Development of a Comprehensive State Monitoring and Assessment Program for Wetlands in Massachusetts

Appendix C

Standard Operating Procedures: Assessment of Wetland Communities

Phase 1: 2007

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Standard Operating Procedures: Assessment of Wetland Communities

1. Scope and Application

This SOP establishes a standard set of procedures to be followed for data collection toward development of a Rapid Assessment Method (RAM) for MA freshwater wetlands and validate the Conservation Assessment and Prioritization System (CAPS) as a mechanism for landscape level analysis (Level 1) of ecological integrity. This project will focus on assessment of wetland characteristics and wetland condition in shrub swamps and forested wetlands.

Described below are the procedures that will be followed in collecting data on vegetation, hydrology, soils, topography, biogeochemistry and evidence of degradation to serve as a basis for development of a RAM for freshwater wetlands.

2. Summary

Although this SOP is applicable for freshwater wetland throughout Massachusetts, data collection for phase 1 will focus on shrub swamp and forested wetland communities in the Westfield River Watershed. Sampling sites will be selected via a stratified random process. Field data collection will involve the assessment and estimation of various field-based metrics for purpose of either 1) characterizing the natural community being sampled or 2) assessing the ecological condition of the site. Characterization data will be used to understand how landscape analyses based on ecological gradients compares with various discrete community classification schemes. Condition data for wetland communities will be used to create a draft Rapid Assessment Method for freshwater wetlands.

Characterization and condition of the wetland will be conducted in the field by assessing hydrology, vegetation, soil, topography, biogeochemistry, and evidence of human disturbance.

3. Safety Considerations

a) Fieldwork will not be conducted during heavy rain events or unsafe conditions such as electrical storms or high wind events. Practice “safety first”.

b) If there is no safe access to a plot point, the RAM will not be conducted for that site.

c) Private property will be respected using the following guidelines.

- If property is posted or in close proximity to buildings or other heavily used areas, landowner permission will be sought
- Posted property will not be accessed without permission of the landowner

4. Sample Collection, Preservation, and Handling

Vascular plant and lichen collections will be limited to species that cannot be identified in the field. For species that cannot be positively identified in the field samples will be collected for lab identification and photographed for digital preservation. Taxonomic identification at the species level (preferred) or genus level (if species identification is not possible) will be achieved in the laboratory through the use of field guides, technical keys, and reference to regional herbaria

housed at research universities such as UMass. Samples will be labeled in the field with the plant ID (e.g. "unknown sedge #1") site location, date, and person who collected the sample, and assigned a code in the laboratory for use in digital preservation.

See also Appendix D (wetland data forms) for further detail.

5. Equipment/Apparatus

Before leaving for the field the Field Manager will confirm the following equipment is available:

SOP
Location maps
Compasses
GPS (Global Positioning System)
Digital camera
50 meter distance tapes
Hip chain
Hand lens
Flagging
Data sheets
Rite-in-rain paper and pen
Clipboard
Plastic collecting bags (vascular plants) with labels for plot ID and date
Turbidity meter
Standard solutions for calibration of turbidity meter
pH/CON 10 pH/Conductivity/C^{o} Meter
Standard solutions for calibration of pH/Conductivity/Temp meter
Lint free wipes
Labels for water sampling jars
Deionized water
Tap water
Spade
Auger
Munsell Soil Chart
Palm computer

6. Reagents

Not applicable

7. Calibration & Training

Equipment calibration procedures for the GPS units, turbidity meter and pH/CON 10 pH/Conductivity/C^{o} Meter will done according to the manufacturers' recommendations. See section 2.6 of the QAPP for details.

Field crew members will have sufficient previous training and experience to reliably conduct field data collection or they will receive training from the UMass QA Manager and/or other project scientists with relevant expertise. The QA Manager will provide specific training on plant identification, estimating vegetative cover, characterization of soils, and interpreting indicators of hydrology.

