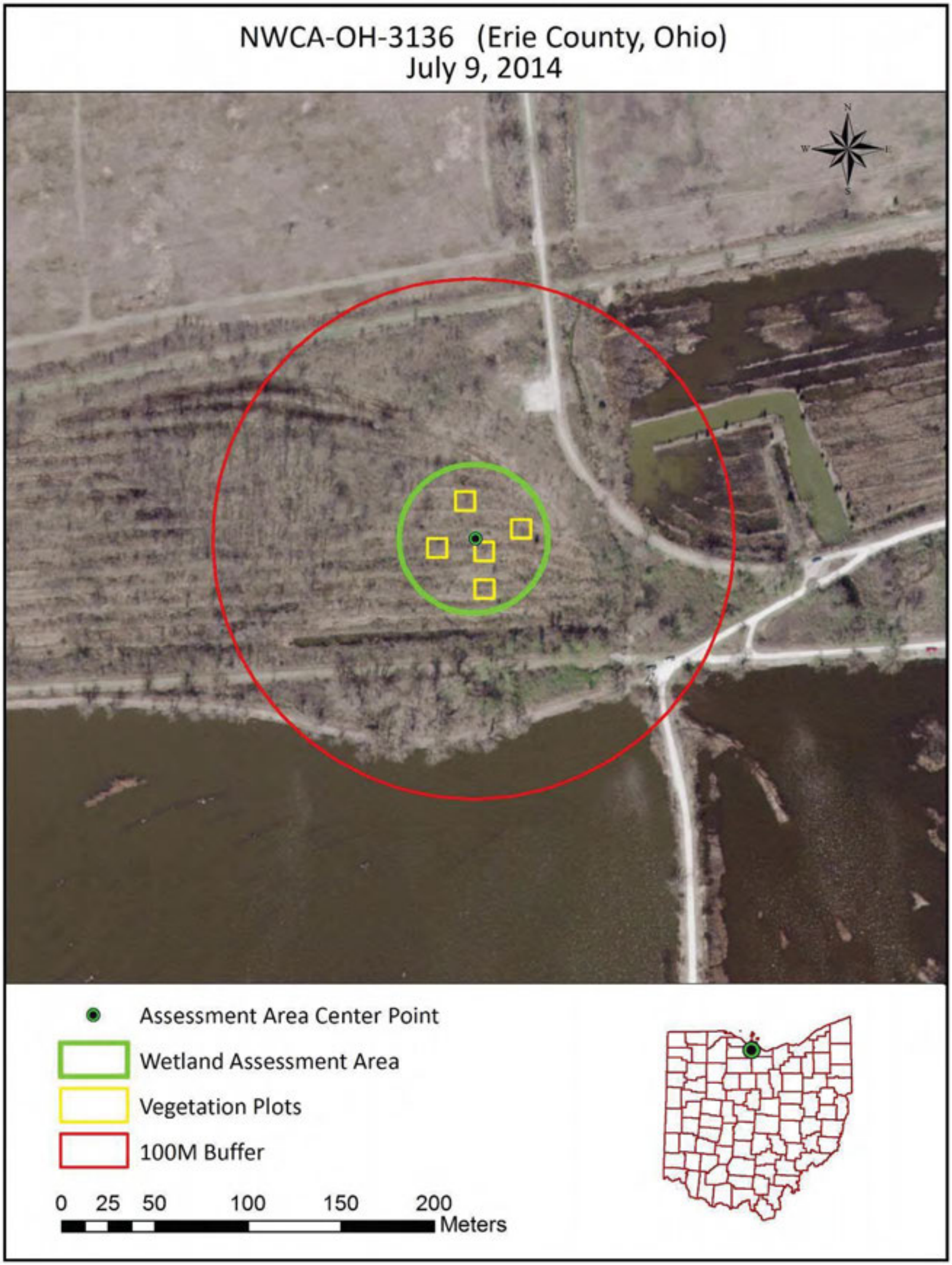
Meters


NWCA-OH-3136 (Erie County, Ohio)
July 9, 2014
N
W
E
S
Assessment Area Center Point
Wetland Assessment Area
Vegetation Plots
100M Buffer
0 25 50 100 150 200
Meters

Appendix II. All vascular plant species recorded in the 50 Ohio NWCA intensification wetland vegetation plots, with frequency of occurrence data. The 10 most commonly encountered species are highlighted in green.

Frequency Rank	Scientific Name	Common Name	Number of Wetlands (out of 50)	C of C	Nativity	Growth Form	Relative Cover %
258	*Abutilon theophrasti*	VELVETLEAF	1	0	adventive	forb	0.00
258	*Acalypha rhomboidea*	RHOMBIC THREE-S. MERCURY	1	0	native	forb	0.00
258	*Acalypha virginica*	VIRGINIA THREE-S. MERCURY	1	0	native	forb	0.01
55	*Acer negundo*	BOX ELDER	9	3	native	tree	0.40
50	*Acer rubrum*	RED MAPLE	10	2	native	tree	0.79
14	*Acer saccharinum*	SILVER MAPLE	20	3	native	tree	2.34
147	*Acer saccharum*	SUGAR MAPLE	3	5	native	tree	0.02
185	*Acer x freemanii*	Freeman maple	2	3	native	tree	0.86
258	*Agastache nepetoides*	YELLOW GIANT-HYSSOP	1	4	native	forb	0.00
185	*Agrimonia gryposepala*	TALL AGRIMONY	2	3	native	forb	0.01
47	*Agrimonia parviflora*	SMALL-FLOWERED AGRIMONY	11	2	native	forb	0.24
258	*Agrostis stolonifera*	CREEPING BENT GRASS	1	0	adventive	grass	0.01
108	*Alisma subcordatum*	SOUTHERN WATER-PLANTAIN	5	2	native	forb	0.07
108	*Alliaria petiolata*	GARLIC MUSTARD	5	0	adventive	forb	0.13
185	*Allium canadense*	WILD GARLIC	2	2	native	forb	0.00
258	*Amaranthus hybridus*	SMOOTH PIGWEED	1	0	adventive	forb	0.00
258	*Ambrosia artemisiifolia*	COMMON RAGWEED	1	0	native	forb	0.00
122	*Ambrosia trifida*	GIANT RAGWEED	4	0	native	forb	0.01
185	*Amelanchier arborea*	DOWNY SERVICEBERRY	2	5	native	sm tree	0.01
258	*Amorpha fruticosa*	FALSE INDIGO	1	3	native	forb	0.01
147	*Amphicarpaea bracteata*	HOG-PEANUT	3	4	native	forb	0.12
258	*Anemone virginiana*	WOODLAND THIMBLEWEED	1	3	native	forb	0.00
185	*Angelica atropurpurea*	PURPLE-STEMMED ANGELICA	2	6	native	forb	0.01
258	*Anthoxanthum odoratum*	SWEET VERNAL GRASS	1	0	adventive	grass	0.07
90	*Apios americana*	COMMON GROUNDNUT	6	3	native	forb	0.08
68	*Apocynum cannabinum*	INDIAN HEMP	8	1	native	forb	0.15
258	*Aralia nudicaulis*	WILD SARSAPARILLA	1	5	native	forb	0.00
147	*Arisaema dracontium*	GREEN DRAGON	3	5	native	forb	0.01
147	*Arisaema triphyllum subsp. triphyllum*	JACK-IN-THE-PULPIT	3	3	native	forb	0.01
258	*Artemisia vulgaris*	COMMON MUGWORT	1	0	adventive	forb	0.01
26	*Asclepias incarnata*	SWAMP MILKWEED	16	4	native	forb	0.11
258	*Asclepias syriaca*	COMMON MILKWEED	1	1	native	forb	0.00

Frequency Rank	*Scientific Name*	Common Name	Number of Wetlands (out of 50)	C of C	Nativity	Growth Form	Relative Cover %
258	*Asimina triloba*	PAWPAW	1	6	native	sm tree	0.05
258	*Aster cordifolius*	BLUE WOOD ASTER	1	4	native	forb	0.00
258	*Aster lanceolatus*	EASTERN LINED ASTER	1	3	native	forb	0.00
258	*Aster lateriflorus*	CALICO ASTER	1	2	native	forb	0.00
258	*Aster novae-angliae*	NEW ENGLAND ASTER	1	2	native	forb	0.00
147	*Aster pilosus*	AWL ASTER	3	1	native	forb	0.49
147	*Athyrium filix-femina*	COMMON LADY FERN	3	5	native	fern	0.02
108	*Azolla caroliniana*	MOSQUITO-FERN	5	0	adventive	fern	0.22
258	*Barbarea vulgaris*	GARDEN YELLOW ROCKET	1	0	adventive	forb	0.00
258	*Berberis thunbergii*	JAPANESE BARBERRY	1	0	adventive	shrub	0.01
258	*Betula alleghaniensis*	YELLOW BIRCH	1	7	native	tree	0.08
258	*Betula lenta*	SWEET BIRCH	1	7	native	tree	0.01
258	*Bidens bipinnata*	SPANISH-NEEDLES	1	2	native	forb	0.00
122	*Bidens cernua*	NODDING BEGGAR'S-TICK	4	3	native	forb	0.03
185	*Bidens comosa*	SWAMP TICKSEED	2	3	native	forb	0.25
258	*Bidens connata*	PURPLE-STEMMED BEGGAR'S-TICK	1	3	native	forb	0.02
15	*Bidens frondosa*	DEVIL'S BEGGAR'S-TICK	19	2	native	forb	0.27
1	*Boehmeria cylindrica*	FALSE NETTLE	31	4	native	forb	0.66
258	*Bolboschoenus fluviatilis*	RIVER BULRUSH	1	5	native	sedge	0.01
185	*Botrychium dissectum*	LACE-FROND GRAPE FERN	2	3	native	fern	0.00
258	*Brachyelytrum erectum*	LONG-AWNED WOOD GRASS	1	5	native	grass	0.00
185	*Brasenia schreberi*	WATER-SHIELD	2	7	native	forb	0.55
185	*Butomus umbellatus*	FLOWERING-RUSH	2	0	adventive	forb	0.08
185	*Calamagrostis canadensis*	CANADA BLUEJOINT	2	4	native	grass	0.27
258	*Caltha palustris*	MARSH-MARIGOLD	1	6	native	forb	0.00
90	*Calystegia sepium*	HEDGE BINDWEED	6	1	native	forb	0.12
258	*Campanula aparinoides*	MARSH BELLFLOWER	1	7	native	forb	0.01
185	*Campsis radicans*	TRUMPET-CREEPER	2	1	native	vine	0.03
147	*Carex amphibola*	E. NARROW-LEAVED SEDGE	3	5	native	sedge	0.01
258	*Carex aquatilis*	LEAFY TUSSOCK SEDGE	1	9	native	sedge	0.05
185	*Carex blanda*	COMMON WOOD SEDGE	2	1	native	sedge	0.00
55	*Carex bromoides*	BROME SEDGE	9	7	native	sedge	0.65

Frequency Rank	*Scientific Name*	Common Name	Number of Wetlands (out of 50)	C of C	Nativity	Growth Form	Relative Cover %
258	*Carex canescens*	GLAUCOUS SEDGE	1	7	native	sedge	0.00
55	*Carex comosa*	BEARDED SEDGE	9	2	native	sedge	0.13
55	*Carex crinita var. crinita*	TASSELED SEDGE	9	3	native	sedge	0.17
108	*Carex cristatella*	CRESTED SEDGE	5	3	native	sedge	0.08
258	*Carex davisii*	DAVIS' SEDGE	1	5	native	sedge	0.00
258	*Carex debilis Michx. var. rudgei*	RUDGE'S SEDGE	1	8	native	sedge	0.00
147	*Carex frankii*	FRANK'S SEDGE	3	2	native	sedge	0.01
258	*Carex gracilescens*	SLENDER WOOD SEDGE	1	3	native	sedge	0.00
122	*Carex gracillima*	GRACEFUL SEDGE	4	4	native	sedge	0.13
185	*Carex granularis*	MEADOW SEDGE	2	3	native	sedge	0.00
122	*Carex grayi*	GRAY'S SEDGE	4	5	native	sedge	0.02
185	*Carex hyalinolepis*	SWEET MARSH SEDGE	2	5	native	sedge	0.08
147	*Carex intumescens*	BLADDER SEDGE	3	5	native	sedge	0.05
108	*Carex lacustris*	LAKE SEDGE	5	5	native	sedge	0.59
185	*Carex laevivaginata*	SMOOTH-SHEATHED FOX SEDGE	2	6	native	sedge	0.07
55	*Carex lupulina*	HOP SEDGE	9	3	native	sedge	0.06
38	*Carex lurida*	BOTTLEBRUSH SEDGE	13	3	native	sedge	0.36
185	*Carex molesta*	TROUBLESOME SEDGE	2	3	native	sedge	0.02
258	*Carex muskingumensis*	MUSKINGUM SEDGE	1	7	native	sedge	0.00
258	*Carex pallescens*	PALE SEDGE	1	5	native	sedge	0.00
185	*Carex pellita*	WOOLLY SEDGE	2	6	native	sedge	0.25
258	*Carex pensylvanica*	PENNSYLVANIA SEDGE	1	3	native	sedge	0.00
147	*Carex prasina*	DROOPING SEDGE	3	8	native	sedge	0.12
258	*Carex pseudocyperus*	NORTHERN BEARDED SEDGE	1	6	native	sedge	0.00
185	*Carex rosea*	ROSE SEDGE	2	3	native	sedge	0.00
258	*Carex scabrata*	ROUGH SEDGE	1	6	native	sedge	0.01
185	*Carex scoparia*	POINTED BROOM SEDGE	2	3	native	sedge	0.03
185	*Carex seorsa*	WEAK STELLATE SEDGE	2	7	native	sedge	0.02
258	*Carex squarrosa*	SQUARROSE SEDGE	1	4	native	sedge	0.00
42	*Carex stipata*	CROWDED SEDGE	12	2	native	sedge	0.07
258	*Carex stricta*	TUSSOCK SEDGE	1	5	native	sedge	0.04
10	*Carex tribuloides*	BLUNT BROOM SEDGE	21	4	native	sedge	0.36

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258	*Carex tuckermanii*	TUCKERMAN'S SEDGE	1	8	native	sedge	0.01
185	*Carex typhina*	CAT-TAIL SEDGE	2	5	native	sedge	0.01
50	*Carex vulpinoidea*	FOX SEDGE	11	1	native	sedge	0.12
76	*Carpinus caroliniana*	BLUE-BEECH	7	5	native	sm tree	0.57
185	*Carya cordiformis*	BITTERNUT HICKORY	2	5	native	tree	0.14
68	*Carya laciniosa*	SHELLBARK HICKORY	8	7	native	tree	0.33
258	*Catalpa speciosa*	NORTHERN CATALPA	1	0	adventive	tree	0.00
258	*Celastrus scandens*	BITTERSWEET	1	2	native	vine	0.00
147	*Celtis occidentalis*	HACKBERRY	3	4	native	tree	0.01
25	*Cephalanthus occidentalis*	BUTTONBUSH	17	6	native	shrub	3.46
90	*Ceratophyllum demersum*	COONTAIL	6	2	native	forb	0.21
90	*Chelone glabra*	TURTLEHEAD	6	6	native	forb	0.01
258	*Chrysanthemum leucanthemum*	OX-EYE DAISY	1	0	adventive	forb	0.00
47	*Cicuta bulbifera*	BULBLET-BEARING WATER-HEML.	11	3	native	forb	0.15
122	*Cicuta maculata*	SPOTTED WATER-HEMLOCK	4	3	native	forb	0.03
76	*Cinna arundinacea*	COMMON WOOD-REED	7	4	native	grass	0.27
68	*Circaea lutetiana*	BROAD-LF ENCHANTER'S-NIGHTSH.	8	3	native	forb	0.02
90	*Cirsium arvense*	CANADA THISTLE	6	0	adventive	forb	0.10
147	*Clematis virginiana*	VIRGIN'S-BOWER	3	3	native	forb	0.02
258	*Collinsonia canadensis*	RICH WEED	1	5	native	forb	0.00
147	*Convolvulus arvensis*	FIELD BINDWEED	3	0	adventive	forb	0.03
258	*Coreopsis tripteris*	TALL TICKSEED	1	5	native	forb	0.00
258	*Cornus alternifolia*	ALTERNATE-LEAVED DOGWOOD	1	5	native	shrub	0.01
7	*Cornus amomum*	SILKY DOGWOOD	23	2	native	shrub	1.78
258	*Cornus drummondii*	ROUGH-LEAVED DOGWOOD	1	3	native	shrub	0.47
258	*Cornus florida*	FLOWERING DOGWOOD	1	5	native	sm tree	0.01
122	*Cornus racemosa*	GRAY DOGWOOD	4	1	native	shrub	0.02
258	*Cornus rugosa*	ROUND-LEAVED DOGWOOD	1	8	native	shrub	0.01
258	*Cornus sericea*	RED-OSIER DOGWOOD	1	3	native	shrub	0.02
147	*Corylus americana*	AMERICAN HAZEL	3	4	native	shrub	0.02
90	*Crataegus crus-galli*	COCKSPUR	6	3	native	sm tree	0.05

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76	*Cryptotaenia canadensis*	HONEWORT	7	3	native	forb	0.01
122	*Cuscuta gronovii*	COMMON DODDER	4	3	native	forb	0.04
122	*Cyperus esculentus*	YELLOW NUT-SEDGE	4	0	native	sedge	0.18
185	*Cyperus odoratus*	RUSTY UMBRELLA-SEDGE	2	4	native	sedge	0.01
147	*Cyperus strigosus*	STRAW-COLORED UMBRELLA-S.	3	1	native	sedge	0.01
258	*Dactylis glomerata*	ORCHARD GRASS	1	0	adventive	grass	0.00
185	*Daucus carota*	QUEEN-ANNE'S-LACE	2	0	adventive	forb	0.01
68	*Decodon verticillatus*	SWAMP LOOSESTRIFE	8	6	native	forb	0.93
258	*Desmodium canadense*	CANADA TICK-TREFOIL	1	4	native	forb	0.00
258	*Diarrhena obovata*	OBOVATE BEAK GRASS	1	7	native	grass	0.00
147	*Dichanthelium clandestinum*	DEER'S-TONGUE PANIC GRASS	3	2	native	grass	0.02
258	*Dioscorea villosa*	WILD YAM	1	4	native	vine	0.00
185	*Dipsacus fullonum*	WILD TEASEL	2	0	adventive	forb	0.07
55	*Dryopteris carthusiana*	SPINULOSE WOOD FERN	9	5	native	fern	0.14
185	*Dryopteris cristata*	CRESTED WOOD FERN	2	8	native	fern	0.00
258	*Dryopteris intermedia*	EVERGREEN WOOD FERN	1	6	native	fern	0.00
258	*Duchesnea indica*	INDIAN-STRAWBERRY	1	0	adventive	forb	0.01
258	*Dulichium arundinaceum*	THREE-WAY SEDGE	1	6	native	sedge	0.00
258	*Echinochloa crus-galli*	BARNYARD GRASS	1	0	adventive	grass	0.00
258	*Echinochloa muricata*	ROUGH BARNYARD GRASS	1	3	native	grass	0.01
258	*Echinocystis lobata*	WILD CUCUMBER	1	2	native	vine	0.01
258	*Eclipta prostrata*	YERBA-DE-TAJO	1	3	native	forb	0.00
185	*Elaeagnus umbellata*	AUTUMN-OLIVE	2	0	adventive	sm tree	0.01
122	*Eleocharis acicularis*	NEEDLE SPIKE-RUSH	4	5	native	sedge	0.17
258	*Eleocharis elliptica*	YELLOW-SEEDED SPIKE-RUSH	1	7	native	sedge	0.00
185	*Eleocharis obtusa*	BLUNT SPIKE-RUSH	2	1	native	sedge	0.00
68	*Eleocharis palustris*	SMALL'S SPIKE-RUSH	8	5	native	sedge	1.42
258	*Elodea canadensis*	COMMON WATERWEED	1	3	native	forb	0.00
258	*Elymus hystrix*	BOTTLEBRUSH GRASS	1	4	native	grass	0.01
147	*Elymus riparius*	RIVERBANK WILD RYE	3	5	native	grass	0.04
185	*Elymus virginicus*	VIRGINIA WILD RYE	2	3	native	grass	0.05
68	*Epilobium coloratum*	PURPLE-LEAVED WILLOW-HERB	8	1	native	forb	0.03

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76	*Equisetum arvense*	FIELD HORSETAIL	7	0	native	fern	0.02
258	*Eragrostis hypnoides*	CREEPING LOVE GRASS	1	4	native	grass	0.00
147	*Erechtites hieracifolia*	PILEWORT	3	2	native	forb	0.02
185	*Erigeron annuus*	DAISY FLEABANE	2	0	native	forb	0.00
258	*Erigeron strigosus*	ROUGH FLEABANE	1	1	native	forb	0.00
55	*Eupatorium maculatum*	SPOTTED JOE-PYE WEED	9	6	native	forb	0.07
32	*Eupatorium perfoliatum*	COMMON BONESET	14	3	native	forb	0.13
185	*Eupatorium purpureum*	PURPLE JOE-PYE WEED	2	5	native	forb	0.02
258	*Eupatorium rugosum*	WHITE SNAKEROOT	1	3	native	forb	0.02
258	*Euphorbia humistrata*	SPREADING SPURGE	1	3	native	forb	0.02
185	*Euthamia graminifolia*	FLAT-TOPPED GOLDENROD	2	2	native	forb	0.02
76	*Fagus grandifolia*	AMERICAN BEECH	7	7	native	tree	0.60
147	*Fragaria virginiana*	WILD STRAWBERRY	3	1	native	forb	0.08
185	*Fraxinus americana*	WHITE ASH	2	6	native	tree	0.01
122	*Fraxinus nigra*	BLACK ASH	4	7	native	tree	0.15
1	*Fraxinus pennsylvanica*	GREEN ASH	31	3	native	tree	2.78
147	*Galium aparine*	CLEAVERS	3	0	native	forb	0.01
147	*Galium asprellum*	ROUGH BEDSTRAW	3	4	native	forb	0.14
185	*Galium obtusum*	BLUNT-LEAVED BEDSTRAW	2	5	native	forb	0.01
258	*Galium palustre*	MARSH BEDSTRAW	1	9	native	forb	0.00
19	*Galium tinctorium*	SMALL THREE-LOBED BEDSTRAW	18	4	native	forb	0.24
185	*Galium triflorum*	SWEET-SCENTED BEDSTRAW	2	4	native	forb	0.00
185	*Geranium maculatum*	WILD GERANIUM	2	4	native	forb	0.01
15	*Geum canadense*	WHITE AVENS	19	2	native	forb	0.13
147	*Geum laciniatum*	ROUGH AVENS	3	2	native	forb	0.06
185	*Glechoma hederacea*	GROUND IVY	2	0	adventive	forb	0.01
258	*Gleditsia triacanthos*	HONEY LOCUST	1	4	native	tree	0.00
258	*Glyceria canadensis*	RATTLESNAKE MANNA GRASS	1	7	native	grass	0.01
122	*Glyceria septentrionalis*	FLOATING MANNA GRASS	4	6	native	grass	0.01
19	*Glyceria striata*	FOWL MANNA GRASS	18	2	native	grass	0.54
185	*Hamamelis virginiana*	WITCH-HAZEL	2	5	native	sm tree	0.19
258	*Helianthus decapetalus*	FOREST SUNFLOWER	1	4	native	forb	0.01

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258	*Hemerocallis fulva*	ORANGE DAY-LILY	1	0	adventive	forb	0.01
90	*Hibiscus moscheutos*	SWAMP ROSE-MALLOW	6	4	native	forb	0.64
258	*Hibiscus trionum*	FLOWER-OF-AN-HOUR	1	0	adventive	forb	0.00
258	*Holcus lanatus*	VELVET GRASS	1	0	adventive	grass	0.02
258	*Hordeum jubatum*	SQUIRREL-TAIL BARLEY	1	0	adventive	grass	0.00
258	*Humulus lupulus*	COMMON HOPS	1	2	native	vine	0.07
258	*Huperzia lucidula*	SHINING CLUB-MOSS	1	5	native	fern	0.00
258	*Hydrocharis morsus-ranae*	Common Frog-bit	1	0	adventive	forb	0.80
185	*Hypericum mutilum*	SLENDER ST. JOHN'S-WORT	2	3	native	forb	0.00
258	*Hypericum Mutilum*	SLENDER ST. JOHN'S-WORT	1	3	native	forb	0.00
258	*Hypericum punctatum*	SPOTTED ST. JOHN'S-WORT	1	2	native	forb	0.00
108	*Ilex verticillata*	WINTERBERRY	5	6	native	shrub	0.10
258	*Impatiens balsamina*	BALSAM	1	0	adventive	forb	0.04
6	*Impatiens capensis*	SPOTTED TOUCH-ME-NOT	26	2	native	forb	2.45
258	*Impatiens pallida*	PALE TOUCH-ME-NOT	1	3	native	forb	0.01
258	*Ipomoea purpurea*	COMMON MORNING-GLORY	1	0	adventive	forb	0.00
108	*Juglans nigra*	BLACK WALNUT	5	5	native	tree	0.17
258	*Juncus acuminatus*	SHARP-FRUITED RUSH	1	4	native	forb	0.12
258	*Juncus balticus*	BALTIC RUSH	1	6	native	forb	0.03
258	*Juncus dudleyi*	DUDLEY'S RUSH	1	3	native	forb	0.01
19	*Juncus effusus*	SOFT RUSH	18	1	native	forb	1.43
258	*Juncus marginatus*	GRASS-LEAVED RUSH	1	4	native	forb	0.00
147	*Juncus tenuis*	PATH RUSH	3	1	native	forb	0.01
258	*Juncus torreyi*	TORREY'S RUSH	1	3	native	forb	0.00
258	*Juniperus virginiana*	EASTERN RED CEDAR	1	3	native	tree	0.00
258	*Lactuca serriola*	PRICKLY LETTUCE	1	0	adventive	forb	0.01
90	*Laportea canadensis*	WOOD-NETTLE	6	5	native	forb	0.09
258	*Lathyrus palustris*	MARSH PEA	1	5	native	forb	0.00
258	*Leersia lenticularis*	CATCHFLY GRASS	1	9	native	grass	0.00
9	*Leersia oryzoides*	RICE CUT GRASS	22	1	native	grass	2.69
55	*Leersia virginica*	WHITE GRASS	9	4	native	grass	0.11
10	*Lemna minor*	COMMON DUCKWEED	21	3	native	forb	5.22

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108	*Lemna trisulca*	STAR DUCKWEED	5	6	native	forb	1.45
185	*Ligustrum vulgare*	COMMON PRIVET	2	0	adventive	shrub	0.01
32	*Lindera benzoin*	SPICEBUSH	14	5	native	shrub	1.21
258	*Liquidambar styraciflua*	SWEETGUM	1	6	native	tree	0.01
147	*Liriodendron tulipifera*	TULIP TREE	3	6	native	tree	0.08
185	*Lobelia cardinalis*	CARDINAL-FLOWER	2	5	native	forb	0.02
258	*Lobelia spicata*	PALE-SPIKE LOBELIA	1	5	native	forb	0.00
108	*Lonicera morrowii*	MORROW'S HONEYSUCKLE	5	0	adventive	shrub	0.08
258	*Lonicera tatarica*	TATARIAN HONEYSUCKLE	1	0	adventive	shrub	0.02
32	*Ludwigia palustris*	WATER-PURSLANE	14	3	native	forb	0.42
258	*Lycopodium dendroideum*	TREE CLUB-MOSS	1	5	native	fern	0.00
32	*Lycopus americanus*	AMERICAN WATER-HOREHOUND	14	3	native	forb	0.10
185	*Lycopus rubellus*	STALKED WATER-HOREHOUND	2	4	native	forb	0.00
38	*Lycopus virginicus*	VIRGINIA BUGLE-WEED	13	3	native	forb	0.04
38	*Lysimachia ciliata*	FRINGED LOOSESTRIFE	13	4	native	forb	0.19
42	*Lysimachia nummularia*	MONEYWORT	12	0	adventive	forb	1.18
185	*Lysimachia terrestris*	SWAMP-CANDLES	2	6	native	forb	0.00
122	*Lythrum salicaria*	PURPLE LOOSESTRIFE	4	0	adventive	forb	0.04
258	*Magnolia acuminata*	CUCUMBER TREE	1	7	native	tree	0.09
185	*Maianthemum canadense*	CANADA MAYFLOWER	2	6	native	forb	0.09
147	*Maianthemum racemosum*	FALSE SOLOMON'S-SEAL	3	4	native	forb	0.00
185	*Medeola virginiana*	INDIAN CUCUMBER-ROOT	2	6	native	forb	0.01
258	*Menispermum canadense*	CANADA MOONSEED	1	5	native	vine	0.00
76	*Mentha arvensis*	FIELD MINT	7	2	native	forb	0.06
185	*Microstegium vimineum*	RECLINING EULALIA	2	0	adventive	grass	0.35
258	*Mimulus alatus*	WINGED MONKEY-FLOWER	1	6	native	forb	0.03
90	*Mimulus ringens*	COMMON MONKEY-FLOWER	6	4	native	forb	0.02
185	*Mitchella repens*	PARTRIDGE-BERRY	2	5	native	forb	0.08
185	*Monarda fistulosa*	WILD BERGAMOT	2	3	native	forb	0.00
258	*Morus alba*	WHITE MULBERRY	1	0	adventive	tree	0.00
258	*Myosotis scorpioides*	TRUE FORGET-ME-NOT	1	0	adventive	forb	0.00
258	*Myriophyllum spicatum*	EUROPEAN WATER-MILFOIL	1	0	adventive	forb	0.00

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185	*Nuphar advena*	SPATTERDOCK	2	4	native	forb	1.07
258	*Nymphaea odorata*	FRAGRANT WATER-LILY	1	6	native	forb	0.00
122	*Nyssa sylvatica*	BLACK-GUM	4	7	native	tree	0.08
10	*Onoclea sensibilis*	SENSITIVE FERN	21	2	native	fern	1.15
185	*Osmunda cinnamomea*	CINNAMON FERN	2	6	native	fern	0.12
258	*Osmunda claytoniana*	INTERRUPTED FERN	1	6	native	fern	0.02
147	*Osmunda regalis*	ROYAL FERN	3	7	native	fern	0.03
122	*Ostrya virginiana*	HOP-HORNBEAM	4	5	native	tree	0.02
108	*Oxalis stricta*	COMMON YELLOW WOOD-SORREL	5	0	native	forb	0.01
185	*Panicum clandestinum*	DEER'S-TONGUE PANIC GRASS	2	2	native	grass	0.07
258	*Panicum lanuginosum*	WESTERN PANIC GRASS	1	3	native	grass	0.08
7	*Parthenocissus quinquefolia*	VIRGINIA CREEPER	23	2	native	vine	0.26
185	*Peltandra virginica*	ARROW-ARUM	2	5	native	forb	0.88
258	*Penstemon digitalis*	FOXGLOVE BEARD-TONGUE	1	2	native	forb	0.00
108	*Penthorum sedoides*	DITCH-STONECROP	5	2	native	forb	0.01
3	*Phalaris arundinacea*	REED CANARY GRASS	30	0	native	grass	10.85
90	*Phragmites australis ssp. australis*	GIANT REED	6	0	adventive	grass	0.68
258	*Phryma leptostachya*	LOPSEED	1	5	native	forb	0.00
258	*Phyla lanceolata*	FOG-FRUIT	1	3	native	forb	0.08
147	*Phytolacca americana*	POKEWEED	3	1	native	forb	0.05
258	*Pilea fontana*	COOLWORT	1	4	native	forb	0.00
38	*Pilea pumila*	CANADIAN CLEARWEED	13	2	native	forb	0.63
258	*Plantago lanceolata*	ENGLISH PLANTAIN	1	0	adventive	forb	0.00
258	*Plantago major*	COMMON PLANTAIN	1	0	adventive	forb	0.00
185	*Platanthera lacera*	RAGGED FRINGED ORCHID	2	3	native	forb	0.01
90	*Platanus occidentalis*	SYCAMORE	6	7	native	tree	0.69
258	*Poa compressa*	CANADA BLUEGRASS	1	0	adventive	grass	0.00
122	*Poa palustris*	FOWL MEADOW GRASS	4	5	native	grass	0.04
185	*Poa pratensis*	KENTUCKY BLUEGRASS	2	0	adventive	grass	0.00
258	*Poa sylvestris*	WOODS BLUEGRASS	1	5	native	grass	0.00
185	*Poa trivialis*	ROUGH BLUEGRASS	2	0	adventive	grass	0.02
185	*Podophyllum peltatum*	MAYAPPLE	2	4	native	forb	0.01

