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Standard Operation Procedure 5: Plot Establishment in Randomly-Selected, Intensively-Assessed Wetlands

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Standard Operation Procedure 5: Plot Establishment in Randomly-Selected, Intensively-Assessed Wetlands

This SOP describes the process used to establish sampling arrays in the 60 randomly selected, intensively assessed wetlands that we refer to as “survey wetlands”. A list of survey wetlands is provided in Table 5.1 with important attribute information regarding number of modules, dominant vegetation type, the azimuth of the centerline, array of modules, and coordinates (UTM Zone 19 N, NAD 1983).

Waypoint Selection

After intensively assessed wetlands were selected, the following procedures were used to locate a sampling array in each wetland.

1. Create a shapefile containing the boundaries of all 60 intensively-assessed wetlands (see SOP 3 for delineation procedures).
2. Select 10 random points per wetland. Each point is a potential location for the sampling array.
3. Create a waypoint file containing the random points and load it onto the Trimble GPS unit for navigation
4. Navigate to the waypoints for centroids of intensively-assessed wetlands, starting with Waypoint 1 and determine its suitability for the establishment of a sampling array.

Placement of Sampling Arrays

1. Determine the dominant vegetation type as emergent, forested, or scrub shrub wetland.
 - a. The preferred sampling array for emergent and scrub-shrub wetlands is a 2x2 array of 100m² modules (Figure 5.1).
 - b. The preferred sampling array for forested wetlands is a 2x5 array of 100m² modules (Figure 5.1).
2. The waypoint is evaluated as the centroid of each preferred sampling array.
3. The following criterion must be met for the placement of the sampling array to be acceptable:
 - a. Work could be conducted safely.
 - b. The vegetation reflected the dominant vegetation type.
4. The above criteria were first evaluated by orienting the sampling array in a north-south direction with the waypoint as the centroid.
5. If the criteria were not met, an east-west orientation was attempted.
6. If the criteria were still not met, any azimuth that would meet the criteria was allowed.
7. If the criteria were still not met, a shift of the centroid up to one-half the length of long-axis was attempted using any qualifying azimuth.
8. If the criteria were still not met, a new waypoint was visited and the process was repeated until the sampling array was placed.
9. If none of the 10 waypoints met the criteria, differently shaped arrays, in preferential order (see Figure 5.2), were then tried using the procedures described above.
10. When the final plot location was selected, the ends of the central axis were staked temporarily while the plot corners were established perpendicular to the central axis.
11. PVC monuments (1m length) were installed at each of the four plot corners using a rubber mallet to drive stakes in to the ground to refusal. The amount of exposed PVC was generally between 30 cm and 60 cm above ground, but changed depending on visibility.

12. The Wetland ID was written on the corner stakes using a china marker and an NPS arrowhead decal was placed near the top of all permanent stakes.
13. The final configuration and azimuth of the final sample point was recorded on the plot establishment data sheet (Attachment 5.1).