All Field Managers and Field Scientists will receive training from the QA Manager on appropriate QA/QC procedures.

8.0 Procedures

Sampling will occur between July 1, and September 30, to ensure adequate characterization of vegetative characteristics. Forested and Shrub/scrub wetlands in the Westfield River Watershed will be identified using the MassDEP Wetlands Mapping data (1:12,000 based on photography from 1999 to 2000).

Sample locations will be randomly stratified across six equal wetland size classes and 10 gradients of ecological integrity from the CAPS assessment of 2005 (McGarigal et al 2005). Wetland plots will be selected by stratifying across 6-tiles of wetland complex size (excluding open water) and deciles of IEI to create 60 wetland size x IEI bins. A large number of uniform random points will be selected within the watershed. Only points that fall within shrub swamp and forested wetland (as depicted in DEP wetlands) will be retained. Points will be randomly ordered and points that fall within 500 m of a lower-ordered point will be thrown out. Each point will be assigned to the appropriate wetland size x IEI bin and given a within-bin index from 1 to n. The procedure will be repeated until there are at least 20 plots each in shrub swamps and forested wetlands. The goal is to visit one plot per bin this season. If a plot needs to be dropped the next-higher plot number will be used.

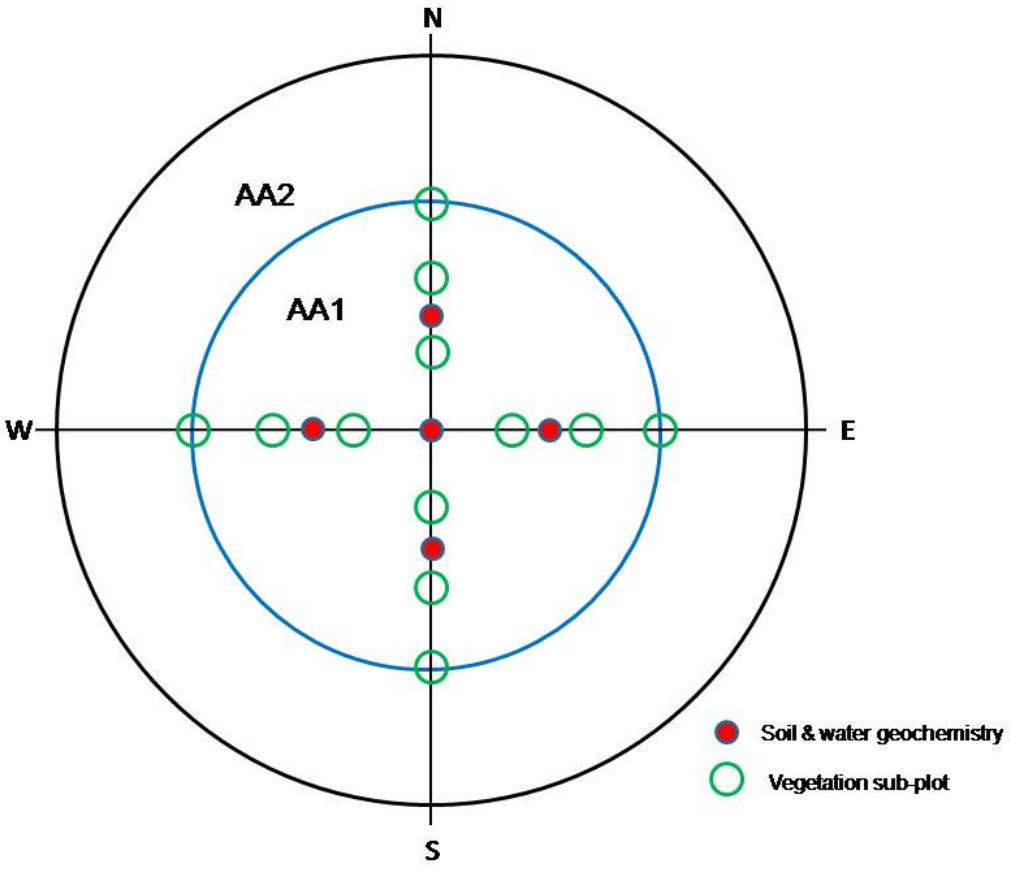
Field plots will maintain a minimum separation of 500m. GPS navigation will be used to locate each wetland plot. GPS precision must be 10m or less and the navigator will stop and establish the plot once the distance to plot center is 0m. In the case of GPS interference from tree-canopy or atmospheric effects two procedures may be followed. The first is to wait 10 minutes for satellite reception to improve. If a dense forest canopy appears to be the problem use triangulation to locate the plot. We will approach the plot from three different locations where the canopy is mainly deciduous. Using compass and distance measurements provided by the GPS (precision must be 10m or less), the plot will be located.