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42	*Polygonum amphibium*	WATER SMARTWEED	12	4	native	forb	2.10
55	*Polygonum arifolium*	HALBERD-LEAVED TEARTHUMB	9	4	native	forb	0.23
258	*Polygonum cespitosum*	LONG-BRISTLED SMARTWEED	1	0	adventive	forb	0.00
258	*Polygonum cuspidatum*	JAPANESE KNOTWEED	1	0	adventive	forb	0.21
15	*Polygonum hydropiperoides*	MILD WATER-PEPPER	19	6	native	forb	1.19
185	*Polygonum lapathifolium*	DOCK-LEAVED SMARTWEED	2	1	native	forb	0.01
108	*Polygonum pensylvanicum*	PINKWEED	5	0	native	forb	0.02
185	*Polygonum persicaria*	LADY'S THUMB	2	0	adventive	forb	0.01
122	*Polygonum punctatum*	DOTTED SMARTWEED	4	6	native	forb	0.02
10	*Polygonum sagittatum*	ARROW-LEAVED TEARTHUMB	21	2	native	forb	0.41
258	*Polygonum scandens*	CLIMBING FALSE BUCKWHEAT	1	2	native	vine	0.00
76	*Polygonum virginianum*	JUMPSEED	7	3	native	forb	0.20
258	*Polystichum acrostichoides*	CHRISTMAS FERN	1	3	native	fern	0.00
258	*Pontederia cordata*	PICKEREL-WEED	1	6	native	forb	0.00
76	*Populus deltoides*	EASTERN COTTONWOOD	7	3	native	tree	0.75
122	*Populus tremuloides*	QUAKING ASPEN	4	2	native	tree	0.23
258	*Portulaca oleracea*	COMMON PURSLANE	1	0	adventive	forb	0.00
258	*Potamogeton crispus*	CURLY-LEAVED PONDWEED	1	0	adventive	forb	0.00
185	*Potamogeton foliosus*	LEAFY PONDWEED	2	2	native	forb	0.05
258	*Potamogeton nodosus*	LONG-LEAVED PONDWEED	1	3	native	forb	0.01
258	*Potentilla norvegica*	STRAWBERRY-WEED	1	1	native	forb	0.00
122	*Potentilla simplex*	OLD FIELD CINQUEFOIL	4	1	native	forb	0.08
185	*Prunella vulgaris*	SELF-HEAL	2	0	native	forb	0.00
32	*Prunus serotina*	BLACK CHERRY	14	3	native	tree	0.30
185	*Prunus virginiana*	CHOKE CHERRY	2	2	native	sm tree	0.02
258	*Pycnanthemum virginianum*	VIRGINIA MOUNTAIN-MINT	1	4	native	forb	0.00
258	*Pyrola elliptica*	SHINLEAF	1	7	native	forb	0.02
258	*Pyrus coronaria*	WILD CRABAPPLE	1	3	native	sm tree	0.01
258	*Quercus alba*	WHITE OAK	1	6	native	tree	0.00
76	*Quercus bicolor*	SWAMP WHITE OAK	7	7	native	tree	0.16
185	*Quercus imbricaria*	SHINGLE OAK	2	5	native	tree	0.02
258	*Quercus macrocarpa*	BUR OAK	1	6	native	tree	0.01

Frequency Rank	*Scientific Name*	Common Name	Number of Wetlands (out of 50)	C of C	Nativity	Growth Form	Relative Cover %
258	*Quercus muehlenbergii*	CHINQUAPIN OAK	1	7	native	tree	0.01
29	*Quercus palustris*	PIN OAK	15	5	native	tree	0.31
147	*Quercus rubra*	RED OAK	3	6	native	tree	0.23
258	*Quercus velutina*	BLACK OAK	1	7	native	tree	0.02
258	*Ranunculus acris*	TALL BUTTERCUP	1	0	adventive	forb	0.00
76	*Ranunculus hispidus*	NORTHERN SWAMP BUTTERCUP	7	4	native	forb	0.12
258	*Ranunculus sceleratus*	CURSED CROWFOOT	1	1	native	forb	0.00
147	*Rhamnus cathartica*	EUROPEAN BUCKTHORN	3	0	adventive	sm tree	0.01
50	*Rhamnus frangula*	GLOSSY BUCKTHORN	10	0	adventive	shrub	0.39
258	*Rhus glabra*	SMOOTH SUMAC	1	2	native	shrub	0.00
147	*Ribes americanum*	WILD BLACK CURRANT	3	4	native	shrub	0.08
185	*Ribes cynosbati*	DOGBERRY	2	3	native	shrub	0.00
258	*Rorippa nasturtium-aquaticum*	WATERCRESS	1	0	adventive	forb	0.07
147	*Rorippa palustris*	YELLOW CRESS	3	2	native	forb	0.01
15	*Rosa multiflora*	MULTIFLORA ROSE	19	0	adventive	shrub	0.73
29	*Rosa palustris*	SWAMP ROSE	15	5	native	shrub	0.44
108	*Rosa setigera*	CLIMBING PRAIRIE ROSE	5	4	native	shrub	0.02
32	*Rubus allegheniensis*	COMMON BLACKBERRY	14	1	native	shrub	0.29
108	*Rubus hispidus*	SWAMP DEWBERRY	5	5	native	forb	0.16
76	*Rubus occidentalis*	BLACK RASPBERRY	7	1	native	shrub	0.03
258	*Rubus pensilvanicus*	PENNSYLVANIA BLACKBERRY	1	1	native	shrub	0.02
258	*Rudbeckia hirta*	BLACK-EYED SUSAN	1	1	native	forb	0.00
90	*Rudbeckia laciniata*	GREEN-HEADED CONEFLOWER	6	6	native	forb	0.02
90	*Rumex crispus*	CURLY DOCK	6	0	adventive	forb	0.02
122	*Rumex obtusifolius*	BITTER DOCK	4	0	adventive	forb	0.01
185	*Rumex orbiculatus*	GREAT WATER DOCK	2	5	native	forb	0.00
55	*Rumex verticillatus*	SWAMP DOCK	9	6	native	forb	0.22
47	*Sagittaria latifolia*	COMMON ARROWHEAD	11	1	native	forb	0.99
42	*Salix discolor*	PUSSY WILLOW	12	3	native	shrub	1.06
122	*Salix exigua*	SANDBAR WILLOW	4	1	native	shrub	0.24
147	*Salix fragilis*	CRACK WILLOW	3	0	adventive	tree	0.17
19	*Salix nigra*	BLACK WILLOW	18	2	native	tree	2.20

Frequency Rank	*Scientific Name*	Common Name	Number of Wetlands (out of 50)	C of C	Nativity	Growth Form	Relative Cover %
147	*Salix sericea*	SILKY WILLOW	3	4	native	shrub	0.03
26	*Sambucus canadensis*	COMMON ELDERBERRY	16	3	native	shrub	0.12
258	*Sanicula canadensis*	SHORT-STYLED SNAKEROOT	1	3	native	forb	0.00
185	*Sanicula gregaria*	CLUSTERED SNAKEROOT	2	3	native	forb	0.01
258	*Saururus cernuus*	LIZARD'S-TAIL	1	8	native	forb	0.00
258	*Schoenoplectus acutus*	HARD-STEMMED BULRUSH	1	7	native	sedge	0.02
258	*Schoenoplectus mucronatus*	RICEFIELD BULRUSH	1	0	adventive	sedge	0.00
258	*Schoenoplectus pungens*	THREE-SQUARE	1	5	native	sedge	0.00
55	*Schoenoplectus tabernaemontani*	SOFT-STEMMED BULRUSH	9	2	native	sedge	0.20
76	*Scirpus atrovirens*	GREEN BULRUSH	7	1	native	sedge	0.03
29	*Scirpus cyperinus*	WOOL-GRASS	15	1	native	sedge	0.99
185	*Scirpus polyphyllus*	LEAFY BULRUSH	2	6	native	sedge	0.05
258	*Scutellaria galericulata*	MARSH SKULLCAP	1	6	native	forb	0.00
42	*Scutellaria lateriflora*	MAD-DOG SKULLCAP	12	3	native	forb	0.03
258	*Senecio glabellus*	BUTTERWEED	1	0	adventive	forb	0.00
258	*Setaria faberi*	GIANT FOXTAIL GRASS	1	0	adventive	grass	0.01
258	*Sida spinosa*	PRICKLY SIDA	1	0	adventive	forb	0.31
90	*Sium suave*	WATER-PARSNIP	6	6	native	forb	0.06
185	*Smilax hispida*	BRISTLY GREENBRIER	2	3	native	vine	0.00
258	*Smilax rotundifolia*	COMMON GREENBRIER	1	4	native	vine	0.00
258	*Solanum carolinense*	HORSE NETTLE	1	0	adventive	forb	0.00
19	*Solanum dulcamara*	BITTERSWEET NIGHTSHADE	18	0	adventive	vine	0.41
90	*Solidago canadensis*	CANADA GOLDENROD	6	1	native	forb	0.70
122	*Solidago gigantea*	SMOOTH GOLDENROD	4	3	native	forb	0.40
90	*Sparganium americanum*	AMERICAN BUR-REED	6	6	native	forb	0.61
50	*Sparganium eurycarpum*	GIANT BUR-REED	10	4	native	forb	1.86
50	*Spiraea alba*	MEADOW-SWEET	10	3	native	shrub	1.91
258	*Spiraea tomentosa*	STEEPLEBUSH	1	4	native	shrub	0.02
68	*Spirodela polyrhiza*	GREATER DUCKWEED	8	5	native	forb	0.38
185	*Stachys tenuifolia*	SMOOTH HEDGE-NETTLE	2	4	native	forb	0.01
147	*Stellaria longifolia*	LONG-LEAVED STITCHWORT	3	4	native	forb	0.05
258	*Stellaria media*	COMMON CHICKWEED	1	0	adventive	forb	0.00

Frequency Rank	*Scientific Name*	Common Name	Number of Wetlands (out of 50)	C of C	Nativity	Growth Form	Relative Cover %
258	*Stenanthium gramineum*	FEATHER-BELLS	1	8	native	forb	0.01
258	*Stuckenia pectinata*	SAGO PONDWEED	1	2	native	forb	0.00
258	*Symphyotrichum lateriflorum*	CALICO ASTER	1	2	native	forb	0.01
68	*Symplocarpus foetidus*	SKUNK-CABBAGE	8	6	native	forb	0.69
147	*Taraxacum officinale*	COMMON DANDELION	3	0	adventive	forb	0.00
258	*Taxodium distichum*	BALD CYPRESS	1	0	adventive	tree	0.03
258	*Teucrium canadense*	AMERICAN GERMANDER	1	3	native	forb	0.02
258	*Thalictrum dioicum*	EARLY MEADOW-RUE	1	5	native	forb	0.00
147	*Thalictrum pubescens*	TALL MEADOW-RUE	3	5	native	forb	0.01
185	*Thelypteris novaboracensis*	NEW YORK FERN	2	4	native	fern	0.15
122	*Thelypteris palustris*	MARSH FERN	4	6	native	fern	0.12
258	*Tiarella cordifolia*	FOAMFLOWER	1	6	native	forb	0.00
122	*Tilia americana*	AMERICAN BASSWOOD	4	6	native	tree	0.11
5	*Toxicodendron radicans*	POISON-IVY	27	1	native	vine	1.16
258	*Triadenum virginicum*	VIRGINIA MARSH ST. JOHN'S-W.	1	6	native	forb	0.00
258	*Trillium grandiflorum*	LARGE-FLOWERED TRILLIUM	1	5	native	forb	0.00
76	*Typha angustifolia*	NARROW-LEAVED CAT-TAIL	7	0	adventive	forb	0.81
26	*Typha latifolia*	BROAD-LEAVED CAT-TAIL	16	1	native	forb	1.35
185	*Typha x glauca*	HYBRID CAT-TAIL	2	0	adventive	forb	1.77
4	*Ulmus americana*	AMERICAN ELM	28	2	native	tree	2.51
258	*Ulmus rubra*	SLIPPERY ELM	1	3	native	tree	0.00
258	*Urtica dioica L. var. procera*	AMERICAN STINGING NETTLE	1	1	native	forb	0.00
76	*Urtica dioica var. dioica*	EUROPEAN STINGING NETTLE	7	0	adventive	forb	0.35
55	*Utricularia vulgaris*	COMMON BLADDERWORT	9	6	native	forb	1.78
185	*Vaccinium corymbosum*	HIGHBUSH BLUEBERRY	2	6	native	shrub	0.09
258	*Verbascum blattaria*	MOTH MULLEIN	1	0	adventive	forb	0.00
147	*Verbena urticifolia*	WHITE VERVAIN	3	3	native	forb	0.01
90	*Verbesina alternifolia*	WINGSTEM	6	5	native	forb	0.32
90	*Vernonia gigantea*	TALL IRONWEED	6	2	native	forb	0.02
258	*Viburnum acerifolium*	MAPLE-LEAVED VIBURNUM	1	6	native	shrub	0.00
185	*Viburnum dentatum*	ARROW-WOOD	2	2	native	shrub	0.03
122	*Viburnum lentago*	NANNYBERRY	4	5	native	shrub	0.03

Frequency Rank	*Scientific Name*	Common Name	Number of Wetlands (out of 50)	C of C	Nativity	Growth Form	Relative Cover %
258	*Viburnum opulus L. var. americana*	HIGHBUSH-CRANBERRY	1	8	native	shrub	0.02
258	*Viburnum opulus var. opulus*	EUROPEAN CRANBERRY-BUSH	1	0	adventive	shrub	0.02
258	*Viburnum prunifolium*	BLACK-HAW	1	4	native	shrub	0.00
55	*Viburnum recognitum*	NORTHERN ARROW-WOOD	9	2	native	shrub	0.35
258	*Viola cucullata*	MARSH BLUE VIOLET	1	6	native	forb	0.00
19	*Vitis riparia*	RIVERBANK GRAPE	18	3	native	vine	0.39
122	*Wolffia columbiana*	COMMON WATER-MEAL	4	3	native	forb	0.11
185	*Xanthium strumarium*	COMMON COCKLEBUR	2	0	adventive	forb	0.49
258	*Zanthoxylum americanum*	PRICKLY-ASH	1	3	native	shrub	0.01
258	*Zizia aptera*	HEART-LEAVED GOLDEN ALEX.	1	7	native	forb	0.00
147	*Zizia aurea*	GOLDEN ALEXANDERS	3	6	native	forb	0.02

Appendix III. Draft U.S. EPA NWCA site data with VMMI, VIBI-FQ, field buffer stress and LDI parameters.

Site ID	Vegetation Condition	VMMI	Total Buffer Stress	Weighted C of C	FQAI	US VIBI-FQ	Buffer 1 LDI (0 to 100M)	Buffer 2 LDI (100 to 350M)	Buffer 3 LDI (350 to 1000M)	Buffer 4 LDI (1000 to 2000M)	Total Buffer LDI
NWCA11-1240	3-Good	87.80	10	6.10	50.80	88.14	1.00	1.06	1.03	1.05	1.03
NWCA11-2426	3-Good	83.10	0	7.43	18.37	65.54	1.00	1.00	1.02	1.08	1.01
NWCA11-1266	1-Poor	27.50	7	0.44	9.50	9.16	1.00	1.00	1.01	1.10	1.01
NWCA11-1304	2-Fair	53.00	9	4.97	30.86	68.02	1.00	1.00	1.09	1.26	1.04
NWCA11-1299	3-Good	63.10	12	4.89	21.17	53.65	5.04	5.94	6.03	5.34	5.54
NWCA11-2418	3-Good	75.00	3	7.00	7.00	46.61	1.02	2.14	2.77	1.95	1.80
NWCA11-2432	2-Fair	57.60	2	6.52	24.09	68.03	1.00	1.02	1.03	1.17	1.03
NWCA11-2407	3-Good	77.10	6	7.00	9.90	50.75	1.16	1.56	1.63	1.68	1.43
NWCA11-1006	2-Fair	57.60	1	5.30	27.78	65.66	1.00	1.01	1.70	1.38	1.18
NWCA11-2434	2-Fair	74.00	3	7.63	20.67	70.09	1.63	3.28	2.06	1.80	2.23
NWCA11-2435	2-Fair	65.10	0	7.42	20.67	68.74	1.00	1.02	1.22	1.29	1.08
NWCA11-1002	2-Fair	67.00	0	5.03	21.75	55.39	1.00	1.37	2.64	2.25	1.57
NWCA11-1014	2-Fair	52.80	0	4.97	33.04	71.12	1.00	1.66	2.43	2.86	1.67
NWCA11-1011	3-Good	65.80	0	5.19	31.87	70.81	1.00	1.00	1.00	1.00	1.00
NWCA11-2410	3-Good	77.20	4	7.31	21.36	69.07	1.00	1.00	1.01	1.08	1.01
NWCA11-1105	1-Poor	51.20	3	3.47	11.72	31.29	1.00	1.00	1.60	2.52	1.27
NWCA11-2639	2-Fair	67.00	0	5.57	23.53	61.27	1.00	1.00	2.18	1.73	1.31
NWCA11-2637	3-Good	76.20	0	7.50	15.20	61.45	1.00	1.19	1.09	1.61	1.14
NWCA11-2536	3-Good	74.40	0	7.39	23.81	73.08	1.27	2.57	2.57	2.06	2.00
NWCA11-2420	2-Fair	67.90	3	7.03	23.25	70.00	1.11	3.20	3.62	2.56	2.38
NWCA11-2055	1-Poor	42.70	9	2.90	26.67	49.08	3.61	4.23	3.55	3.31	3.75
NWCA11-2027	1-Poor	45.40	0	2.10	34.84	55.75	1.00	1.11	2.42	2.98	1.51
NWCA11-2402	1-Poor	49.30	2	4.86	23.47	56.78	1.00	1.00	1.16	1.26	1.06
NWCA11-2066	3-Good	69.70	6	6.00	28.85	71.59	1.52	1.65	1.86	1.38	1.61
NWCA11-2025	2-Fair	58.60	1	4.77	32.82	69.53	1.00	1.00	2.75	3.59	1.61
NWCA11-2404	3-Good	83.80	1	6.99	21.19	66.83	1.22	2.77	3.92	2.69	2.37
NWCA11-2412	3-Good	75.00	0	7.00	7.00	46.61	1.00	1.85	2.69	2.78	1.77
NWCA11-2777	1-Poor	40.50	7	3.78	42.39	73.65	1.09	1.74	1.22	1.12	1.31
NWCA11-2666	1-Poor	45.50	6	3.59	23.24	48.49	1.13	2.53	2.38	1.54	1.84
NWCA11-2653	2-Fair	59.00	3	4.71	13.60	41.69	1.74	2.73	2.83	1.53	2.23
NWCA11-2647	3-Good	74.10	1	7.15	13.61	57.00	1.18	1.90	2.22	2.00	1.69
NWCA11-ND-5052	3-Good	38.10	2	1.64	12.16	20.47	1.93	2.66	3.10	3.07	2.50
NWCA11-2634	3-Good	81.40	6	7.42	15.00	60.64	2.24	1.49	1.67	1.73	1.85
NWCA11-2651	3-Good	65.40	2	6.18	15.75	53.96	1.00	2.22	2.00	1.85	1.65
NWCA11-2652	3-Good	75.00	0	7.00	7.00	46.61	1.00	1.00	1.00	1.06	1.01
NWCA11-2427	3-Good	75.00	0	7.00	7.00	46.61	1.10	3.43	1.83	1.58	1.99
NWCA11-OH-3020	1-Poor	25.90	9	0.24	9.55	7.98	4.54	4.46	3.74	3.89	4.29
NWCA11-ND-5001	3-Good	53.40	8	2.34	9.64	21.28	4.54	4.28	3.30	4.13	4.17
NWCA11-1059	1-Poor	51.10	8	3.49	28.22	55.01	1.26	1.04	1.31	1.50	1.23
NWCA11-1054	1-Poor	39.80	10	3.30	8.02	24.95	3.99	5.69	4.74	3.48	4.60
NWCA11-1021	3-Good	80.50	0	7.00	14.00	56.61	1.00	1.16	1.09	1.85	1.15
NWCA11-1017	3-Good	78.80	0	6.79	17.49	60.29	1.00	1.00	1.02	2.00	1.10
NWCA11-1823	3-Good	76.90	0	6.39	25.89	69.79	1.04	1.85	2.78	3.13	1.84
NWCA11-1821	3-Good	65.90	0	5.67	26.75	66.54	1.00	1.08	1.13	1.09	1.06
NWCA11-1837	2-Fair	61.80	0	2.84	35.17	60.83	1.06	1.47	1.58	1.31	1.31
NWCA11-2225	1-Poor	14.50	10	0.43	8.55	7.75	3.51	2.66	2.22	2.24	2.87
NWCA11-2232	3-Good	64.90	8	2.93	6.63	20.64	2.32	3.28	3.22	2.87	2.84
NWCA11-2238	1-Poor	32.10	6	1.73	12.85	22.05	2.23	2.27	2.31	2.29	2.26
NWCA11-2241	2-Fair	49.30	9	3.53	20.51	44.22	2.28	2.33	2.30	2.29	2.30
NWCA11-2785	2-Fair	37.30	6	1.97	12.65	23.25	1.49	1.62	2.26	2.90	1.82
NWCA11-2790	2-Fair	57.30	5	3.52	31.13	59.33	1.00	1.16	1.23	1.41	1.14
NWCA11-2794	3-Good	59.90	2	5.25	35.27	76.07	1.50	1.44	1.27	1.48	1.44
NWCA11-2799	1-Poor	28.70	8	0.84	9.65	11.88	1.98	1.98	2.14	2.71	2.08
NWCA11-2800	1-Poor	46.20	2	2.67	29.40	51.54	2.61	2.24	1.71	1.53	2.21
NWCA11-4025	3-Good	65.00	10	2.92	4.54	18.27	3.25	3.41	3.00	2.36	3.16
NWCA11-4029	1-Poor	25.60	10	0.70	4.33	4.40	3.41	3.38	3.15	2.50	3.26
NWCA11-4031	1-Poor	43.90	5	3.22	21.19	43.22	2.02	2.16	2.08	2.18	2.09
NWCA11-4583	3-Good	67.10	4	4.35	30.30	63.32	1.08	1.26	1.59	1.58	1.28
NWCA11-1162	3-Good	68.30	1	5.21	44.82	82.56	1.00	1.04	1.16	1.83	1.13

Site ID	Vegetation Condition	VMMI	Total Buffer Stress	Weighted C of C	FQAI	US VIBI-FQ	Buffer 1 LDI (0 to 100M)	Buffer 2 LDI (100 to 350M)	Buffer 3 LDI (350 to 1000M)	Buffer 4 LDI (1000 to 2000M)	Total Buffer LDI
NWCA11-1174	3-Good	69.00	0	6.89	33.05	83.11	4.02	3.64	3.64	3.68	3.79
NWCA11-1824	2-Fair	60.00	0	3.05	25.00	47.63	1.00	1.04	1.42	1.67	1.16
NWCA11-2974	3-Good	67.20	3	6.36	38.89	88.17	1.68	1.43	1.14	2.03	1.53
NWCA11-OH-3006	3-Good	63.80	3	5.14	14.25	45.33	1.00	1.19	1.91	2.53	1.39
NWCA11-2415	3-Good	61.20	4	5.79	28.30	69.44	1.05	1.60	1.26	1.13	1.26
NWCA11-1836	3-Good	78.80	0	6.77	21.43	65.77	1.00	1.54	2.12	1.51	1.44
NWCA11-1010	3-Good	82.00	0	6.96	15.92	59.12	1.00	1.00	1.96	1.34	1.23
NWCA11-1203	3-Good	81.00	4	7.00	14.50	57.32	1.00	1.00	1.02	2.21	1.12
NWCA11-2599	2-Fair	73.40	1	8.03	21.50	73.58	1.00	1.10	1.08	2.08	1.15
NWCA11-2600	2-Fair	61.10	2	5.36	17.79	51.78	1.00	2.31	3.71	2.56	2.09
NWCA11-2582	1-Poor	48.90	7	1.12	11.88	16.84	1.00	2.04	1.41	1.28	1.42
NWCA11-2531	2-Fair	66.70	0	5.32	12.80	44.38	2.77	2.66	2.81	1.60	2.63
NWCA11-1222	1-Poor	59.30	4	6.41	10.00	47.22	1.00	1.01	1.53	1.68	1.18
NWCA11-1210	3-Good	82.30	8	6.98	17.15	60.96	2.22	2.21	2.28	3.03	2.31
NWCA11-ND-5003	3-Good	49.80	6	1.75	7.54	14.56	3.82	4.55	4.07	3.74	4.08
NWCA11-ND-5004	2-Fair	32.40	6	0.64	4.25	3.99	4.61	4.59	4.38	4.22	4.52
NWCA11-ND-5007	3-Good	66.40	7	2.03	22.63	37.86	3.04	3.02	3.09	3.09	3.05
NWCA11-ND-5008	3-Good	41.50	6	1.66	7.14	13.46	4.54	4.61	4.52	4.38	4.54
NWCA11-ND-5010	1-Poor	12.40	9	0.09	7.30	3.83	4.71	3.95	3.71	3.71	4.18
NWCA11-ND-5011	3-Good	38.30	2	3.50	12.34	32.36	2.75	2.67	3.07	3.69	2.88
NWCA11-ND-5012	3-Good	45.10	2	2.28	11.25	23.18	3.10	3.36	3.64	3.51	3.32
NWCA11-ND-5013	3-Good	52.30	4	3.29	20.83	43.19	2.21	3.44	3.64	3.64	3.01
NWCA11-ND-5006	1-Poor	24.40	0	0.06	2.04	0.37	1.00	1.47	2.76	3.52	1.75
NWCA11-1622	2-Fair	67.30	0	8.53	11.50	59.29	4.79	3.00	1.62	1.21	3.26
NWCA11-1638	3-Good	82.90	0	8.95	20.33	71.90	1.20	1.56	1.78	1.26	1.43
NWCA11-1646	1-Poor	23.80	0	2.26	4.04	14.15	1.00	1.00	1.00	1.03	1.00
NWCA11-1661	3-Good	76.60	0	9.00	9.00	55.71	1.00	1.00	1.00	1.00	1.00
NWCA11-1677	3-Good	83.70	0	9.26	20.03	71.47	1.00	1.24	1.67	1.26	1.23
NWCA11-1685	1-Poor	59.90	0	6.12	18.66	57.79	2.59	2.93	1.59	1.22	2.36
NWCA11-1697	3-Good	74.50	0	8.44	9.81	56.88	1.47	1.57	1.01	1.04	1.36
NWCA11-2578	1-Poor	13.90	3	0.62	7.72	7.77	4.13	4.10	4.00	3.38	4.02
NWCA11-2588	1-Poor	40.10	0	2.40	10.02	22.15	3.37	3.94	2.51	1.61	3.19
NWCA11-1226	1-Poor	41.90	5	3.29	9.39	26.83	1.00	1.00	1.49	1.67	1.17
NWCA11-2012	3-Good	75.10	2	6.36	46.75	89.74	1.00	1.03	1.61	1.53	1.18
NWCA11-2016	3-Good	85.00	3	6.39	38.89	88.37	1.00	1.20	1.28	1.28	1.15
NWCA11-3816	1-Poor	13.90	7	0.81	21.72	28.94	3.44	3.69	3.06	2.95	3.39
NWCA11-2437	1-Poor	48.80	4	4.24	27.59	58.77	1.14	1.98	2.02	1.97	1.65
NWCA11-2443	2-Fair	72.50	0	7.85	21.08	72.00	1.17	3.05	1.79	1.59	1.90
NWCA11-2450	2-Fair	67.10	0	7.00	9.90	50.75	1.09	1.22	1.01	1.59	1.16
NWCA11-2453	2-Fair	58.40	0	4.54	25.44	57.56	1.00	1.23	1.38	2.27	1.27
NWCA11-2454	3-Good	75.00	0	7.00	7.00	46.61	1.00	1.00	1.00	1.00	1.00
NWCA11-2458	3-Good	75.00	0	7.00	7.00	46.61	1.00	1.02	1.85	2.54	1.33
NWCA11-1202	1-Poor	40.60	2	3.13	10.96	28.08	1.00	1.12	2.08	1.59	1.31
NWCA11-3047	3-Good	76.80	0	7.05	10.61	52.05	1.00	1.00	1.01	1.00	1.00
NWCA11-2677	1-Poor	55.00	6	4.21	28.90	60.48	3.32	4.04	2.33	1.50	3.16
NWCA11-2229	1-Poor	21.80	10	2.77	8.08	21.72	3.61	2.82	2.18	2.17	2.94
NWCA11-1085	1-Poor	47.00	7	3.40	20.98	44.06	3.47	3.97	2.91	3.25	3.48
NWCA11-1051	1-Poor	51.60	9	5.43	37.29	80.07	1.18	1.50	1.50	1.64	1.38
NWCA11-1072	1-Poor	52.00	10	4.53	23.35	54.54	2.91	4.19	4.59	4.56	3.80
NWCA11-1356	3-Good	77.00	2	6.96	10.50	51.38	1.00	1.00	1.00	1.00	1.00
NWCA11-1335	1-Poor	54.90	5	7.65	19.75	68.86	2.76	4.01	4.46	3.49	3.54
NWCA11-1326	3-Good	75.00	2	7.00	7.00	46.61	1.00	1.00	1.39	3.37	1.31
NWCA11-1303	3-Good	75.00	0	7.00	7.00	46.61	1.00	1.00	1.00	1.03	1.00
NWCA11-1243	1-Poor	55.60	0	5.24	14.74	46.65	1.00	1.00	1.00	1.00	1.00
NWCA11-3042	3-Good	81.10	0	6.98	15.91	59.18	1.00	1.00	1.00	1.00	1.00
NWCA11-1020	1-Poor	47.50	0	4.08	17.22	42.98	1.00	1.24	1.38	1.13	1.16
NWCA11-1029	3-Good	60.20	0	6.15	26.13	68.60	1.00	1.16	1.80	1.37	1.24
NWCA11-1217	1-Poor	30.20	3	3.85	17.79	42.34	1.49	2.84	5.57	6.05	3.17
NWCA11-1218	2-Fair	65.50	2	7.00	9.90	50.75	1.00	1.49	3.10	3.63	1.83
NWCA11-OH-3005	3-Good	57.70	9	2.73	7.35	20.41	2.97	3.90	4.74	4.77	3.78
NWCA11-1213	1-Poor	24.40	0	0.00	0.00	0.00	1.00	1.00	1.13	1.21	1.05