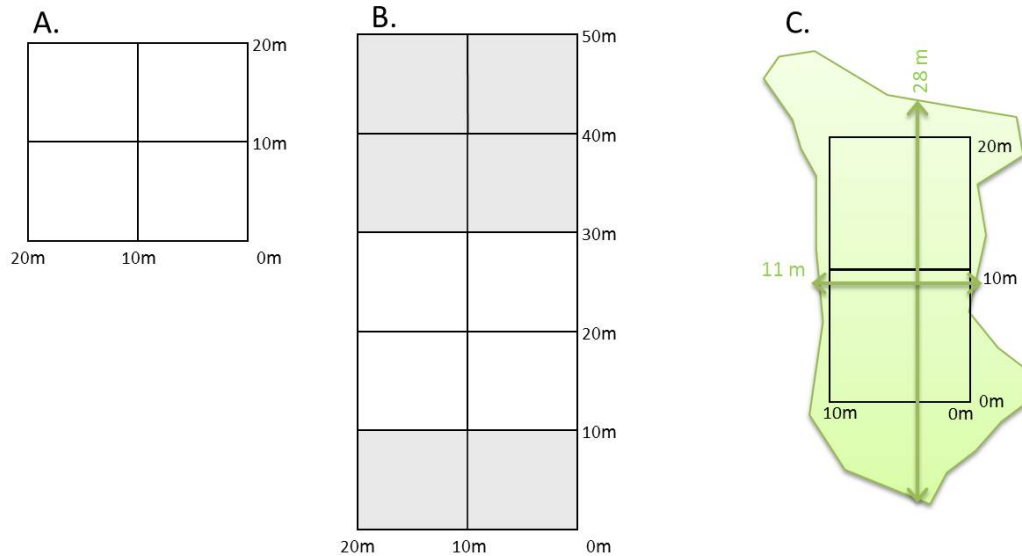


Figure 5.1. The preferred sampling array for (A) emergent, aquatic bed, and scrub-shrub wetlands, (B) forested wetlands, and (C) an example alternative sampling array for situations where the preferred array was not possible because of wetland shape, size, or vegetative composition.