It will not be necessary to hit the plot exactly (since it's randomly selected) it just needs to be selected without bias. However, a reasonably precise GPS point is needed of where the plot actually ends up. The strategy is (1) do the best we can when locating the plot and (2) take a precise location (precision $\leq$ 10 m RMS) once the plot has been established. Field workers will be on the plot for 2-3 hours and will be able to keep trying until they get good GPS coverage.

8.1 Establishing Assessment Area

From the central plot point two circular plots will be established to define the Assessment Areas (AA). If the central plot point coordinates fall outside the targeted wetland, we will move the central plot point into the wetland to the nearest location 20m from the wetland edge. Sample plot 1 (AA1) will have a radius of 30m and will be used to characterize the wetland. Wetland characterization will only include those areas of AA1 that match the target wetland type (shrub swamp or forested wetland). Sample plot 2 (AA2) will have a radius of 50m and will be used to assess the condition of the wetland. All areas of wetland that fall within AA2 will be assessed for condition regardless of wetland type. Four transects will run at 0^o, 90^o, 180^o, and 270^o compass bearings from the central plot point. Flagging will be used to mark the central plot point and boundary of each sampling plot (30m and 50m).

Figure 8.1 Wetlands Plot Sampling Scheme



All data will be recorded in the field on paper field data forms (Appendix D) or using hand held Palm style computers.

8.2 Overview of Characterization and Condition

Each plot will be characterized using the HGM (Brinson, 1993) and the Cowardin classification (Cowardin et al., 1978) methods, and by additional characteristics of hydrology, vegetative structure, soil, and topography. Characterization will be assessed in sample plot 1(AA1).

Condition of the wetland will be determined using indicators of altered hydrology, altered plant community, altered soils, water pollution, and human disturbance in sample plot 2 (AA2). The 30.5m (100 ft) buffer zone will also be assessed for condition using indicators of altered plant community, soils, and human disturbance. Variables used for characterization and condition assessment will be independently recorded on field data sheets (or Palm-style computers) to facilitate evaluation of each variable for potential use in the RAM.

8.3 Hydrology

Hydrology is a fundamental component of a wetland system and will be used to characterize and assess the condition of the assessment areas. In addition to the HGM and Cowardin hydrologic classification, hydraulic state at the time of assessment, percent of AA inundated during most recent high water, average water depth at most recent high water and flow pattern will be determined to characterize the hydrology of AA1. Indicators of altered hydrology will include the presence of water control structures (dam, weir, culvert, fill, ditching, channelization , beaver dam, storm water inputs) upstream, downstream, and within AA2. These will be used to assess the hydrologic condition of the AA2.

From the center point of the plot walk four 30m transects and make visual observations of the following within AA1 and record them on field data forms.

a. Indicate whether AA1 is ponded or inundated, has surface water, or is dry.
b. Based on field indicators of surface water (water stained leaves, water marks on trees, etc) estimate the percent of AA1 that was inundated during the most recent high water period.
c. Based on field indicators of surface water estimate the average depth of the inundated portion of AA1 during the most recent high water period.
d. Indicate if there is evidence that surface water moves through the wetland (drift lines, surface scour or sediment deposits, etc.) as surface sheet flow or single/multiple channels.

