Manual for the
Nearshore Assessment Tool for Alaska: Southeast
(NATAK-SE version 1.0)

Southeast Alaska Land Trust
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Contents

1.0 Introduction

1.1 General Description

The Nearshore Assessment Tool for Alaska: Southeast (NATAK-SE) is a standardized protocol for rapidly assessing the habitat and functions of a particular marine or estuarine shore segment (intertidal zone and immediately adjoining upland) anywhere in Southeast Alaska. It consists of data forms and a spreadsheet. It has a **Rapid** component and a **Biosurvey** component. Both can be completed during a one-day visit to a shore segment. Only the Rapid protocol should be used if the user lacks skills at basic identification of seaweeds and macroinvertebrates. Use of the Biosurvey protocol, which adds to the information provided by the Rapid protocol, is recommended for persons who do have those identification skills because it provides a more accurate and meaningful assessment. Rapid assessments of vegetated tidal *wetlands* (salt marshes) should be done with a separate tool developed by the author for the Southeast Alaska Land Trust (SEAL Trust), called WESPAK-SE Tidal Calculator. For all other intertidal habitats (rocky shores, gravel flats, sand beaches, etc.), NATAK-SE is the appropriate tool.

At the scale of a shore segment mapped by the NOAA ShoreZone Program, NATAK-SE is intended to provide a preliminary indication of the relative diversity and importance of the segment as habitat for several biological resources and ecological functions. NATAK-SE does so by providing a consistent platform for summarizing and applying existing natural resource information as well as providing a practical approach for collecting and processing new data. This allows comparison with reference data collected previously using both the Rapid and Biosurvey components of NATAK-SE at 47 shore segments throughout the region.

During a single visit around the time of daily low tide, NATAK-SE users answer 16 questions based mainly on their observations. In addition, 13 questions are answered using online resources prior to the visit, and additional data are pasted into the spreadsheet from a reference table. NATAK-SE then automatically generates scores on a scale of 0 (lowest capacity or function) to 10 (highest) which reflect seven attributes of the shore segment: Food Web Diversity, Focal Fish Habitat, Sea and Shore Bird Habitat, Pinniped Habitat, Buffer Habitat for Wildlife, Subsidy Function, and Filter Function. The scores are automatically compared with (normalized to) those from the statistical sample of 47 other shore segments in the region. No "overall" score is computed. Shore segments that may differ with regard to substrate type, salinity, wave exposure, human disturbances, and other factors can be compared.

The scores and supporting documentation can be used to help evaluate applications for new structures (e.g., piers, bulkheads, bridges) within all or part of a shore segment, or can be used with other tools to help prioritize conservation or restoration opportunities. In addition, this study's consistently-collected survey data on seaweeds and intertidal macroinvertebrates provide a baseline for future use assisting evaluations of major trends in these resources.

1.2 Background

The author developed this tool for the Southeast Alaska Land Trust (SEAL Trust) in support of its In-Lieu Fee (ILF) Program. SEAL Trust's ILF Program was revised in 2011 to comply with the Final Rule for *Compensatory Mitigation for Losses of Aquatic Resources*, which was published in the Federal Register on April 10, 2008. This NATAK-SE tool is one of two rapid assessment tools funded by a CIAP grant (Coastal Impact Assistance Program, U.S. Fish & Wildlife Service, through the Alaska Department of Commerce, Community, and Economic Development). The other tool (WESPAK-SE) by the same author (Adamus 2015) focuses exclusively on vegetated wetlands (tidal as well as non-tidal) and similarly features a spreadsheet calculator that computes scores which indicate the relative degree to which various functions may be performed by a particular wetland. SEAL Trust, in consultation with many agencies, is currently developing guidance for rolling up WESPAK-SE scores into a single score for a wetland, and then combining that score with other information to help determine mitigation credits and debits. In parallel, scores from NATAK-SE might be used to help calculate credits and debits for a particular non-wetland shore segment if necessary to compensate for proposed impacts. Ideally, roll-up procedures similar to those approved for wetlands based on WESPAK-SE would be used.

Coastal resources worldwide are being subjected to numerous impacts. Although many habitat classification systems have been proposed for coastal environments, including Southeast Alaska (Schoch et al. 2013), apparently no standardized science-based tool existed prior to NATAK-SE for rapidly assigning relative scores to diverse resources of an intertidal site or shore segment of any type using a combination of existing spatial data and original field data. The author and colleagues drafted and field-calibrated a conceptually similar spreadsheet tool for nearshore resources in a portion of Puget Sound (Adamus et al. 2015) but due to unexpected loss of funding that tool was not completed. A Habitat Equivalency Analysis (HEA) was conducted by an interagency group for a Sitka Airport project affecting intertidal and subtidal habitat, but did not result in a rapid standardized tool which could be used anywhere in the region.

Regional assessments which mainly relied on existing spatial data to assess historical impacts and current threats to nearshore habitats at a broad scale (rather than site-specifically) include a *Conservation Action Plan (CAP) for Estuarine Ecosystems of SE Alaska* by Baker et al. (2011), an ongoing Alaska Coastal Assessment as part of NOAA's *National Fish Habitat Assessment Plan*, and various oil spill contingency/sensitivity planning documents.

Surveys of multiple biological resources throughout Southeast Alaska have included:

- the 2004 survey of invertebrates and fish in subtidal waters and sediments, by the Alaska Department of Environmental Conservation and US Environmental Protection Agency (Dasher & Lomax 2011).
- the NOAA ShoreZone surveys of seaweed, macroinvertebrate, fish, and vascular plant species at 81 intertidal locations, each sampled once during the period 2005-2008: Shore Stations database online at: https://alaskafisheries.noaa.gov/mapping/szflex/
- the NOAA surveys of intertidal and subtidal fish species at 66 locations in the region (27 Northern Inside, 17 Northern Outside, 10 Southern Inside, 12 Southern Outside) by Johnson et al. 2012.

Development of NATAK-SE first involved identifying and reading technical literature on nearshore marine, intertidal, and marine riparian habitats of Southeast Alaska. A bibliography with 197 citations (sortable by resource topic) was constructed in an Excel spreadsheet and is available upon request. The author then created the rudiments of the NATAK-SE calculator for discussion by 20 topic experts during a structured workshop hosted in November 2015. Information gained from that workshop was used to refine and expand the calculator.

Next, in order to calibrate a draft of the tool to actual conditions in the region, a series a shore segments needed to be assessed. Because the data from these would become the standard against which future assessment scores would be judged, it was imperative to minimize bias in their selection. To inform the selection process, existing spatial data with resource themes potentially relevant to this tool were queried using GIS by Dave Albert and Colin Shanley of the Juneau Office of The Nature Conservancy. The resulting Excel database quantifies over 50 attributes of each of Southeast Alaska's 88,677 shore segments and is available upon request.