Site ID	Vegetation Condition	VMMI	Total Buffer Stress	Weighted C of C	FQAI	US VIBI-FQ	Buffer 1 LDI (0 to 100M)	Buffer 2 LDI (100 to 350M)	Buffer 3 LDI (350 to 1000M)	Buffer 4 LDI (1000 to 2000M)	Total Buffer LDI
NWCA11-1225	2-Fair	55.70	1	3.39	20.27	43.01	1.09	3.85	5.46	4.30	3.11
NWCA11-2597	1-Poor	35.80	2	2.15	20.24	35.22	3.74	3.21	2.64	3.01	3.29
NWCA11-2549	2-Fair	73.40	0	8.35	12.00	60.00	1.00	2.15	1.47	1.21	1.46
NWCA11-2577	3-Good	79.50	0	8.43	13.50	62.14	1.00	1.00	1.19	1.33	1.07
NWCA11-1039	1-Poor	63.90	0	5.42	17.22	51.36	1.00	1.00	1.00	1.00	1.00
NWCA11-1030	2-Fair	58.00	1	4.92	32.26	69.67	1.52	1.53	2.20	2.63	1.77
NWCA11-1028	2-Fair	54.30	1	5.76	22.71	61.32	1.02	1.77	1.90	2.40	1.56
NWCA11-4151	1-Poor	41.50	7	1.93	10.06	19.27	5.18	5.36	3.81	2.60	4.70
NWCA11-4147	1-Poor	25.40	4	0.43	4.47	2.70	1.85	3.09	2.73	2.94	2.51
NWCA11-4145	1-Poor	32.90	10	2.70	19.69	37.87	1.00	1.15	1.71	1.55	1.24
NWCA11-4141	2-Fair	56.20	7	2.80	16.00	33.19	1.28	1.32	1.61	1.72	1.40
NWCA11-4138	3-Good	58.40	8	2.17	13.67	25.95	2.17	1.57	1.31	1.39	1.74
NWCA11-2359	3-Good	57.40	7	4.62	30.60	65.45	1.14	1.00	1.01	1.60	1.12
NWCA11-2358	2-Fair	37.60	7	1.10	3.47	6.88	3.78	2.96	3.25	2.81	3.33
NWCA11-2355	1-Poor	28.60	11	2.54	17.80	34.16	2.83	3.39	3.43	2.69	3.10
NWCA11-2350	2-Fair	49.20	5	3.27	22.65	45.65	1.64	1.38	1.74	2.01	1.62
NWCA11-2343	1-Poor	24.90	6	0.55	1.11	3.41	1.49	3.21	2.76	2.94	2.40
NWCA11-2342	2-Fair	51.60	6	2.12	17.68	31.36	1.15	1.25	1.64	1.75	1.34
NWCA11-2339	1-Poor	25.80	9	0.16	3.50	0.99	4.70	2.97	3.64	2.72	3.77
NWCA11-2078	3-Good	66.10	0	5.10	41.96	81.85	1.00	1.00	2.50	1.89	1.39
NWCA11-2072	2-Fair	59.40	4	4.04	25.21	54.10	4.08	2.86	2.72	2.64	3.30
NWCA11-2067	1-Poor	55.70	7	3.49	33.95	63.18	2.25	1.87	3.21	2.79	2.38
NWCA11-2056	3-Good	65.60	4	4.34	35.16	70.24	4.54	4.35	3.32	2.88	4.07
NWCA11-2044	3-Good	66.60	3	4.04	27.42	57.28	4.54	4.34	3.27	2.79	4.05
NWCA11-2034	3-Good	70.00	0	6.97	29.35	78.31	1.00	1.00	1.00	1.00	1.00
NWCA11-5529	1-Poor	40.20	5	2.04	15.20	27.32	2.38	2.56	2.95	3.37	2.65
NWCA11-3737	1-Poor	32.50	8	2.55	15.89	31.51	3.74	2.76	2.97	3.50	3.26
NWCA11-2967	3-Good	59.20	4	5.18	27.93	65.15	1.07	1.11	1.05	1.12	1.08
NWCA11-2959	2-Fair	48.80	0	4.34	25.30	56.11	1.00	1.17	1.12	1.18	1.09
NWCA11-1930	2-Fair	26.50	2	0.31	2.56	1.95	1.75	2.88	1.96	2.55	2.21
NWCA11-2654	1-Poor	53.00	4	3.83	31.37	61.61	1.31	3.56	3.66	1.92	2.52
NWCA11-2640	2-Fair	54.10	0	3.74	24.36	51.02	1.46	2.74	2.46	1.70	2.06
NWCA11-2636	1-Poor	41.60	2	2.62	18.44	35.55	1.43	1.95	1.62	1.83	1.66
NWCA11-2643	3-Good	66.30	0	4.93	21.02	53.68	1.00	1.00	1.48	1.27	1.12
NWCA11-2674	3-Good	74.50	2	5.99	25.97	67.40	2.05	2.70	2.29	1.83	2.27
NWCA11-2664	2-Fair	59.90	3	4.17	21.20	49.23	1.00	1.03	1.69	1.55	1.20
NWCA11-1633	3-Good	74.80	0	9.03	16.00	65.71	1.00	1.00	1.74	2.62	1.31
NWCA11-1221	2-Fair	53.50	8	3.27	33.27	60.81	3.64	3.93	2.95	4.18	3.65
NWCA11-1827	1-Poor	48.30	3	4.30	41.86	76.91	1.00	1.09	1.21	1.10	1.08
NWCA11-2227	1-Poor	19.40	5	2.72	11.14	25.80	1.64	2.46	2.77	2.91	2.24
NWCA11-2798	3-Good	62.90	4	5.76	35.51	79.60	1.63	1.66	1.70	1.47	1.64
NWCA11-1825	1-Poor	54.70	2	4.69	29.24	63.94	1.31	1.83	1.66	1.49	1.55
NWCA11-1828	1-Poor	53.60	2	3.92	33.44	65.13	1.00	1.00	1.14	1.25	1.05
NWCA11-2538	1-Poor	48.20	6	4.04	16.40	41.57	1.00	2.15	1.38	1.28	1.45
NWCA11-OH-3014	2-Fair	48.90	5	2.91	26.53	48.96	1.00	1.00	1.34	1.43	1.11
NWCA11-OH-3031	1-Poor	44.80	5	2.68	18.99	36.73	1.12	1.81	2.03	3.26	1.72
NWCA11-1617	1-Poor	43.20	4	2.51	5.50	16.39	2.46	2.24	2.08	2.09	2.28
NWCA11-1669	2-Fair	57.50	0	6.20	12.66	49.72	1.96	1.63	1.81	1.23	1.76
NWCA11-1830	1-Poor	55.70	3	5.14	14.55	45.78	1.00	1.34	1.62	1.34	1.26
NWCA11-1643	1-Poor	43.50	2	3.74	15.88	38.94	1.00	1.10	1.05	1.07	1.05
NWCA11-1630	1-Poor	47.10	0	2.70	9.84	23.79	1.00	1.00	1.00	1.01	1.00
NWCA11-1645	1-Poor	21.20	0	0.02	0.82	0.14	1.00	1.62	2.07	1.80	1.48
NWCA11-1614	1-Poor	41.00	0	4.53	8.50	33.30	1.00	1.00	1.00	1.04	1.00
NWCA11-1673	2-Fair	66.10	4	8.08	12.97	61.38	1.00	1.00	1.12	1.11	1.04
NWCA11-1961	3-Good	63.70	0	5.03	15.22	46.01	1.00	1.14	1.20	1.00	1.08
NWCA11-2961	3-Good	40.00	8	2.90	3.54	18.11	4.54	4.63	4.61	4.49	4.58
NWCA11-2581	3-Good	78.50	0	8.99	11.31	59.02	1.00	1.00	1.00	1.00	1.00
NWCA11-2575	1-Poor	54.50	0	9.99	12.70	61.00	1.00	1.28	1.10	1.76	1.18
NWCA11-2603	1-Poor	57.30	2	9.31	16.00	65.71	1.00	1.08	1.21	1.56	1.12
NWCA11-2565	3-Good	84.60	1	8.81	19.19	70.27	1.00	1.70	1.72	1.45	1.40
NWCA11-2704	2-Fair	33.80	7	2.42	21.84	39.16	2.27	2.33	1.95	1.84	2.18
NWCA11-4505	2-Fair	30.50	6	0.91	16.81	22.57	1.02	1.13	1.56	2.15	1.27

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NWCA11-1200	1-Poor	39.20	8	5.58	6.94	37.62	1.87	3.34	3.22	2.55	2.65
NWCA11-3065	3-Good	64.30	2	7.14	27.06	76.16	1.00	1.15	1.52	1.59	1.21
NWCA11-1665	1-Poor	23.90	0	0.24	3.50	1.50	1.00	1.00	1.00	1.00	1.00
NWCA11-1635	1-Poor	22.50	1	0.17	2.24	1.05	1.00	1.62	2.76	2.13	1.65
NWCA11-1683	1-Poor	23.10	1	0.03	1.73	0.18	1.00	1.00	1.03	1.62	1.07
NWCA11-1705	2-Fair	73.50	3	7.95	13.28	61.50	1.00	2.23	2.71	2.44	1.85
NWCA11-1199	1-Poor	25.40	0	1.13	10.54	14.96	1.00	1.09	1.06	1.94	1.13
NWCA11-1003	3-Good	66.20	3	5.08	29.10	66.17	1.37	1.67	1.59	1.30	1.50
NWCA11-2026	3-Good	83.30	0	7.59	17.44	65.18	1.00	1.21	2.14	2.14	1.40
NWCA11-2080	3-Good	66.10	0	7.48	29.46	81.68	1.00	1.00	1.08	1.14	1.03
NWCA11-2064	3-Good	64.80	0	7.19	25.75	74.56	1.00	1.50	1.13	1.09	1.18
NWCA11-1027	3-Good	66.00	0	5.86	18.78	56.32	1.00	1.00	1.00	1.00	1.00
NWCA11-1005	1-Poor	49.40	0	3.47	22.80	47.14	1.00	1.00	1.00	1.00	1.00
NWCA11-1019	3-Good	66.50	0	5.55	19.40	55.23	1.00	1.00	1.00	1.00	1.00
NWCA11-6368	2-Fair	58.10	9	4.54	33.57	69.20	2.44	4.75	3.91	2.50	3.43
NWCA11-4579	2-Fair	57.50	11	5.02	29.14	65.88	3.94	3.96	4.01	2.49	3.81
NWCA11-OH-3004	3-Good	65.80	8	4.75	15.00	44.00	3.48	6.87	7.16	6.26	5.51
NWCA11-OH-3003	1-Poor	20.30	4	1.38	17.34	26.25	1.74	1.75	2.17	2.72	1.93
NWCA11-6363	1-Poor	37.90	7	3.20	19.35	40.53	2.07	1.14	1.84	1.88	1.73
NWCA11-OH-3030	2-Fair	25.30	5	0.93	13.97	18.64	1.27	1.65	2.69	3.04	1.85
NWCA11-1260	3-Good	75.00	0	7.00	7.00	46.61	1.00	1.00	1.08	1.41	1.06
NWCA11-1364	1-Poor	55.40	5	7.88	20.14	70.86	2.67	4.32	4.85	3.74	3.71
NWCA11-1334	3-Good	75.00	0	7.00	7.00	46.61	1.00	1.00	1.00	1.34	1.03
NWCA11-1267	3-Good	77.80	2	5.78	32.11	74.85	1.00	1.30	1.45	1.34	1.21
NWCA11-1337	3-Good	64.60	6	7.78	18.90	68.47	1.00	1.70	1.21	1.11	1.26
NWCA11-1852	1-Poor	54.90	0	4.31	27.57	59.19	1.29	1.36	1.80	1.49	1.43
NWCA11-1854	1-Poor	31.50	0	1.44	16.79	25.83	5.18	4.83	6.47	5.98	5.41
NWCA11-1857	3-Good	79.50	1	7.71	28.38	81.60	1.26	1.72	2.19	2.08	1.67
NWCA11-1861	1-Poor	52.70	4	4.23	30.60	62.99	1.19	1.58	2.08	1.64	1.53
NWCA11-1864	3-Good	68.10	0	4.63	36.19	73.52	1.00	1.00	1.00	1.03	1.00
NWCA11-1865	1-Poor	39.60	1	2.76	25.66	46.79	3.65	2.71	2.47	3.52	3.12
NWCA11-2028	2-Fair	57.80	6	4.97	26.53	61.83	3.11	2.79	2.73	2.61	2.89
NWCA11-4499	1-Poor	56.30	8	3.73	12.67	34.23	1.61	1.25	2.06	1.82	1.61
NWCA11-2721	1-Poor	50.30	4	3.52	12.00	32.01	1.02	1.52	1.45	1.83	1.34
NWCA11-4522	1-Poor	45.00	4	3.09	18.63	38.76	1.12	2.31	3.24	4.50	2.24
NWCA11-6315	1-Poor	23.40	9	1.37	6.45	10.63	7.54	7.22	6.00	4.88	6.87
NWCA11-2710	1-Poor	64.00	4	4.12	14.16	38.82	1.00	1.81	3.91	4.80	2.20
NWCA11-1634	1-Poor	24.60	0	0.07	8.08	4.87	1.00	1.00	1.00	1.00	1.00
NWCA11-1618	1-Poor	29.60	0	2.41	6.93	17.82	1.00	1.00	1.00	1.01	1.00
NWCA11-2608	2-Fair	74.00	0	6.86	17.76	61.08	1.00	1.13	1.95	1.56	1.28
NWCA11-2606	1-Poor	23.80	6	1.92	10.39	19.70	3.94	4.53	4.18	3.98	4.17
NWCA11-2605	3-Good	74.10	0	7.70	12.00	58.15	1.00	1.27	1.14	1.15	1.12
NWCA11-2598	3-Good	77.40	3	10.00	10.00	57.14	1.00	1.03	1.25	1.80	1.14
NWCA11-2566	3-Good	76.10	6	8.73	12.50	60.71	1.88	1.27	1.22	1.13	1.49
NWCA11-2537	3-Good	78.90	2	8.80	15.91	65.59	1.00	1.00	1.00	1.06	1.01
NWCA11-2058	3-Good	60.30	4	7.33	20.55	68.01	1.00	1.09	1.14	1.17	1.07
NWCA11-2035	3-Good	65.70	0	5.14	29.26	66.79	1.12	2.03	2.60	2.47	1.82
NWCA11-2030	2-Fair	70.60	0	7.20	23.57	71.51	2.51	1.46	2.87	3.67	2.38
NWCA11-6302	1-Poor	45.20	4	3.35	21.13	44.01	1.00	1.19	1.27	1.62	1.17
NWCA11-6301	1-Poor	44.00	8	2.66	12.76	27.73	1.74	1.28	2.00	1.86	1.67
NWCA11-4526	1-Poor	25.10	1	2.60	19.51	36.99	2.40	4.64	6.10	5.23	4.09
NWCA11-4503	1-Poor	51.00	6	2.89	12.20	28.35	1.00	1.35	1.45	1.83	1.28
NWCA11-2706	2-Fair	43.90	6	1.88	12.05	21.83	5.14	4.46	4.68	3.95	4.73
NWCA11-1420	3-Good	74.70	0	4.40	22.36	52.32	1.00	1.72	1.78	1.44	1.41
NWCA11-1418	3-Good	75.00	0	7.00	7.00	46.61	1.00	1.00	1.03	1.08	1.01
NWCA11-1417	3-Good	75.00	0	7.00	7.00	46.61	1.00	1.00	1.10	1.11	1.03
NWCA11-1416	3-Good	81.00	0	6.84	18.69	62.32	1.00	1.14	1.12	1.02	1.07
NWCA11-1413	3-Good	82.10	1	6.33	20.85	62.17	1.00	1.07	1.04	1.03	1.03
NWCA11-2931	3-Good	67.80	4	4.49	11.84	37.86	1.00	1.18	2.44	2.07	1.45
NWCA11-3586	1-Poor	57.00	0	3.69	22.31	47.79	1.00	1.00	1.00	1.45	1.05
NWCA11-3583	3-Good	79.00	0	7.95	12.12	59.84	1.00	1.00	1.31	1.66	1.13
NWCA11-2373	1-Poor	48.90	4	4.21	32.50	65.58	1.56	2.34	2.48	2.58	2.08

Site ID	Vegetation Condition	VMMI	Total Buffer Stress	Weighted C of C	FQAI	US VIBI-FQ	Buffer 1 LDI (0 to 100M)	Buffer 2 LDI (100 to 350M)	Buffer 3 LDI (350 to 1000M)	Buffer 4 LDI (1000 to 2000M)	Total Buffer LDI
NWCA11-2371	1-Poor	43.30	3	4.68	26.24	59.61	1.28	1.14	1.06	1.24	1.19
NWCA11-2369	1-Poor	36.30	0	1.22	18.83	27.39	1.52	2.38	2.26	3.12	2.08
NWCA11-2368	1-Poor	29.10	1	2.53	19.54	36.60	1.70	3.74	3.64	3.55	2.88
NWCA11-2367	1-Poor	53.60	1	4.98	23.24	57.16	2.49	4.21	2.19	2.28	2.92
NWCA11-1792	3-Good	83.90	0	7.21	19.65	66.00	1.00	1.02	1.67	1.89	1.23
NWCA11-1814	1-Poor	36.10	6	2.06	11.70	22.42	4.01	2.83	1.79	1.95	3.01
NWCA11-1813	1-Poor	26.20	0	0.41	10.21	9.98	1.00	1.00	1.13	1.64	1.09
NWCA11-1805	3-Good	76.70	1	8.38	12.00	60.00	1.00	1.00	1.13	1.56	1.08
NWCA11-1803	1-Poor	33.60	0	0.89	15.01	19.85	1.00	1.11	1.60	1.59	1.21
NWCA11-1793	3-Good	81.80	0	7.93	15.50	64.56	1.00	1.00	1.00	1.04	1.00
NWCA11-1790	2-Fair	58.00	5	4.06	12.33	35.82	1.15	1.09	1.02	1.59	1.15
NWCA11-1779	1-Poor	54.40	0	4.62	13.42	40.90	1.00	1.00	1.09	1.54	1.07
NWCA11-2365	2-Fair	56.10	4	4.23	31.90	64.83	1.34	1.27	2.24	3.14	1.68
NWCA11-2366	1-Poor	35.80	0	3.58	18.63	41.86	1.57	2.71	2.65	2.05	2.17
NWCA11-2370	1-Poor	54.10	2	5.33	30.63	69.95	1.05	1.62	2.40	2.83	1.67
NWCA11-2376	2-Fair	61.30	8	3.50	8.37	26.67	4.95	3.89	2.30	2.42	3.85
NWCA11-3572	1-Poor	48.10	0	2.49	15.71	30.85	1.00	1.00	1.53	1.28	1.13
NWCA11-3580	3-Good	82.50	0	7.42	18.74	65.99	1.00	1.37	1.26	1.19	1.18
NWCA11-3588	3-Good	76.50	0	6.19	25.12	67.41	1.00	1.00	1.00	1.54	1.05
NWCA11-1180	3-Good	81.80	7	9.00	15.59	65.13	2.43	2.84	3.13	3.05	2.75
NWCA11-1181	2-Fair	56.80	3	4.10	35.85	69.68	1.00	1.05	1.26	1.45	1.11
NWCA11-1743	2-Fair	42.30	2	2.90	27.32	50.00	1.09	2.66	2.51	2.25	1.96
NWCA11-1744	2-Fair	50.00	7	3.91	20.40	46.44	1.91	2.38	1.87	1.66	2.02
NWCA11-1745	1-Poor	42.00	8	3.52	26.37	52.56	4.01	3.97	2.67	2.85	3.61
NWCA11-1746	1-Poor	32.00	1	2.84	17.67	35.83	3.63	4.24	5.50	3.48	4.17
NWCA11-1747	1-Poor	54.90	3	3.08	28.46	52.74	1.21	2.53	3.82	3.12	2.32
NWCA11-1748	1-Poor	21.00	11	1.20	12.66	18.45	7.17	5.95	3.61	1.58	5.53
NWCA11-1749	1-Poor	41.80	6	2.89	29.76	53.46	1.27	1.86	3.71	2.87	2.09
NWCA11-1750	1-Poor	28.60	2	0.75	13.91	17.43	2.39	3.85	5.25	3.51	3.51
NWCA11-1751	2-Fair	48.30	5	5.80	15.50	51.24	5.57	4.43	2.82	3.18	4.44
NWCA11-1752	2-Fair	62.80	4	6.91	22.46	68.12	2.40	2.61	2.53	3.07	2.56
NWCA11-1753	3-Good	79.00	4	8.37	20.86	72.66	1.31	3.50	2.73	2.19	2.34
NWCA11-1754	1-Poor	29.70	2	1.35	18.62	27.91	1.67	2.67	4.98	5.03	2.96
NWCA11-2264	1-Poor	47.10	6	4.71	32.49	68.70	1.22	1.68	2.46	1.80	1.66
NWCA11-2265	3-Good	80.80	2	9.01	16.99	67.13	1.00	1.00	1.79	3.85	1.44
NWCA11-2267	1-Poor	36.40	7	1.95	29.26	46.87	2.17	1.86	2.42	3.01	2.21
NWCA11-2268	1-Poor	34.00	6	3.95	27.73	57.15	3.94	3.38	2.03	2.60	3.26
NWCA11-2269	1-Poor	62.80	5	6.07	18.90	57.81	1.95	5.39	5.08	3.22	3.74
NWCA11-2392	1-Poor	50.40	2	3.58	21.39	45.80	1.00	3.31	3.74	2.85	2.42
NWCA11-2390	1-Poor	31.40	4	0.39	19.51	23.14	1.00	3.05	4.15	4.88	2.63
NWCA11-2389	1-Poor	49.90	10	4.11	31.88	64.09	1.67	1.95	1.44	1.39	1.68
NWCA11-2388	3-Good	77.50	7	6.04	26.93	69.05	1.00	1.00	1.07	1.87	1.10
NWCA11-2386	1-Poor	21.80	6	1.74	21.75	34.81	1.88	4.88	6.79	5.06	4.08
NWCA11-2385	2-Fair	58.30	0	4.45	26.75	58.90	1.00	1.62	1.61	1.30	1.34
NWCA11-2384	1-Poor	53.40	3	4.56	26.10	58.66	1.00	1.02	1.47	1.75	1.17
NWCA11-2382	3-Good	77.00	7	7.59	19.09	67.56	3.62	3.32	1.81	2.87	3.09
NWCA11-2381	1-Poor	43.20	0	4.01	30.26	61.18	1.00	1.00	1.31	1.44	1.11
NWCA11-1849	1-Poor	50.50	6	4.72	30.09	65.32	1.06	1.77	3.75	4.05	2.11
NWCA11-4703	3-Good	75.80	6	5.27	24.66	61.00	1.98	2.68	2.02	1.59	2.16
NWCA11-2529	2-Fair	69.90	0	6.97	17.15	60.91	1.00	1.10	1.75	2.02	1.28
NWCA11-4699	3-Good	73.90	8	5.57	32.57	74.22	1.49	2.38	2.06	1.64	1.89
NWCA11-4692	3-Good	73.20	8	5.86	26.80	67.78	1.42	2.08	2.05	1.92	1.79
NWCA11-2900	2-Fair	56.70	6	5.64	28.97	69.48	2.82	2.57	2.01	1.60	2.46
NWCA11-2897	3-Good	68.00	7	4.47	20.82	50.54	1.36	1.93	2.11	1.71	1.72
NWCA11-2890	3-Good	67.70	2	4.97	26.69	62.04	1.90	2.51	1.99	1.91	2.10
NWCA11-2262	3-Good	82.20	0	9.00	16.17	65.95	1.00	1.00	1.00	1.17	1.02
NWCA11-2281	3-Good	87.50	2	9.02	22.86	75.52	1.00	1.00	1.00	1.08	1.01
NWCA11-2280	2-Fair	52.30	2	3.09	19.04	39.40	2.25	3.32	3.38	2.60	2.83
NWCA11-2279	3-Good	86.60	4	9.00	22.45	74.93	1.00	1.09	1.78	1.25	1.21
NWCA11-2278	1-Poor	33.50	5	2.58	15.93	31.76	2.87	2.48	3.01	2.33	2.73
NWCA11-2277	1-Poor	19.90	6	0.22	13.14	13.02	7.17	7.25	6.35	4.85	6.80
NWCA11-2276	1-Poor	16.10	8	2.81	16.40	33.84	3.84	3.66	3.47	3.53	3.68

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NWCA11-2275	3-Good	63.80	2	4.73	25.69	59.14	1.00	1.04	1.02	1.02	1.02
NWCA11-2273	3-Good	88.70	0	9.15	24.57	77.95	1.00	1.00	1.00	2.43	1.14
NWCA11-2271	1-Poor	27.70	10	1.82	17.66	29.47	2.74	3.23	3.43	2.57	3.01
NWCA11-1092	3-Good	59.40	7	3.65	27.58	55.05	1.67	1.50	1.98	1.71	1.69
NWCA11-1095	3-Good	67.30	8	4.89	21.17	53.66	1.48	2.65	2.02	1.60	1.95
NWCA11-2754	3-Good	70.90	2	6.28	41.58	89.26	1.00	1.53	2.70	2.30	1.63
NWCA11-2752	3-Good	68.50	0	6.38	34.21	81.61	1.00	1.06	1.05	1.16	1.05
NWCA11-2749	1-Poor	27.80	11	0.89	19.94	26.93	5.36	4.58	4.09	3.26	4.66
NWCA11-2748	3-Good	83.80	4	6.65	32.50	80.86	1.00	1.06	1.17	1.07	1.06
NWCA11-2747	1-Poor	25.20	11	0.98	20.55	28.36	2.89	3.08	3.76	3.99	3.23
NWCA11-2746	3-Good	80.20	2	5.99	28.59	71.13	1.18	1.40	1.21	1.29	1.26
NWCA11-2745	1-Poor	20.20	11	1.84	18.34	30.56	3.82	2.94	3.06	3.21	3.34
NWCA11-2744	3-Good	73.70	8	5.40	26.40	64.30	1.24	1.30	1.11	1.15	1.22
NWCA11-2743	3-Good	77.70	2	6.21	42.01	88.79	1.00	1.00	1.06	1.27	1.04
NWCA11-2742	3-Good	75.90	0	8.29	36.85	95.50	1.19	1.61	1.16	1.13	1.30
NWCA11-2740	3-Good	65.80	2	4.76	35.03	72.65	1.00	1.00	1.01	1.38	1.04
NWCA11-2737	2-Fair	33.40	7	1.52	14.92	23.65	4.54	4.73	5.90	5.90	5.00
NWCA11-2736	3-Good	75.80	3	4.70	36.52	74.40	1.05	1.52	1.34	1.23	1.27
NWCA11-2734	3-Good	70.10	0	8.39	32.76	89.66	1.00	1.06	1.26	1.67	1.14
NWCA11-2732	3-Good	70.80	2	5.34	40.80	83.37	1.00	1.02	1.07	1.14	1.03
NWCA11-2181	2-Fair	47.80	7	2.69	19.44	37.41	2.67	4.45	2.13	2.29	3.06
NWCA11-2179	3-Good	83.20	3	6.33	19.90	60.87	3.43	4.89	4.17	4.42	4.12
NWCA11-3073	3-Good	74.50	0	6.08	22.39	62.84	1.00	1.22	1.37	1.27	1.17
NWCA11-2032	3-Good	65.80	2	5.33	25.71	62.89	1.00	1.00	1.00	1.57	1.06
NWCA11-2045	3-Good	81.40	0	7.48	15.00	61.01	1.00	1.17	1.01	1.01	1.05
NWCA11-2049	3-Good	82.50	0	7.99	18.03	68.56	1.00	1.00	1.19	1.87	1.13
NWCA11-2361	1-Poor	47.20	3	3.54	31.89	60.55	1.14	2.79	3.20	2.81	2.21
NWCA11-3340	1-Poor	31.20	8	1.32	20.11	29.86	2.94	3.24	3.65	4.31	3.31
NWCA11-3344	3-Good	43.30	8	3.06	14.09	32.13	1.00	2.43	3.96	4.30	2.35
NWCA11-2393	2-Fair	58.40	5	4.96	19.96	52.35	1.00	2.38	3.85	3.23	2.21
NWCA11-1543	1-Poor	37.40	8	3.57	30.56	58.82	1.87	1.50	1.90	2.18	1.80
NWCA11-1542	1-Poor	38.40	6	4.22	25.31	55.37	1.72	3.81	3.87	4.27	3.03
NWCA11-1515	1-Poor	24.80	6	1.95	18.46	31.39	1.22	2.95	3.13	3.69	2.37
NWCA11-1193	2-Fair	54.10	2	3.97	33.85	66.02	1.00	1.31	1.24	1.58	1.20
NWCA11-1190	2-Fair	58.00	5	4.23	40.65	76.42	2.90	2.86	3.82	2.95	3.08
NWCA11-1189	1-Poor	27.10	8	2.20	29.67	48.99	1.13	1.82	2.93	2.59	1.84
NWCA11-1188	1-Poor	40.50	9	4.18	25.03	54.71	4.59	3.02	2.05	1.86	3.34
NWCA11-1187	1-Poor	27.20	6	2.35	26.41	45.25	2.12	2.88	1.86	2.32	2.31
NWCA11-1186	3-Good	64.80	7	4.95	37.18	76.91	1.56	1.51	1.49	1.31	1.50
NWCA11-1184	3-Good	83.70	8	9.00	18.00	68.57	2.17	2.60	1.76	1.73	2.17
NWCA11-1183	1-Poor	49.10	4	3.73	36.94	68.96	1.56	1.45	1.88	1.98	1.63
NWCA11-1179	2-Fair	56.90	5	3.58	37.99	69.52	1.00	1.33	1.24	1.47	1.19
NWCA11-3063	3-Good	62.70	0	5.43	25.63	63.39	1.00	1.08	1.24	1.43	1.11
NWCA11-1501	2-Fair	50.10	3	5.14	31.90	70.53	1.32	2.03	1.89	2.31	1.74
NWCA11-1489	3-Good	58.00	7	5.04	28.99	65.80	1.00	1.03	1.20	1.17	1.07
NWCA11-3310	3-Good	69.70	1	6.04	33.91	79.05	1.00	1.08	1.07	1.09	1.05
NWCA11-3309	1-Poor	38.90	1	4.07	26.29	55.88	1.77	1.88	2.09	2.05	1.89
NWCA11-3292	3-Good	60.60	2	4.31	37.92	73.97	1.00	1.18	1.11	1.15	1.09
NWCA11-3291	3-Good	62.90	2	3.97	36.75	70.19	1.00	1.49	2.23	1.68	1.46
NWCA11-1514	3-Good	71.20	2	4.91	40.54	80.67	1.16	1.35	1.79	2.05	1.43
NWCA11-1504	3-Good	69.40	0	5.43	38.35	81.58	1.64	1.62	1.65	1.96	1.67
NWCA11-3303	3-Good	58.50	7	4.91	31.42	68.41	1.00	1.07	1.19	1.16	1.08
NWCA11-3312	1-Poor	39.00	9	4.05	18.76	44.96	1.18	1.54	2.13	2.99	1.66
NWCA11-3300	2-Fair	49.60	3	4.46	33.94	69.21	1.23	1.93	1.90	2.29	1.68
NWCA11-3297	3-Good	62.80	1	5.14	32.86	71.89	1.00	1.00	1.02	1.01	1.01
NWCA11-1511	3-Good	56.40	3	5.24	30.86	69.68	1.00	2.05	1.52	1.46	1.46
NWCA11-3322	2-Fair	33.60	10	2.33	21.29	37.81	4.33	3.13	3.23	4.24	3.74
NWCA11-3315	2-Fair	25.80	8	0.73	13.66	16.91	4.19	4.40	4.72	4.70	4.41
NWCA11-1559	3-Good	59.90	1	4.38	22.39	52.20	1.00	1.35	1.15	1.77	1.21
NWCA11-1552	3-Good	54.50	2	3.60	26.74	53.54	1.00	1.01	1.11	1.78	1.10
NWCA11-1547	1-Poor	35.50	12	3.27	23.50	46.88	5.99	4.71	5.27	4.23	5.29
NWCA11-1546	1-Poor	30.50	4	1.71	20.15	32.34	3.49	3.72	4.18	4.52	3.80