Depth to groundwater will be evaluated using the soil test pits located at the plot center and center of each of the four transects (see section 8.5 for detail).

From the center point of the plot walk four 50m transects and make visual observations of the following within AA2 and record them on field data forms.

a. Determine if any water control structures are present within AA2 and indicate type: culvert, dam, weir, storm water input, fill (road/railroad), ditching, channelization, beaver dam, other.
b. From central plot point walk a minimum of 100 m up and down gradient of AA2 to look for water control structures. Follow any stream channel that has the greatest impact to the wetland. Indicate type of any control structures found.
c. Determine the net effect of all water control structures on the hydrology of AA2 based on structures found within and outside the plot. Indicate if AA2 is unlikely, some-what likely, likely, or definitely affected by the water control structures, and whether it is drier or wetter as a result.
d. If AA2 is definitely, some-what likely, or likely to be impacted by water control structures, indicate the percent of AA2 impacted.

8.4 Vegetation

The total percent cover for major vegetation classes and dominant plant species will be used to characterize wetland vegetation. Whenever possible plants will be identified to the species level; if that is not possible they will be identified by genus or other taxonomic grouping (e.g. unknown grass). Invasive species richness and percent cover, evidence of mowing and/or burning will be determined as indicators of plant community condition. Invasive species include species that have been identified by the Massachusetts Invasive Plant Advisory Group as "invasive", likely invasive", or "potentially invasive" (http://www.massnrc.org/MIPAG/index.htm).

From the center point of the plot walk four 30m transects and make visual observations of the vegetation within 2m circular plots every 10 m along the transect within AA1.

a. Determine the total percent cover of each major vegetation class (trees, shrubs, climbing woody vines, ground cover)
b. Identify and record all species that contribute >10% cover in each vegetative stratum. If identification of vegetation can not be determined in the field, take a sample and photo of the plant, and make a note on the data sheet. Label plastic bag with photo ID number, date, plot ID, transect bearing, and name of the person collecting the sample
c. For each species with percent cover >10% in a vegetative stratum, estimate the percent cover (ocular estimation) of that species within the stratum based on cover classes used in the MassDEP wetland delineation methodology (Jackson 1995)

From the center point of the plot walk four 50m transects and spend an additional 20 minutes walking the rest of the plot and make visual observations of the following within AA2.

a. Identify all invasive plant species that can be seen from the transect line and found during the 20 minute walk around AA2.
b. Estimate percent cover using the line intercept method and assign a cover class for each invasive species. Take samples and pictures of plants that can not be identified and are suspected to be invasive. Make a note on the data sheet. Label plastic bag with photo ID number, date, plant ID, plot ID, date and name of the person collecting the sample.
c. Indicate the percent of AA2 that shows evidence of mowing, burning, or timber harvesting using the following categories: absent, <10%, 10-50%, 50-90%, >90%. Make a note on the data sheet if the vegetation management is likely to be part of an ecological restoration project.

8.5 Soils

A soil profile will be described and the depth to groundwater observed to characterize AA1. Indicators of altered soils will be assessed for the condition of AA2.

At the plot center and the midpoint of each transect use a spade to dig a test pit to a depth of 0.5m and record the following.

a. Determine the depth to groundwater observed in the soil test pit and indicate the depth to soil saturation as evidenced by weeping from the side walls.
b. Determine the depth/thickness and matrix color of each soil horizon
c. Determine the predominant color and percent cover of redoximorphic features (e.g., mottling) within the top 15 cm of the mineral soil.

Walk four 50m transects and determine the percent of AA2 that is disturbed by each of the following.

a. Filling,
b. Plowing,
c. Grading,
d. Grazing,
e. Dredging,
f. Sedimentation,
g. Vehicle use.

Take a photo of any disturbance and record photo ID number and transect on data sheet.