Using that database, the author implemented a statistical procedure (k-means cluster analysis) to objectively select 50 geographically-distributed shore segments, one segment per cluster. This procedure has been used by other scientists to select sample sites elsewhere in Alaska (Hoffman et al. 2013) and defines clusters based on similarity using characteristics compiled with a spatial data query. Specifically, we defined clusters by their coastal ("BC") class (sediment type, slope, exposure), estuarine class and subclass according to Schoch et al. 2013, extent of four major biobands (from ShoreZone), river intersection, and a coarse-scale human disturbance index (provided by The Nature Conservancy). The k-means data processor was instructed to define no more than 10 clusters in the Yakutat area and 40 in the remainder of the region because we determined that no more than 50 shore segments could be visited and assessed during the single summer available for this field effort. Yakutat-area shore segments were clustered separately from the rest due to incomplete spatial data for some clustering variables in that area.

Ultimately, between May 15 and August 30, we were able to visit and assess one representative of each cluster except for two clusters in the Yakutat area. With regards to coastal class, we were able to survey 27 of the 32 classes (see Appendix C for details). Due to budget constraints, nearly all segments had to be accessible by road; the few remaining were accessed by boat. The assessed segments were mostly near Petersburg (9), Juneau (8), Yakutat (7), Chichagof Island (6), Prince of Wales Island(5), Haines (5), Sitka(4), and Yacobi Island (3). Sample sizes are enumerated by coastal class and other characteristics in Appendix C.

Biological data were entered and compiled to yield estimates of macroalgal and macroinvertebrate species richness by segment, transect, and zone (low, mid, and high intertidal). Many other ecologically relevant attributes (e.g., salinity) of the visited segments were measured on-site or from aerial imagery and are included in an Excel database available upon request.

This project was conceived by Diane Mayer, a former director of SEAL Trust, to help support the Trust's responsibilities for in-lieu-fee mitigation throughout Southeast Alaska. The field biosurveys were conducted by a trained crew mostly comprised of combinations of the following people: Patricia Harris (SEINT Consultants), Paul Adamus (Adamus Resource Assessment, Inc.), Katie Ashbaugh (SEAL Trust intern), and Stacy Shutts (SEAL Trust intern). In addition, Allison Gillum (Director, SEAL Trust), a volunteer (Dr. Adelaide "Di" Johnson), and three undergraduate student observers assisted with non-biological measurements at some of the segments. The NATAK-SE calculator was designed and constructed by Dr. Paul Adamus of Oregon State University (Marine Resource Management Program) under a contract between SEAL Trust and his consultancy (ARA, Inc.).

2.0 How to Use the Rapid Protocol

Here are the steps to follow:

1. Determine the PHY_IDENT of your shore segment. To do so, go online to **http://seakgis.alaska.edu/flex/wetlands/** In the menu on the right, scroll down and check the **ShoreZone** box, then expand the ShoreZone menu by clicking on the "+". Scroll down and check **Units**. Then in the map portion, navigate to your site and notice the rectangular box that bounds it. That is its **shore segment**. At the top of the web page, click on the

Identify icon, then click on the shore segment. A pop-up Identify box will contain an item called PHYS_IDENT. That is your shore segment ID -- write it down.

2. Open the separate but related file you downloaded called **DBpaste**. Find the row containing data for your shore segment by inserting its PHY_IDENT in the Find (CTR-F) tool. Going across that row, copy all the data (except the PHY_IDENT) and open the tab (below) in this NAT-SE Calculator file called **1_FormDB**. Paste the data you just copied from the other file into column C of this file using the TRANSPOSE command (see Figure xx in Appendix A if you're unfamiliar with that command).

3. Open the **2_FormM** worksheet tab. For each indicator (row), make the measurement described in the last column. Enter the numeric code associated with it (choices from column C) into column D. See Appendix A for more-detailed illustrated instructions for making the measurements.

4. Check local tide tables and plan to arrive at your shore segment at least 1 hour before the daytime low tide. In addition to a clipboard and the usual field gear, bring **Form F** (see Appendix B) and if possible, a tool to measure salinity, e.g., a refractometer.

5. Answer the questions on the printed copy of Form F, then enter those responses in the **3_FormF** worksheet when you return to the office. Also, where your on-site observations indicate inaccuracies in data you entered into **1_FormDB** and **2_FormM** (steps 2 and 3 above), edit that information. Fill out the information requested in the header at the top of the RESULTS worksheet.

6. If you will <u>not</u> be using the Biosurvey Protocol, you can find the scores resulting from only the Rapid assessment in the **RESULTS** worksheet, **column D**.

7. Save the file (SaveAs) after appending the segment ID or another unique identifier to the file name. If you do another assessment, same segment or a different one, clear the previous data on in the worksheet columns before entering new data, and give the new assessment a different file name when saving it.

3.0 How to Use the Biosurvey Protocol

The Biosurvey Protocol requires at least 2 persons surveying three transects which run perpendicular to the shore, beginning at marine water (where it exists at low tide) and extending upgradient to the annual high water line, usually represented by the tree line or a road (Figure xx).

When implementing the Biosurvey Protocol, first complete steps 1-3 of the Rapid protocol and print the completed data forms, DB and M. Then follow the instructions below. These steps were followed for all shore segments where this protocol was calibrated in 2016, so in order to make your data comparable, it is essential to follow these steps closely.

1. Using GoogleEarth or another source, write down the shore segment's length (in meters) and divide by 4. If the number is less than 100 m, that will be the separation distance between your three transects. If the number is equal or greater, use 100 m as the separation distance. Also using GoogleEarth or another source, write down the coordinates of the segment's approximate midpoint and the coordinates for the beginning of the route you'll take to get safely from your vehicle or boat landing to the shore segment.

2. If possible, schedule the biosurvey for a day with a *negative* daytime low tide. You must arrive at least one hour before that time. In addition to the items noted in #4 above, take quadrat frame, meter tape, shovel, GPS, salinity-measuring instrument, marker flags or other bright objects, data forms, and a printed aerial image of the shore segment. The quadrat frame, which you can make from narrow PVC pipe or wood, should have dimensions of 1 meter x 1 meter. The subquadrats that you'll survey within that can be marked off with tape or by marking the PVC.

3. Use a GPS to navigate to the shore segment. Locate and mark one transect at a distance from either of the shore segment's ends which is equal to one-quarter of the shore segment's length. Locate a second transect that same distance from the first, but in no case more than 100 m from the first, and mark it. Locate the third transect similarly. Transect placement

should be adjusted to avoid unsafe conditions, but do not attempt to align transects so as to hit "more representative" areas or "more interesting" microhabitats such as tide pools.

4. Near the time of low tide, photograph the intertidal area parallel to the shore and measure salinity. Measure salinity as far as possible from freshwater streams and seeps that intersect the segment. Measure it about 0.5 m below the water surface, especially if raining. Note if the water appears cloudy from glacier water or other factors. Repeat at or near the time of high tide.

5. Because tides will be incoming during your survey, it will normally be most efficient to set up your transects as you conduct your survey rather than all at once when you first arrive. The survey on each transect will consist of (a) enumerating mussels, clams, periwinkles, and limpets in 3 quadrats with subquadrats, and estimating the associated cover of seaweed, (b) estimating worm density by excavating if possible 3 shovel-fulls of sediment (approximately 0.005 cubic meters), and (c) recording all seaweed and macroinvertebrate taxa encountered within approximately 1 meter on either side of the transect.