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NWCA11-1539	2-Fair	53.90	1	4.25	30.09	62.44	1.00	1.30	1.71	2.49	1.38
NWCA11-3317	2-Fair	40.40	3	2.71	27.79	49.49	1.04	2.02	2.67	3.55	1.91
NWCA11-2332	3-Good	47.60	5	3.82	12.73	34.94	2.05	3.44	3.53	3.56	2.91
NWCA11-2331	1-Poor	24.90	2	1.70	8.43	15.56	3.50	3.84	3.72	4.11	3.71
NWCA11-2327	1-Poor	20.30	2	0.50	2.41	3.13	3.41	3.49	3.94	3.76	3.58
NWCA11-2325	3-Good	63.40	0	5.20	22.39	57.35	1.00	1.00	1.30	1.58	1.12
NWCA11-2324	1-Poor	14.70	10	1.84	6.71	13.96	7.54	7.68	7.72	7.22	7.58
NWCA11-2321	2-Fair	62.70	8	4.69	33.52	70.08	1.00	1.11	1.36	1.56	1.16
NWCA11-2319	2-Fair	28.30	5	2.06	11.67	22.42	3.12	3.68	3.32	2.97	3.31
NWCA11-2315	2-Fair	29.70	3	1.07	6.36	8.65	4.52	4.61	4.55	4.03	4.51
NWCA11-1709	3-Good	77.40	0	10.00	10.00	57.14	1.00	1.00	1.00	1.00	1.00
NWCA11-1708	2-Fair	54.50	1	4.79	24.40	57.65	2.34	1.80	1.71	1.67	1.98
NWCA11-1707	3-Good	77.40	0	10.00	10.00	57.14	1.00	1.00	1.00	1.00	1.00
NWCA11-1658	2-Fair	70.00	0	9.37	10.97	58.53	1.00	1.92	2.85	2.07	1.75
NWCA11-1554	1-Poor	39.00	6	2.72	23.97	44.10	1.63	3.32	4.26	3.79	2.88
NWCA11-1533	1-Poor	32.50	3	1.64	10.24	17.74	2.69	3.33	3.95	3.62	3.23
NWCA11-1529	1-Poor	32.30	10	1.88	14.91	25.93	3.54	3.01	3.28	3.71	3.35
NWCA11-2142	3-Good	59.40	4	3.91	27.81	57.01	3.41	3.16	3.38	3.24	3.31
NWCA11-2146	3-Good	56.70	6	4.40	19.31	47.98	3.41	3.30	3.38	3.27	3.36
NWCA11-2149	3-Good	44.10	2	2.52	20.02	37.21	1.19	2.31	3.23	3.31	2.14
NWCA11-2150	2-Fair	40.90	1	1.57	14.07	22.79	1.00	1.00	2.02	3.27	1.43
NWCA11-2153	3-Good	66.30	2	4.29	14.62	40.56	2.76	3.35	3.12	3.11	3.04
NWCA11-2154	1-Poor	20.40	1	0.64	13.92	16.77	1.00	1.06	2.56	3.36	1.57
NWCA11-ND-5015	3-Good	64.40	6	3.59	16.89	39.39	4.32	4.35	4.43	4.00	4.32
NWCA11-3316	1-Poor	40.60	9	3.27	7.75	24.38	3.40	4.81	3.73	3.77	3.92
NWCA11-1555	1-Poor	20.40	6	1.23	14.19	20.81	2.61	2.70	3.92	3.19	2.96
NWCA11-1528	1-Poor	31.90	9	2.30	19.17	34.60	2.91	3.78	4.44	4.33	3.62
NWCA11-2555	3-Good	82.20	0	7.97	16.76	66.59	1.82	1.35	1.26	1.51	1.54
NWCA11-5086	1-Poor	25.40	4	1.01	23.07	32.10	3.46	3.58	3.96	4.09	3.66
NWCA11-5071	1-Poor	27.30	2	2.39	15.12	29.39	2.52	2.31	1.52	1.98	2.20
NWCA11-5069	1-Poor	21.70	4	0.96	6.63	8.34	4.02	4.50	4.39	4.44	4.28
NWCA11-3284	3-Good	62.20	5	3.95	19.20	44.99	1.00	1.48	2.07	2.37	1.49
NWCA11-3278	2-Fair	26.20	6	2.83	18.95	37.59	4.45	4.62	4.68	4.60	4.56
NWCA11-3275	2-Fair	27.90	6	1.62	20.75	32.63	4.94	3.93	3.91	4.17	4.36
NWCA11-3270	1-Poor	19.80	6	1.54	10.62	17.64	3.86	3.85	4.20	4.28	3.97
NWCA11-1478	1-Poor	13.80	7	0.35	19.42	22.80	4.14	4.69	4.65	4.59	4.45
NWCA11-1481	3-Good	55.90	4	1.81	19.89	32.61	1.00	1.36	1.85	1.53	1.33
NWCA11-2178	1-Poor	43.70	1	3.68	29.70	58.26	2.61	4.35	2.93	1.70	3.10
NWCA11-1473	3-Good	55.00	0	3.09	15.00	33.61	1.00	1.13	1.94	1.46	1.27
NWCA11-1465	3-Good	65.00	6	2.82	12.00	27.63	1.47	1.44	2.28	2.93	1.77
NWCA11-1477	2-Fair	35.00	3	2.19	10.55	21.60	2.03	2.30	1.61	2.17	2.04
NWCA11-ND-5083	1-Poor	16.00	2	0.17	12.44	11.69	2.22	2.18	2.34	3.70	2.38
NWCA11-ND-5084	3-Good	70.50	7	5.06	19.42	52.22	3.51	3.81	3.77	3.83	3.68
NWCA11-1704	3-Good	76.20	2	7.58	25.49	76.68	1.00	1.13	1.71	1.63	1.24
NWCA11-ND-5094	3-Good	62.70	4	3.38	9.39	27.38	2.92	4.36	4.50	4.55	3.83
NWCA11-1700	3-Good	66.00	1	7.03	26.37	74.46	1.00	1.00	1.28	1.74	1.13
NWCA11-1698	3-Good	58.70	1	4.85	32.26	69.23	1.00	1.22	2.05	3.05	1.48
NWCA11-1696	2-Fair	71.50	0	6.89	16.25	59.17	1.00	1.00	1.00	1.02	1.00
NWCA11-1695	1-Poor	42.30	6	2.92	12.02	28.28	3.01	2.14	2.51	3.60	2.71
NWCA11-1674	1-Poor	47.10	2	3.19	23.84	46.83	1.85	1.77	1.65	1.94	1.80
NWCA11-1668	3-Good	61.30	6	5.54	34.57	76.87	1.24	1.58	1.53	1.44	1.42
NWCA11-1664	2-Fair	54.10	2	4.97	28.95	65.28	1.00	1.21	1.35	1.95	1.23
NWCA11-1663	2-Fair	56.10	3	4.58	31.25	66.13	1.00	1.42	2.13	2.48	1.50
NWCA11-1660	1-Poor	18.80	9	1.33	12.75	19.39	4.01	4.55	4.58	4.51	4.34
NWCA11-1648	1-Poor	20.00	0	2.63	13.86	29.07	3.06	3.88	3.90	4.27	3.59
NWCA11-1639	3-Good	65.90	6	4.13	27.80	58.40	4.54	4.38	4.36	4.27	4.43
NWCA11-1636	3-Good	68.60	2	5.97	36.88	82.85	1.00	1.06	1.48	1.75	1.19
NWCA11-ND-5085	1-Poor	22.20	2	1.16	8.00	11.51	2.83	3.70	3.36	3.15	3.23
NWCA11-ND-5089	3-Good	62.80	3	4.86	10.25	37.87	3.69	3.54	3.71	3.58	3.64
NWCA11-ND-5091	1-Poor	20.60	6	0.79	12.86	16.15	4.51	4.59	4.20	4.19	4.44
NWCA11-ND-5093	1-Poor	25.20	4	1.08	8.13	11.23	2.18	2.68	3.83	3.45	2.78
NWCA11-ND-5095	3-Good	42.90	2	3.02	6.94	21.64	1.60	2.83	3.08	3.19	2.42

Site ID	Vegetation Condition	VMMI	Total Buffer Stress	Weighted C of C	FQAI	US VIBI-FQ	Buffer 1 LDI (0 to 100M)	Buffer 2 LDI (100 to 350M)	Buffer 3 LDI (350 to 1000M)	Buffer 4 LDI (1000 to 2000M)	Total Buffer LDI
NWCA11-1632	3-Good	65.00	7	5.20	16.01	48.21	4.68	4.41	4.43	3.89	4.47
NWCA11-1627	2-Fair	54.30	0	6.39	28.40	73.35	1.00	1.59	2.70	3.32	1.75
NWCA11-1611	3-Good	64.60	1	6.75	28.57	75.89	1.00	1.34	1.96	1.57	1.35
NWCA11-OH-3019	3-Good	50.90	5	4.38	20.24	49.17	1.38	3.22	3.40	4.06	2.61
NWCA11-OH-3022	1-Poor	30.70	3	1.19	22.19	31.99	2.03	1.50	1.63	2.05	1.79
NWCA11-OH-3025	1-Poor	15.70	2	0.56	16.17	19.47	4.87	4.14	4.24	4.25	4.46
NWCA11-WI-1001	3-Good	73.40	8	5.26	36.14	77.39	1.59	1.18	1.26	2.64	1.51
NWCA11-WI-1006	3-Good	59.80	0	5.18	42.01	82.35	1.00	2.32	3.51	3.31	2.13
NWCA11-WI-1009	3-Good	63.80	2	3.75	10.00	30.58	1.27	1.88	2.48	2.44	1.81
NWCA11-WI-1010	3-Good	62.90	0	4.32	31.18	64.41	1.00	1.49	2.61	2.90	1.66
NWCA11-WI-1011	3-Good	54.40	4	5.19	47.65	82.43	1.00	1.08	2.20	3.86	1.55
NWCA11-1245	3-Good	69.40	3	5.78	25.10	64.83	1.12	1.18	1.30	1.28	1.19
NWCA11-1278	3-Good	85.60	2	7.02	20.55	66.07	1.00	1.00	1.10	1.55	1.08
NWCA11-1280	3-Good	60.60	0	5.33	23.00	59.01	1.00	1.00	1.13	1.58	1.08
NWCA11-1286	3-Good	71.20	5	4.92	20.41	52.79	2.83	3.51	3.67	4.87	3.40
NWCA11-1291	3-Good	75.00	5	7.00	7.00	46.61	1.53	1.30	1.16	1.24	1.36
NWCA11-1292	3-Good	75.00	2	7.00	7.00	46.61	1.00	2.15	5.07	4.93	2.55
NWCA11-1300	3-Good	77.40	0	7.00	9.90	50.75	1.00	1.00	1.27	1.64	1.12
NWCA11-1305	1-Poor	61.10	0	6.82	16.33	58.83	1.00	1.01	1.22	1.08	1.05
NWCA11-1311	1-Poor	50.10	6	4.63	21.09	51.90	1.00	1.79	3.16	3.12	1.88
NWCA11-1316	3-Good	81.30	4	6.35	17.33	57.28	1.00	1.00	1.01	1.13	1.01
NWCA11-1308	3-Good	64.90	0	5.77	37.64	82.66	1.00	1.00	1.42	1.63	1.15
NWCA11-1321	3-Good	68.40	6	5.78	18.71	55.70	1.21	1.37	1.98	1.61	1.45
NWCA11-1322	3-Good	62.10	1	6.94	22.81	68.79	1.00	1.00	1.09	1.13	1.03
NWCA11-1324	3-Good	66.90	0	5.16	32.67	71.75	1.00	1.00	1.00	1.18	1.02
NWCA11-1325	3-Good	63.00	6	5.22	26.94	63.97	2.89	2.35	2.81	1.97	2.62
NWCA11-1329	2-Fair	57.10	2	7.09	16.74	61.07	1.93	1.22	1.05	1.08	1.46
NWCA11-1336	3-Good	59.00	5	5.08	47.59	81.75	1.79	1.41	1.26	1.22	1.51
NWCA11-1342	3-Good	79.50	0	6.88	22.20	67.60	1.00	1.00	1.06	1.33	1.04
NWCA11-ND-5016	3-Good	55.40	5	5.15	40.94	82.20	1.00	3.13	3.20	3.75	2.35
NWCA11-1587	1-Poor	49.50	5	4.19	10.25	33.67	2.49	2.76	2.59	2.16	2.55
NWCA11-1589	3-Good	53.10	0	4.04	25.16	54.05	1.00	1.23	2.73	3.20	1.63
NWCA11-1591	2-Fair	43.40	8	3.00	21.55	42.38	1.00	1.52	3.16	3.29	1.82
NWCA11-1599	1-Poor	43.10	2	3.41	17.84	39.67	2.04	2.05	2.61	2.12	2.16
NWCA11-1602	1-Poor	48.40	10	3.97	13.63	37.12	3.38	2.48	1.62	1.88	2.61
NWCA11-1608	3-Good	69.40	0	6.05	13.44	49.87	1.00	1.00	1.00	1.09	1.01
NWCA11-1610	1-Poor	49.90	3	5.26	20.52	55.07	1.00	1.00	1.46	2.29	1.22
NWCA11-1612	3-Good	63.90	4	5.92	17.32	54.58	1.56	1.15	1.07	1.43	1.32
NWCA11-1613	3-Good	80.10	0	9.50	13.44	62.05	1.00	1.00	1.00	1.00	1.00
NWCA11-1626	2-Fair	71.90	0	8.40	14.43	63.48	5.80	2.88	1.58	1.31	3.63
NWCA11-1629	2-Fair	72.40	0	6.84	14.70	56.57	1.00	1.00	1.00	1.00	1.00
NWCA11-1631	1-Poor	52.40	8	4.44	13.91	40.50	4.59	3.91	4.63	4.96	4.43
NWCA11-1637	3-Good	82.30	0	9.01	16.99	67.13	1.00	1.00	1.00	1.00	1.00
NWCA11-2159	2-Fair	28.60	0	1.20	15.10	21.92	1.38	2.22	4.31	4.32	2.51
NWCA11-1345	1-Poor	28.90	8	0.63	10.55	11.90	2.31	3.17	3.21	3.43	2.86
NWCA11-1346	3-Good	61.30	6	5.85	42.08	86.56	2.26	2.21	1.50	1.44	2.01
NWCA11-1348	1-Poor	55.00	2	7.99	13.28	61.76	1.00	1.00	1.41	2.68	1.25
NWCA11-1357	1-Poor	27.10	6	3.06	15.97	34.80	1.00	1.92	3.71	2.99	2.02
NWCA11-1359	2-Fair	56.80	2	7.61	16.33	63.77	1.00	2.29	3.66	3.19	2.14
NWCA11-1363	2-Fair	56.40	0	7.98	15.00	64.14	1.00	1.00	1.00	1.29	1.03
NWCA11-1365	3-Good	63.50	2	6.54	34.16	82.52	1.13	1.20	1.86	1.39	1.32
NWCA11-1366	3-Good	76.20	0	5.20	41.11	82.53	1.00	1.03	1.20	1.50	1.10
NWCA11-1368	3-Good	79.50	0	7.05	12.70	55.04	1.00	1.00	1.78	1.41	1.20
NWCA11-1369	3-Good	75.00	0	7.00	7.00	46.61	1.00	1.00	1.11	1.74	1.10
NWCA11-1370	3-Good	78.50	1	7.16	18.90	64.60	1.00	1.05	1.02	2.11	1.13
NWCA11-1372	3-Good	66.60	0	5.24	21.21	55.90	1.00	1.00	1.25	1.21	1.07
NWCA11-1373	2-Fair	61.40	1	5.77	24.22	63.53	1.00	1.48	1.44	2.43	1.37
NWCA11-1374	3-Good	64.70	0	6.03	24.57	65.67	1.32	4.46	2.47	1.58	2.52
NWCA11-1376	3-Good	69.70	0	4.83	23.84	57.08	1.19	2.29	1.75	1.39	1.65
NWCA11-1377	3-Good	75.00	3	7.00	7.00	46.61	1.00	1.00	1.00	1.04	1.00
NWCA11-1379	3-Good	75.00	0	7.00	7.00	46.61	1.00	1.00	1.03	1.07	1.01
NWCA11-ND-5066	3-Good	50.30	4	0.99	5.33	6.64	3.84	4.65	4.48	4.36	4.26

Site ID	Vegetation Condition	VMMI	Total Buffer Stress	Weighted C of C	FQAI	US VIBI-FQ	Buffer 1 LDI (0 to 100M)	Buffer 2 LDI (100 to 350M)	Buffer 3 LDI (350 to 1000M)	Buffer 4 LDI (1000 to 2000M)	Total Buffer LDI
NWCA11-ND-5017	3-Good	42.30	9	4.06	7.75	29.31	3.85	3.63	2.89	3.22	3.53
NWCA11-ND-5019	1-Poor	23.40	6	0.08	6.50	2.63	1.80	3.32	3.76	3.10	2.78
NWCA11-ND-5021	3-Good	37.90	2	2.53	16.16	31.78	2.18	2.35	3.21	3.25	2.54
NWCA11-ND-5023	3-Good	68.30	6	3.19	9.00	25.65	2.31	2.37	2.76	2.95	2.48
NWCA11-ND-5027	1-Poor	15.90	8	0.04	3.60	0.25	4.54	4.69	4.26	4.05	4.48
NWCA11-ND-5030	3-Good	40.20	2	2.41	12.22	25.40	2.96	2.90	2.97	3.18	2.97
NWCA11-ND-5032	3-Good	51.00	5	2.88	12.75	29.06	3.40	3.33	3.55	3.71	3.44
NWCA11-ND-5034	3-Good	48.20	7	2.68	15.20	31.33	4.01	3.84	4.19	4.26	4.02
NWCA11-ND-5037	2-Fair	31.70	2	1.00	8.50	11.23	2.13	2.14	3.50	3.70	2.56
NWCA11-ND-5067	3-Good	51.40	3	2.99	16.19	34.67	3.64	2.84	3.21	3.32	3.28
NWCA11-5915	1-Poor	16.90	2	0.60	6.48	5.88	4.32	4.50	4.19	4.08	4.32
NWCA11-5917	3-Good	61.20	6	5.28	32.42	72.19	3.15	3.29	2.41	2.40	2.97
NWCA11-1007	2-Fair	58.50	2	6.52	24.40	68.46	1.00	1.30	1.44	1.57	1.23
NWCA11-5918	1-Poor	51.30	2	4.20	22.47	51.19	1.00	1.35	2.73	3.01	1.65
NWCA11-4116	1-Poor	46.60	2	2.54	17.20	33.29	1.19	1.35	2.32	3.01	1.64
NWCA11-1009	2-Fair	57.90	0	4.49	18.40	47.20	1.00	1.00	1.00	1.00	1.00
NWCA11-1015	3-Good	65.00	1	6.21	28.44	72.30	1.00	1.00	1.15	1.18	1.05
NWCA11-1023	3-Good	67.00	2	6.10	22.25	62.75	1.00	1.00	1.00	1.00	1.00
NWCA11-1035	1-Poor	50.90	0	3.17	16.49	36.23	1.00	1.00	1.00	1.00	1.00
NWCA11-1043	1-Poor	35.90	7	3.56	23.04	48.00	3.54	2.34	1.92	3.00	2.80
NWCA11-1045	1-Poor	56.50	8	4.18	20.89	48.85	1.00	1.42	2.47	3.27	1.65
NWCA11-1046	2-Fair	54.90	2	4.99	24.46	58.99	1.70	2.69	2.60	1.97	2.20
NWCA11-1047	1-Poor	47.60	5	3.56	30.38	58.50	1.21	1.56	1.82	1.76	1.49
NWCA11-1050	2-Fair	53.20	11	2.99	18.86	38.51	4.54	3.51	3.55	2.58	3.84
NWCA11-1053	3-Good	77.80	12	4.99	16.28	47.33	4.35	4.48	4.03	4.25	4.32
NWCA11-2401	1-Poor	34.80	8	3.08	12.14	29.46	3.81	3.32	2.73	2.07	3.27
NWCA11-2416	3-Good	67.10	0	5.32	29.62	68.41	1.00	1.00	1.27	1.38	1.09
NWCA11-ND-5079	1-Poor	22.10	0	0.12	5.31	1.18	2.76	3.51	4.10	4.18	3.39
NWCA11-ND-5077	2-Fair	36.10	8	2.01	17.52	30.48	4.54	4.52	4.22	4.23	4.44
NWCA11-2417	3-Good	58.60	0	5.13	25.40	61.19	1.00	1.00	1.95	2.00	1.29
NWCA11-1948	1-Poor	51.00	1	5.48	22.81	59.67	1.00	1.02	1.69	2.73	1.32
NWCA11-1953	3-Good	79.10	0	7.27	16.55	61.91	1.57	1.04	1.65	1.25	1.39
NWCA11-1946	3-Good	79.40	0	7.11	12.50	55.15	1.29	3.86	3.33	2.25	2.56
NWCA11-1942	1-Poor	39.10	5	3.02	25.38	47.99	4.16	3.50	2.32	2.96	3.47
NWCA11-1651	1-Poor	36.90	4	2.91	13.91	30.94	4.37	3.60	4.23	4.39	4.11
NWCA11-1653	3-Good	77.80	0	8.90	12.12	60.18	1.00	1.00	1.00	1.00	1.00
NWCA11-1654	3-Good	77.70	0	8.29	14.76	63.94	1.00	1.00	1.36	1.43	1.11
NWCA11-1659	3-Good	69.40	0	5.05	25.47	60.80	1.00	1.00	1.13	1.62	1.09
NWCA11-1662	3-Good	78.10	5	6.20	15.00	53.02	1.08	1.04	1.00	1.35	1.08
NWCA11-1666	3-Good	82.60	0	8.61	16.50	66.43	1.00	1.00	1.08	1.38	1.05
NWCA11-1935	3-Good	51.80	3	5.15	22.87	57.74	1.78	4.30	4.20	3.87	3.23
NWCA11-1642	3-Good	81.40	0	9.13	15.01	64.30	1.00	1.00	1.68	1.12	1.15
NWCA11-2069	2-Fair	71.40	1	6.44	31.16	77.62	2.22	3.53	3.28	2.44	2.85
NWCA11-2488	3-Good	43.40	6	4.99	7.35	34.57	2.63	4.03	4.12	4.03	3.49
NWCA11-2481	3-Good	43.90	3	2.47	8.05	19.82	4.84	4.33	3.90	3.87	4.40
NWCA11-2459	1-Poor	35.10	4	1.61	20.59	32.33	1.00	1.06	1.06	1.07	1.04
NWCA11-2455	3-Good	79.50	0	7.00	14.50	57.35	1.00	1.14	1.62	1.29	1.19
NWCA11-2451	1-Poor	36.90	1	1.73	15.49	25.80	1.20	1.36	1.24	1.28	1.26
NWCA11-2448	3-Good	59.50	3	4.67	24.29	56.73	1.00	1.00	2.33	2.14	1.38
NWCA11-2446	2-Fair	73.60	0	7.05	12.70	55.07	1.00	1.00	1.05	1.23	1.03
NWCA11-2444	1-Poor	48.70	5	4.88	10.55	38.45	1.00	1.64	1.90	2.44	1.52
NWCA11-2442	3-Good	75.00	0	7.00	7.00	46.61	1.00	1.00	1.00	1.07	1.01
NWCA11-2424	3-Good	75.00	0	7.00	7.00	46.61	2.61	2.91	2.09	1.69	2.50
NWCA11-2403	1-Poor	61.30	0	7.17	19.00	64.82	1.00	1.18	1.59	1.23	1.20
NWCA11-1394	3-Good	58.90	4	4.05	21.60	49.00	2.51	2.24	1.75	1.92	2.22
NWCA11-1070	3-Good	59.50	0	5.11	26.75	63.01	1.00	1.07	2.61	2.94	1.54
NWCA11-1065	1-Poor	53.70	9	4.12	18.00	44.33	1.79	3.70	4.44	4.43	3.15
NWCA11-1078	2-Fair	55.10	9	5.67	22.95	61.08	1.00	1.86	3.13	3.54	1.94
NWCA11-2068	3-Good	81.70	2	8.00	15.50	65.00	1.00	1.00	1.23	1.40	1.09
NWCA11-2065	3-Good	82.70	0	7.26	21.65	69.14	1.00	1.00	1.00	1.26	1.03
NWCA11-3988	3-Good	78.60	4	6.00	11.55	46.86	2.95	2.29	1.25	2.03	2.32
NWCA11-3989	1-Poor	64.70	2	5.42	17.32	51.49	3.17	1.74	2.29	1.63	2.41

Site ID	Vegetation Condition	VMMI	Total Buffer Stress	Weighted C of C	FQAI	US VIBI-FQ	Buffer 1 LDI (0 to 100M)	Buffer 2 LDI (100 to 350M)	Buffer 3 LDI (350 to 1000M)	Buffer 4 LDI (1000 to 2000M)	Total Buffer LDI
NWCA11-3990	3-Good	69.70	3	7.80	34.66	91.16	1.02	1.31	1.87	2.22	1.40
NWCA11-3986	3-Good	59.20	1	5.84	31.70	74.63	1.00	4.16	6.43	5.88	3.52
NWCA11-2222	3-Good	79.90	3	5.94	18.00	55.71	1.00	1.17	1.06	1.43	1.11
NWCA11-2220	3-Good	81.40	2	5.53	15.11	49.00	1.00	1.00	1.00	1.00	1.00
NWCA11-2215	2-Fair	72.20	1	5.85	17.33	54.19	2.65	1.80	2.36	1.58	2.23
NWCA11-2207	3-Good	74.60	3	6.21	15.30	53.51	2.78	2.17	2.31	1.64	2.39
NWCA11-2205	3-Good	76.00	0	6.00	8.49	42.48	1.00	2.60	4.04	3.65	2.35
NWCA11-2204	3-Good	81.60	2	6.22	15.51	53.92	1.00	1.00	1.00	1.07	1.01
NWCA11-2203	2-Fair	69.40	0	6.19	12.50	49.37	1.00	1.00	1.00	1.00	1.00
NWCA11-2199	3-Good	82.20	3	6.13	17.39	55.98	1.00	2.20	2.52	1.52	1.72
NWCA11-2198	2-Fair	72.30	2	5.70	19.90	56.93	1.00	1.50	2.92	3.02	1.74
NWCA11-2197	3-Good	76.20	1	6.00	8.49	42.48	1.12	2.38	1.26	2.60	1.68
NWCA11-2196	3-Good	79.10	2	5.46	15.50	49.15	1.00	1.00	1.00	1.05	1.00
NWCA11-2195	3-Good	79.00	2	5.87	12.00	46.66	3.84	3.51	3.92	3.95	3.77
NWCA11-2190	1-Poor	55.40	3	4.28	12.67	37.71	2.19	1.45	1.18	1.36	1.68
NWCA11-2188	3-Good	61.10	4	4.58	29.07	63.03	1.00	1.58	1.38	1.92	1.34
NWCA11-ND-5040	3-Good	62.10	5	2.40	15.25	29.65	3.82	4.04	3.68	3.74	3.85
NWCA11-ND-5042	3-Good	72.80	2	3.41	21.39	44.74	3.59	3.79	3.75	3.61	3.68
NWCA11-ND-5043	2-Fair	30.60	4	1.64	14.79	24.21	2.67	3.66	4.14	3.81	3.37
NWCA11-ND-5046	2-Fair	26.90	2	0.26	9.95	8.71	3.30	3.08	3.18	3.27	3.21
NWCA11-ND-5048	3-Good	66.20	3	4.07	18.86	45.23	2.18	3.65	3.78	3.55	3.08
NWCA11-ND-5049	3-Good	54.90	7	2.88	11.67	27.54	3.44	3.28	3.49	3.23	3.38
NWCA11-ND-5055	3-Good	50.70	3	2.08	21.13	36.05	2.65	3.77	4.03	3.65	3.36
NWCA11-ND-5056	3-Good	46.10	5	6.16	13.18	50.17	3.15	3.41	3.59	3.71	3.37
NWCA11-ND-5062	3-Good	54.90	4	3.52	12.97	33.37	3.53	4.00	3.66	3.52	3.70
NWCA11-ND-5059	3-Good	40.90	9	2.41	9.38	21.33	3.38	3.83	3.74	3.78	3.63
NWCA11-ND-5065	2-Fair	33.00	4	1.63	20.83	32.81	2.50	3.14	2.88	2.86	2.80
NWCA11-ND-5069	3-Good	41.40	7	2.42	21.25	38.33	3.91	3.63	3.16	3.29	3.61
NWCA11-ND-5072	3-Good	42.30	7	2.34	12.45	25.27	2.83	3.53	4.18	4.32	3.46
NWCA11-ND-5073	3-Good	52.50	8	4.14	16.52	42.32	3.52	3.13	3.12	3.13	3.28
NWCA11-ND-5075	1-Poor	19.70	0	0.13	9.04	6.55	1.82	2.98	3.88	3.36	2.73
NWCA11-2411	3-Good	77.70	0	6.89	18.03	61.68	1.00	1.50	1.59	2.44	1.41
NWCA11-2186	3-Good	78.60	1	6.00	11.55	46.86	1.64	2.26	1.41	2.26	1.84
NWCA11-2408	3-Good	75.00	0	7.00	7.00	46.61	1.00	1.00	1.18	1.38	1.07
NWCA11-2223	1-Poor	43.00	3	3.14	25.96	49.58	1.95	3.97	3.83	2.46	2.98
NWCA11-ND-5078	2-Fair	25.60	2	2.11	12.85	24.43	3.67	3.93	3.54	3.83	3.74
NWCA11-ND-5082	3-Good	55.40	1	5.46	40.23	84.10	2.22	2.43	3.19	3.68	2.62
NWCA11-ND-5068	3-Good	68.50	4	6.92	41.31	93.22	1.04	2.73	2.97	3.45	2.17
NWCA11-ND-5018	2-Fair	26.30	6	0.97	10.01	13.22	3.29	3.19	3.48	3.66	3.33
NWCA11-2431	3-Good	78.50	0	7.21	20.15	66.73	1.00	1.00	1.65	3.15	1.35
NWCA11-2433	3-Good	68.40	4	5.03	20.47	53.55	1.22	3.77	3.50	2.94	2.61
NWCA11-2436	3-Good	75.00	0	7.00	7.00	46.61	1.00	1.00	1.00	1.02	1.00
NWCA11-2445	2-Fair	56.30	6	4.72	26.18	59.75	3.57	2.54	2.71	2.49	2.98
NWCA11-2447	3-Good	71.00	8	6.76	18.68	61.79	3.78	4.04	4.39	2.85	3.89
NWCA11-2452	2-Fair	68.00	0	7.43	21.50	70.00	1.00	1.00	1.58	3.22	1.34
NWCA11-1649	2-Fair	69.70	0	8.35	18.78	69.69	1.00	1.00	1.42	1.41	1.12
NWCA11-1938	2-Fair	52.80	6	4.85	28.86	64.42	1.68	3.01	3.86	3.66	2.71
NWCA11-1940	2-Fair	46.60	6	3.86	28.21	57.29	3.90	3.55	3.23	3.21	3.59
NWCA11-1380	2-Fair	53.70	2	4.58	29.67	63.87	1.34	2.78	3.23	2.74	2.29
NWCA11-1086	1-Poor	34.50	10	3.76	24.97	52.02	3.22	3.87	3.15	3.60	3.44
NWCA11-1074	2-Fair	58.00	12	5.60	30.71	71.71	3.68	4.32	4.27	4.35	4.06
NWCA11-1061	1-Poor	44.50	11	4.41	17.46	45.36	5.38	4.80	4.46	3.90	4.88
NWCA11-2061	3-Good	82.50	0	7.47	21.21	69.87	1.00	1.00	1.00	1.00	1.00
NWCA11-2059	1-Poor	42.80	0	2.88	31.01	55.17	1.00	1.01	1.75	2.83	1.34
NWCA11-2052	2-Fair	71.20	0	7.36	17.75	64.23	1.00	1.05	1.06	1.00	1.03
NWCA11-1965	3-Good	77.90	2	7.90	10.61	57.38	1.00	1.00	1.72	3.06	1.35
NWCA11-1963	1-Poor	31.40	4	1.88	9.80	18.58	4.54	4.17	2.78	3.41	3.97
NWCA11-1959	1-Poor	49.60	5	5.24	27.77	65.27	3.59	3.55	4.56	4.70	3.88
NWCA11-1958	2-Fair	71.70	1	5.94	12.66	48.08	1.00	1.19	3.88	3.09	1.84
NWCA11-1957	3-Good	77.90	0	7.63	10.61	55.70	1.00	1.00	1.44	2.01	1.19
NWCA11-1955	1-Poor	25.90	5	2.71	7.25	20.14	4.54	3.57	2.71	3.57	3.79
NWCA11-1956	1-Poor	36.00	6	1.95	18.97	32.18	4.54	4.63	4.20	2.96	4.34