8.6 Topographic complexity

Topographic complexity will be determined to assist in the characterization of the wetland. Each transect will be walked to observe and record variations in slope/elevation.

From the center point of the plot walk four 30m transects and count the number of hummocks and slope transitions (ascending to descending; descending to ascending) along each transect within AA1. Count only those slope transitions where the slope is at least 4:1 for an average stride (two steps).

8.7 Water Geochemistry

Water conductivity, pH, and temperature will be assessed to help characterize the wetland (AA1) but will not be used to access wetland condition. Turbidity and indicators of water pollution (obvious spills, excessive algae, and sediment plumes from point source discharges) will be used to assess the condition of AA2. Massachusetts Water Quality Standards for surface water will be used as a reference for interpreting turbidity data.

Conductivity, temperature and pH will be measured for surface water if present or groundwater within 50cm using a portable pH/Conductivity meter at five locations within AA1. Surface water samples will be collected at the central plot point and at the midpoint (or the closest point with standing water within 10m of the midpoint) of the four 30m transects. If surface water is not present then groundwater will be evaluated (if present) for conductivity, temperature and pH in the soil test pits (see section 8.5) located at the plot center and center of each of the four transects.

Turbidity of surface water (if present) will be measured at five locations within AA2. Turbidity will be assessed at the central plot point and at the midpoint (or the closest point with standing water within 20m of the midpoint of the four 50 m transects.

From the center point of the plot walk six 50m transects and make visual observations of the following within AA2.

a. Obvious spills. Determine presence or absence. If present indicate percent of the AA2 that is affected: <10%, 10-50%, 50-90%, >90%.

b. Excessive algae. Determine presence or absence. If present indicate the percent of the AA affected: <10%, 10-50%, 50-90%, >90%. Record on data sheet.

c. Direct point or nonpoint source discharge from agricultural operations, septic or sewage treatment systems, or stormwater. Indicate if such discharges are present and the percent of AA2 that is directly affected by discharges from each source: <10%, 10-50%, 50-90%, >90%.

8.8 Human Disturbance

Evidence of motorized or non-motorized vehicle use, presence of trash/litter, garbage dumping, and organic dumping will be determined within AA2 to assess wetland condition.

Walk the four 50m transects in the sample plot and look for:

a. Walking trails, horse trails, logging roads, ATV trails, old cart paths, and roads within AA2. If found determine the linear meters of each feature within AA2. Take a photo and record the photo number and transect(s) on the data sheet.

b. Presence of trash/litter. Determine the percent of AA2 that is affected.

c. Presence of garbage dumping. Indicate whether it is recent or historic. Determine the percent of AA2 that is affected.