6. Although it will require more walking, attempt to survey the Low zones of all three transects before beginning the three Mid zones and finally the three High zones, as tide moves in. Spend about 30 minutes in each Low and Mid zone, adjusting that search time to reflect the zone length and substrate complexity. The Low zone begins in the water where it is present at or near the day's low tide, as deep as you can safely walk and view macroinvertebrates and/or underwater plants. In this region, the Mid zone often begins where large flat-bladed seaweeds such as *Alaria* kelp are no longer present and popweed (*Fucus* seaweed) and/or blue mussel become predominant. The High intertidal zone usually begins where barnacles became sparse or absent, or where other indicators suggest that tidal inundation does not occur daily, on the average. We acknowledge that our definitions of intertidal zones do not conform to those used by some biologists. Record the distance from the bottom of the transect to the approximate start of the Mid and High intertidal zones and the HHW line (highest point reached by tides at least once per year) or tree line. Measure all distances from the low-water beginning point of the transect. Record those distances at the top of the RESULTS Form.

7. On each transect, place one **quadrat** at the beginning (bottom) of each zone on the left side, or if not possible, then within another area that is most representative of the zone. In the 0.5 x 0.5m quadrat, estimate seaweed cover to the closest 5%, excluding encrusting forms. In the 0.25 x 0.25m subquadrat, record the number of mussels and the number of barnacles. In the 0.125 x 0.125m subquadrat within the 0.25 x 0.25 m subquadrat, record the number of periwinkles and number of limpets. You may push aside seaweed that obscures viewing these animals. Also include animals you can see attached to the side of rocks within the quadrats

8. On each transect and within each zone, dig a **pit** in sandy or mud substrate in an area that is unflooded at the time of visit, and as close to the quadrat as substrate texture allows. If digging is precluded by boulders, bedrock, or densely-rooted marsh vegetation, note that fact on the data form. However, substrate suitable for digging a pit can often be found beneath moveable rocks within a few paces of a transect if not on it. As you remove the sediment from each pit, spread it out on a plastic sheet and go through it slowly, searching for and counting any worm longer than about 0.5 cm. If present, note anoxic conditions in sediments by a sulfur smell and/or grayish-black sediment color.

9. While walking through each of a transect's zones after completing its quadrat and pit counts, record the number of **sea stars** found and turn over as many rocks as time allows, searching for all visible macroinvertebrates (most will be larger than 0.5 cm). For each transect (not each zone), **make a list** of all macroinvertebrate and seaweed taxa you can name or at least suspect are different from others found on that transect, e.g., Alaria marginata, Alaria sp. 2, Alaria sp. 3. Be aware that in some cases considerable variation in color, size, and pattern occurs among individuals of the same species, e.g., many seaweeds, some limpets. Include taxa even if the only evidence is an empty shell, unless it is apparent that the shell was brought into the area by humans. In the transect list, include any taxa found only in the quadrat and/or pit.

10. After completing all three transects, fill out the parts of **Form F** that deal with intertidal conditions. Then, close to the time of high tide, walk through as much of the upland that is within 100 horizontal feet from (inland of) the HHW or tree line and can be safely accessed, and answer the remaining questions on Form F.

11. After you return to your office and enter all the data into worksheets **3_FormF** and **4_Biosurvey** of the NATAK-SE calculator, you can find the scores resulting from the combined Rapid and Biosurvey assessment in the **RESULTS** worksheet, **column F**. Save the file (SaveAs) after appending the segment ID or another unique identifier to the file name. If you do another assessment, same segment or a different one, clear the previous data on in the worksheet columns before entering new data, and give the new assessment a different file name when saving it.

4.0 Limitations

1. The seven attributes for which NATAK-SE provides scores (Food Web Diversity, Focal Fish Habitat, Sea and Shore Bird Habitat, Pinniped Habitat, Buffer Habitat for Wildlife, Subsidy Function, Filter Function) do not provide a complete or independently validated accounting of the functions and important habitats of Southeast Alaska's nearshore

environment. They are simply the attributes for which it seemed practical to attempt a scoring using only the indicators that can be assessed rapidly during a single visit to a shore segment and from existing spatial data. While based on scientific principles, the calculations that determine NATAK-SE scores do not comprise deterministic models of ecosystem processes, and the scores are *not actual measures* of the attributes they represent. The relationship between most of NATAK-SE's indicators and the attributes they score has not been proven in Southeast Alaska or, in some cases, even generally. Nonetheless, the lack of validation is not, by itself, sufficient reason to avoid use of any standardized rapid method, because the only practical alternative—relying entirely on non-systematic judgments (best professional judgment)—is not demonstrably better overall. When properly applied, NATAK-SE's indicators and scoring formulas are believed in most cases to adequately describe the *relative* importance of a shore segment for the named attributes.

3. The boundaries of some of the shore segments were drawn somewhat subjectively by ShoreZone. Many segments can be expected to contain more than one coastal class (i.e., more than one combination of substrate type, slope, and wave exposure) despite ShoreZone's intent to delimit them based on relative homogeneity of these factors. Thus, habitat conditions and resultant scores can be expected to vary considerably within some shore segments, but this is not addressed by NATAK-SE.

4. For the portion of NATAK-SE which incorporates existing digital data (DBpaste worksheet), it is understood that those data were originally created at scales much coarser than represented by most of the region’s shore segments. Consequently, when those data are interpolated to the scale of an individual shore segment, some of the data are likely to be inaccurate. Also, some of the conditions described by the spatial data, such as for land cover, may have changed since the layer was created years ago and many features, such as anadromous fish streams, are incompletely mapped. Nonetheless, the advantages of judiciously using the existing spatial data as just one component of each segment's NATAK-SE scores are believed to outweigh the disadvantages.

5. The NATAK-SE raw scores were normalized using only 47 of the region's 88,677 shore segments, and many subregions within Southeast Alaska were not included due to geographical isolation and access difficulty. Although the survey segments were chosen using a statistical procedure, the degree to which they are representative of the region overall was not quantified. In particular, access restrictions are expected to have created a selection bias.

6. Similarly, it is unknown in what situations the number of transects, quadrats, and pits specified by the NATAK-SE Biosurvey protocol will be sufficient to describe a shore segment adequately (e.g., leveling off of a segment's species-area or species-effort curve). The

numbers chosen (3 transects, 9 quadrats, 9 pits) and the configuration of these sample units within a segment were selected simply because our experience indicated that that number could be covered reasonably during a one-day visit and within the few hours available around the time of daily low tide.

7. NATAK-SE converts raw scores to normalized scores by comparing among the raw scores of other shore segments in the calibration data set developed by this project. However, if 90% of the segments in the data set had raw scores for the Fish attribute of 0 and among the remainder the maximum score was 0.4, after those raw scores are normalized (i.e., mathematically spread out into a scale of 0 to 1.0), a segment with a score of 0.3 would have a normalized score of 0.9 (because 0.3 is close to the maximum score of 0.4 for this attribute in this hypothetical data set). The high normalized score implies the shore segment is functioning very well for Fish when in fact the very low raw score of 0.3 (out of a theoretically possible score of 1.0) indicates it probably is not.