Site ID	Vegetation Condition	VMMI	Total Buffer Stress	Weighted C of C	FQAI	US VIBI-FQ	Buffer 1 LDI (0 to 100M)	Buffer 2 LDI (100 to 350M)	Buffer 3 LDI (350 to 1000M)	Buffer 4 LDI (1000 to 2000M)	Total Buffer LDI
NWCA11-5174	3-Good	44.90	4	3.20	14.06	32.94	3.41	3.52	3.88	3.89	3.58
NWCA11-5167	1-Poor	17.90	5	0.42	5.89	3.87	1.00	1.85	3.63	3.52	2.03
NWCA11-5528	3-Good	36.50	2	0.42	6.01	4.04	2.58	1.80	2.39	2.75	2.33
NWCA11-5615	1-Poor	39.50	4	4.35	30.20	63.20	1.07	1.07	1.14	1.30	1.11
NWCA11-5614	3-Good	66.60	9	3.54	19.38	42.67	2.03	1.85	1.26	1.19	1.74
NWCA11-5616	2-Fair	49.50	10	3.83	26.81	55.07	3.26	3.12	3.33	3.49	3.25
NWCA11-5610	3-Good	68.30	5	5.54	24.22	62.11	1.41	1.07	1.12	1.10	1.22
NWCA11-6086	3-Good	59.10	6	3.70	11.76	32.80	3.41	3.31	3.03	3.76	3.34
NWCA11-6092	3-Good	58.30	5	3.96	14.76	38.71	3.83	3.84	3.78	3.88	3.83
NWCA11-6101	3-Good	64.90	6	5.60	14.79	48.99	2.97	3.77	3.67	3.73	3.43
NWCA11-6308	2-Fair	46.30	0	3.97	12.26	35.16	3.92	3.20	3.00	2.42	3.37
NWCA11-7004	1-Poor	24.40	7	1.47	10.71	17.35	2.32	3.93	3.69	3.91	3.23
NWCA11-7006	3-Good	54.90	8	3.45	12.04	31.64	2.54	2.39	2.94	3.19	2.64
NWCA11-1082	1-Poor	50.70	6	4.88	27.57	62.73	1.99	1.68	1.73	1.99	1.84
NWCA11-1071	1-Poor	51.10	5	5.11	38.54	79.85	1.00	1.00	1.03	1.24	1.03
NWCA11-1063	3-Good	59.80	1	5.63	33.33	75.64	1.00	1.00	1.00	1.30	1.03
NWCA11-2686	1-Poor	49.90	0	4.12	36.90	71.33	1.06	1.64	2.04	1.70	1.49
NWCA11-2423	1-Poor	48.20	4	3.57	21.55	45.95	4.61	6.09	3.69	2.53	4.66
NWCA11-4495	2-Fair	55.90	3	3.98	35.30	68.16	1.70	1.28	1.79	1.82	1.60
NWCA11-1106	1-Poor	22.00	7	1.75	9.19	16.90	2.00	2.17	2.02	2.22	2.08
NWCA11-1109	1-Poor	45.50	5	3.14	9.19	25.63	3.46	2.06	1.23	1.76	2.43
NWCA11-1114	1-Poor	28.40	4	2.99	8.00	22.98	1.46	1.22	1.20	1.48	1.34
NWCA11-1116	1-Poor	27.20	5	2.21	11.84	23.56	2.96	3.29	3.11	3.12	3.10
NWCA11-1118	1-Poor	29.80	2	2.67	5.67	17.61	1.00	1.04	1.25	1.33	1.10
NWCA11-1123	2-Fair	72.00	4	5.71	6.36	37.64	1.00	1.19	1.35	1.15	1.14
NWCA11-1125	1-Poor	27.80	2	2.96	11.14	27.30	1.38	3.20	4.77	4.70	2.94
NWCA11-1127	1-Poor	52.10	4	3.77	7.60	27.30	1.00	2.04	3.01	2.91	1.90
NWCA11-1129	1-Poor	32.90	3	2.02	4.43	12.60	1.00	3.48	3.65	3.46	2.52
NWCA11-1131	3-Good	54.90	0	5.53	17.49	52.40	1.00	1.57	2.69	1.61	1.57
NWCA11-1133	1-Poor	46.70	4	3.19	10.00	27.07	1.00	1.10	1.76	2.25	1.31
NWCA11-1136	3-Good	65.10	4	3.20	6.35	21.90	1.00	1.27	1.44	1.65	1.23
NWCA11-1140	1-Poor	46.60	5	4.19	7.07	29.16	1.40	1.33	1.30	1.30	1.35
NWCA11-1144	1-Poor	23.20	8	0.47	9.81	9.84	2.86	3.69	3.57	3.48	3.31
NWCA11-1146	1-Poor	13.60	5	1.97	9.33	18.53	1.62	2.58	2.89	2.89	2.29
NWCA11-1147	2-Fair	32.40	5	3.33	6.20	22.49	2.67	1.49	1.48	1.35	1.95
NWCA11-1150	1-Poor	45.10	0	2.01	12.96	23.93	1.60	2.04	2.99	2.57	2.11
NWCA11-1153	2-Fair	33.90	2	3.49	4.91	21.79	4.54	4.62	4.61	4.57	4.58
NWCA11-1163	1-Poor	7.20	9	1.66	10.73	18.59	2.79	2.56	2.09	1.61	2.46
NWCA11-1168	3-Good	52.60	6	3.19	16.63	36.58	2.03	3.32	3.06	3.07	2.73
NWCA11-1197	1-Poor	54.80	0	4.69	14.50	42.86	1.00	1.77	2.38	2.03	1.61
NWCA11-1198	1-Poor	57.60	0	3.97	20.75	47.32	1.00	1.00	1.09	1.41	1.06
NWCA11-1205	1-Poor	42.00	2	3.14	20.83	42.27	1.00	1.10	1.00	1.11	1.04
NWCA11-1207	3-Good	78.80	4	6.95	14.70	57.31	1.00	2.15	2.45	1.56	1.69
NWCA11-1209	1-Poor	40.90	5	3.40	17.00	38.40	1.00	1.00	1.13	1.06	1.03
NWCA11-1223	3-Good	75.00	4	7.00	7.00	46.61	2.54	4.45	3.13	2.40	3.22
NWCA11-1233	1-Poor	53.40	5	8.00	11.31	59.02	3.91	3.74	2.70	2.51	3.48
NWCA11-1235	1-Poor	38.50	6	1.84	13.80	24.08	3.49	3.30	2.49	2.11	3.10
NWCA11-1238	3-Good	72.20	2	5.65	31.01	72.45	1.00	1.00	1.33	1.12	1.08
NWCA11-1239	1-Poor	55.00	0	7.82	13.28	60.68	1.00	1.00	1.00	1.00	1.00
NWCA11-1247	3-Good	66.50	0	6.06	24.73	66.07	1.00	1.00	1.03	1.14	1.02
NWCA11-1248	3-Good	75.00	0	7.00	7.00	46.61	1.00	1.00	1.01	1.10	1.01
NWCA11-1249	2-Fair	57.60	0	7.44	16.55	63.03	1.00	1.00	1.49	1.06	1.10
NWCA11-1256	3-Good	80.60	4	7.00	17.96	62.27	1.67	1.71	1.79	2.07	1.74
NWCA11-1258	1-Poor	51.00	8	5.78	25.47	65.37	1.71	2.81	2.66	2.74	2.33
NWCA11-1263	3-Good	82.70	3	7.00	17.96	62.28	1.00	1.20	1.85	1.64	1.29
NWCA11-1271	3-Good	80.30	6	5.73	20.75	58.33	1.00	1.00	1.15	1.29	1.06
NWCA11-1275	1-Poor	41.60	11	6.12	27.22	69.97	5.63	5.76	6.02	5.32	5.72
NWCA11-1574	3-Good	40.00	5	2.53	10.83	24.12	3.33	3.53	3.90	3.87	3.56
NWCA11-1581	1-Poor	45.00	0	3.79	26.83	54.88	1.00	1.00	1.00	1.00	1.00
NWCA11-1381	3-Good	75.00	0	7.00	7.00	46.61	1.00	1.03	1.32	1.94	1.17
NWCA11-1382	1-Poor	45.40	6	3.11	17.40	37.14	2.07	4.22	2.50	2.50	2.84
NWCA11-1384	3-Good	80.40	5	7.21	14.50	58.62	1.00	1.00	1.23	1.52	1.10

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NWCA11-1385	3-Good	73.60	5	5.32	25.86	63.03	2.63	2.22	2.15	2.35	2.38
NWCA11-1388	3-Good	78.30	1	6.49	26.83	71.76	2.95	1.10	1.23	1.44	1.90
NWCA11-1389	3-Good	68.60	2	7.09	20.80	66.89	3.92	2.78	2.06	2.36	3.05
NWCA11-1392	3-Good	75.10	0	5.27	27.20	64.64	1.00	1.14	1.15	1.20	1.09
NWCA11-1393	3-Good	75.00	0	7.00	7.00	46.61	1.00	1.00	1.02	1.24	1.03
NWCA11-1395	3-Good	79.00	0	6.88	24.01	70.18	1.00	1.12	1.04	1.21	1.06
NWCA11-1396	3-Good	71.40	2	6.52	27.72	73.19	1.00	1.00	1.03	1.20	1.03
NWCA11-1397	3-Good	75.00	0	7.00	7.00	46.61	1.00	1.00	1.00	1.32	1.03
NWCA11-1398	1-Poor	45.30	7	3.20	13.31	31.87	3.02	3.76	2.43	2.57	3.08
NWCA11-1400	3-Good	75.00	0	7.00	7.00	46.61	1.00	1.01	1.13	1.19	1.05
NWCA11-1401	3-Good	75.00	0	7.00	7.00	46.61	1.00	1.00	1.23	1.59	1.11
NWCA11-1404	3-Good	75.00	0	7.00	7.00	46.61	1.00	1.00	1.01	1.06	1.01
NWCA11-1408	3-Good	75.00	0	7.00	7.00	46.61	1.00	1.00	1.07	1.65	1.08
NWCA11-1409	3-Good	80.90	0	7.00	14.50	57.33	1.00	1.00	1.39	2.02	1.18
NWCA11-1411	3-Good	75.00	0	7.00	7.00	46.61	1.00	1.00	1.00	1.00	1.00
NWCA11-1412	3-Good	75.00	0	7.00	7.00	46.61	1.00	1.18	1.42	1.18	1.15
NWCA11-1414	1-Poor	44.60	7	3.06	13.86	31.79	2.27	4.16	2.41	2.53	2.89
NWCA11-1516	1-Poor	9.60	5	0.76	12.17	15.02	1.06	4.53	5.06	4.61	3.26
NWCA11-1531	1-Poor	38.80	2	3.50	22.12	46.33	1.00	1.78	3.45	3.78	2.00
NWCA11-1532	1-Poor	16.40	5	0.24	8.31	6.20	1.04	1.79	3.18	4.46	2.04
NWCA11-1535	1-Poor	15.00	4	0.85	16.71	22.03	2.78	3.40	4.32	4.93	3.49
NWCA11-1570	3-Good	48.50	9	2.27	8.76	19.59	3.59	4.19	4.29	3.88	3.94
NWCA11-1582	1-Poor	40.30	10	3.63	23.11	48.55	2.94	2.65	2.37	2.35	2.68
NWCA11-1583	1-Poor	45.90	4	2.98	21.01	41.52	2.02	2.00	2.36	1.92	2.07
NWCA11-1586	1-Poor	30.40	8	2.17	10.25	21.04	1.31	1.90	2.89	2.08	1.88
NWCA11-1667	1-Poor	24.60	5	1.11	10.82	15.25	3.29	4.39	4.51	4.36	3.97
NWCA11-1670	3-Good	78.20	6	8.61	16.99	67.13	1.00	1.24	1.40	1.33	1.18
NWCA11-1675	1-Poor	26.70	5	0.45	12.02	12.84	1.00	1.24	1.89	1.53	1.30
NWCA11-1676	2-Fair	55.40	2	3.95	20.25	46.47	1.00	1.09	1.52	1.20	1.15
NWCA11-1678	1-Poor	63.80	0	5.89	16.62	53.40	1.24	1.41	2.55	2.49	1.68
NWCA11-1680	1-Poor	24.40	0	0.00	0.00	0.00	1.00	1.00	1.01	1.01	1.00
NWCA11-1681	1-Poor	21.90	4	0.24	4.08	1.50	1.00	1.06	1.83	2.01	1.28
NWCA11-1690	1-Poor	53.60	4	5.26	17.03	50.05	1.00	1.00	1.00	1.00	1.00
NWCA11-1691	3-Good	75.50	0	8.08	15.51	65.02	1.00	2.78	2.45	1.67	1.89
NWCA11-1694	3-Good	75.80	1	8.54	17.15	67.35	1.00	1.00	1.00	1.00	1.00
NWCA11-1701	1-Poor	36.50	9	2.79	12.37	27.94	2.56	3.20	3.74	3.48	3.08
NWCA11-1703	3-Good	74.40	0	2.00	2.00	12.50	1.00	1.00	1.00	1.00	1.00
NWCA11-1860	2-Fair	57.60	0	6.74	16.45	58.49	1.00	1.02	1.15	1.07	1.04
NWCA11-1773	2-Fair	67.20	0	5.70	19.33	56.12	1.00	1.00	1.50	2.01	1.20
NWCA11-1776	1-Poor	31.70	0	0.28	15.49	16.76	1.03	1.13	1.05	1.65	1.13
NWCA11-1777	1-Poor	55.30	3	5.07	14.98	45.95	1.00	1.08	2.21	1.80	1.34
NWCA11-1778	3-Good	75.00	0	7.00	7.00	46.61	1.00	1.00	1.00	1.65	1.07
NWCA11-1788	1-Poor	63.30	0	6.16	15.98	54.18	1.00	1.00	1.34	1.40	1.11
NWCA11-1789	2-Fair	71.80	0	6.97	10.73	51.74	1.00	1.00	1.18	1.32	1.07
NWCA11-1798	2-Fair	70.60	3	6.38	17.75	58.08	3.77	3.60	2.03	1.53	3.15
NWCA11-1801	1-Poor	22.90	0	0.31	5.31	2.41	1.03	1.75	2.38	1.64	1.58
NWCA11-1810	1-Poor	22.30	0	0.39	6.36	4.39	1.00	1.32	1.93	2.06	1.39
NWCA11-1816	3-Good	82.90	2	7.00	16.99	60.90	1.00	1.00	1.31	1.67	1.13
NWCA11-1817	1-Poor	23.80	0	0.51	7.18	6.31	1.00	1.61	1.84	1.54	1.41
NWCA11-1819	3-Good	82.80	2	7.37	19.67	67.00	1.00	1.00	1.32	1.18	1.08
NWCA11-1822	1-Poor	54.30	2	4.62	39.66	78.38	1.13	1.07	1.02	1.12	1.09
NWCA11-1829	1-Poor	46.20	4	4.49	35.91	72.21	1.63	2.70	2.40	1.93	2.13
NWCA11-1832	3-Good	81.20	1	6.81	25.31	71.56	1.23	1.14	1.67	1.74	1.34
NWCA11-1833	3-Good	68.50	0	3.01	28.45	52.29	1.00	2.81	2.62	1.67	1.93
NWCA11-1835	1-Poor	44.60	0	3.65	28.62	56.54	1.00	1.20	3.12	3.29	1.71
NWCA11-1855	2-Fair	47.80	2	4.42	19.05	47.71	1.00	1.31	2.39	2.78	1.55
NWCA11-1858	2-Fair	49.00	0	3.74	32.45	62.57	1.00	1.14	2.26	3.03	1.50
NWCA11-1859	1-Poor	28.60	4	2.76	23.00	42.95	1.41	1.96	1.64	1.48	1.63
NWCA11-1862	1-Poor	23.80	6	0.81	17.71	23.23	6.65	5.72	4.39	4.08	5.66
NWCA11-1863	2-Fair	57.00	2	5.25	30.49	69.23	1.94	1.33	1.11	1.28	1.53
NWCA11-1866	3-Good	75.70	0	3.73	27.70	55.71	1.00	1.40	1.44	1.45	1.25
NWCA11-1867	3-Good	72.80	0	4.64	25.21	57.85	1.02	1.15	1.38	1.70	1.20

Site ID	Vegetation Condition	VMMI	Total Buffer Stress	Weighted C of C	FQAI	US VIBI-FQ	Buffer 1 LDI (0 to 100M)	Buffer 2 LDI (100 to 350M)	Buffer 3 LDI (350 to 1000M)	Buffer 4 LDI (1000 to 2000M)	Total Buffer LDI
NWCA11-1966	1-Poor	55.90	5	2.44	20.45	37.31	1.40	1.48	3.69	4.35	2.18
NWCA11-1969	3-Good	73.20	0	5.69	19.89	56.84	1.00	1.51	1.15	1.00	1.18
NWCA11-1970	3-Good	80.20	0	7.43	15.11	60.87	1.00	1.03	1.11	1.70	1.10
NWCA11-1971	1-Poor	48.30	6	3.96	19.13	44.96	3.71	2.46	2.84	2.90	3.08
NWCA11-1972	1-Poor	49.80	0	4.67	23.66	55.82	1.00	2.33	2.51	2.55	1.86
NWCA11-1973	3-Good	80.30	2	7.55	16.55	63.65	1.00	1.49	1.71	1.14	1.30
NWCA11-1974	2-Fair	55.50	0	4.92	27.29	62.62	1.00	1.01	1.10	1.39	1.06
NWCA11-1975	1-Poor	37.10	6	2.59	8.60	21.36	4.54	4.00	2.70	3.52	3.91
NWCA11-1977	3-Good	77.90	0	7.50	10.61	54.88	1.00	1.00	1.17	1.29	1.06
NWCA11-1407	3-Good	66.10	3	5.39	26.48	64.39	1.00	2.35	2.68	2.76	1.92
NWCA11-1391	1-Poor	49.90	3	5.30	25.46	62.37	1.26	2.58	2.56	2.38	2.03
NWCA11-1371	2-Fair	53.60	2	4.39	31.36	65.11	1.00	1.60	3.19	3.16	1.83
NWCA11-1978	1-Poor	42.80	7	4.45	12.20	38.10	1.75	2.85	2.59	3.43	2.42
NWCA11-1979	2-Fair	57.40	1	4.68	25.00	57.83	1.00	2.35	3.35	3.64	2.14
NWCA11-1980	1-Poor	44.80	2	4.07	25.21	54.28	2.74	4.14	3.56	3.71	3.42
NWCA11-1990	2-Fair	54.30	3	5.06	31.86	70.00	1.00	1.00	1.16	1.65	1.10
NWCA11-1991	1-Poor	31.80	4	3.80	7.50	27.34	4.54	4.33	2.80	3.46	4.02
NWCA11-1993	3-Good	77.90	0	7.51	10.61	54.95	1.00	1.00	1.08	1.24	1.04
NWCA11-2006	1-Poor	35.30	3	4.14	25.08	54.53	2.05	2.72	2.47	2.75	2.40
NWCA11-2011	3-Good	62.00	8	3.87	20.92	46.95	4.06	4.06	4.22	4.41	4.13
NWCA11-2020	1-Poor	23.90	2	0.04	4.04	0.27	1.99	2.03	2.44	1.91	2.08
NWCA11-2022	3-Good	83.30	2	5.31	29.10	67.64	3.87	1.31	1.22	1.09	2.29
NWCA11-2023	1-Poor	44.50	1	3.51	25.49	51.22	1.06	2.50	2.94	2.88	2.05
NWCA11-2031	3-Good	67.90	0	7.05	30.41	80.34	1.03	1.73	2.86	2.88	1.79
NWCA11-2033	3-Good	63.70	2	4.53	24.83	56.63	1.65	2.48	3.03	2.69	2.28
NWCA11-2036	2-Fair	54.60	0	4.25	27.47	58.63	1.00	1.58	2.21	1.43	1.46
NWCA11-2038	2-Fair	67.70	2	7.99	15.00	64.22	1.00	1.00	1.53	1.61	1.17
NWCA11-2039	3-Good	60.70	1	4.86	33.03	70.43	3.41	3.33	2.96	2.89	3.25
NWCA11-2040	3-Good	64.00	2	4.26	33.04	66.68	1.00	1.00	1.07	1.27	1.04
NWCA11-2042	2-Fair	54.00	0	5.98	25.59	66.81	1.00	1.30	1.19	1.69	1.20
NWCA11-2043	3-Good	67.80	3	7.54	31.75	85.37	1.98	1.67	1.64	1.80	1.80
NWCA11-2047	3-Good	74.70	2	7.23	40.07	95.17	1.00	1.02	1.01	1.21	1.03
NWCA11-2048	3-Good	77.90	2	7.28	21.08	68.50	1.00	1.00	1.00	1.28	1.03
NWCA11-2051	2-Fair	52.80	4	3.66	38.37	70.53	1.82	1.61	2.79	2.72	2.04
NWCA11-2070	3-Good	83.50	2	7.76	29.34	83.29	1.00	1.00	1.00	1.23	1.02
NWCA11-2073	1-Poor	36.90	6	2.19	20.17	35.38	4.54	4.54	3.95	3.63	4.33
NWCA11-2074	3-Good	83.60	1	7.87	18.78	68.84	3.95	5.71	4.15	2.84	4.41
NWCA11-2075	1-Poor	51.00	1	4.19	33.13	66.41	1.04	1.03	1.36	2.59	1.25
NWCA11-2076	3-Good	81.20	1	7.33	17.76	64.03	1.00	1.00	1.28	1.12	1.07
NWCA11-2077	2-Fair	72.30	0	6.95	18.76	63.09	1.00	1.00	1.21	1.80	1.12
NWCA11-2079	2-Fair	71.30	1	7.87	13.98	62.01	1.00	1.04	1.21	2.01	1.16
NWCA11-2081	2-Fair	67.80	0	6.56	13.42	53.04	1.00	1.00	1.00	1.06	1.01
NWCA11-2140	2-Fair	34.70	2	2.38	12.70	25.86	2.05	3.72	4.26	4.27	3.21
NWCA11-2139	2-Fair	29.60	2	1.83	9.61	18.00	4.29	4.78	4.27	4.34	4.44
NWCA11-2151	2-Fair	35.10	0	2.24	12.53	24.73	1.74	3.50	4.00	4.34	2.98
NWCA11-2143	1-Poor	37.30	0	2.36	20.04	36.25	1.40	2.53	3.49	3.33	2.35
NWCA11-2148	2-Fair	44.10	2	3.13	25.17	48.36	2.45	2.94	3.21	3.46	2.85
NWCA11-2163	3-Good	64.80	1	4.48	27.78	60.54	1.00	1.26	1.77	1.45	1.28
NWCA11-2167	1-Poor	44.30	6	4.29	27.44	58.90	1.00	1.39	1.78	1.75	1.35
NWCA11-2168	3-Good	86.20	2	6.78	21.41	65.81	1.29	1.63	3.86	4.42	2.22
NWCA11-2170	3-Good	85.00	2	6.83	21.07	65.65	1.35	1.85	1.73	1.53	1.60
NWCA11-2172	1-Poor	38.80	4	3.93	26.17	54.80	4.30	3.21	1.86	1.62	3.22
NWCA11-2175	3-Good	76.20	0	7.01	19.45	64.43	1.00	1.35	2.56	3.18	1.64
NWCA11-2176	1-Poor	41.80	6	4.25	30.20	62.57	1.26	1.90	2.10	1.39	1.64
NWCA11-2177	3-Good	67.20	2	3.53	22.98	47.77	1.27	2.04	3.09	2.71	2.01
NWCA11-2243	3-Good	60.30	7	6.10	24.80	66.40	4.11	5.38	4.06	2.90	4.36
NWCA11-2245	1-Poor	34.90	6	2.16	4.81	13.52	1.00	1.30	1.55	2.08	1.31
NWCA11-2246	1-Poor	29.60	6	1.50	11.78	19.09	4.45	5.08	6.17	6.57	5.19
NWCA11-2247	3-Good	68.00	0	5.82	34.36	78.30	1.69	2.32	2.25	2.19	2.04
NWCA11-2248	1-Poor	25.00	7	0.98	5.30	6.53	1.27	1.47	1.53	1.94	1.45
NWCA11-2249	2-Fair	51.70	6	3.40	4.00	21.24	1.93	1.06	1.33	1.91	1.55
NWCA11-2251	3-Good	61.20	4	5.26	30.74	69.64	1.00	1.23	1.43	1.97	1.25