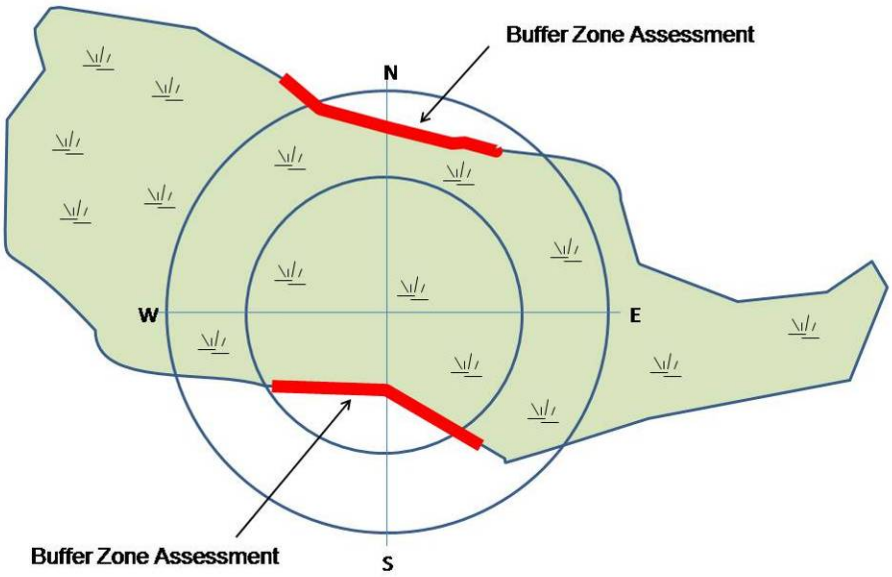
8.9 Buffer Zone

For wetland sampling locations location within 100m of the wetland edge all or a portion of the 30.5m upland buffer zone that abuts the wetland will be assessed for condition. The buffer zone will be divided into 3 zones: Inner 7.5m, Middle 7.5m, and Outer 15m. Conditions within the buffer zone will be accessed for a distance of 25m on each side (50m total) of each 50m transect that intersects the wetland boundary (but without double sampling in buffer zone areas that overlap). If the nearest wetland boundary is >50m but less than 100m from the plot center point, then 100m of buffer zone will be assessed centered on the point nearest AA2. If the distance to the wetland edge is >100m from the central plot point the buffer zone will not be assessed because any buffer disturbance is much less likely to have an impact on the assessment area from such a distance. Aerial photos (2005, 1:5000) will be used to assist in determining the closest wetland edge to the central plot point.

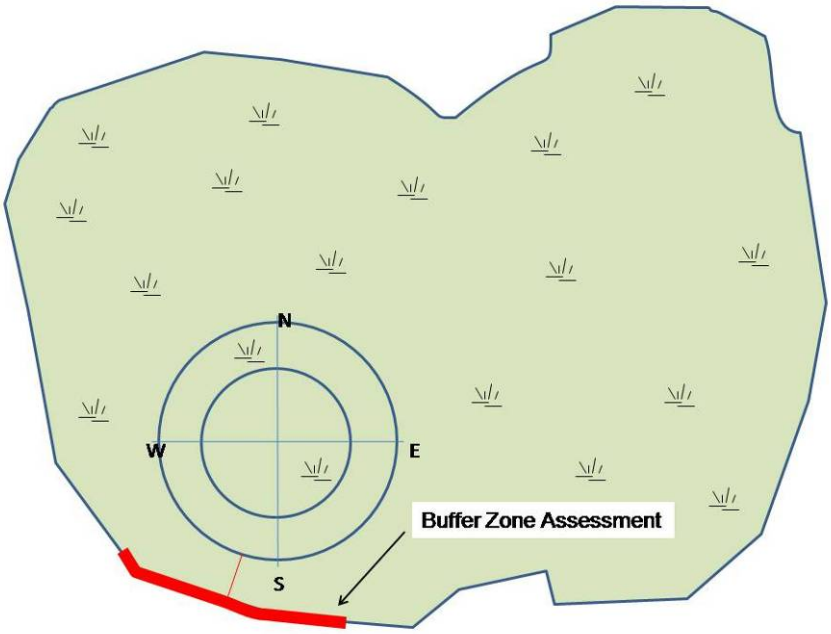
Figure 8.2 Wetland Buffer Zone Sampling Scheme. A) 50 m transects intercept the wetland boundary in two places. From each of these points the buffer zone will be assessed for 25m in each direction. B) None of the 50 m transect lines intercept the wetland boundary, however, the boundary is within 100m of the plot center point. The buffer zone will be assessed for 50 m in both directions from the point where the wetland boundary comes nearest to the plot center point.

C) Nowhere is the wetland boundary within 100m of the plot center point, therefore no buffer zone is assessed for this plot.