8. When normalizing the raw data, NATAK-SE treats all coastal classes the same. Ideally, separate scoring ranges would be established for each coastal class, e.g., different standards for rocky cliffs than for sand beach. However, the sample size (47 sites) was not sufficient to allow replicates of most coastal classes, even if similar classes had been combined, and thus prohibits the establishment of meaningful norms for any class at this time. This situation could be alleviated if additional shore segments could be surveyed in the future. However, in order to not bias the existing database to which their scores would be added, those segments would need to be chosen using exactly the same selection procedure (k-means cluster analysis of the same GIS-based data) and surveyed using exactly the same Rapid and Biosurvey protocols.

9. NATAK-SE does not assess the suitability of a shore segment as habitat for any individual wildlife or plant *species*. Models of greater accuracy, using the same spreadsheet calculator that NATAK-SE-A uses, could be created for individual species, for more specific biological guilds (e.g., diving ducks vs. alcids), and/or for functions. However, as attributes are split into finer categories, the amount of output information increases, perhaps gaining accuracy and specificity but losing simplicity in the interpreting and applying of results.

10. In some shore segments, the scores that NATAK-SE's models generate may not be sufficiently sensitive to detect, in the short term, mild changes in some functions. For example, it is unknown whether NATAK-SE can meaningfully quantify small year-to-year changes in sea level or nearshore uplift. Nonetheless, in such situations, NATAK-SE can use information about a trend to predict at least the *direction* of change in the attributes it assesses. Quantifying the actual change will often require repetition using more intensive (not rapid) measurement protocols that are complementary.

11. Science is constantly evolving as new studies refine, refute, or support what currently is known about nearshore ecological relationships. It is incumbent that planning tools keep pace with new findings and their models be revised at regular intervals, perhaps every 5-10 years, to reflect that. This poses challenges to permit applicants and regulatory programs because necessary revisions to a method or expansion of the set of calibration segments used to normalize the scores can create a "moving target".

12. It is possible that two NATAK-SE users, viewing the same shore segment, will interpret some indicator questions differently. Potentially, this could result in different scores for one or more of the segment's attributes. This is true regardless of whether two users employ NATAK-SE or independently render their professional judgment. The repeatability of neither the Rapid nor the Biosurvey part of NATAK-SE has yet been tested. However, averaging of indicators when rolling up into an overall score for an attribute is expected to reduce the variance of attribute scores more often than increase it, thus favoring greater repeatability.

13. The repeatability of the Biosurvey portion of the tool is expected to be the most variable due to the widely varying abilities of marine biologists to identify seaweed and macroinvertebrates to species.

14. NATAK-SE may be used to augment the data or interpretations of a subject professional (e.g., a fisheries biologist, plant ecologist, ornithologist, biogeochemist) when such expertise or finer-resolution data are available. NATAK-SE outputs, like those of other rapid methods, are not necessarily more accurate than judgments of a subject expert, partly because NATAK-SE's spreadsheet models lack the intuitiveness and integrative skills of an actual person knowledgeable of a particular function. Also, a model cannot anticipate every situation that may occur in nature. NATAK-SE outputs should always be screened by the user to see if they "make sense." Nonetheless, NATAK-SE's scoring models provide a degree of standardization, balance, relevance, and comprehensiveness that seldom is obtainable from a single expert or limited set of measurements.

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Appendix A. Illustrations in Support of the Rapid Protocol

1_FormDB worksheet: Finding the PHY_IDENT of your shore segment

Go online to: **http://seakgis.alaska.edu/flex/wetlands/**
Drag down the bottom right corner of the menu (1) to expand it and check ShoreZone (2). Click on the + to expand the ShoreZone menu and check Units (3).

Figure 1. Determining the PHY_IDENT, step 1

In the ShoreZone menu, also check and expand **Coastal Class** (4). Video Flightline can be unchecked to reduce clutter.

Figure 2. Determining the PHY_IDENT, step 2.

Then enable the Identify tool (5), click on the **line** of a shore segment of interest (bounded by a unit box), and look in either menu that pops up for the PHY_IDENT (6).

