

Surveys

Survey protocol

Prior to commencement of a survey, an orthophotograph of the area will be obtained and loaded into Arcview (GIS). An outline of the water body will be digitized and used to create survey points every 1 square acre. Navigational maps will be generated for the field crew, as well as points loaded into several Garmin GPS units.



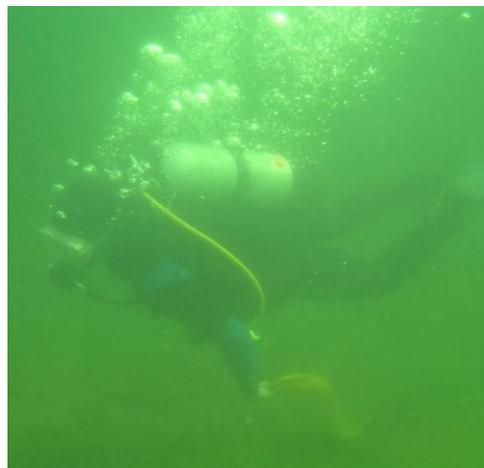
The survey will be conducted using an 18 foot Airboat. The pilot will navigate to each survey location using the pre-loaded GPS unit and a rake sample will be collected. Each rake sample will have the presence or absence of a species recorded on a datasheet. Depth, Percent Cover, Milfoil Density, and Sediment Type will also be noted.

After the survey data has been collected, data will be compiled and loaded into Arcview (GIS). Data can then be used to provide distribution and density information.

Ideal timing for surveys vary depending on lake, most can be completed between June and August. Survey schedules are coordinated with the project manager.

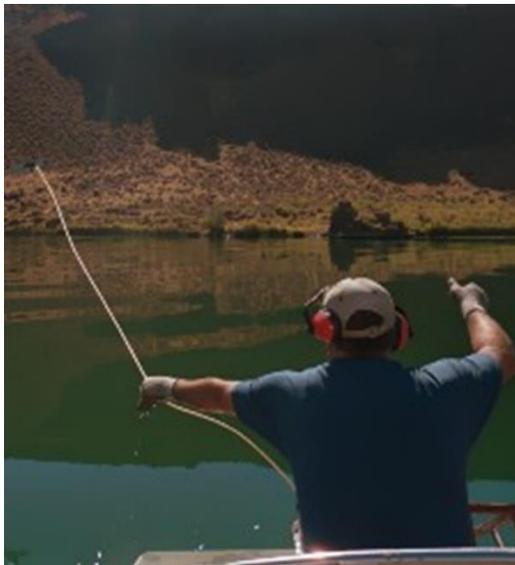
A typically post treatment surveys are scheduled in September.

In order to identify EWM and other exotic plant populations, a survey of the lake's entire littoral area is conducted. The littoral zone is defined as the shallow area near the shore of a body of water that extends from the shoreline lakeward to the limit of occupancy of rooted plants. This survey may be conducted from a boat using rake throws and/or underwater viewers, by



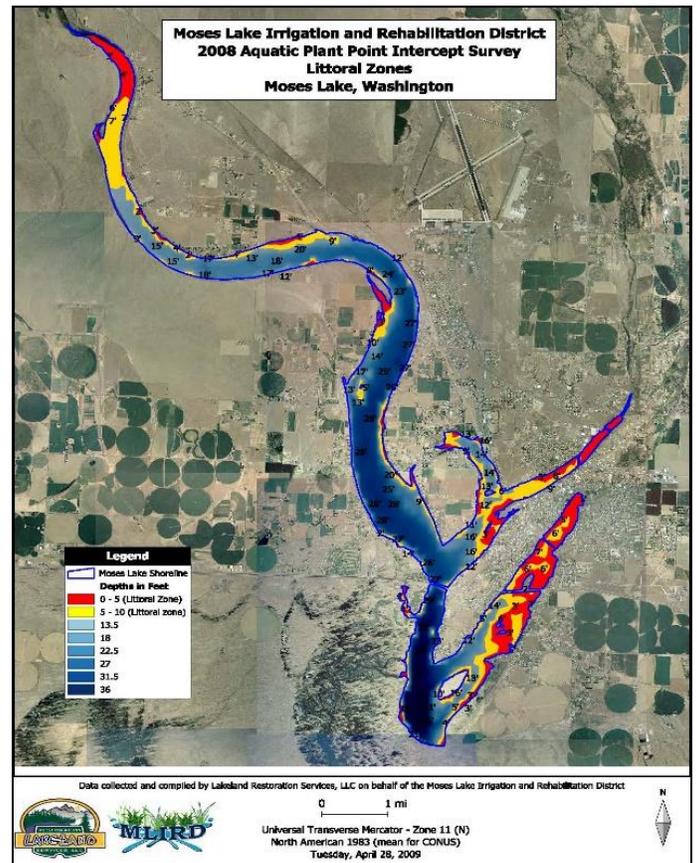
snorkeling, or by SCUBA divers. The entire littoral zone is surveyed by navigating in a regular pattern so that the entire bottom is observed.

