

Protocol for identifying/georeferencing the marsh edge - written by C. Field, January 2013

Each transect into the upland (see plot schematic) starts at a point located at the transition between salt marsh and upland vegetation. Identifying and creating a long-term record of this location with the greatest possible accuracy and precision is a top priority, as this information will be used to look for evidence of past marine transgression and will ensure that we have an accurate baseline that will allow us to make comparisons in the future. The first part of this SOP deals with identifying the marsh edge in the field, and the second part deals with georeferencing this location with the greatest possible accuracy and precision.

Identifying the marsh edge

We define the marsh edge according to vegetation because 1) we are primarily interested in monitoring how plant community composition changes across the transgression zone, and 2) it is likely that shifts in vegetation are the indicator of transgression that is most relevant to wildlife.

We define the marsh edge as the seaward frontier of upland vegetation. For Long Island Sound, we define upland vegetation as any plant NOT listed in Table 1 of the **Salt-marsh vegetation transect SOP**.

After navigating to your best estimate of where the point is located (accepting some error from the GPS unit), use the compass to identify the bearing of a transect that is perpendicular to the marsh edge. Record the bearing (relative to magnetic north) on the georeferencing datasheet. Within 2m on either side of this transect, find the southern-most stem of upland vegetation. Place the flagged PVC on the transect line directly perpendicular to the identified stem and take a GPS reading (see below).

Georeferencing the point

The best strategy for georeferencing the point will depend on the GPS equipment being used. To be sure we can properly quantify the error in the estimated point coordinates, it is important to keep a record of what equipment is used and the details of the procedure on the georeferencing datasheet. All measurements should be taken in NAD83, UTM 18N.

When using a Trimble w/ external antenna: Details will depend on 1) what software/routines are being used on the handheld computer to correct biases and increase precision, and 2) what post-processing will be used. Whatever combination of routines is used, it is important to attain sub-meter precision; sub-decimeter precision should be possible under most circumstances. One way to achieve this is to mount the external antenna in the PVC point marker and take a reading for at least 10 minutes.

When using consumer-grade GPS units: If consumer-grade GPS units are being used, it is essential to use the point averaging feature, which is available on most GPS units released in the last few years. Point averaging should be done for at least 10 minutes (this can be achieved by leaving the GPS on the point marker while surveying the transect). Most GPS units released in the last year also have the option of taking multiple point-averaged samples over time. By spacing the samples over time (greater than 90 minutes), the GPS will correct for the error that arises because of the specific configuration of the satellite constellation when the sample was taken. When using a GPS unit without the ability to take multiple samples, precision can still be gained by taking multiple samples over time (e.g. at each visit to the transect) and recording the coordinates from each visit on the georeferencing datasheet. If the GPS is WAAS-enabled or has some other type of real-time differential correction, C. Field has a script in R that can be used to post-process data from multiple readings to increase precision and estimate the uncertainty of latitude and longitude. Be sure to also record the estimated precision of the GPS unit when each sample is taken - usually visible right before or after a waypoint is recorded. (It is important to note that the precision displayed on most consumer-grade GPS units is a 68.3% confidence interval, so to get a sense of the 95% confidence interval you should multiply the displayed estimated by 1.98.)

One way to improve precision when using consumer-grade GPS units is to avoid taking measurements when the “dilution of precision” (DOP) is high. DOP is a multiplier that decreases the estimated precision to account for uncertainty arising from the specific array of satellites available at any given location and time. Trimble has free software that shows the DOP for any location for a stretch of time: <http://www.trimble.com/planningsoftware.shtml>. We are only interested in the “horizontal” DOP because we are not taking elevation or speed measurements (Figure 1).

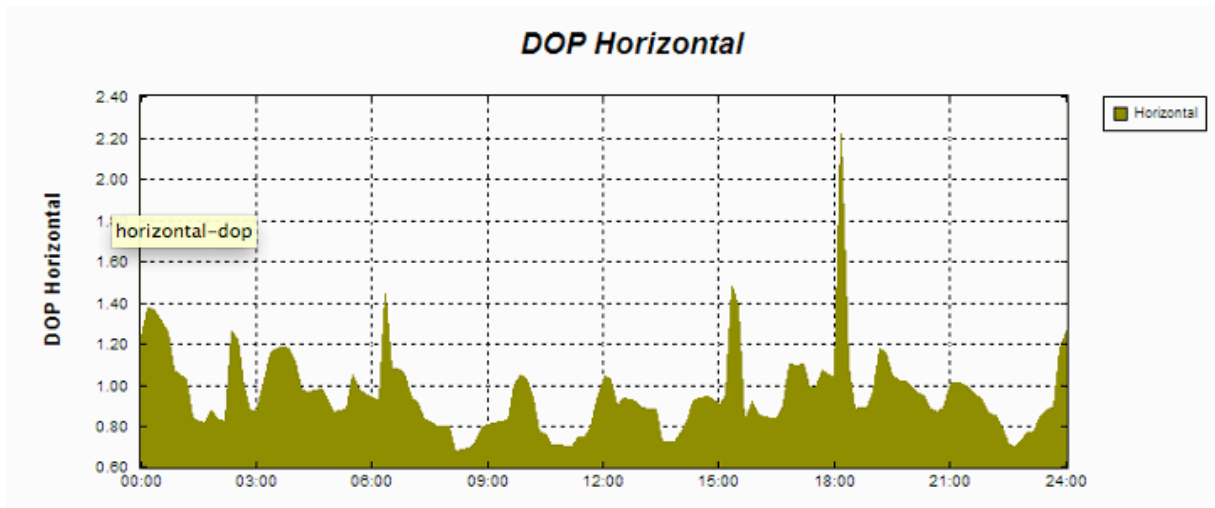


Figure 1. The horizontal component of DOP for one location over time. In this case, it would be good to avoid taking GPS measurements at this location at 18:00.