Figure 3. Determining the PHY_IDENT, step 3

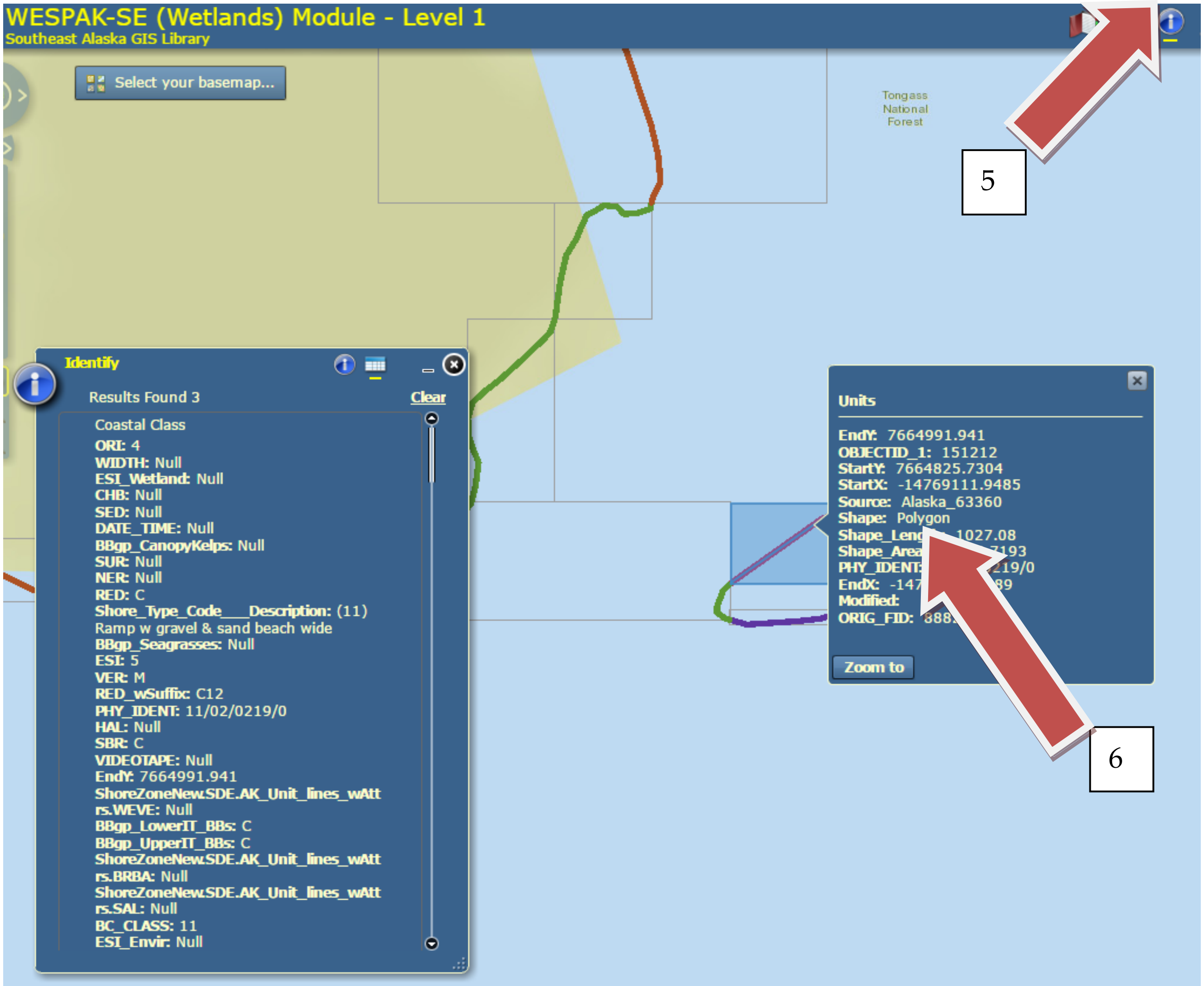
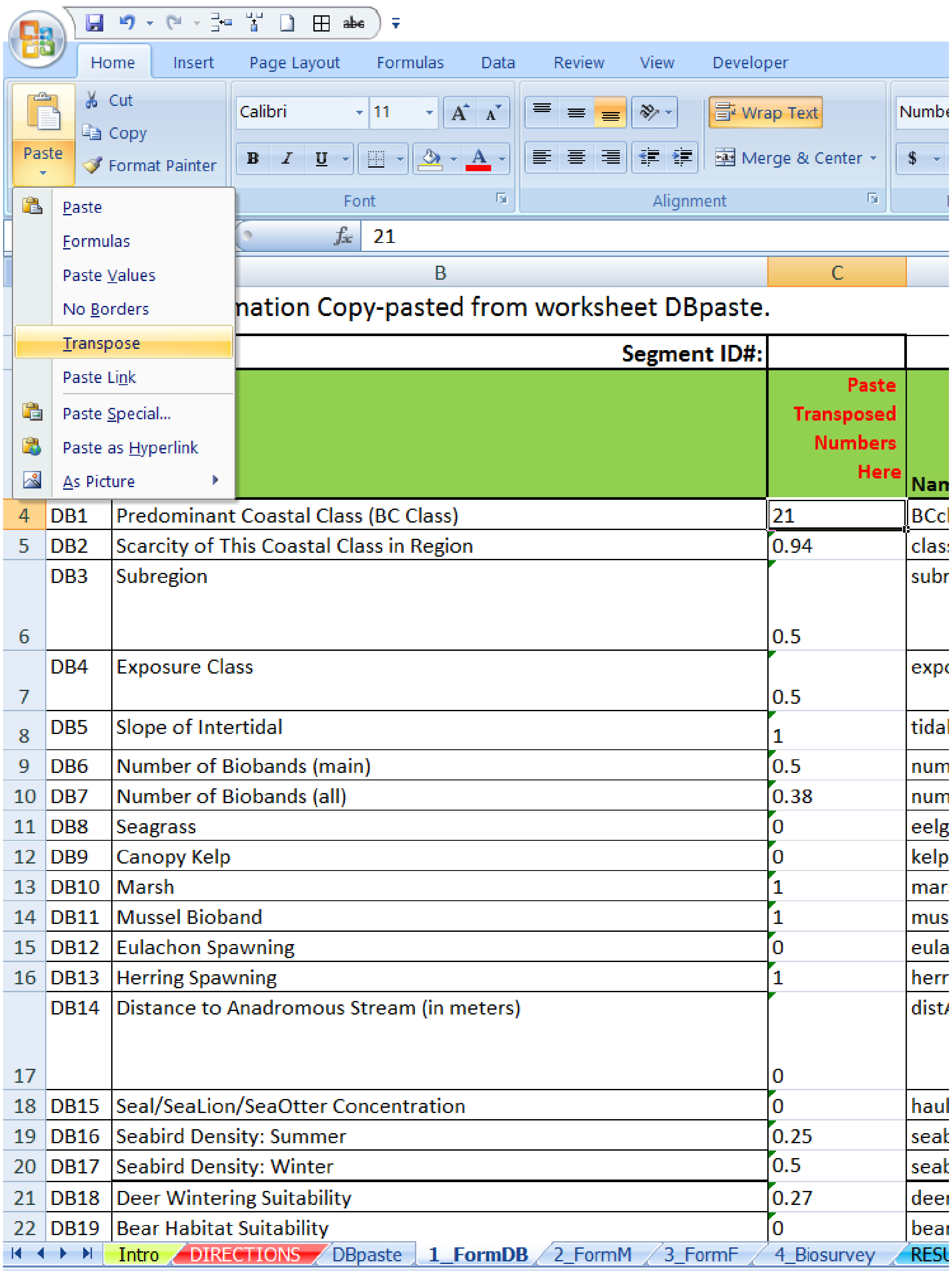