Site ID	Vegetation Condition	VMMI	Total Buffer Stress	Weighted C of C	FQAI	US VIBI-FQ	Buffer 1 LDI (0 to 100M)	Buffer 2 LDI (100 to 350M)	Buffer 3 LDI (350 to 1000M)	Buffer 4 LDI (1000 to 2000M)	Total Buffer LDI
NWCA11-2252	1-Poor	47.80	6	2.49	2.27	15.58	1.12	1.37	1.50	1.87	1.34
NWCA11-2253	1-Poor	42.20	6	2.58	3.67	16.10	1.17	1.14	1.44	1.85	1.28
NWCA11-2494	2-Fair	34.60	5	2.31	9.13	20.33	5.60	4.86	4.63	4.41	5.06
NWCA11-2495	3-Good	55.10	6	6.51	9.00	46.41	2.82	3.37	3.56	3.61	3.21
NWCA11-2500	2-Fair	25.90	6	1.68	16.01	26.21	3.64	3.65	3.61	3.70	3.64
NWCA11-2502	3-Good	62.40	6	2.36	11.13	23.53	4.38	4.08	4.06	4.40	4.23
NWCA11-2507	3-Good	59.00	4	4.54	30.34	64.56	1.44	1.88	1.98	2.46	1.78
NWCA11-2509	2-Fair	53.20	4	3.38	23.56	47.66	1.00	1.83	2.07	1.93	1.56
NWCA11-2512	2-Fair	55.10	2	4.03	22.16	49.68	1.00	1.00	1.78	1.75	1.23
NWCA11-2513	1-Poor	32.20	3	2.72	11.16	25.77	4.32	4.02	2.56	2.59	3.70
NWCA11-2514	3-Good	76.70	2	4.66	17.64	47.17	1.00	1.00	1.02	1.59	1.06
NWCA11-2515	3-Good	60.30	2	4.65	23.88	56.06	1.00	2.00	2.87	2.50	1.82
NWCA11-2516	1-Poor	50.80	4	4.17	16.09	41.91	1.00	1.00	1.26	1.44	1.10
NWCA11-2518	2-Fair	61.90	4	5.07	15.81	47.12	1.00	1.00	1.00	1.26	1.03
NWCA11-2519	3-Good	68.30	3	4.78	19.16	50.08	1.00	1.40	2.26	2.49	1.52
NWCA11-2521	1-Poor	40.20	5	3.57	12.76	33.37	3.19	2.54	2.60	2.83	2.84
NWCA11-2522	3-Good	62.40	3	4.99	26.00	61.22	1.23	2.76	3.34	2.12	2.20
NWCA11-2526	3-Good	68.30	2	4.45	24.32	55.38	1.00	1.00	1.00	1.43	1.04
NWCA11-2527	2-Fair	68.80	0	6.74	12.50	52.84	1.81	2.21	3.61	2.92	2.40
NWCA11-2530	3-Good	79.70	2	7.34	20.20	67.60	1.00	1.51	2.32	1.72	1.49
NWCA11-2535	3-Good	77.90	3	7.23	27.30	77.03	1.03	1.62	2.12	2.24	1.55
NWCA11-2540	2-Fair	69.60	3	7.62	15.00	61.90	1.00	1.00	2.04	1.74	1.28
NWCA11-2541	2-Fair	61.20	2	5.50	19.25	54.70	1.12	2.43	3.60	2.63	2.16
NWCA11-2542	1-Poor	45.20	4	3.45	24.54	49.46	1.00	1.00	2.00	3.45	1.44
NWCA11-2543	1-Poor	52.90	8	3.21	9.39	26.33	3.27	3.21	3.18	2.80	3.18
NWCA11-2546	1-Poor	44.10	1	3.33	25.63	50.30	1.43	3.86	2.26	1.57	2.34
NWCA11-2551	3-Good	77.30	6	7.29	23.00	71.26	1.03	1.57	2.20	2.22	1.54
NWCA11-2557	1-Poor	39.60	0	2.25	17.82	32.36	7.52	2.71	3.11	2.07	4.65
NWCA11-2562	1-Poor	46.40	9	4.37	25.92	57.20	5.02	2.53	2.81	2.93	3.62
NWCA11-2564	2-Fair	69.50	0	8.11	12.70	61.00	1.00	1.35	3.07	3.06	1.73
NWCA11-2571	1-Poor	33.90	8	2.77	15.11	31.76	1.00	1.72	1.68	2.01	1.45
NWCA11-2573	1-Poor	51.20	0	4.35	18.03	45.81	3.67	2.80	3.36	2.26	3.21
NWCA11-2580	3-Good	86.30	3	8.08	21.67	73.81	3.60	4.07	3.64	2.56	3.64
NWCA11-2584	1-Poor	49.60	0	4.29	16.67	43.50	1.00	1.00	1.49	1.83	1.18
NWCA11-2589	1-Poor	48.60	0	4.17	18.19	44.90	7.73	5.16	2.79	2.31	5.43
NWCA11-2591	2-Fair	66.60	2	7.04	18.14	62.77	1.84	1.59	2.99	2.04	2.02
NWCA11-2593	1-Poor	58.60	3	4.47	20.04	49.41	1.72	1.96	3.64	2.70	2.27
NWCA11-2612	3-Good	70.50	8	4.95	25.35	60.03	1.11	1.22	1.42	1.38	1.23
NWCA11-2619	1-Poor	28.40	7	2.92	14.06	31.19	3.76	3.56	2.85	2.47	3.39
NWCA11-2620	2-Fair	52.20	10	3.86	21.41	47.59	2.34	2.55	2.91	2.33	2.52
NWCA11-2623	3-Good	77.80	4	5.07	27.72	64.16	1.03	1.28	1.13	1.21	1.15
NWCA11-2628	1-Poor	17.30	10	0.32	4.48	2.02	3.38	3.08	2.75	2.61	3.09
NWCA11-2632	3-Good	71.70	1	5.78	22.80	61.56	1.09	1.56	1.19	1.26	1.27
NWCA11-2642	1-Poor	48.70	0	5.19	14.98	46.69	1.00	1.14	1.48	1.15	1.15
NWCA11-2644	3-Good	61.30	0	4.20	35.28	69.51	1.00	1.69	2.31	2.89	1.66
NWCA11-2655	3-Good	75.60	0	6.55	17.39	58.62	1.34	1.76	1.11	1.17	1.40
NWCA11-2656	2-Fair	55.00	1	4.03	33.85	66.43	1.08	1.62	2.55	2.84	1.71
NWCA11-2658	3-Good	79.50	0	7.53	12.70	58.09	1.10	1.62	1.83	1.72	1.46
NWCA11-2660	3-Good	80.20	2	7.32	21.21	68.93	1.00	1.00	1.11	1.29	1.05
NWCA11-2665	1-Poor	42.40	1	2.35	12.97	26.08	1.00	1.70	1.97	1.80	1.48
NWCA11-2667	2-Fair	56.50	2	4.53	17.37	45.96	1.00	1.05	1.58	1.20	1.15
NWCA11-2670	3-Good	67.00	0	3.97	33.69	65.79	1.00	1.07	2.28	2.69	1.45
NWCA11-2718	3-Good	59.60	6	3.36	5.81	22.16	4.23	3.85	3.07	2.56	3.72
NWCA11-2720	2-Fair	31.90	3	2.31	16.92	31.49	1.02	1.12	1.49	1.65	1.21
NWCA11-2764	3-Good	65.10	11	6.62	19.67	62.33	3.80	3.90	2.44	2.09	3.39
NWCA11-2765	2-Fair	58.30	4	3.09	31.90	57.72	1.00	1.14	1.10	1.22	1.08
NWCA11-2673	3-Good	75.00	0	7.00	7.00	46.61	1.00	1.00	1.14	1.00	1.03
NWCA11-2780	2-Fair	52.50	5	3.18	34.04	61.39	1.00	1.27	1.20	1.24	1.14
NWCA11-2781	1-Poor	31.40	9	2.62	38.68	64.51	1.19	1.85	1.22	1.15	1.39
NWCA11-5539	2-Fair	41.50	3	3.53	26.76	53.13	3.30	3.21	3.18	3.25	3.25
NWCA11-1383	3-Good	58.70	2	5.13	28.77	66.03	1.00	1.01	1.11	1.35	1.06
NWCA11-1954	1-Poor	42.90	0	2.26	13.59	26.40	1.49	2.83	2.57	3.43	2.30

Site ID	Vegetation Condition	VMMI	Total Buffer Stress	Weighted C of C	FQAI	US VIBI-FQ	Buffer 1 LDI (0 to 100M)	Buffer 2 LDI (100 to 350M)	Buffer 3 LDI (350 to 1000M)	Buffer 4 LDI (1000 to 2000M)	Total Buffer LDI
NWCA11-1410	2-Fair	53.70	2	4.90	25.50	59.89	1.61	1.92	3.52	3.53	2.28
NWCA11-1387	3-Good	62.70	4	5.27	25.86	62.74	1.27	1.85	1.55	1.38	1.51
NWCA11-1415	3-Good	59.50	4	5.00	31.72	69.40	1.84	2.34	3.14	2.98	2.36
NWCA11-2791	3-Good	74.90	7	4.59	22.11	53.11	1.02	1.48	1.88	2.02	1.43
NWCA11-2795	1-Poor	38.60	6	2.63	25.51	45.72	1.05	1.23	1.89	2.01	1.37
NWCA11-2846	1-Poor	39.10	6	3.10	19.29	39.78	3.74	3.91	3.08	2.54	3.54
NWCA11-2847	1-Poor	51.10	3	3.95	27.60	56.99	1.00	1.00	1.83	3.58	1.42
NWCA11-2905	2-Fair	43.70	2	2.95	11.80	28.13	3.41	3.57	2.85	2.61	3.26
NWCA11-2908	1-Poor	56.80	5	3.55	13.06	33.69	6.30	4.57	3.77	2.97	4.94
NWCA11-2910	1-Poor	36.20	5	2.88	6.12	19.61	2.04	1.81	1.31	1.33	1.75
NWCA11-2914	2-Fair	45.50	4	3.00	5.77	19.86	1.00	1.07	1.51	1.66	1.19
NWCA11-2917	2-Fair	53.90	7	4.33	26.12	57.23	2.56	2.33	1.95	1.78	2.29
NWCA11-2918	1-Poor	57.40	4	3.22	15.56	35.19	1.00	1.14	1.43	2.05	1.23
NWCA11-2921	2-Fair	47.30	4	2.69	7.91	20.96	1.00	1.00	1.36	1.18	1.09
NWCA11-2922	1-Poor	64.90	4	5.01	13.88	43.99	1.00	1.11	1.46	2.25	1.25
NWCA11-2924	1-Poor	16.90	4	2.25	3.40	14.09	1.24	1.93	1.48	1.43	1.51
NWCA11-2930	1-Poor	13.80	6	1.37	6.67	10.98	1.40	3.01	3.87	4.05	2.64
NWCA11-2940	1-Poor	46.70	4	3.21	14.43	33.53	1.00	1.00	1.52	2.28	1.23
NWCA11-2941	2-Fair	49.50	4	3.15	14.07	32.64	3.30	2.90	2.88	2.99	3.06
NWCA11-2946	2-Fair	53.80	6	3.54	3.50	22.13	4.54	4.54	4.45	3.84	4.45
NWCA11-2947	1-Poor	49.40	2	3.00	5.66	19.69	1.00	1.00	1.29	1.19	1.08
NWCA11-2949	1-Poor	42.00	4	3.51	9.80	28.79	1.00	1.00	1.26	2.19	1.17
NWCA11-2957	2-Fair	42.50	8	2.99	17.23	36.16	2.77	2.99	3.06	3.11	2.93
NWCA11-2960	2-Fair	26.60	2	3.02	8.04	23.21	4.54	4.65	4.60	4.58	4.59
NWCA11-2968	1-Poor	24.90	7	1.97	10.77	20.58	2.96	2.37	2.12	1.60	2.48
NWCA11-2633	2-Fair	54.00	1	4.38	36.87	72.91	1.26	1.65	2.00	2.18	1.62
NWCA11-3043	3-Good	60.00	2	5.70	33.92	76.95	1.00	1.72	4.84	4.16	2.30
NWCA11-3045	3-Good	76.70	8	4.58	21.38	52.02	1.00	1.33	1.45	1.61	1.25
NWCA11-3051	2-Fair	57.10	6	7.48	19.34	67.22	2.38	4.13	4.91	3.84	3.55
NWCA11-3052	3-Good	70.30	7	5.73	36.47	80.79	1.00	1.67	1.54	1.37	1.34
NWCA11-3062	1-Poor	55.00	0	7.73	13.28	60.14	1.00	1.00	1.00	1.00	1.00
NWCA11-3069	3-Good	79.00	1	7.00	12.12	53.93	1.00	1.00	1.31	2.14	1.18
NWCA11-3077	3-Good	65.00	3	6.42	29.03	74.45	1.00	1.51	1.35	1.80	1.30
NWCA11-3091	1-Poor	51.30	4	7.21	14.70	58.92	4.44	2.08	2.35	3.23	3.19
NWCA11-3093	3-Good	75.00	2	7.00	7.00	46.61	1.00	2.58	1.73	1.82	1.70
NWCA11-3365	1-Poor	10.00	3	0.33	5.30	2.50	1.00	1.81	2.94	3.54	1.89
NWCA11-3369	1-Poor	12.60	6	0.37	5.29	2.74	1.00	1.78	2.87	3.53	1.86
NWCA11-3374	3-Good	37.00	7	2.00	16.85	29.41	3.37	3.56	3.86	3.87	3.58
NWCA11-3383	1-Poor	38.60	7	3.02	26.56	49.69	2.40	2.57	2.45	2.26	2.45
NWCA11-3384	1-Poor	33.80	7	0.83	3.48	5.21	2.20	2.56	2.53	2.14	2.37
NWCA11-3388	1-Poor	30.30	0	2.40	19.78	36.09	1.89	2.27	2.08	1.85	2.04
NWCA11-3568	1-Poor	60.90	3	5.53	12.00	44.57	1.00	1.00	1.27	1.55	1.11
NWCA11-3581	1-Poor	22.50	1	0.44	6.43	4.80	1.00	1.34	1.69	2.13	1.35
NWCA11-3730	3-Good	39.40	2	0.35	5.82	3.37	1.98	1.61	2.38	2.81	2.03
NWCA11-3726	1-Poor	22.40	0	0.75	8.81	10.16	2.24	2.16	2.29	2.68	2.27
NWCA11-3803	1-Poor	47.70	8	4.48	22.63	53.16	2.79	2.70	2.66	2.59	2.72
NWCA11-3814	1-Poor	33.40	8	3.66	28.84	56.94	2.56	2.21	2.41	2.35	2.40
NWCA11-3818	2-Fair	32.10	7	3.19	20.20	41.68	3.41	3.71	3.90	4.10	3.67
NWCA11-3821	3-Good	81.10	2	5.69	15.50	50.58	2.17	1.72	1.12	1.14	1.72
NWCA11-4294	1-Poor	21.60	8	0.84	8.38	10.10	4.33	4.17	3.99	4.09	4.19
NWCA11-4298	3-Good	38.20	12	1.69	12.02	20.58	3.17	3.69	3.58	3.60	3.45
NWCA11-4411	3-Good	63.20	8	3.73	7.60	27.02	1.91	1.97	1.90	1.68	1.90
NWCA11-4414	2-Fair	45.40	10	3.05	16.10	34.89	1.97	1.65	1.49	1.30	1.71
NWCA11-4419	3-Good	79.40	8	5.98	33.95	78.74	2.99	1.95	1.54	1.31	2.22
NWCA11-4423	3-Good	60.70	2	5.14	27.20	63.82	1.00	1.02	1.34	1.42	1.11
NWCA11-4577	2-Fair	56.50	5	4.22	37.48	72.76	1.00	1.28	1.19	1.25	1.15
NWCA11-4581	2-Fair	57.10	5	3.86	31.25	61.62	1.00	1.38	1.12	1.17	1.16
NWCA11-4706	1-Poor	44.50	4	2.99	7.16	21.76	1.00	1.97	3.06	2.95	1.90
NWCA11-4708	2-Fair	32.10	7	3.13	10.25	27.07	2.81	2.81	2.87	2.81	2.82
NWCA11-4709	1-Poor	34.90	2	3.40	16.34	37.43	3.33	3.41	2.77	2.70	3.18
NWCA11-4713	1-Poor	63.00	6	4.63	6.36	30.91	1.00	1.21	1.30	1.16	1.14
NWCA11-4716	1-Poor	55.90	4	3.70	9.86	30.08	1.60	3.69	3.06	3.40	2.70

Site ID	Vegetation Condition	VMMI	Total Buffer Stress	Weighted C of C	FQAI	US VIBI-FQ	Buffer 1 LDI (0 to 100M)	Buffer 2 LDI (100 to 350M)	Buffer 3 LDI (350 to 1000M)	Buffer 4 LDI (1000 to 2000M)	Total Buffer LDI
NWCA11-4717	2-Fair	48.60	4	3.45	6.75	24.09	1.00	1.32	1.27	1.27	1.18
NWCA11-4718	1-Poor	16.70	7	0.62	7.83	7.94	4.54	4.54	4.51	4.15	4.49
NWCA11-4721	1-Poor	45.20	2	3.33	12.99	32.25	1.00	1.00	1.42	1.71	1.15
NWCA11-4729	2-Fair	43.40	6	3.18	7.76	23.80	1.64	1.75	1.39	1.34	1.59
NWCA11-MN-0002	2-Fair	44.10	4	2.42	9.05	20.92	4.53	4.43	3.30	3.60	4.16
NWCA11-MN-0001	3-Good	63.80	0	5.49	42.74	84.29	1.00	1.02	1.02	1.13	1.02
NWCA11-MN-0003	3-Good	63.60	0	4.52	45.24	78.25	1.00	1.00	1.00	1.04	1.00
NWCA11-MN-0004	1-Poor	19.80	2	0.58	15.12	18.09	1.09	1.19	1.43	1.49	1.23
NWCA11-MN-0005	3-Good	81.30	2	8.12	33.00	90.00	1.00	1.38	1.63	1.84	1.33
NWCA11-MN-0006	2-Fair	52.80	1	3.37	38.82	69.36	1.95	3.03	3.68	3.80	2.80
NWCA11-MN-0010	3-Good	71.00	2	6.66	40.76	91.61	1.00	1.00	1.00	1.02	1.00
NWCA11-MN-0011	1-Poor	17.80	3	1.14	15.97	22.80	3.47	3.80	3.61	4.22	3.67
NWCA11-MN-0008	2-Fair	26.00	4	1.07	8.00	10.98	4.54	4.66	4.80	4.67	4.64
NWCA11-MN-0017	3-Good	71.80	2	8.24	27.42	82.03	1.00	1.08	1.51	1.83	1.21
NWCA11-MN-0018	1-Poor	49.10	2	4.05	43.83	75.29	1.00	1.21	2.40	2.85	1.53
NWCA11-MN-0019	3-Good	60.40	4	3.36	28.16	54.11	1.00	1.19	2.63	2.74	1.56
NWCA11-MN-0020	3-Good	70.20	0	5.96	47.00	87.28	1.00	1.00	1.00	1.00	1.00
NWCA11-MN-0021	3-Good	82.50	0	6.89	48.30	93.09	2.32	1.40	1.28	1.44	1.75
NWCA11-MN-0024	3-Good	68.60	0	4.80	49.85	80.01	1.00	1.00	1.00	1.00	1.00
NWCA11-MN-0025	3-Good	60.10	3	3.51	26.85	53.16	2.85	3.68	4.51	4.08	3.55
NWCA11-MN-0026	3-Good	72.30	1	7.41	37.12	92.22	1.00	1.25	1.34	1.27	1.17
NWCA11-MN-0027	2-Fair	30.50	5	0.94	16.73	22.65	2.20	2.59	3.81	3.92	2.81
NWCA11-MN-0029	2-Fair	55.80	0	3.13	38.93	68.05	1.00	1.00	1.72	2.29	1.27
NWCA11-MN-0030	1-Poor	54.10	2	4.17	45.77	76.09	1.00	1.45	1.55	1.43	1.29
NWCA11-MN-0032	3-Good	69.20	5	4.33	33.91	68.33	3.64	4.59	4.60	4.52	4.20
NWCA11-MN-0007	3-Good	74.20	2	4.46	17.10	45.14	1.67	1.54	2.71	2.60	1.93
NWCA11-2687	1-Poor	38.50	10	3.50	27.73	54.34	3.07	1.81	1.71	2.25	2.34
NWCA11-2688	2-Fair	61.30	5	5.15	20.04	53.70	1.30	1.97	2.27	2.48	1.81
NWCA11-2693	1-Poor	34.50	4	2.74	24.11	44.40	1.11	1.83	2.93	2.91	1.87
NWCA11-4486	2-Fair	44.40	8	3.84	30.19	60.00	2.66	3.37	2.49	2.42	2.82
NWCA11-2698	1-Poor	55.20	6	3.23	39.31	69.22	1.00	1.00	1.01	1.07	1.01
NWCA11-2694	3-Good	73.80	2	5.15	22.55	57.26	1.00	1.00	1.00	1.13	1.01
NWCA11-2071	3-Good	60.50	2	5.27	25.86	62.70	1.00	1.00	1.30	1.69	1.13
NWCA11-1314	1-Poor	53.20	6	3.77	38.89	72.00	1.00	2.11	1.74	1.56	1.54
NWCA11-1951	1-Poor	28.30	4	1.21	6.45	9.66	4.54	3.90	2.70	3.39	3.86
NWCA11-1402	2-Fair	57.50	0	4.70	25.76	59.06	1.00	1.65	1.49	1.41	1.33
NWCA11-1421	2-Fair	57.90	4	5.35	22.31	58.17	1.00	1.00	1.06	1.39	1.05
NWCA11-1386	3-Good	64.30	6	4.38	33.02	67.43	2.14	2.43	2.23	2.08	2.24
NWCA11-1406	1-Poor	45.20	0	4.18	22.09	50.55	1.00	1.05	1.89	2.45	1.34
NWCA11-1423	3-Good	61.00	1	5.67	29.50	70.41	1.19	1.27	1.04	1.10	1.17
NWCA11-1390	3-Good	74.90	2	5.54	26.61	65.52	1.00	1.00	1.05	1.03	1.01

Appendix IV. All bryophyte species recorded for the 50 Ohio NWCA intensification study wetlands.

Species	CofC	Type	Number of Sites
Amblystegium serpens	3	Moss	19
Amblystegium sp.	N/A	Moss	1
Amblystegium varium	2	Moss	35
Anacamptodon splachnoides	5	Moss	1
Anomodon attenuatus	3	Moss	6
Anomodon minor	6	Moss	1
Anomodon rostratus	4	Moss	1
Anthoceros laevis	+2	Hornwort	1
Atrichum altecristatum	3	Moss	2
Atrichum angustatum	2	Moss	1
Atrichum crispulum	4	Moss	5
Aulacomnium palustre	3	Moss	8
Brachythecium acuminatum	4	Moss	16
Brachythecium campestre	5	Moss	6
Brachythecium laetum	2	Moss	6
Brachythecium rutabulum	4	Moss	20
Brachythecium sp.	N/A	Moss	1
Brotherella recurvans	5	Moss	1
Bryhnia novae-angliae	3	Moss	10
Bryoandersonia illecebra	3	Moss	3
Bryum argenteum	1	Moss	1
Bryum capillare	3	Moss	5
Bryum lisae	3	Moss	1
Bryum pseudotriquetrum	3	Moss	5
Callicladium haldanianum	4	Moss	22
Calliergon cordifolium	6	Moss	1
Calliergonella cuspidata	4	Moss	1
Calypogeia fissa	+3	Liverwort	3
Calypogeia sp.	N/A	Liverwort	1
Campylium chrysophyllum	3	Moss	6
Campylium hispidulum	3	Moss	1
Campylium stellatum	8	Moss	1
Ceratodon purpureus	1	Moss	1
Climacium americanum	3	Moss	12
Ctenidium molluscum	4	Moss	4
Dicranella heteromalla	2	Moss	2
Dicranella rufescens	2	Moss	1
Dicranella varia	2	Moss	1
Dicranum flagellare	3	Moss	2
Dicranum montanum	3	Moss	7
Dicranum scoparium	3	Moss	1
Dicranum viride	4	Moss	5
Ditrichum pallidum	2	Moss	1
Drepanocladus aduncus var. kneiffi	4	Moss	2
Entodon cladorrhizans	5	Moss	1
Entodon seductrix	2	Moss	28
Eurhynchium hians	3	Moss	7
Eurhynchium pulchellum	3	Moss	3
Fissidens taxifolius	3	Moss	10
Forsstroemia trichomitria	5	Moss	1
Frullania eboracensis	+5	Liverwort	20

Species	CofC	Type	Number of Sites
Frullania inflata	$^{+}4$	Liverwort	1
Funaria hygrometrica	1	Moss	1
Haplocladium microphyllum	3	Moss	15
Haplohymenium triste	6	Moss	1
Helodium blandowii	7	Moss	1
Helodium paludosum	6	Moss	1
Herzogiella turfacea	6	Moss	1
Hygroamblystegium tenax	2	Moss	3
Hypnum curvifolium	5	Moss	5
Hypnum imponens	5	Moss	2
Hypnum lindbergii	6	Moss	12
Hypnum pallescens	3	Moss	1
Isopterygiopsis muelleriana	7	Moss	1
Isopterygiopsis pulchella	6	Moss	1
Isopterygium tenerum	5	Moss	7
Leptodictyum humile	2	Moss	27
Leptodictyum riparium	2	Moss	38
Leskea gracilescens	3	Moss	19
Leskea obscura	3	Moss	3
Leucobryum albidum	3	Moss	1
Leucobryum glaucum	4	Moss	6
Lophocolea heterophylla	$^{+}2$	Liverwort	18
Nowellia curvifolia	$^{+}4$	Liverwort	7
Orthotrichum ohioense	4	Moss	1
Orthotrichum pumilum	4	Moss	1
Orthotrichum pusillum	3	Moss	3
Orthotrichum sp.	N/A	Moss	8
Orthotrichum sordidum	$^{+}4$	Moss	1
Orthotrichum stellatum	4	Moss	1
Pallavicinia lyellii	$^{+}5$	Liverwort	1
Pellia epiphylla	$^{+}5$	Liverwort	1
Plagiomnium ciliare	5	Moss	2
Plagiomnium cuspidatum	2	Moss	25
Plagiomnium ellipticum	7	Moss	4
Plagiothecium cavifolium	5	Moss	4
Plagiothecium denticulatum	4	Moss	10
Plagiothecium laetum	4	Moss	1
Platydictya confervoides	5	Moss	1
Platydictya subtilis	$^{+}5$	Moss	6
Platygyrium repens	3	Moss	27
Pohlia sp.	N/A	Moss	2
Pohlia wahlenbergii	3	Moss	5
Polytrichastrum pallidisetum	$^{+}3$	Moss	1
Polytrichastrum ohioense	2	Moss	2
Porella platyphylloidea	$^{+}6$	Liverwort	1
Pylaisiadelpha tenuirostris	4	Moss	1
Radula complanata	$^{+}4$	Liverwort	2
Rauiella scita	5	Moss	1
Rhizomnium punctatum	5	Moss	11
Riccia fluitans	$^{+}2$	Liverwort	9
Ricciocarpos natans	$^{+}2$	Liverwort	2
Schwetschkeopsis fabronia	5	Moss	1
Sphagnum capillifolium	4	Moss	1

Species	CofC	Type	Number of Sites
Sphagnum fimbriatum	3	Moss	3
Sphagnum palustre	3	Moss	1
Steerecleus serrulatus	3	Moss	15
Syntrichia papillosa	3	Moss	1
Tetraphis pellucida	4	Moss	4
Thuidium delicatulum	3	Moss	15
Tortella humilis	3	Moss	2
Trichocolea tomentella	+7	Liverwort	1
Ulota crispa	5	Moss	1
Weissia sp.	N/A	Moss	1
Weissia controversa	1	Moss	1

+ C of C values assigned via personal communication with Barb Andreas and Diane Lucas.

Appendix V. Soil morphology data recorded for the 50 Ohio NWCA intensification study wetlands

Site ID	Horizon	Depth	Matrix Hue	Matrix Value/Chroma	% Prominent Redox	Redox Feature Hue	Redox Feature Value/Chroma	Soil Structure	Soil Texture
OH-3003	A	10	10YR	4/2				WEAK, MEDIUM GRANULAR	Silt Loam
OH-3003	Bg1	33	5Y	5/1	25	10YR	5/6	MEDIUM, SUBANGULAR BLOCKY	Silt Loam
OH-3003	Bg2	60	5Y	6/1	35	10YR	5/6	WEAK, COARSE SUBANGULAR BLOCKY	Silt Loam
OH-3003	BC	125	10YR	6/2	30	10YR	5/6	WEAK, COARSE SUBANGULAR BLOCKY	Silty Clay Loam
OH-3004	Oa1	18	10YR	2/1				WEAK COARSE GRANULAR	Organic
OH-3004	Oa2	60	10YR	2/1				MASSIVE	Organic
OH-3005	Oa	6	2.5Y	3/2				NO STRUCTURE DETECTED	Silty Clay
OH-3005	AB	14	2.5Y	4/1				WEAK, MEDIUM & COARSE GRANULAR	Silty Clay
OH-3005	BA	32	10YR	3/2	3	2.5YR	3/6	WEAK MEDIUM SUBANGULAR BLOCKY PARTS TO WEAK COARSE GRANULAR	Clay Loam
OH-3005	Ab	49	10YR	2/1	5	2.5YR	3/4	MODERATE MEDIUM SUBANGULAR BLOCKY	Silty Clay
OH-3005	ABb	60	10YR	3/1	7	10YR	5/8	WEAK AND MODERATE COARSE SUBANGULAR BLOCKY	Clay
OH-3006	A1	13	7.5YR	2.5/1	3	2.5YR	4/6	VERY WEAK OR NO STRUCTURE	Clay
OH-3006	A2	23	10YR	2/1	7	10YR	5/1	MASSIVE	Clay
OH-3006	Bg1	44	N	6/	8	10YR	5/6	MASSIVE	Clay
OH-3006	Bg2	60	N	5/	15	10YR	5/6	MASSIVE	Clay
OH-3014	A	8	10YR	3/2				missing	Sandy Loam
OH-3014	Cg	17	2.5Y	4/1	6	7.5YR	4/6	missing	Loam
OH-3014	Ab1	33	2.5Y	3/1				missing	Silt Loam
OH-3014	Cgb1	51	2.5Y	4/1	4	2.5YR	2.5/4	missing	Loam
OH-3014	Cgb2	60	10YR	4/2	2	7.5YR	4/4	missing	Sandy Loam
OH-3019	Oa	15	10YR	3/2	15			missing	Organic
OH-3019	A1	33	10YR	2/1	33			missing	Organic
OH-3019	A2	56	10YR	2/1	56			missing	Organic
OH-3019	AB	70	10YR	2/1	70			missing	Organic
OH-3020	A1	9	10YR	3/1				NO STRUCTURE DETECTED	Silt Loam
OH-3020	A2	28	10YR	3/1	7	5YR	3/4	WEAK, MEDIUM AND COARSE GRANULAR	Silt Loam
OH-3020	Ab1	40	10YR	2/1	7	2.5YR	3/6	WEAK, SUBANGULAR BLOCKY PARTS TO WEAK, MEDIUM GRANULAR	Silt Loam
OH-3020	Ab2	49	10YR	2/1	7	2.5YR	3/6	MODERATE, MEDIUM SUBANGULAR BLOCKY PARTS TO WEAK, MEDIUM GRANULAR	Silty Clay Loam
OH-3020	Bgb	60	10YR	4/1	3	10YR	5/8	NO STRUCTURE DETECTED, MASSIVE	Silty Clay Loam

Site ID	Horizon	Depth	Matrix Hue	Matrix Value/Chroma	% Prominent Redox	Redox Feature Hue	Redox Feature Value/Chroma	Soil Structure	Soil Texture
OH-3022	A	12	10YR	4/3				WEAK, MEDIUM GRANULAR	Silty Clay Loam
OH-3022	AB	25	2.5Y	4/2	18	7.5YR	4/6	WEAK, COARSE & MEDIUM SUBANGULAR BLOCKY	Silty Clay Loam
OH-3022	Bg1	52	10YR	5/2	22	7.5YR	4/4	WEAK, MEDIUM SUBANGULAR BLOCKY	Silt Loam
OH-3025	Ap	18	10YR	3/2	7	10YR	5/1	MODERATE, COARSE GRANULAR	Silty Clay
OH-3025	A1	38	2.5Y	3/2	12	10YR	5/1	WEAK COARSE AND MEDIUM SUBANGULAR BLOCKY	Silty Clay
OH-3025	A2	57	10YR	3/2	14	10YR	5/1	MODERATE, MEDIUM, SUBANGULAR BLOCKY	Silty Clay
OH-3025	B1	62	10YR	4/2	25	10YR	5/1	WEAK, COARSE, SUBANGULAR BLOCKY	Silty Clay
OH-3025	B2	92	10YR	4/4	20	10YR	4/1	missing	Silty Clay
OH-3025	Bg3	125	10YR	4/1	25	10YR	3/6	missing	Silty Clay
OH-3030	A1	7	10YR	2/2				NO STRUCTURE DETECTED	Clay
OH-3030	A2	20	10YR	3/1				WEAK, MEDIUM TO COARSE GRANULAR	Silty Clay
OH-3030	A3	38	10YR	2/1	6	7.5YR	4/6	missing	Silty Clay
OH-3030	Bg	60	N	6/	4	7.5YR	4/6	VERY WEAK SUBANGULAR BLOCKY	Silty Clay
OH-3030	C	72	N	6/	6	7.5YR	5/8	MASSIVE	Clay
OH-3031	A1	17	2.5Y	3/2	5	10YR	4/6	WEAK, COARSE GRANULAR	Clay
OH-3031	A2	39	10YR	3/3	30	10YR	3/1	WEAK, MEDIUM GRANULAR	Silty Clay
OH-3031	C1	53	10YR	4/2				WEAK, MEDIUM TO COARSE SUBANGULAR BLOCKY	Organic
OH-3031	C2	87	2.5Y	4/1	5	10YR	5/4	WEAK, COARSE SUBANGULAR BLOCKY	Silty Clay
OH-3031	Ab	125	10YR	2/1	20	5YR	4/6	missing	Clay
OH-3044	Oa1	4	10YR	2/1	lay	lay	lay	missing	Clay
OH-3044	Oa2	41	10YR	2/1	lay	lay	lay	WEAK, MEDIUM, GRANULAR STRUCTURE	Clay
OH-3044	Oa3	76	10YR	2/2				WEAK, MEDIUM SUB-ANGULAR BLOCKY	Silty Clay
OH-3045	A1	12	10YR	4/1				WEAK, MEDIUM GRANULAR	Silty Clay
OH-3045	A2	28	10YR	3/1	2	5YR	3/4	MEDIUM, WEAK, SUBANGULAR BLOCKY	Silty Clay
OH-3045	Bg	40	10YR	4/1	15	5YR	3/4	COARSE WEAKE SUBANGULAR BLOCKY PARTING TO MEDIUM WEAK GRANULAR	Silty Clay
OH-3045	BCg11	60	10YR	3/1				MASSIVE	Silty Clay Loam
OH-3045	BCg12	85	10YR	3/1				missing	Silty Clay Loam
OH-3046	Oa	15	10YR	2/2				STRUCTURELESS	Clay Loam
OH-3046	Cg1	42	2.5Y	3/1				MASSIVE	Loam
OH-3046	Cg2	63	10Y	5/1				MASSIVE	Loam