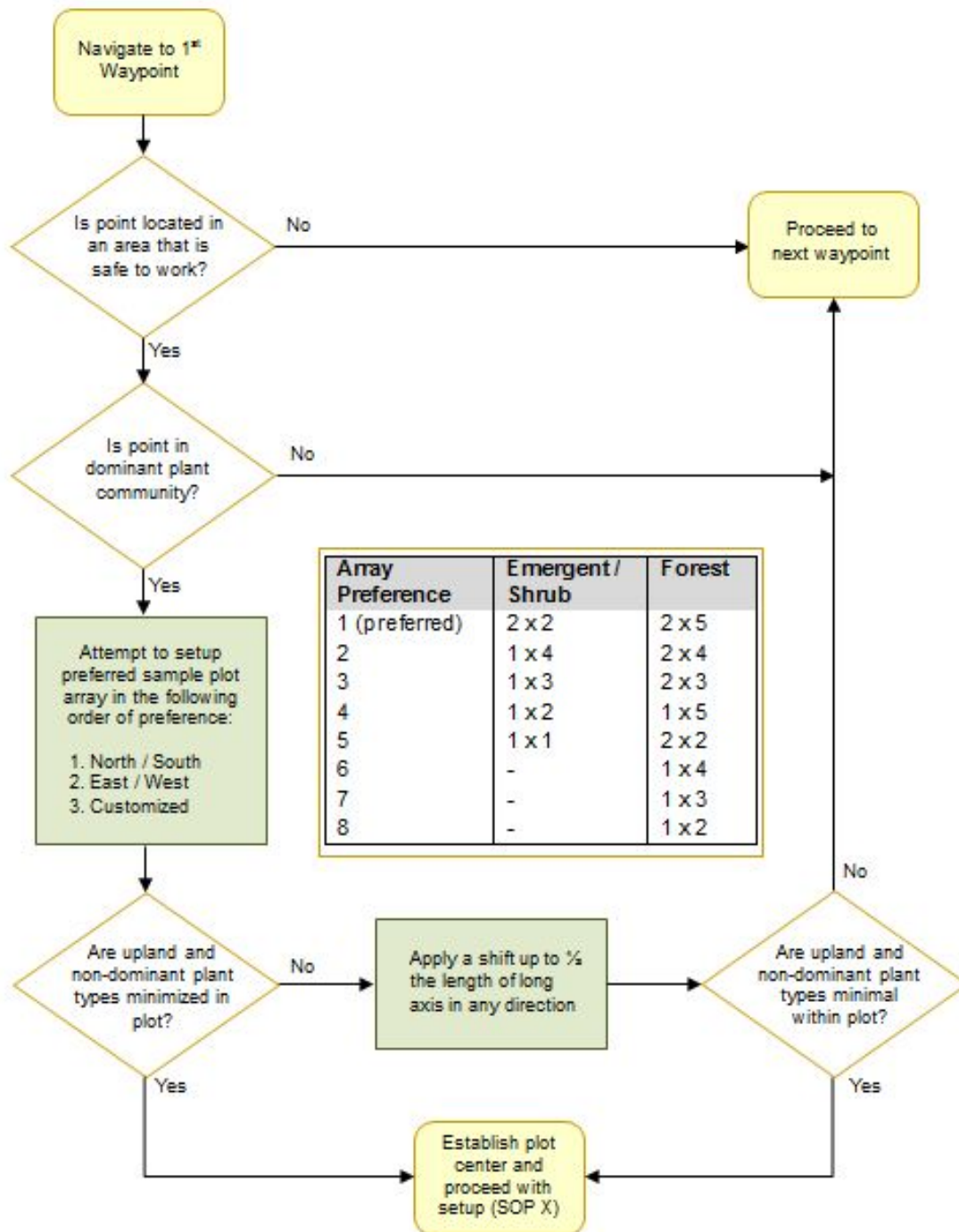


Figure 5.2. Flowchart for sampling array (SA) placement in intensively assessed wetlands. Up to ten points were visited in random order. We first followed the flow chart using the preferred SA of 10m x 10m modules for emergent/shrub or forested wetlands. If all points were exhausted and the preferred array did not fit within the wetland, we followed the same procedure using arrays of different sizes in a preferred order until we found a point that met the desired SA conditions.

Table 5.1. List of 60 survey wetlands, identified by PlotID, and showing number of modules, dominant vegetation type, azimuth of the center line, module array shape, and coordinates (UTM Zone 19 N, NAD 1983).

Plot Number	PlotID	Dominant Veg. Type	Azimuth Center Line	Array	X_Coord	Y_Coord
1	28	emergent	0°	2 x 2	451777.581025	4556542.604980
2	29	emergent	0°	2 x 2	451744.953057	4556417.829690
3	30	forested	0°	2 x 2	451567.317857	4556481.756470
4	32	emergent	0°	2 x 2	451701.756513	4556610.150200
5	39	emergent	154°	1 x 1	450669.051872	4558116.003000
6	43	emergent	0°	2 x 2	451012.282593	4558823.953720
7	56	emergent	0°	1 x 1	450705.570784	4558052.159670
8	192	forested	0°	2 x 4	454624.701284	4568648.855750
9	305	scrub-shrub	0°	2 x 2	451364.481121	4563056.698940
10	306	forested	0°	2 x 5	451638.873953	4562915.342010
11	307	scrub-shrub	0°	2 x 2	451649.450593	4563096.249790
12	309	emergent	0°	1 x 4	452040.173794	4562811.307580
13	310	forested	0°	2 x 5	451875.898721	4562600.682300
14	311	forested	24°	2 x 2	451654.102625	4562718.043840
15	317	emergent	13°	1 x 1	452850.252642	4563056.045760
16	343	emergent	35°	1 x 4	452409.010402	4562153.677500
17	351	emergent	15°	1 x 4	453854.080355	4565508.463170
18	363	emergent	0°	2 x 2	451921.862369	4560185.249210
19	413	emergent	0°	2 x 2	451164.030689	4571937.473220
20	416	forested	0°	2 x 2	451122.701409	4572508.956740
21	422	forested	47°	1 x 3	450723.714912	4572133.494470
22	623	forested	90°	2 x 5	456680.706150	4566818.020030
23	627	forested	0°	2 x 5	456457.029478	4566936.435270
24	669	emergent	282°	1 x 4	456382.839782	4567221.824830
25	676	forested	90°	2 x 3	455713.429093	4566435.258940
26	692	forested	19°	1 x 2	455246.545893	4568347.035330
27	697	emergent	100°	1 x 1	455021.954148	4569147.234500
28	743	forested	72°	1 x 4	450104.692704	4570065.576640
29	748	forested	142°	1 x 1	450527.364320	4570521.015490
30	867	forested	342°	1 x 5	453773.423843	4569071.938760
31	885	emergent	0°	2 x 2	454596.012004	4570635.722050
32	887	forested	90°	2 x 5	454423.620708	4570653.665730
33	889	forested	280°	2 x 5	454343.165028	4571188.327370
34	927	forested	30°	2 x 5	450161.365984	4573601.061580
35	939	forested	90°	2 x 5	449017.253343	4571730.991810
36	941	emergent	290°	1 x 4	450207.123808	4572417.442500
37	947	emergent	0°	2 x 2	448799.970398	4574860.206660
38	950	forested	48°	2 x 2	449111.307487	4574445.562570
39	951	emergent	335°	1 x 2	449294.112991	4574414.774220