Figure 4. Use of the TRANSPOSE command in Excel

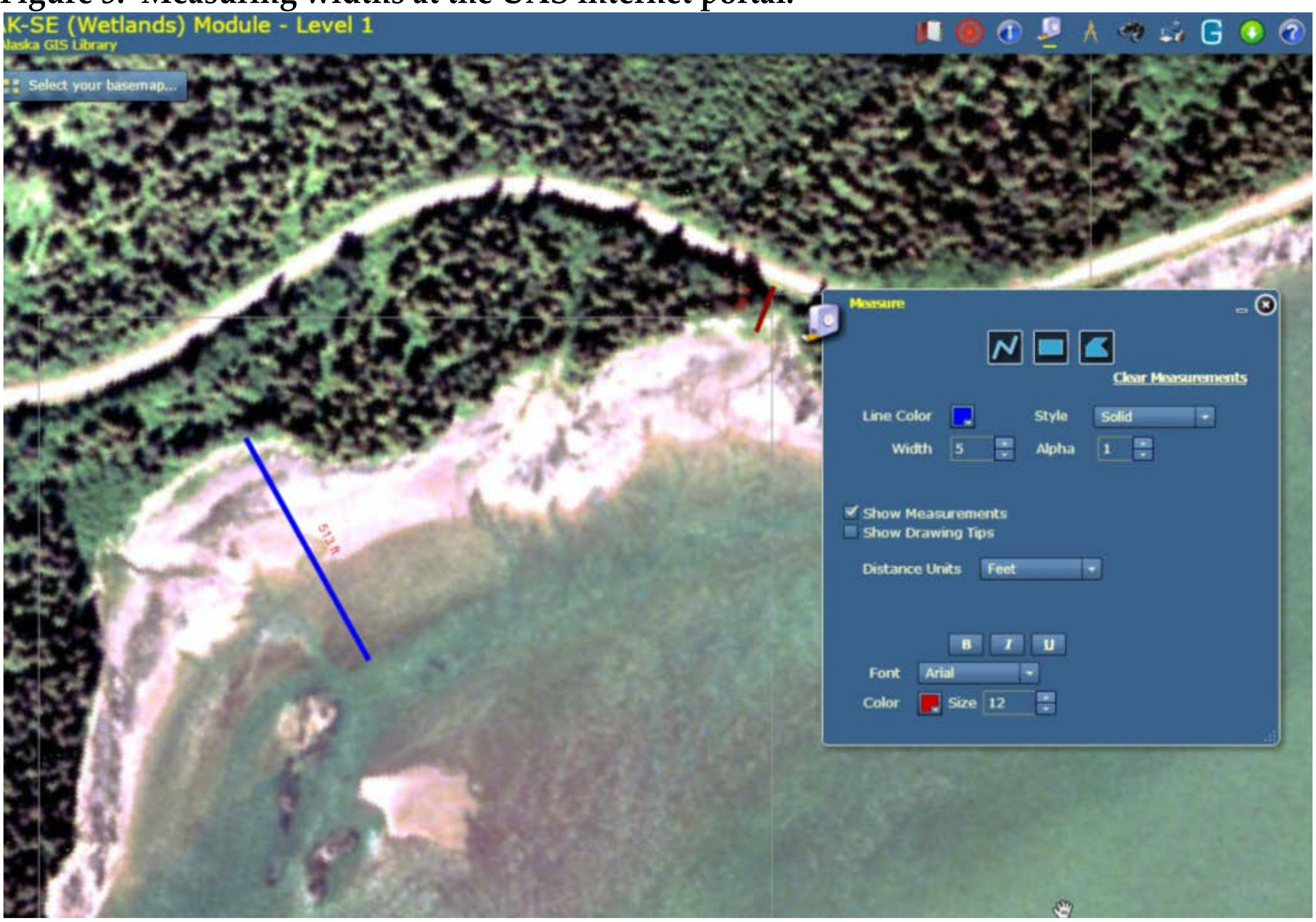
In the NATAK-SE Calculator, use the Excel COPY command to copy the row of scores for your shore segment from the **DBpaste** worksheet (tab) beginning in column B. Then switch to the **1_FormDB** worksheet, place the cursor over cell **C4**, and press TRANSPOSE. Do not be concerned about any error messages in column C when you paste the numbers.



Question m1. Width of Intertidal Zone
Question m2. Width of Vegetated Intertidal
Question m3. Buffer Width

At the web site: **http://seakgis.alaska.edu/flex/wetlands/**
use the Measure tool (upper right, fourth icon from left) to measure the maximum width of your segment's intertidal zone approximately perpendicular to tree line as shown by the blue line. Imagery does not always depict the shore segment at low tide, so some visual estimation may be necessary. The short red line in the upper right part of this shore segment (just to the left of the top left corner of the Measure menu) measures the minimum distance from HHW (the estimated upper extent of annual high tide) to the nearest road, i.e., the minimum buffer width, question M3. Measured distances will appear along the lines you draw.

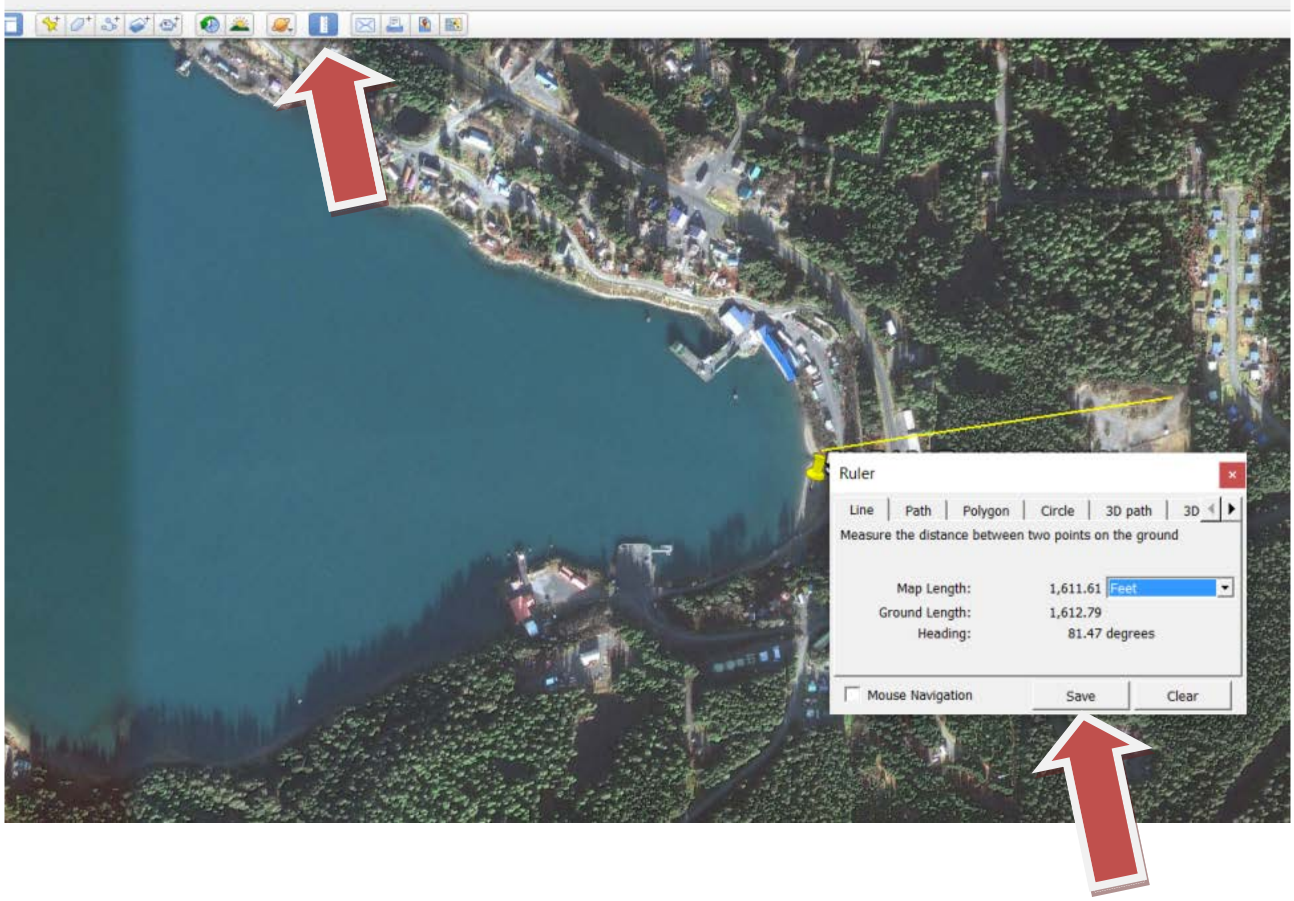
Figure 5. Measuring widths at the UAS internet portal.