Site ID	Horizon	Depth	Matrix Hue	Matrix Value/Chroma	% Prominent Redox	Redox Feature Hue	Redox Feature Value/Chroma	Soil Structure	Soil Texture
OH-3046	Cg3	72	N	6/		10YR	6/6	MASSIVE	Clay Loam
OH-3048	A	10	2.5 Y	4/2	10	10 YR	3/1	STRUCTURELESS	Silty Clay Loam
OH-3048	B1	30	7.5 YR	4/1	5	10 YR	4/6	MODERATE COARSE SUBANGULAR BLOCKY	Loam
OH-3048	B2	50	2.5 Y	4/2	1	5 Y	5/6	MODERATE VERY COARSE SUBANGULAR BLOCKY	Loam
OH-3048	B31	60	2.5 Y	4/2	3	5 Y	4/4	MODERATE COARSE-VERY COARSE SUBANGULAR BLOCKY	Loam
OH-3048	B32	65	2.5 Y	4/2	3	5 Y	4/4	missing	Loam
OH-3048	C1	110	7.5 YR	4/2	7	5 Y	4/4	missing	Clay Loam
OH-3049	Oa1	5	10YR	3/3				NO STRUCTURE - TOO MANY ROOTS	Organic
OH-3049	Oa2	22	10YR	2/1				MASSIVE - SAPRIC	Organic
OH-3049	Oa3	60	10YR	3/2				MASSIVE - SAPRIC	Organic
OH-3049	Oa4	80	10YR	3/2				MASSIVE - SAPRIC	Organic
OH-3050	A	4	7.5YR	2.5/2				FINE, WEAK TO MODERATE GRANULAR	N/A
OH-3050	Bg1	34	10YR	6/2	30	10YR	5/6	MEDIUM, MODERATE SUBANGULAR BLOCKY	Silt Loam
OH-3050	Bg21	60	2.5Y	6/2	40	10YR	5/8	MEDIUM AND COARSE, MODERATE SUBANGULAR BLOCKY	Silt Loam
OH-3050	Bg22	75	2.5Y	6/2	40	10YR	5/8	missing	Silty Clay Loam
OH-3050	Bg3	90	10YR	6/1	3	7.5YR	5/8	FINE, WEAK TO MODERATE GRANULAR	Silty Clay Loam
OH-3050	Bg4	105	2.5Y	6/1	45	7.5YR	5/8	MODERATE, MEDIUM AND COARSE SUBANGULAR BLOCKY	Silty Clay Loam
OH-3050	Bc	125	2.5Y	5/1	30	7.5YR	5/8	MODERATE, MEDIUM AND COARSE SUBANGULAR BLOCKY	Silty Clay Loam
OH-3054	A1	20	10YR	4/1	1	7.5YR	5/6	MODERATE MEDIUM SUBANGULAR BLOCKY	Silt Loam
OH-3054	A2b	33	10YR	3/1	0			MODERATE MEDIUM SUBANGULAR BLOCKY PARTING TO WEAK GRANDULAR	Silty Clay Loam
OH-3054	Bg11	65	10YR	6/1	25	7.5YR	5/6	SUBANGULAR BLOCKY	Silt Loam
OH-3054	Bg12	113	10YR	6/1	40	7.5YR	5/6	missing	Silty Clay Loam
OH-3054	Bg2	125	N	5/	40	7.5YR	5/6	missing	Silty Clay Loam
OH-3057	A1	6	10YR	4/2	12	2.5Y	4/1	WEAK, MEDIUM-FINE SUBANGULAR BLOCKY	Silty Clay Loam
OH-3057	AB	18	2.5Y	4/1	7	7.5YR	5/6	MODERATE, MED-COARSE GRANULAR	Silt Loam
OH-3057	B1	30	2.5Y	4/3	25	2.5Y	5/1	MODERATE; MED SUBANGULAR BLOCKY	Silt Loam
OH-3057	B2	50	10YR	4/3	30	2.5Y	5/1	MODERATE, MED SUBANGULAR BLOCKY	Silt Loam
OH-3057	Bg1	60	2.5Y	4/2	10	10YR	5/6	UNDECTABLE	Silt Loam
OH-3057	Bg2	90	2.5Y	4/1	20	7.5YR	5/6	missing	Loam
OH-3057	BC	125	10YR	5/1	25	7.5YR	5/8	missing	Loam

Site ID	Horizon	Depth	Matrix Hue	Matrix Value/Chroma	% Prominent Redox	Redox Feature Hue	Redox Feature Value/Chroma	Soil Structure	Soil Texture
OH-3058	Oa	16	N	2.5/1	lay	lay	lay	WEAK-COARSE SUBANGULAR BLOCKY	Clay
OH-3058	Bg	32	5Y	5/1	5	10YR	4/6	SANDY LOAM, WEAK-COARSE SUBANGULAR BLOCKY	Sand Loam
OH-3058	2Ab	51	N	2.5/	1	10YR	5/8	STRUCTURELESS	Clay
OH-3058	3Oab2	60	N	2.5/	lay	lay	lay	STRUCTURELESS	Clay
OH-3062	A	8	10YR	3/2				WEAK, MEDIUM GRANULAR	Silt Loam
OH-3062	B1	30	10YR	5/1	25	10YR	5/6	MODERATE MEDIUM, SUBANGULAR BLOCKY	Loam
OH-3062	B21	60	10YR	5/1	30	10YR	5/5	COARSE, SUBANGULAR BLOCKY	Clay Loam
OH-3062	B22	105	10YR	5/1	30	10YR	5/8	missing	Loam
OH-3062	B3	125	N	6/	20	7.5YR	5/6	missing	Loam
OH-3063	A1	9	10YR	3/2	5	10YR	4/4	MODERATE, FINE GRANULAR	Silty Clay
OH-3063	A2	20	10YR	3/1	12	10YR	4/4	STRONG FINE SUBANGULAR BLOCKY	Silty Clay
OH-3063	Bg1	40	2.5Y	4/1	10	10YR	4/6	STRONG, COARSE PRISMATIC PARTING TO COURSE SUBANGULAR BLOCKY	Silty Clay
OH-3063	Bg2	60	2.5Y	5/1	10	10YR	4/6	STRONG, COARSE PRISMATING PARTING TO COARSE SUBANGULAR BLOCKY	Silty Clay
OH-3063	Bg3	80	2.5Y	4/1	30	10YR	5/6	missing	Silty Clay
OH-3063	BC	125	N	6/	35	10YR	5/6	missing	Silty Clay
OH-3066	Oe	4	10YR	3/3				missing	N/A
OH-3066	A	10	10YR	2/2				missing	N/A
OH-3066	Bw1	15	10YR	4/6				missing	N/A
OH-3066	Bw2	35	2.5Y	6/6	20	7.5YR	5/6	MEDIUM WEAK SUMBANGULAR BLOCKY	Fine Sandy Loam
OH-3066	Bw3	60	2.5Y	5/4	40	7.5YR	5/6	WEAK, MEDIUM SUBANGULAR BLOCKY	Fine Sandy Loam
OH-3066	BC	102	10YR	7/1	35	10YR	3/6	missing	Fine Sandy Loam
OH-3066	C	125	10YR	4/4				missing	Fine Sand
OH-3068	Oa1	26	10YR	3/1	5	10YR	5/6	COARSE TO VERY COARSE GRANULAR, MODERATE	Clay
OH-3068	Oa2	39	10YR	3/1	8	10YR	5/6	COARSE TO VERY COARSE PLATY, MODERATE	Clay
OH-3068	Cg1	60	10YR	4/1	7	10YR	4/6	missing	Clay
OH-3068	Cg2	100	10YR	5/1	20	10YR	5/8	missing	Clay
OH-3068	Cg3	125	2.5Y	5/2	20	10YR	6/8	missing	Clay
OH-3070	Oa	10	10YR	2/2				missing	Silty Clay Loam
OH-3070	2A	41	10YR	3/1				missing	Silty Clay Loam
OH-3070	3Cg	65	10YR	4/1	lay	lay	lay	missing	Clay

Site ID	Horizon	Depth	Matrix Hue	Matrix Value/Chroma	% Prominent Redox	Redox Feature Hue	Redox Feature Value/Chroma	Soil Structure	Soil Texture
OH-3072	A1	2	10YR	3/2				MODERATE MEDIUM GRANULAR	Organic
OH-3072	A2	28	10YR	3/1	12	10YR	3/6	WEAK COARSE SUBANGULAR BLOCKY PARTING TO WEAK MEDIUM SUBANGULAR BLOCKY	Silty Clay
OH-3072	A3	39	N	3/	5	10YR	4/6	WEAK MEDIUM SUBANGULAR BLOCKY PARTING TO WEAK FINE SUBANGULAR BLOCKY	Silty Clay
OH-3072	Bg	58	N	6/	20	10YR	6/8	MODERATE FINE SUBANGULAR BLOCKY	Silty Clay
OH-3073	A	10	10YR	4/1		10YR	4/4	WEAK MEDIUM SUBANGULAR BLOCKY	Silty Clay Loam
OH-3073	Bg	26	10YR	5/2		5YR	4/4	MODERATE MEDIUM SUBANGULAR BLOCKY	Silty Clay Loam
OH-3073	Bgt1	55	10YR	5/2		7.5YR	4/4	WEAK MEDIUM SUBANGULAR BLOCKY	Silt Loam
OH-3073	Bgt2	60	10YR	5/1	21	5YR	3/4	MODERATE MEDIUM SUBANGULAR BLOCKY	Silt Loam
OH-3073	Bgt3	90	2.5Y	5/1		10YR	4/6	WEAK MEDIUM SUBANGULAR BLOCKY	Silt Loam
OH-3073	BCgR	125	10YR	5/1		N	3/1	STRONG	Silt Loam
OH-3075	Oa1	17	N	2.5/0				WEAK MEDIUM SUBANGULAR BLOCKY	Silt Loam
OH-3075	Oa2	24	5Y	3/1		2.5Y	3/1	WEAK-MEDIUM SUBANGULAR BLOCKY	Silt Loam
OH-3075	A1	32	10Y	3/1	1	7.5YR	4/4	WEAK-COURSE SUBANGULAR BLOCKY	Silt Loam
OH-3075	A2	39	5Y	3/1	30	5Y	4/1	WEAK-COURSE SUBANGULAR BLOCKY	Silt Loam
OH-3075	A3	53	5Y	3/1	7	5Y	4/1	MASSIVE	Silt Loam
OH-3075	Bg1	55	5Y	4/1		5Y	2.5/1	MASSIVE	Silt Loam
OH-3075	Bg2	65	5Y	7.5/1		5Y	4/1	WEAK-COURSE SUBANGULAR BLOCKY	Silt Loam
OH-3080	A1	2	10YR	3/2				NONE SEEN	N/A
OH-3080	A2	40	2.5Y	1/1	12	2.5YR	3/6	WEAK, MEDIUM, SUBANGULAR BLOCKY	Silt Loam
OH-3080	Bg1	50	2.5Y	5/1	25	10YR	5/6	WEAK, MEDIUM, SUBANGULAR BLOCKY	Silty Clay
OH-3080	Bg2	60	10YR	6/1	20	10YR	6/6	WEAK, COARSE, SUBANGULAR BLOCKY	Silty Clay
OH-3080	BCg	85	10YR	6/1	20	10YR	6/6	missing	Silty Clay Loam
OH-3080	Cg	125	2.5Y	7/1	8	7.5YR	5/8	missing	Silt Loam
OH-3081	A	11	10YR	4/3				missing	Silt Loam
OH-3081	2C	52	10YR	4/3				MASSIVE	Silt Loam
OH-3081	3C11	60	10YR	5/4				missing	Fine Sand Loam
OH-3081	3C12	90	10YR	4/4	5	10YR	5/6	missing	Fine Sand Loam
OH-3081	3C2	105	10YR	4/4		10YR	5/6	missing	Loam
OH-3082	A	13	10YR	2/1	1	10YR	4/6	MODERATE COARSE SUBANGULAR BLOCKY PARTING TO MODERATE VERY COARSE GRANULAR, FIRM	Loam
OH-3082	AB	25	10YR	4/1	5	10YR	5/6	MODERATE FINE SUBANGULAR BLOCKY PARTING TO MODERATE GRANULAR COARSE, FIRM	Loam

Site ID	Horizon	Depth	Matrix Hue	Matrix Value/Chroma	% Prominent Redox	Redox Feature Hue	Redox Feature Value/Chroma	Soil Structure	Soil Texture
OH-3082	Bg1	43	7.5YR	5/1	30	10YR	5/6	MODERATE COARSE SUBANGULAR BLOCKY	Loam
OH-3082	Bg2	60	N	4/	25	10YR	5/6	MODERATE COARSE SUBANGULAR BLOCKY	Loam
OH-3082	Bg3	70	N	4/	25	10YR	5/6	missing	Loam
OH-3082	Bg4	118	N	4/	15	10YR	5/8	missing	Fine Sandy Loam
OH-3082	Bg5	125	7.5YR	5/1	45	7.5YR	5/8	missing	Loam
OH-3083	A1	5	10YR	2/2				STRUCTURELESS SINGLE GRAIN	N/A
OH-3083	A2	36	10YR	3/1	12	10YR	4/6	WEAK COARSE SUB-ANGULAR BLOCKY PARTING TO MODERATE MEDIUM SUB-ANGULAR BLOCKY	Silty Clay Loam
OH-3083	Bg	60	10YR	4/1	20	10YR	5/6	WEAK COARSE SUB ANGULAR BLOCKING PARTING TO WEAK MEDIUM SUB ANGULAR BLOCKY	Silty Clay Loam
OH-3083	Bc	125	N	6/	30	10YR	5/6	missing	Silty Clay Loam
OH-3085	A	9	10YR	4/3				MODRATE MEDIUM SUBANGULAR BLOCKY	Silt Loam
OH-3085	Bg1	23	10YR	5/2	15	5YR	4/4	MODRATE MEDIUM SUBANGULAR BLOCKY	Silt Loam
OH-3085	Bg2	40	2.5YR	4/2	9	2.5YR	5/4	MODRATE MEDIUM SUBANGULAR BLOCKY	Silt Loam
OH-3085	Bg3	60	10YR	5/1	28	7.5YR	5/4	MODRATE MEDIUM SUBANGULAR BLOCKY	Silt Loam
OH-3085	Bg4	90	10Y	5/1	20	7.5YR	5/4	missing	Silt Loam
OH-3085	C	125	7.5YR	5/1	28	7.5YR	5/6	missing	Silt Loam
OH-3086	A	8	10YR	3/1				STRUCTURELESS	Organic
OH-3086	Bg1	25	5Y	5/1				MEDIUM, WEAK & COARSE, SUBANGULAR BLOCKY	Silty Clay
OH-3086	Bg2	38	2.5Y	4/1				MODERATE, MEDIUM & COARSE, SUBANGULAR BLOCKY	Silty Clay
OH-3086	Bg3	49	10Y	5/1	1	7.5YR	3/4	MASSIVE	Silty Clay
OH-3090	A1	9	10YR	2/2				STRUCTURELESS	Silty Clay Loam
OH-3090	A2	25	10YR	3/1	10	10YR	4/4	WEAK MEDIUM SUBANGULAR BLOCKY PARTS TO MEDIUM GRANULAR	Silt Loam
OH-3090	Bg1	50	10YR	5/1	30	10YR	4/6	WEAK TO MODERATE COARSE SUBANGULAR BLOCKY	Silt Loam
OH-3090	Bg2	60	10YR	5/1	30	10YR	4/6	MASSIVE STRUCTURE	Fine Sandy Loam
OH-3090	Bg3	65	10YR	5/1	30	10YR	4/6	MASSIVE STRUCTURE	N/A
OH-3090	C	100	N	4/				STRUCTURELESS-SINGLE GRAIN	N/A
OH-3094	A	10	7.5YR	3/1				missing	Silty Clay Loam
OH-3094	Bg1	17	10YR	5/1	7	10YR	3/1	missing	Silty Clay Loam
OH-3094	Bg2	29	N	5/1	10	10YR	6/8	missing	Silt Loam
OH-3094	Bg3	54	N	5/	35	7.5YR	6/8	missing	Silty Clay Loam
OH-3097	Oa	9	10YR	2/2				missing	Silty Clay Loam

Site ID	Horizon	Depth	Matrix Hue	Matrix Value/Chroma	% Prominent Redox	Redox Feature Hue	Redox Feature Value/Chroma	Soil Structure	Soil Texture
OH-3097	A1	23	10YR	3/1		10YR	5/1	missing	Silty Clay Loam
OH-3097	A2	40	10YR	3/1		10YR	4/1	LARGE MEDIUM SUBANGULAR BLOCKY	Silty Clay Loam
OH-3097	A1b	60	10YR	2/1	lay	5YR	5/6	missing	Clay
OH-3097	A2b	70	10YR	2/1	lay	10YR	6/1	MODERATE SUBANGULAR BLOCKY	Clay
OH-3097	C1b	87	10YR	4/1		5YR	5/6	missing	Silty Clay Loam
OH-3097	C2b	125	5Y	5/1		10YR	3/1	LARGE SUBANGULAR BLOCKY	Silty Clay Loam
OH-3099	A	27	10YR	4/1	10	2.5YR	2.5/4	COARSE-MODERATE SUBANGULAR BLOCKY PART TO MODERATE MEDIUM SUBANGULAR BLOCKY	Silt Loam
OH-3099	C1	45	5Y	4/1	10	2.5YR	2.5/4	MEDIUM COARSE PLATY	Loam
OH-3099	C2	75	10YR	3/1	0			COARSE-VERY COARSE PLATY	Silt Loam
OH-3099	C3	125	5Y	4/1	10	10G	4/1	missing	Silty Clay Loam
OH-3100	A1	12	10YR	3/2				MODERATE, MEDIUM TO COARSE GRANULAR	Silty Clay Loam
OH-3100	A2	26	10YR	3/1				MODERATE, FINE, SUBANGULAR BLOCKY	Silt Loam
OH-3100	Bw11	60	10YR	5/6	45	10YR	4/2	STRONG, COARSE, (WITH SOME FINE) TO MEDIUM SUBANGULAR BLOCKY	Silty Clay Loam
OH-3100	Bw12	110	10YR	5/6	45	10YR	4/2	STRONG, COARSE, (WITH SOME FINE) TO MEDIUM SUBANGULAR BLOCKY	N/A
OH-3100	Bw2	125	10YR	4/2	45	10YR	5/6	missing	N/A
OH-3104	A	9	10YR	4/2				WEAK, MEDIUM SUB ANGULAR BLOCKY AND WEAK MEDIUM TO COARSE GRANULAR	Silty Clay
OH-3104	Bg1	37	10YR	4/2	15	7.5YR	4/6	STRONG, PRISMATIC, COARSE TO VERY COARSE	Silty Clay
OH-3104	Bg21	60	2.5YR	5/1	28	7.5YR	5/6	STRONG, PRISMATIC, COARSE TO VERY COARSE	Silty Clay
OH-3104	Bg22	75	2.5YR	5/1	28	7.5YR	5/6	STRONG, PRISMATIC, COARSE TO VERY COARSE	Loam
OH-3104	Bw	85	10YR	4/3	40	10YR	5/8	missing	Fine Sandy Loam
OH-3104	BCg	100	2.5YR	6/1	30	5YR	3/4	missing	Fine Sandy Loam
OH-3104	Cg	125	10YR	6/1				missing	Sandy Loam
OH-3105	A	10	10YR	3/2	1	7.5YR	5/6	MODERATE MEDIUM GRANULAR COARSE	Silty Clay Loam
OH-3105	Ac	22	2.5Y	5/1	8	5YR	4/6	MODERATE MEDIUM COARSE SUBANGULAR BLOCKY	Silt Loam
OH-3105	C1	35	5Y	5/1	17	10YR	5/6	MODERATE MEDIUM COARSE SUBANGULAR BLOCKY	Silt Loam
OH-3105	C2	54	2.5Y	6/1	23	7.5YR	5/6	MEDIUM COARSE-VERY COARSE SUBANGULAR BLOCKY	Silty Clay Loam
OH-3105	C31	60	10B	6/1	9	10YR	5/6	MEDIUM COARSE-VERYCOARSE SUBANGULAR BLOCKY	Silty Clay Loam
OH-3105	C32	90	Claylay	Claylay				WEAK COARSE TO MASSIVE SUBANGULAR BLOCKY	Silty Clay Loam
OH-3105	C4	100	Claylay	Claylay				missing	Sandy Loam
OH-3106	A	11	2.5YR	3/2	5	10YR	4/6	STRONG, MEDIUM TO COARSE GRANULAR	Silty Clay

Site ID	Horizon	Depth	Matrix Hue	Matrix Value/Chroma	% Prominent Redox	Redox Feature Hue	Redox Feature Value/Chroma	Soil Structure	Soil Texture
OH-3106	Btg	62	10YR	6/1	40	10YR	6/8	MODERATE, VERY COARSE DEGRADED COLUMNAR PARTING TO COARSE PRISMATIC	Silty Clay Loam
OH-3106	Bc	80	10YR	3/2	35	5Y	4/6	missing	Loam
OH-3106	Cg	125	10YR	4/3	40	10YR	5/6	missing	Loamy Coarse Sand
OH-3107	A	10	5Y	4/1	15	7.5YR	5/8	MEDIUM GRANULAR	Silty Clay Loam
OH-3107	Btg1	33	N	4/	12	7.5YR	4/6	MEADIUM COARSE SUBANGULAR BLOCKY	Silty Clay Loam
OH-3107	Btg2	51	N	5/	30	7.5YR	5/8	MEDIUM COARSE MODRATE SUBANGULAR BLOCKY	Silty Clay Loam
OH-3107	Btg31	60	N	5/	12	10YR	5/8	WEAK COARSE SUBANGULAR BLOCKY	Silty Clay Loam
OH-3107	Btg32	75	N	5/	12	10YR	5/8	missing	Silty Clay Loam
OH-3107	Btg4	125	10YR	4/1		10YR	5/6	missing	Silty Clay Loam
OH-3118	Oa1	18	N	2.5/				MEDIUM-MODERATE GRANULAR	Clay Loam
OH-3118	Oa2	35	10YR	2/1				MASSIVE, STRUCTURELESS	Silty Clay Loam
OH-3118	Oa3	54	10YR	2/1				VERY COARSE SUBK MODERATE	Silty Clay Loam
OH-3118	Oa4	60	10YR	2/1				MODERATE-MEDIUM SUBANGULAR BLOCKY	Silt Loam
OH-3118	Oe	125	10YR	3/2				missing	Silty Clay Loam
OH-3132	A	25	10YR	2/2				missing	N/A
OH-3132	Bg	50	2.5Y	6/1	30	10YR	5/8	missing	N/A
OH-3132	Bgt	60	2.5Y	6/1	30	10YR	5/8	missing	Clay
OH-3136	A1	15	10YR	2/2				STRUCTURELESS	Silt Loam
OH-3136	A2	25	7.5YR	3/1				WEAK, FINE AND MEDIUM MEDIUM SUBANGULAR BLOCKY	Loam
OH-3136	Cg1	58	N	5/	30	2.5Y	6/8	MASSIVE	Loam
OH-3136	Cg2	72	N	5/	17	10YR	6/8	MASSIVE	Very Fine Sandy Loam
OH-3138	A	2	10YR	3/2				STRUCTURELESS	N/A
OH-3138	B/C	13	2.5YR	6/1	3	7.5YR	4/6	WEAK, VERY COARSE, SUB BLOCKY	Silty Clay Loam
OH-3138	Cg1	35	2.5YR	6/1	25	10YR	6/8	MASSIVE	Silt Loam
OH-3138	Cg2	77	5PB	6/1	50	10YR	5/8	MASSIVE	Silty Clay Loam
OH-3138	C3	110	10YR	4/3	1	5PB	6/1	MASSIVE	Silt Loam
OH-3139	A	13	10YR	4/1				STRUCTURELESS	Silty Clay
OH-3139	Bg1	35	2.5Y	4/1	10	7.5YR	5/8	MODERATE VERY COARSE, SUBANGULAR BLOCKY	Silty Clay
OH-3139	Bg2	60	2.5Y	4.5/1	5	5YR	4/4	MODERATE TO MEDIUM COARSE, SUBANGULAR BLOCKY	Silty Clay
OH-3139	2Oa	70	10YR	2/1				MODERATE MEDIUM SUBANGULAR BLOCKY	Silty Clay Loam

Site ID	Horizon	Depth	Matrix Hue	Matrix Value/Chroma	% Prominent Redox	Redox Feature Hue	Redox Feature Value/Chroma	Soil Structure	Soil Texture
OH-3142	A1	12	10YR	2/2				STRUCTURELESS	Silt Loam
OH-3142	A2	25	2.5Y	2.75/1				STRUCTURELESS	Loam
OH-3142	Bt	70	10GY	5/1				MASSIVE	Loam
OH-3143	A	15	2.5Y	3/1				MODERATE-MEDIUM SUBANGULAR BLOCKY	Silty Clay
OH-3143	AB	22	5Y	2.5/1	5	10YR	5/6	MODERATE, COARSE, MEDIUM SUBANGULAR BLOCKY	Silty Clay
OH-3143	Bg	70	10B	7/1	50	10YR	5/6	COARSE, WEAK SUBANGULAR BLOCKY BREAKING TO MODERATE MEDIUM SUBANGULAR BLOCKY	Silty Clay

Appendix VI. Soil chemistry data recorded for the 50 Ohio NWCA intensification study wetlands

SAMPLE-ID	CLAY (%)	SILT (%)	SAND (%)	TOTAL C (% wt)	TOTAL N (% wt)	TOTAL S (% wt)	pH 1:1 H2O	pH 0.1M CaCl2	NH4OAc CEC (cmol(+)/kg)	P Mehlich (mg/kg)	Bulk Density Field Moist (g/cc)
OH-3003-1-11-OH-157-001-1	35.4	51.7	12.9	7.55	0.56	0.12	5.4	5.2	31.7	11.8	0.45
OH-3003-1-11-OH-157-001-2	15.6	69.3	15.1	0.79	0.1	0	5.4	4.8	6.8	13.1	1.2
OH-3003-1-11-OH-157-001-3	21.5	58.9	19.6	0.3	0.01	0	5.6	5.1	10.2	2.9	1.27
OH-3003-1-11-OH-157-001-4	18.2	53.2	28.6	0.24	0.01	0.01	5.4	5	9.2	7.8	
OH-3003-2-11-OH-157-002-1	39.7	51.1	9.2	6.19	0.44	0.08	5.3	5.1	26.5	9.8	0.72
OH-3003-2-11-OH-157-002-2	15.7	68.6	15.7	1.13	0.07	0.01	5.4	4.9	7.7	10.3	1.26
OH-3003-2-11-OH-157-002-3	18.7	63.7	17.6	0.3	0.02	0.02	5	4.5	7.5	1.9	1.44
OH-3003-2-11-OH-157-002-4	24.8	65.6	9.6	0.21	0.07	0.02	4.8	4.3	12.8	1.1	
OH-3003-2-11-OH-157-002-5	22.5	58.9	18.6	0.18	0	0.02	4.8	4.3	11.6	1.3	
OH-3003-2-11-OH-157-002-6	20.8	54.8	24.4	0.18	0	0.03	4.9	4.5	11.3	2.8	
OH-3004-1-11-OH-151-001-1				51.4	2.22	1.09	5.5	5.1	114	23.2	0.11
OH-3004-1-11-OH-151-001-2				61.42	1.6	0.27	3.8	3.3	137.9	1.2	0.16
OH-3005-1-11-OH-045-001-2	54.3	45	0.7	4.98	0.46	0.08	5.3	5.1	31.8	29.4	0.81
OH-3005-1-11-OH-045-001-3	52.9	44.7	2.4	6.26	0.53	0.08	5.8	5.4	40.5	13.6	1.1
OH-3005-1-11-OH-045-001-4	31.7	39.3	29	19.46	1.57	0.31	6	5.8	85.6	4	0.34
OH-3005-1-11-OH-045-001-5	41.2	52.8	6	9.53	0.68	0.17	6.3	5.9	55	2.8	0.74
OH-3005-2-11-OH-045-002-1	57.9	32.7	9.4	17.82	1.67	0.31	4.7	4.7	69.8	33.3	
OH-3005-2-11-OH-045-002-2	45.8	53.3	0.9	3.13	0.4	0.03	5.3	5	23.9	21.1	0.86
OH-3005-2-11-OH-045-002-3	51.5	46.4	2.1	5.25	0.45	0.07	5.7	5.2	33.8	17.4	0.99
OH-3005-2-11-OH-045-002-4				20.38	1.5	0.34	6.1	5.8	91.1	4.7	0.42
OH-3005-2-11-OH-045-002-5	24.6	35	40.4	16.77	1.26	0.34	6.2	5.8	76.8	2.5	0.44
OH-3006-1-11-OH-123-001-1	64.4	32.8	2.8	6.36	0.61	0.14	5.1	5	39.9	3.2	0.96
OH-3006-1-11-OH-123-001-2	64.9	33.3	1.8	0.95	0.13	0.03	6.3	6.1	26.4	19.4	1.13
OH-3006-1-11-OH-123-001-3	65.3	33	1.7	0.96	0.1	0.03	6.3	6.2	26.1	17.5	1.16
OH-3006-1-11-OH-123-001-4	66.9	31.6	1.5	0.76	0.07	0.02	7.2	6.9	27.3	3.6	1.02
OH-3014-1-11-OH-081-001-1	9.2	24.2	66.6	2.5	0.2	0.03	6.1	5.7	9.3	8.5	1.12
OH-3014-1-11-OH-081-001-2	14.8	43.5	41.7	3.13	0.24	0.03	5.5	4.9	12.9	11	0.99
OH-3014-1-11-OH-081-001-3	16.9	57.3	25.8	3.26	0.26	0.05	5.1	4.5	13.8	5.5	0.88
OH-3014-1-11-OH-081-001-4	18	46.8	35.2	3.24	0.21	0.07	4.8	4.4	13.6	5.2	0.86
OH-3014-1-11-OH-081-001-5	7.8	19.7	72.5	0.65	0.04	0	6.2	5.7	6.1	7.9	
OH-3014-1-11-OH-081-001-6	8.2	23.1	68.7	0.96	0.05	0	5.9	5.3	6.4	7.5	
OH-3014-1-11-OH-081-001-7	12.9	35.2	51.9	3.05	0.25	0.06	5.1	4.7	10.3	6.3	
OH-3014-1-11-OH-081-001-8	17.2	51.9	30.9	2.02	0.17	0.03	5.3	4.8	10.1	3.4	
OH-3019-1-11-OH-139-001-1				25.05	1.92	0.68	4.5	4.2	65.1	7.2	0.13
OH-3019-1-11-OH-139-001-2				22.17	1.49	0.56	4.5	4.2	76.8	19.3	0.25
OH-3019-1-11-OH-139-001-3				23.06	1.46	0.47	4.6	4.3	85.4	19.9	0.21
OH-3019-1-11-OH-139-001-4				23.06	1.75	0.67	4.4	4.2	89.6	11.8	0.25
OH-3020-1-11-OH-103-001-1	19.4	70.1	10.5	3.34	0.25	0.03	6.2	5.7	20.2	15.9	0.81
OH-3020-1-11-OH-103-001-2	17.6	66.1	16.3	1.85	0.18	0.01	6.9	6.3	14.3	12.4	1.05
OH-3020-1-11-OH-103-001-3	21.1	69	9.9	2	0.18	0.02	7	6.4	13	9	1.27
OH-3020-1-11-OH-103-001-4	32.9	58.7	8.4	2.04	0.15	0.03	6.7	6.2	20.5	8.6	0.31
OH-3020-1-11-OH-103-001-5	34.2	54.7	11.1	1.58	0.17	0	6.6	6.1	21.6	36.6	0.67
OH-3022-1-11-OH-127-001-1	30.1	61.2	8.7	4.29	0.37	0.12	5	4.7	21.2	2	0.5
OH-3022-1-11-OH-127-001-2	29.6	63	7.4	1.84	0.16	0.06	4.7	4.3	13.9	1.6	0.98
OH-3022-1-11-OH-127-001-3	25	64.3	10.7	1.57	0.13	0.04	5.2	4.8	11.5	3	0.92
OH-3025-1-11-OH-101-001-1	50.1	44.6	5.3	4.7	0.4	0.06	7	6.8	32.4	51.8	0.79
OH-3025-1-11-OH-101-001-2	44.6	50.4	5	2.77	0.22	0.02	7.3	7	26.8	41.7	0.95
OH-3025-1-11-OH-101-001-3	43.5	49.3	7.2	2.25	0.18	0.02	7.5	7.1	23.7	39.3	1.26