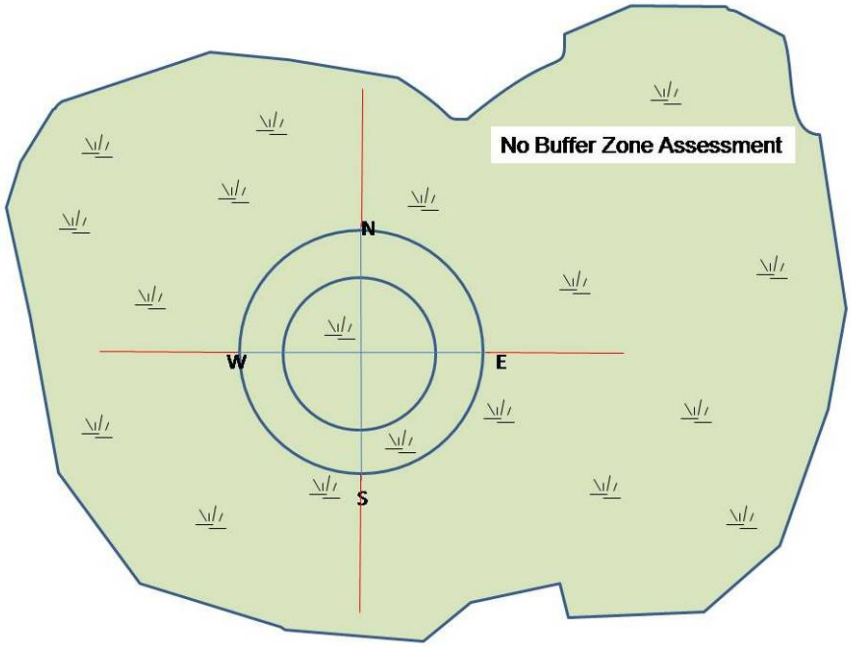
A)



B)



C)



For each buffer zone (inner, middle, and outer) in the areas to be assessed, determine:

a. Percent (none, <10%, 10-50%, 50-90%, >90%) that is in the following condition: mowed turf, hay/pasture, row crop, impervious, subject to vegetation management, and natural.
b. Percent (none, <10%, 10-50%, 50-90%, >90%) of the zone that is affected by trash/litter, garbage (indicate historic/recent), and/or leaf/brush dumping.
c. The number of point and nonpoint source discharges.
d. If there is evidence of erosion and sedimentation, indicate the extent of the area impacted (none, <10%, 10-50%, 50-90%, >90%).
e. Indicate the number of structures in the following categories that are present: Agricultural, Residential, Commercial, and Industrial.

9. Quality Control

Compliance with procedures in this SOP will be maintained through monthly internal reviews. Personnel will conduct periodic self-checks by comparing their results with similarly trained personnel working on the project. See sections 2.5 and 2.6 of the QAPP for details about QA/QC measures.

10. Interferences

Inclement weather (heavy rain) may interfere with our ability to collect representative data on a variety of parameters. Severe weather may delay field data collection due to safety concerns. Heavy tree canopy cover and atmospheric effects may make it difficult to locate sampling plots using GIS. Access may be a challenging aspect of data collection in more developed areas of the

study area. Posted property or sites that are too difficult to access or unsafe to sample will be replaced with alternative sites from the same stratified sampling bin.

11. Preventative Maintenance

Field equipment will be inspected by the UMass Field Manager each day before going out to collect field data. At the field site equipment will be tested prior to data collection to ensure that it is working properly. Equipment will be subject to regular maintenance as needed and as recommended by the manufacturer. GPS accuracy will be assessed once a month by a check of any units used in the field with a known location. See section 2.6 of the QAPP for more detail.

12. Corrective Actions

Data quality control ensures high quality data, however we are prepared to re-measure any plots which contain data anomalies or if data need to be re-gathered for any reason. Any plots that contain anomalous data that cannot be resolved will be removed from the data set (either the anomalous data will be removed or all data from that plot will be removed if data cannot be salvaged without compromising the quality of the entire dataset).

13. Waste Minimization and Pollution Prevention

Care will be taken to avoid transport of vegetation and soil other sites. This will be done by thorough inspection of all equipment and clothing prior to departure from a site. Invasive plant samples will be disposed of in a way to avoid accidental release into the environment.

14. References

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