Question M4. Percent-Slope of Contributing Area

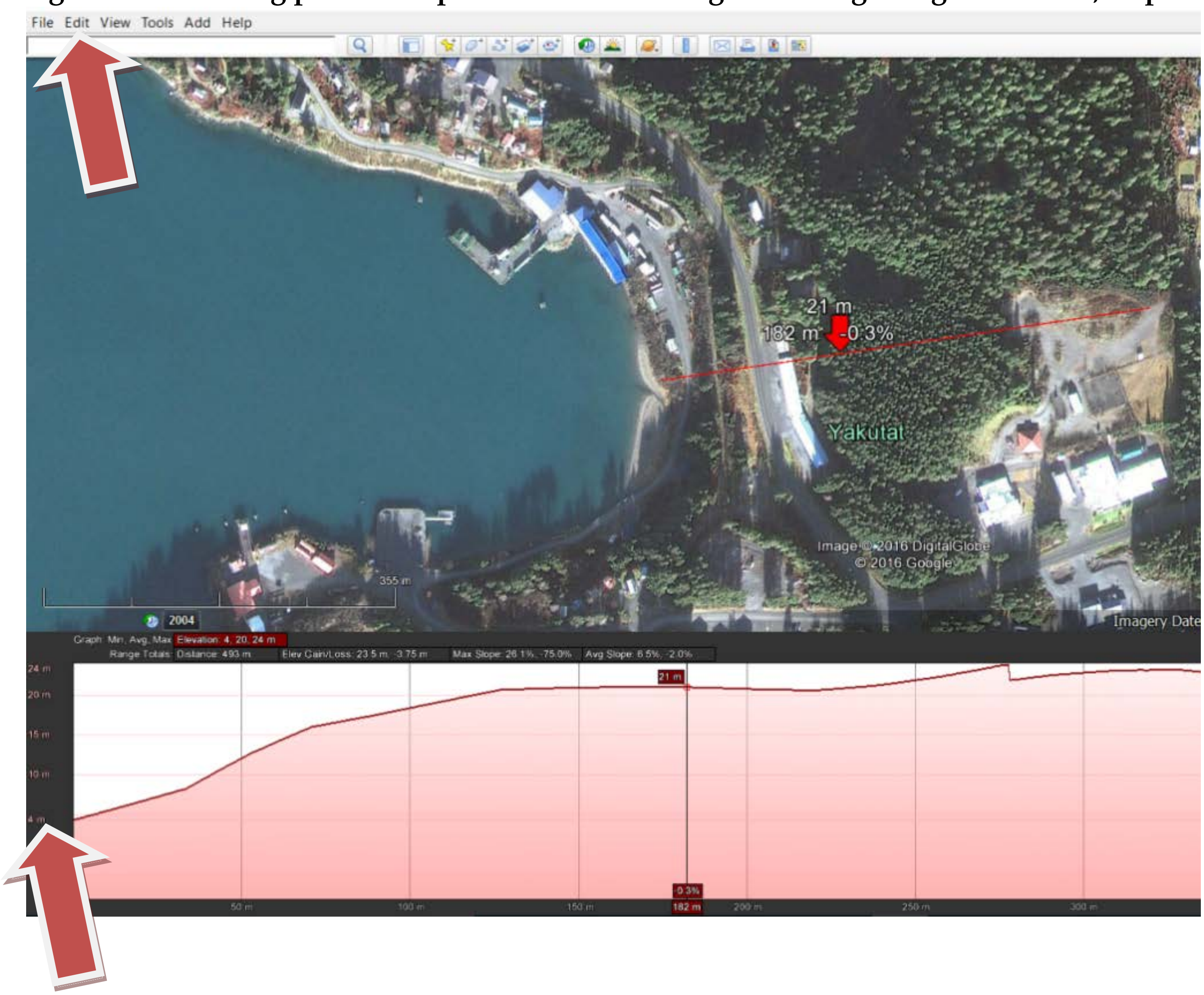
For purposes of NATAK-SE, a shore segment's contributing area is defined as the upland area (including the segment's 100-foot buffer) that is most likely to contribute runoff to the shore segment. This potentially could be an enormous area, but using imagery you will measure a more limited area according to criteria as follows. Begin by locating your shore segment in GoogleEarth **Pro** (currently a free download program), visually matching its boundaries as they are shown in the previously-described ShoreZone image. Next, measure the approximate length of its shoreline using the Measure tool in ShoreZone or the Ruler tool in the GoogleEarth Pro toolbar. Then, click on "Line" within the Ruler tool pop-up menu in GoogleEarth Pro, specify the units of measurement (which must be the same as used to measure segment length), and draw a line approximately perpendicular to shore and extending from the shore segment's tree line (or HHW) going upslope for distance of about double the length of the shore segment (which you measured in the last step). Click on "Save" and name the line (Figure xx).

Figure 6. Measuring percent slope of the contributing area using GoogleEarth Pro, step 1.



Next click on Edit (top of the page, left) and within that menu click on "Show Elevation Profile". A cross-section chart will appear beneath the aerial image (Figure xx). Moving from left to right, identify the first point on the chart where the slope appears to level off or drop, and record its elevation and distance from the start point as will be shown next to a red arrow immediately above the line in the aerial image. Finally, subtract that elevation from the line's starting elevation (indicated on the left axis of the chart) and divide by the line's length. Be sure the same units (meters or feet) are used for elevation and length. Multiply by 100 to get the overall percent slope of the contributing area, as requested by NATAK-SE question m4. Notice that the precision of your estimate does not need to be large because the question choices are simply <10%, 10-25%, 25-35%, 35-45%, or >45%.