SAMPLE-ID	CLAY (%)	SILT (%)	SAND (%)	TOTAL C (% wt)	TOTAL N (% wt)	TOTAL S (% wt)	pH 1:1 H2O	pH 0.1M CaCl2	NH4OAc CEC (cmol(+)/kg)	P Mehlich (mg/kg)	Bulk Density Field Moist (g/cc)
OH-3025-1-11-OH-101-001-5	46.4	44.8	8.8	2.14	0.22	0.01	7.4	7.1	28.4	25.9	
OH-3025-1-11-OH-101-001-6	46.1	43.7	10.2	2.03	0.21	0.03	7.4	7	30	24.7	
OH-3030-1-11-OH-123-002-1	54.8	38.3	6.9	11.7	0.94	0.36	5.4	5.1	46.9	24.8	1.38
OH-3030-1-11-OH-123-002-2	57	40	3	7.45	0.73	0.23	4.9	4.7	40.5	9	0.93
OH-3030-1-11-OH-123-002-3	55.3	41.4	3.3	4.87	0.41	0.07	5.5	5.2	39	9.1	0.45
OH-3030-1-11-OH-123-002-4	56	40.7	3.3	0.76	0.12	0.01	6.7	6.4	24.8	17.7	1.27
OH-3030-1-11-OH-123-002-5	58.2	37.9	3.9	0.67	0.14	0.02	6.8	6.5	24.5	8.5	
OH-3031-1-11-OH-169-001-1	49.5	34.8	15.7	15	1.16	0.3	5.1	4.8	45.8	19.3	0.36
OH-3031-1-11-OH-169-001-2	53.4	43.2	3.4	5.32	0.48	0.1	5.2	4.8	36.4	26.9	0.35
OH-3031-1-11-OH-169-001-3				20.07	1.48	0.44	5	4.7	89.1	7.9	1.07
OH-3031-1-11-OH-169-001-4	48.6	41.9	9.5	10.14	0.87	0.25	4.9	4.6	60.2	6.5	
OH-3031-1-11-OH-169-001-5	45.8	38.8	15.4	1.83	0.16	0.03	4.9	4.5	26.1	6.2	
OH-3044-1-11-OH-155-1-1	42	28.7	29.3	39.26	2.93	0.44	5.5	5.2	123.8	22.5	
OH-3044-1-11-OH-155-1-2	46.4	27.3	26.3	37.75	2.72	0.45	6.1	5.9	134.6	3.2	0.18
OH-3044-1-11-OH-155-1-3	42	40.8	17.2	47.53	2.99	1.75	5.2	5.15	145.6	0.7	0.15
OH-3045-1-11-OH-003-1-1	52.5	45.5	2	10.13	0.77	0.2	5.5	5.4	43	34.7	
OH-3045-1-11-OH-003-1-2	46.7	44.6	8.7	5.2	0.32	0.04	7.5	7.1	28.6	49.3	0.8
OH-3045-1-11-OH-003-1-3	44.5	49.1	6.4	4.5	0.31	0.03	7.7	7.3	25.5	49	0.9
OH-3045-1-11-OH-003-1-4	39.2	53.3	7.5	3.04	0.2	0.02	7.6	7.2	20.4	18.5	1.24
OH-3046-1-11-OH-133-1-1	30.5	45.8	23.7	42.52	2.4	1.29	3.6	3.55	105.5	2.8	
OH-3046-1-11-OH-133-1-2	21.9	40	38.1	2.89	0.2	0.02	5.3	4.9	16.5	15.3	1.5
OH-3046-1-11-OH-133-1-3	14.9	42	43.1	0.43	0	0.01	4.9	4.6	7.8	5.2	1.93
OH-3046-1-11-OH-133-1-4	34.7	35.8	29.5	0.37	0.02	0	6.1	5.7	12.5	3	
OH-3048-1-13--OH-079-001-1-1	29.4	60.2	10.4	4.23	0.38	0.11	5.3	5.1	20.4	7.5	0.51
OH-3048-1-13--OH-079-001-1-2	18.9	47.1	34	1.87	0.18	0.05	5.8	5.2	10.1	9.4	1.18
OH-3048-1-13--OH-079-001-1-3	16.2	49.9	33.9	1.05	0.12	0.06	4.9	4.6	7.2	14.1	1.31
OH-3048-1-13--OH-079-001-1-4	18	40.8	41.2	1.15	0.17	0.06	4.9	4.7	8.3	12.6	1.18
OH-3048-1-13--OH-079-001-1-5	17	41.1	41.9	1.22	0.13	0.03	5.4	5	8.9	13.4	
OH-3048-1-13--OH-079-001-1-6	34.6	39.4	26	0.98	0.12	0.02	5.9	5.4	15	8.8	
OH-3049-OH-133-001-1				43.71	3.87	0.85	4.8	4.6	100.8	23.1	
OH-3049-OH-133-001-2				45.61	4.02	0.54	5.4	5.1	129.8	2.1	0.15
OH-3049-OH-133-001-3				55.75	3.18	0.45	5.2	5.1	147.5	0.9	0.12
OH-3049-OH-133-001-4				56.35	2.54	0.64	6.5	6.4	124.4	0.6	
OH-3050-1-11-OH-027-001-2	16.9	63.5	19.6	0.79	0.02	0	4.4	3.8	9	26.2	1.43
OH-3050-1-11-OH-027-001-3	24.1	60	15.9	0.3	0.04	0	4.8	4	12.8	2.2	1.38
OH-3050-1-11-OH-027-001-4	34.9	56.6	8.5	0.29	0	0.01	4.8	4.1	20.3	1.8	
OH-3050-1-11-OH-027-001-5	29.7	58.3	12	0.5	0.03	0	4.9	4.2	15.7	5	
OH-3050-1-11-OH-027-001-6	31.2	61.3	7.5	0.25	0	0	4.9	4.2	19.4	2	
OH-3050-1-11-OH-027-001-7	33.3	48.2	18.5	0.22	0	0.02	5.1	4.5	18.5	4.4	
OH-3054-1-13-OH-079-001-1	26.3	60.1	13.6	2.9	0.34	0.05	6.2	5.7	22.1	10.4	0.99
OH-3054-1-13-OH-079-001-2	30.4	55.8	13.8	1.95	0.21	0.03	6.5	5.8	22.1	7.2	
OH-3054-1-13-OH-079-001-3	24.7	63.7	11.6	0.68	0.14	0.02	6.6	5.9	13.6	11.8	1.43
OH-3054-1-13-OH-079-001-4	31.3	57.1	11.6	0.39	0.1	0.01	6.9	6.4	16.2	10.1	
OH-3054-1-13-OH-079-001-5	33.3	57.8	8.9	0.33	0.08	0.02	7	6.5	16.9	19.5	
OH-3057-1-11-OH-169-002-1	32.9	50.9	16.2	5.06	0.42	0.05	5.1	4.9	24.9	11.8	0.8
OH-3057-1-11-OH-169-002-2	25.7	52.7	21.6	1.59	0.1	0.01	5.8	5.4	14.8	6.8	1.26
OH-3057-1-11-OH-169-002-3	25.4	53.9	20.7	1.3	0.08	0	5.7	5.2	14.7	4.2	1.41
OH-3057-1-11-OH-169-002-4	23.1	52.3	24.6	1.13	0.07	0.01	5.9	5.3	14	4	1.09
OH-3057-1-11-OH-169-002-5	23.4	50.9	25.7	0.79	0.06	0.01	6.1	5.4	12.5	2.9	1.26
OH-3057-1-11-OH-169-002-6	23.6	46.7	29.7	0.81	0.03	0.01	6.1	5.5	12.9	6.2	

SAMPLE-ID	CLAY (%)	SILT (%)	SAND (%)	TOTAL C (% wt)	TOTAL N (% wt)	TOTAL S (% wt)	pH 1:1 H2O	pH 0.1M CaCl2	NH4OAc CEC (cmol(+)/kg)	P Mehlich (mg/kg)	Bulk Density Field Moist (g/cc)
OH-3057-1-11-OH-169-002-7	15.9	39.4	44.7	0.22	0	0.01	6.4	5.7	7.9	2.5	
OH-3058-1-13-OH-079-001-1	52.3	24	23.7	15.98	1.27	0.27	5.3	5	60.4	9.5	0.35
OH-3058-1-13-OH-079-001-2	11.7	15.5	72.8	1.38	0.13	0.03	5.7	5.1	8.3	11.2	1.42
OH-3058-1-13-OH-079-001-3	53	29.4	17.6	7.72	0.51	0.13	5.5	5	48.7	8.1	1.06
OH-3058-1-13-OH-079-001-4	76.8	17	6.2	11.99	0.75	0.27	5.4	5	77	11.1	0.41
OH-3062-1-11-OH-055-2-1	20.2	51.2	28.6	5.5	0.39	0.03	4.5	3.8	19.3	2.3	1.29
OH-3062-1-11-OH-055-2-2	22.2	43.9	33.9	0.76	0.04	0	4.8	4	9.6	1.8	1.53
OH-3062-1-11-OH-055-2-3	32.8	40.3	26.9	0.31	0.05	0	5.8	5.2	13.1	0.5	1.61
OH-3062-1-11-OH-055-2-4	26.6	45	28.4	0.74	0.01	0	8	7.5	8.5	0.6	
OH-3062-1-11-OH-055-2-5	22.9	45	32.1	1.5	0	0	8.1	7.7	6.8	0.5	
OH-3063-1-11-OH-101-002-1	51.5	47.5	1	7.91	0.58	0.06	5.1	4.5	33.7	15.1	
OH-3063-1-11-OH-101-002-2	47.5	51.2	1.3	2.59	0.22	0	6.2	5.6	27	10	1.3
OH-3063-1-11-OH-101-002-3	54.6	44.3	1.1	2.28	0.17	0	6.7	6.2	27	6.7	1.32
OH-3063-1-11-OH-101-002-4	58.8	40.9	0.3	1.34	0.15	0	6.7	6.2	25.2	2.5	0.5
OH-3063-1-11-OH-101-002-5	57.6	41.7	0.7	0.84	0.05	0	7	6.6	21.6	0.7	
OH-3063-1-11-OH-101-002-6	57	42.4	0.6	0.47	0.05	0	7.4	7.2	19.6	0.3	
OH-3066-1-11-OH-155-2-1	10	23	67	1.19	0.03	0	4.5	4	7.1	2.7	1.28
OH-3066-1-11-OH-155-2-2	9.5	22.3	68.2	0.52	0	0	4.5	4	4.8	1.1	1.62
OH-3066-1-11-OH-155-2-3	11.1	17.2	71.7	0.14	0	0	5.9	5.3	5.3	3.1	
OH-3066-1-11-OH-155-2-4	5.8	6.1	88.1	0.09	0	0	6.6	5.8	2.5	13.8	
OH-3068-1-11-OH-077-1-1	54.1	37.2	8.7	22.49	1.6	0.26	5.5	5.1	96.9	12.9	0.62
OH-3068-1-11-OH-077-1-2	67.6	28.8	3.6	32.7	1.97	0.56	5.3	5	112.2	6.5	0.35
OH-3068-1-11-OH-077-1-3	49.6	38.6	11.8	2.85	0.18	0.02	5.7	5.2	26.6	8.8	0.95
OH-3068-1-11-OH-077-1-4	60	35.1	4.9	1.42	0.12	0.01	5.5	5.1	23.9	26.2	
OH-3068-1-11-OH-077-1-5	56.3	37.7	6	0.81	0.06	0.01	6.2	5.8	18.8	14.5	
OH-3070-1-13-OH-079-001-1	30.6	67.5	1.9	14.35	1.06	0.64	5.1	5	41.8	9.3	
OH-3070-1-13-OH-079-001-2	33.6	59.3	7.1	13.41	0.82	0.54	4.2	4.1	53.5	20.6	
OH-3070-1-13-OH-079-001-3	85.9	12.7	1.4	5.4	0.42	0.12	5.5	5.2	56	24.7	0.68
OH-3072-1-11-OH-123-001-1				14.57	1.2	0.5				9.9	
OH-3072-1-11-OH-123-001-2	52.7	44.9	2.4	4.75	0.41	0.1	5.2	5	34.4	15.6	0.87
OH-3072-1-11-OH-123-001-3	54.7	43.1	2.2	4.12	0.35	0.07	5.7	5.5	36.5	18.1	0.91
OH-3072-1-11-OH-123-001-4	57	41.1	1.9	1.14	0.14	0.02	7	6.8	25.6	9.1	1.13
OH-3073-1-11-OH-157-001-1	35	61.5	3.5	4.13	0.32	0.04	5.5	5.4	22	53.4	0.74
OH-3073-1-11-OH-157-001-2	28.7	62.8	8.5	1.79	0.11	0	5.3	5.1	14.2	36.2	1.1
OH-3073-1-11-OH-157-001-3	16.4	59.9	23.7	1.18	0.02	0	5.7	5.3	9.3	17.3	1.25
OH-3073-1-11-OH-157-001-4	21.2	66	12.8	1.22	0.07	0.01	5.5	5.2	10.1	12.9	1.27
OH-3073-1-11-OH-157-001-5	26.3	68.9	4.8	1.01	0.05	0.06	4.6	4.4	11.4	4.8	
OH-3073-1-11-OH-157-001-6	24.7	70.1	5.2	1.19	0.12	0.01	5.5	4.9	11.3	14.7	
OH-3075-1-11-OH-005-001-1	25.8	73.5	0.7	16.24	1.12	0.39	4.7	4.7	39.5	7.3	0.3
OH-3075-1-11-OH-005-001-2	18.3	79.5	2.2	3.54	0.28	0.18	5.2	5	18.2	22.5	0.95
OH-3075-1-11-OH-005-001-3	16.5	79.3	4.2	4.55	0.33	0.08	5.1	5	26.8	10.5	0.92
OH-3075-1-11-OH-005-001-4	21.8	75.9	2.3	9.85	0.82	0.14	5	5	51.7	3.9	0.48
OH-3080-1-11-OH-129-001-2	22.7	59.5	17.8	1.15	0.1	0	6.6	6	14.7	11.8	1.37
OH-3080-1-11-OH-129-001-3	42.4	47.4	10.2	0.48	0.02	0	7.4	7.1	25.6	0.7	1.2
OH-3080-1-11-OH-129-001-4	40.7	49.7	9.6	0.36	0	0	7.6	7.2	24.3	0.6	1.23
OH-3080-1-11-OH-129-001-5	35	55.2	9.8	0.59	0.05	0	7.9	7.5	20.5	0.8	
OH-3080-1-11-OH-129-001-6	23.8	57.3	18.9	2.77	0.05	0	8.1	7.7	13.2	1.2	
OH-3081-1-11-OH-035-001-1	9.7	61.8	28.5	1.74	0.07	0.08	7.3	7.1	5.8	4.4	1.33
OH-3081-1-11-OH-035-001-2	13.4	76.5	10.1	2.28	0.14	0.03	7.4	7.1	9.5	6.8	1.25
OH-3081-1-11-OH-035-001-3	7.7	38.2	54.1	1.23	0.02	0.01	7.4	7.1	5.3	10.6	0.93

SAMPLE-ID	CLAY (%)	SILT (%)	SAND (%)	TOTAL C (% wt)	TOTAL N (% wt)	TOTAL S (% wt)	pH 1:1 H2O	pH 0.1M CaCl2	NH4OAc CEC (cmol(+)/kg)	P Mehlich (mg/kg)	Bulk Density Field Moist (g/cc)
OH-3081-1-11-OH-035-001-4	7.1	34	58.9	1.27	0.02	0.01	7.5	7.1	4.4	11.7	
OH-3081-1-11-OH-035-001-5	9	42.1	48.9	1.02	0.04	0.01	7.5	7.2	4.8	6.4	
OH-3082-1-13-OH-079-001-1	21.9	42.4	35.7	3.39	0.3	0.02	5.6	5.1	18.6	3.8	1.03
OH-3082-1-13-OH-079-001-2	20.1	42.5	37.4	1.46	0.16	0	5.8	5.1	14.4	2.6	1.32
OH-3082-1-13-OH-079-001-3	17.7	41.8	40.5	0.67	0.07	0			9.7	2.4	1.53
OH-3082-1-13-OH-079-001-4	23.8	43.3	32.9	0.41	0.08	0	6	5.2	13	2.2	1.57
OH-3082-1-13-OH-079-001-5	17.8	33.8	48.4	0.48	0.07	0	6.2	5.5	9.7	11.3	
OH-3082-1-13-OH-079-001-6	13.8	30.8	55.4	0.19	0.01	0	6.7	6	6.5	8.7	
OH-3082-1-13-OH-079-001-7	15.8	42.7	41.5	0.18	0.03	0	7.3	6.8	5.5	4.1	
OH-3083-1-11-OH-107-001-2	33.6	48.4	18	2.74	0.3	0.03	7.6	7.3	23.4	7.1	1.31
OH-3083-1-11-OH-107-001-3	35.5	48.2	16.3	0.99	0.18	0	7.8	7.3	21.6	2	1.56
OH-3083-1-11-OH-107-001-4	37.5	49.6	12.9	0.74	0.08	0.01	7.7	7.3	19	3	
OH-3085-1-13-OH-079-001-1	18.2	61.2	20.6	2.78	0.2	0.02	5.8	5.3	13.7	6.4	1.04
OH-3085-1-13-OH-079-001-2	16.4	50.3	33.3	1.44	0.12	0	5.4	4.9	9.5	4.1	1.03
OH-3085-1-13-OH-079-001-3	20.1	57.3	22.6	1.33	0.13	0	5.5	4.9	10.1	3.6	1.13
OH-3085-1-13-OH-079-001-4	21.8	59.6	18.6	1.14	0.13	0	5.6	5	10.4	3.5	1.59
OH-3085-1-13-OH-079-001-5	20.7	53.9	25.4	0.8	0.09	0	5.7	4.9	9.1	2.3	
OH-3085-1-13-OH-079-001-6	23	55.6	21.4	0.74	0.05	0	5.7	5	9.2	3.1	
OH-3086-1-13-OH-079-001-1				25.25	2.15	0.47	4.8	4.6	45.4	23.6	
OH-3086-1-13-OH-079-001-2	47.5	50.8	1.7	3.03	0.29	0.05	4.6	4.2	20.2	1.9	0.89
OH-3086-1-13-OH-079-001-3	45.2	53.7	1.1	4.2	0.43	0.06	4.8	4.4	25.5	4.9	0.72
OH-3086-1-13-OH-079-001-4	47.3	50.9	1.8	2.26	0.27	0.02	5	4.4	22.5	2.4	1.11
OH-3090-1-11-OH-007-1-1	30.4	55.2	14.4	11.15	0.95	0.1	5.8	5.7	39.4	16.1	0.34
OH-3090-1-11-OH-007-1-2	24.4	54.1	21.5	2.2	0.15	0.01	6.7	6.1	19	4.2	0.99
OH-3090-1-11-OH-007-1-3	18.6	53.8	27.6	0.4	0.07	0	7.1	6.4	9.6	1.5	1.6
OH-3090-1-11-OH-007-1-4	10.4	28.2	61.4	0.13	0	0	7.3	6.6	4.7	7.6	1.7
OH-3094-1-11-OH-007-001-1	29	57.7	13.3	11.23	0.71	0.07	4.5	4	33.2	10.1	0.38
OH-3094-1-11-OH-007-001-2	28.7	56.3	15	6.17	0.41	0.03	4.2	3.8	21.3	9.2	0.61
OH-3094-1-11-OH-007-001-3	23.1	58.4	18.5	0.81	0.05	0	4.6	3.9	7.9	1.3	1.35
OH-3094-1-11-OH-007-001-4	29.1	55.4	15.5	0.42	0.03	0	4.7	3.8	10.1	0	1.29
OH-3097-1-11-OH-051-1-1	34.3	52.9	12.8	27.41	2.24	0.54	4	4	79.4	5.2	0.25
OH-3097-1-11-OH-051-1-2	32.7	58	9.3	14.76	1.22	0.33	4.7	4.55	53.8	14.2	0.45
OH-3097-1-11-OH-051-1-3	37.6	54.5	7.9	17.28	1.15	0.43	4.8	4.55	59.5	14	0.23
OH-3097-1-11-OH-051-1-4	58.9	38.3	2.8	16.84	1.04	0.33	5.3	5.1	70.8	23.4	0.55
OH-3097-1-11-OH-051-1-5	65.2	33.3	1.5	10.49	0.57	0.2	5.5	5.3	59.5	24.6	
OH-3097-1-11-OH-051-1-6	38	60	2	7.11	0.48	0.56	5.3	5.2	28.6	9.4	
OH-3097-1-11-OH-051-1-7	27.4	72.2	0.4	4.6	0.16	0.88	7.1	7	12.5	4.9	
OH-3099-1-13-OH-079-001-1	22.8	56.5	20.7	3.35	0.31	0.02	4.9	4.5	14.2	13.6	0.84
OH-3099-1-13-OH-079-001-2	24.9	42.3	32.8	3.89	0.24	0.05	4.7	4.4	17.6	2.9	0.74
OH-3099-1-13-OH-079-001-3	26.3	57.9	15.8	5.77	0.37	0.07	4.6	4.3	23.3	8.8	
OH-3099-1-13-OH-079-001-4	30.8	55.3	13.9	1.87	0.13	0.03	7	7	15.5	10.6	
OH-3099-1-13-OH-079-001-5											0.68
OH-3100-1-11-OH-143-001-1	29.2	51.8	19	4.1	0.32	0.02	6.2	5.9	24.5	5.7	0.97
OH-3100-1-11-OH-143-001-2	25.8	51.3	22.9	1.77	0.12	0	7.1	6.5	16.8	1.8	1.41
OH-3100-1-11-OH-143-001-3	32.9	48.7	18.4	0.44	0.01	0	7.6	6.8	15	0.6	1.66
OH-3104-1-11-OH-093-1-1	42.1	53.5	4.4	4.77	0.38	0.04	6.5	6.3	26.9	102.6	0.9
OH-3104-1-11-OH-093-1-2	49.8	44.3	5.9	2.67	0.25	0.02	6.7	6.2	27.8	89.6	1.12
OH-3104-1-11-OH-093-1-3	43.6	48.8	7.6	2.19	0.24	0.02	6.6	6.1	22.3	46	1.16
OH-3104-1-11-OH-093-1-4	25.7	46.8	27.5	2.29	0.15	0.02	6.3	5.7	17.1	31	
OH-3104-1-11-OH-093-1-5	13.1	32.2	54.7	0.75	0.06	0	6.7	6.1	6.3	16.4	

SAMPLE-ID	CLAY (%)	SILT (%)	SAND (%)	TOTAL C (% wt)	TOTAL N (% wt)	TOTAL S (% wt)	pH 1:1 H2O	pH 0.1M CaCl2	NH4OAc CEC (cmol(+)/kg)	P Mehlich (mg/kg)	Bulk Density Field Moist (g/cc)
OH-3104-1-11-OH-093-1-6	9.7	27.6	62.7	0.73	0	0	6.7	6.1	5.5	19.6	
OH-3104-1-11-OH-093-1-7	9	20.1	70.9	0.81	0.01	0.01	6.9	6.4	4.4	27.9	
OH-3105-1-11-OH-029-001-1	27.5	62.6	9.9	4.6	0.33	0.06	5.6	5.3	18.9	6.8	0.7
OH-3105-1-11-OH-029-001-2	23.1	63.5	13.4	2.45	0.16	0.02	5.5	5.2	13	11.6	0.98
OH-3105-1-11-OH-029-001-3	20.2	70.3	9.5	0.94	0.03	0	5.6	5.1	7.7	6.5	1.32
OH-3105-1-11-OH-029-001-4	36.7	56.4	6.9	0.44	0.05	0	4.8	4.3	13.3	10.7	1.34
OH-3105-1-11-OH-029-001-5	31.1	57.8	11.1	0.23	0.04	0	4.9	4.5	11	2	1.41
OH-3105-1-11-OH-029-001-6	12.8	24.7	62.5	0.15	0	0	6.2	5.5	4.7	5.8	
OH-3106-1-11-OH-055-1-1	41.3	56.6	2.1	4.29	0.38	0.07	5.2	4.8	23.1	48.4	0.81
OH-3106-1-11-OH-055-1-2	36.6	60.4	3	1.06	0.06	0	5.7	5	15	8.7	1.13
OH-3106-1-11-OH-055-1-3	16.8	40.9	42.3	3.42	0.2	0.03	5.3	4.7	14.3	9.3	
OH-3106-1-11-OH-055-1-4	4.2	13.8	82	1.39	0	0	5	4.6	5	4.4	
OH-3107-1-11-OH-117-001-1	33.6	51	15.4	3.56	0.27	0.03	4.9	4.4	23.1	5.1	0.82
OH-3107-1-11-OH-117-001-2	32.7	51	16.3	1.19	0.07	0	5.2	4.4	15.8	4.7	1.37
OH-3107-1-11-OH-117-001-3	29.4	53	17.6	0.56	0.03	0	5.1	4.4	11	2.4	1.35
OH-3107-1-11-OH-117-001-4	38.1	47	14.9	0.48	0.05	0	5	4.5	15.5	1.2	1.32
OH-3107-1-11-OH-117-001-5	34.6	50.2	15.2	0.42	0.01	0	5.6	5.2	14.1	0.7	
OH-3107-1-11-OH-117-001-6	33.1	50.8	16.1	0.51	0.07	0	6.4	6.1	14.2	1.2	
OH-3118-1-13-OH-079-001-1	39.8	37.2	23	34.99	1.6	0.29	4.5	4.3	95.4	14.5	0.38
OH-3118-1-13-OH-079-001-2	36.9	44.8	18.3	49.46	1.89	0.5	5	4.7	190.2	4.4	0.22
OH-3118-1-13-OH-079-001-3	33.1	55.9	11	52.51	1.48	0.61	5	4.6	228.4	5.1	0.12
OH-3118-1-13-OH-079-001-4	25.9	66.2	7.9	52.94	1.73	0.82	4.7	4.4	214.4	7	0.12
OH-3118-1-13-OH-079-001-5	35.1	55.3	9.6	53.11	1.51	0.38	4.7	4.3	124.7	6.6	
OH-3132-1-11-OH-077-2-1	48.7	46.2	5.1	20.34	1.64	0.24	4.8	4.4	80.5	3.3	0.25
OH-3132-1-11-OH-077-2-2	70.6	18.8	10.6	24.68	1.67	0.33	4.7	4.2	93.3	0.5	0.44
OH-3132-1-11-OH-077-2-3	41.6	33.3	25.1	9	0.6	0.08	4.8	4.2	39.9	1.9	
OH-3132-1-11-OH-077-2-4	22.3	41.2	36.5	0.62	0.07	0.01	4.6	4.1	13.8	11.4	
OH-3136-OH-043-001-1				36.02	2.47	1.48	6.9	6.9	97.5	5.3	
OH-3136-OH-043-001-2	14.7	33.4	51.9	10.05	0.63	0.4	7.6	7.5	19.9	1.5	
OH-3136-OH-043-001-3	18.7	47.9	33.4	2.48	0.15	0.96	7.7	7.6	6.3	0.4	1.44
OH-3136-OH-043-001-4	12.6	34.6	52.8	2.59	0.14	0.69	7.8	7.7	4.4	0.3	1.46
OH-3138-1-13-OH-079-001-2	34.3	53.7	12	1.94	0.12	0.01	4.8	4.1	14.3	4.2	1.35
OH-3138-1-13-OH-079-001-2	23.9	55.4	20.7	0.46	0.04	0	4.8	4.2	8	1.9	1.61
OH-3138-1-13-OH-079-001-3	35.8	50.9	13.3	0.26	0.08	0.01	6.4	6.1	10.7	0.8	1.69
OH-3138-1-13-OH-079-001-4	25.3	55.2	19.5	0.84	0.07	0	7.9	7.5	7.9	0.6	
OH-3139-OH-169-001-1	51	47.7	1.3	5.28	0.57	0.21	5.2	4.9	27.2	19.2	
OH-3139-OH-169-001-2	40.2	57	2.8	4.51	0.47	0.07	6.2	5.7	30.3	9.6	1.02
OH-3139-OH-169-001-3	40.5	57	2.5	3.79	0.46	0.04	6.6	6	27	9.8	1.04
OH-3139-OH-169-001-4	38.2	59.1	2.7	19.76	2.06	0.21	5.6	5.4	74.7	5	
OH-3142-OH-155-001-1	15.8	62.6	21.6	18.73	1.69	0.29	5.6	5.3	28.7	55	0.2
OH-3142-OH-155-001-2	15.7	49.4	34.9	4.85	0.45	0.03	5.8	5.1	15.7	119.5	0.78
OH-3142-OH-155-001-3	21.8	49.3	28.9	0.27	0.15	0	5.8	5.2	10.1	8.2	1.48
OH-3143-OH-095-001-1	50.2	47.6	2.2	3.19	0.49	0.07	6.7	6.3	29.1	19.3	0.63
OH-3143-OH-095-001-2	50.1	47.3	2.6	2.83	0.43	0.05	5.9	5.7	28.4	23.9	0.9
OH-3143-OH-095-001-3	50.3	47.2	2.5	0.62	0.23	0	7.1	6.8	19.8	11.1	1.13
OH-R062-1-11-OH-065-001-1	34.5	48.9	16.6	4	0.26	0.01	6.9	6.5	25.5	2.8	0.48
OH-R062-1-11-OH-065-001-3	40.2	46.2	13.6	1.13	0.1	0	7.5	6.9	19.7	0.7	0.57