Table 5.1 (cont.). List of 60 survey wetlands, identified by PlotID, and showing number of modules, dominant vegetation type, azimuth of the center line, module array shape, and coordinates (UTM Zone 19 N, NAD 1983).

Plot Number	PlotID	Dominant Veg. Type	Azimuth Center Line	Array	X_Coord	Y_Coord
40	953	emergent	0°	1 x 1	449873.339743	4573945.344460
41	957	emergent	0°	2 x 2	447986.716766	4573651.887050
42	970PV	forested	320°	2 x 5	449911.815264	4578266.878800
43	1007	emergent	331°	2 x 2	453053.023714	4580239.639370
44	1017	emergent	43°	1 x 3	454069.788643	4580087.319760
45	1034	forested	34°	1 x 1	452024.840162	4580873.768780
46	1036	forested	0°	2 x 2	454279.313892	4582030.014420
47	1058	forested	0°	2 x 2	449573.221087	4579978.605010
48	1068	emergent	0°	2 x 2	448833.754591	4580355.474000
49	1069	emergent	0°	2 x 2	448920.449247	4580681.236810
50	1070	emergent	317°	1 x 1	448956.769247	4580865.931210
51	1079RS2	emergent	0°	2 x 2	447083.081309	4582432.915790
52	1188	emergent	0°	2 x 2	455060.180708	4566663.475140
53	1196	emergent	0°	2 x 2	455166.456292	4566309.502780
54	1205	forested	162°	1 x 1	450575.992032	4558387.495350
55	1221	emergent	0°	2 x 2	453719.447523	4569918.084040
56	1351	forested	0°	2 x 2	452025.379682	4572319.294020
57	1364	emergent	0°	2 x 2	450720.061664	4574064.138700
58	1468	emergent	0°	2 x 2	449315.453535	4573663.379270
59	1485	emergent	352°	2 x 2	452570.421730	4581354.468300
60	1104(1620)	emergent	38°	1 x 3	449206.282591	4579936.302030

Attachment 5.1. Site Establishment Datasheet

Form A-1

Site Establishment Datasheet for Wetland Monitoring

Park:				Evaluator (s):			
A. General Site Information							
Directions to the Wetland (include X, Y coordinates):							
Latitude (X)				Longitude (Y)			
1	Sample Type: (Base or Oversample)			6	Approx wetland Size:		
2	Site ID:			7	Natural or Mitigation:		
3	Circle Visit Type: (if revisit, please indicate which)		1 st visit: Revisit:	8	Dominant Plant Community (Table 1)		
4	Access Permission Requirements:			9	HGM Class: (Table 2)		
5	GPS File Name: (Delineation)			10	Percent Invasive Cover:		
B. Plot Setup and Demarcation							
11	Establishment Date:			12	*Plot Setup Scenario Number: (1-4)		
13	Plot Selection Details			Shifted Centroid		Final	Comments
WP	** NS Code	Centerline Az	Distance	Azimuth	Array	Mod (l x w)	
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
*Possible Plot Setup Scenarios				**Non-Sample Codes (NS Code)			
1 The wetland was an emergent, aquatic bed, or shrub-scrub plant community and a standard 2x2 array of 10x10-m modules fit within the wetland.				i The plot includes areas judged to protect significant cultural or natural resources.			
2 The wetland was a forested plant community and a standard 2x5 array of 10x10-m modules fit within the wetland.				ii The plot is located in an area in which observers can not safely work.			
3 If the wetland was an emergent, aquatic bed, or shrub-scrub plant community but a standard 2x2 array of 10x10-m modules did not fit within the desired community type (even after shifting), the following procedures were followed to customize the array and/or plot size.				iii The plot, if located on private lands, could not be accessed with permission from the landowner.			
4 If the wetland was a forested plant community but a standard 2x5 array of 10x10-m modules did not fit within the desired community type (even after shifting), the following procedures were followed to customize the array and/or plot size.				iv The plot, once established around the centroid, did not fall entirely within the dominant vegetation type.			
Additional Comments:							