Rake throws are used to check for EWM in areas with limited visibility. As water clarity decreases, the frequency of rake sampling increases. Special attention is paid to boat ramps. When EWM or other exotic aquatic species are found, the GPS location is recorded, the area of EWM growth outlined with the GPS, the percent EWM cover estimated. Cover estimates will be recorded as either dense, sparse or no EWM cover. When the bottom cannot be seen underwater viewers and rake throws are used to determine the percent of cover. Also noted with GPS coordinates the location of invasive emergent shoreline plants as they are detected (purple loosestrife, garden loosestrife, phragmites, yellow iris, tamarisk, Russian olive, etc.).



Point Intercept Survey

The point intercept method is a relatively quick and effective way of quantifying the distribution and frequency of aquatic vegetation. Points are pre-selected and are placed in a regularly spaced grid or at random points on a GIS generated map of the water body. Sampling in this manner tracks changes over time in the aquatic plant community by repeatedly returning to the same points for sampling (Madsen 1999). A point intercept survey of a body of water is typically conducted in two person teams. One person navigates the boat with a GPS to the proper point and a second person makes observations. Upon arrival at a sampling point, the depth is recorded and, if possible, the sediment type (mud, sand, rock or organic) determined. The water over the side of the boat is observed using the same side of the boat every time. Species observed from the surface within the area are recorded on a data sheet. A sample rake is used in areas where the bottom cannot be clearly seen. Samples are taken with two rake throws in a crossing pattern within the 1m x 1m sampling area and record all additional species (Parsons et al. 2001). Note any EWM that is observed while traveling between sampling points and record the GPS coordinates.



A species is only recorded once at each sampling point, even if it is observed multiple times on the surface and in rake throws. The data sheets are arranged with all suspected species listed across the top and sample coordinates listed in the left column. When a species is found, a one (1) is marked in the appropriate column for that species. A zero (0) is entered to indicate the absence of a species at that point. Spaces are available for listing new species as they are found. A column is provided to list various physical stages of EWM in order to gage the effectiveness of treatments. A scale of one through five is used to record the status of plants observed. Five indicates no live EWM present, four indicates only a small sprig of EWM (very little live EWM present), three indicates sparse EWM (plants appear stressed, sparse growth, no plants on the surface), two indicates EWM, but not on the water surface (some plants appear distressed but fairly healthy, no plants on the surface) and one indicates EWM on surface (plants appear fairly healthy with little or no apparent control effects, plants on water surface). In addition, a column will be provided for a cover estimate. Cover will be reported as either dense, sparse, or no EWM cover.

In small lakes pre- and post-treatment point intercept surveys are conducted over the entire water body. The pre-treatment survey will be conducted before treatments are applied, preferably within several weeks prior to treatment. The post-treatment survey will revisit the same points and should be conducted late in the year (late August or September) in order to assure the maximum treatment effect is observed. In small lakes the pre-treatment survey can be conducted concurrently with the littoral survey.

Surveys conducted in large lakes that receive EWM treatments may have two types of point intercept surveys completed.

Pre/Post-Treatment Point Intercept Survey: The pre/post-point intercept survey will consist of multiple sampling points arranged in areas where EWM treatments are planned. The points will be established in the treatment areas and will be monitored before and after treatments in order to quantify treatment effects (Madsen 2006). Points will be arranged in either a regular grid pattern or in a random distribution, depending on the size of the treatment area.

Sample Point Survey Log

Lake	Date of Survey	# of Points Surveyed	EWM	Phragmites	Purple Loosestrife	Yellow Flag Iris
Anderson Lake	8/17/2013	247	28 ac.			
Black Lake	8/16/2013	199	13 ac.		2 pts.	
SE and western infestations						
Blue Lake	8/17/2013	171	40 ac.	1 pt.		
southern infestation	1 pt.					
SW infestation						
Cave Lake	8/15/2013	372	272 ac.		3 pts.	
NW infestations						