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Form A-1
Site Establishment Datasheet for Wetland Monitoring

Table 1. Plant Community Modifiers for Ohio Wetlands (Table 8b, Mack 2007). Highlighted communities are not known to occur in CUVA.

1	Forest	2	Emergent	3	Shrub
<i>a</i>	<u>Swamp Forest</u>	<i>a</i>	<u>Marsh</u>	<i>a</i>	<u>Shrub Swamp</u>
(i)	oak-maple	(i)	submergent marsh	(i)	buttonbush swamp
(ii)	oak-maple-ash	(ii)	floating-leaved marsh	(ii)	alder swamp
(iii)	maple-ash	(iii)	mixed emergent marsh	(iii)	mixed shrub swamp
(iv)	pin-oak	(iv)	cattail marsh	(iv)	other (specify)
(v)	pumpkin ash	<i>b</i>	<u>Wet Meadow</u>	<i>b</i>	<u>Bog shrub swamp</u>
(vi)	mixed forest	(i)	wet prairie	(i)	tall shrub bog
(vii)	red maple	(ii)	oak openings sand prairie	(ii)	leatherleaf bog
(viii)	white pine	(iii)	prairie sedge meadow	<i>c</i>	<u>Tall Shrub Fen</u>
(ix)	cottonwood	(iv)	fen		
(x)	river birch	(v)	reed canary grass meadow		
(xi)	other (specify)	(vi)	other (specify)		
<i>b</i>	<u>Bog Forest</u>	<i>c</i>	<u>Sphagnum Bog</u>		
(i)	tamarack bog				
(ii)	tamarack-hardwood bog				
<i>c</i>	<u>Forest Seep</u>				
(i)	skunk cabbage seep				
(ii)	sedge seep				
(iii)	skunk cabbage-sedge seep				
(iv)	other (specify)				

Table 2. Hydrogeomorphic Classes for Ohio Wetlands (Table 8a, Mack 2007). Highlighted classes are not known to occur in CUVA.

Class	Class modifiers		Comments
I	Depression	A B	Surface water (sheet flow, precipitation) Ground water (seasonal to permanent input)
II	Impoundment	A B	Beaver Human
III	Riverine	A B C	Headwater depression (1 st or 2 nd order) Mainstem depression (3 rd order or higher) Channel
IV	Slope	A B C	Riverine Isolated Fringing
V	Fringing	A B	Reservoir Natural lake
VI	Coastal	A B C D E F G	Open embayment Closed embayment Barrier-protected River mouth (barred and open) Diked – managed Diked – unmanaged Diked – failed
VII	Bog	A B C	Strongly ombrotrophic Moderately ombrotrophic Weakly ombrotrophic
add code	Mitigation	mr mc	Add appropriate pre-code to HGM class Mitigation, restoration Mitigation, creation

Form A-1
Site Establishment Datasheet for Wetland Monitoring

C. Site Sketch

Please provide a sketch to highlight key features at the established site. At a minimum, include the plot boundary, position of the final sample point centroid, the Assessment Area boundaries, bearings and estimates of important distances (e.g. shifted plots), environmental gradients (e.g. water bodies, slopes) a north-arrow, general plant community types, and key witness features / attributes)

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