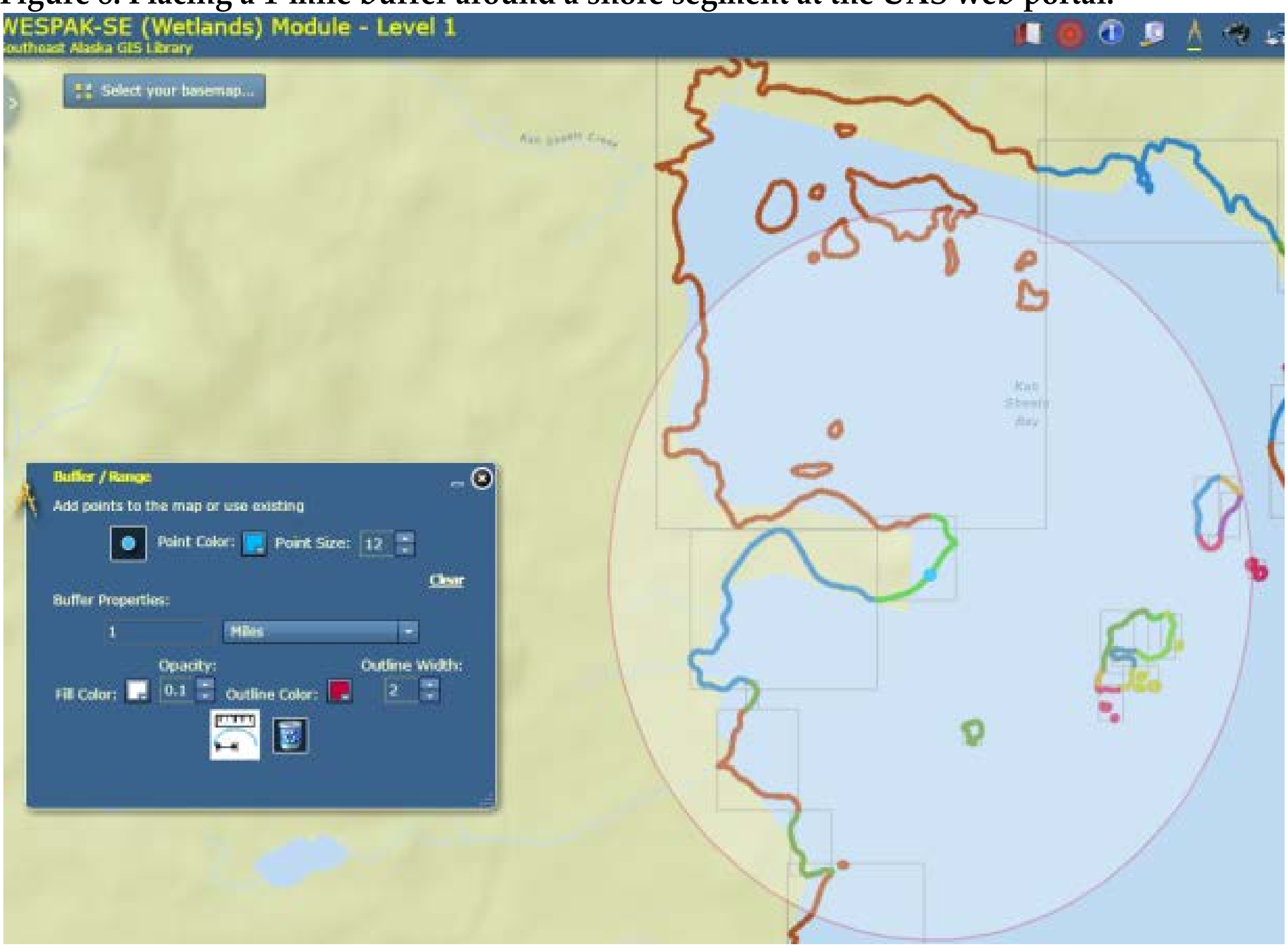
Figure 7. Measuring percent slope of the contributing area using GoogleEarth Pro, step 2.



Question m9. Distance to Nearest Segment of Same Coastal Class (in ft)
Question m10. Number of Different Coastal Classes within 1 mile
Question m11. Number of Segments of Same Coastal Class within 1 mile

Go to the UAS web site: http://seakgis.alaska.edu/flex/wetlands/ Scroll to near the bottom of the menu on the right and check "ShoreZone". Then check "Units" to show the shore segments. Also check "Derived ShoreZone Attributes"> "Coastal Class" (NOT Habitat Class). Uncheck other boxes. Note that different Coastal Classes have different colors, and shore segments are mostly delimited by differences in their Coastal Class (i.e., colors). Draw a buffer of radius 1 mile from the middle of the segment you are assessing. To use the Buffer/Range marking tool, click on the fifth icon from left in the top toolbar. In the pop-up menu, specify 1 mile and set Opacity to 0.1, click on the Point icon, click on the middle of your shore segment, and then click on the square white buffer icon in the Buffer/Range menu. The buffer that encircles your segment is not perfectly round because it compensates for the curvature of the earth's surface.

Figure 8. Placing a 1-mile buffer around a shore segment at the UAS web portal.



For question m9, the "segment of same class" means segment of the same **color**. That segment may adjoin yours or not, and may be either on the same shoreline or on an island as long as it falls within the 1 mile buffer. Use the Measure tool to determine distance and do not measure farther than 1 mile. If there are no other segments of the same color within 1 mile, enter a 1. If you find it visually difficult to determine if two segments have the same color, use the Identify tool (described earlier) to enable a pop-up menu and see the code number for Shore_Type or BC_class of any segment that looks similar.

The number of different coastal classes within 1 mile (question m10) is simply a count of the number of different colors within that distance. Include your shore segment in that count. The number of segments (Units) of the same coastal class within 1 mile (question m11) is the total number of segments having the same color as the one you are assessing. Some may adjoin and appear to be a continuation of yours but count them as separate, and include yours in the count.

Appendix B. Data Form F

FORM F: NATAK-SE version 1.0.
Segment PHY_IDENT #:

Q#	Indicator	Condition Choices	Mark "1" for Choice(s) Here
F1	**Percent of Intertidal Flooded by High Tide (most days)**	What percentage of the substrate downgradient of the annual HHW line is likely to be flooded by tide once daily during MOST days of the month?	
		<1%	
		1-9%	
		10-24%	
		25-49%	
		50-74%	
		75-89%	
		90-99%	
		>99%	
F2	**Seaweed Cover: Percent of Intertidal**	Within the part that is alternately flooded and unflooded daily (i.e., the lower elevations), how much appears to be covered by macro-algae (seaweed)? Estimate the cover as it would exist at its annual maximum.	
		<1%	
		1-9%	
		10-24%	
		25-49%	
		50-74%	
		75-89%	
		90-99%	
		>99%	
F3	**Canopy Kelp & Seagrasses: Percent of Segment Length**	What percent of the segment's length, measured parallel to the shore, is comprised of canopy kelps, eelgrass, and/or surfgrass? Estimate the cover as it would exist at the time of annual maximum growth.	
		none (absent or trace)	
		1-24%	
		25-49%	
		50-74%	
		>75%	

F4	**Tide Pools**	Does the segment contain tide pools, salt pannes, or tidal ponds? Include only those that contain some water of 2-12 inch depth at low tide.	
		No	
		Yes, but only a few	
		Yes, and numerous	
F5	**Trees Fallen in Water**	Does the segment's intertidal zone contain trees, still with branches, that have fallen into or been carried into this segment by currents? Do not include branchless driftwood or trees that have been cut.	
		No	
		Yes, but only a few	
		Yes, and numerous	
F6	**Cloudy Water**	Select one:	
		High confidence that the segment's water is cloudy most of the year as a result of nearby glacier meltwater, erosion, or mining.	
		Low confidence that the segment's water is cloudy most of the year (or high confidence that it is cloudy only infrequently) as a result of nearby glacier meltwater, erosion, or mining. These sediment sources are usually close to tidewater in this estuary.	
		The segment's water is almost never cloudy as a result of nearby glacier meltwater, erosion, or mining.	
F7	**Human Use Indicators**	Mark ALL features with likely impacts on the vegetation, sediments, water flow, water quality, or hazards to wildlife in a large portion of the segment. The features may be either in or out of the segment.	
		Maintained trails	
		Tire tracks or evidence of compaction by off-road machinery use	
		Docks or piers : with probable impact on longshore currents or waves	
		Docks or piers : with little/no impact on longshore currents or waves	
		Berms or dikes: with probable impact on tidal timing or amplitude in blocked area.	
		Berms or dikes: with little/no impact on tidal timing or amplitude in blocked area.	
		Log transfer facility	
		Marine debris (plastics, styrofoam, etc. carried in by water)	
		Litter (decay-resistant items left onsite by people)	
F8	**Bulkheads, Seawalls, and Levees (Shoreline Armoring)**	The percentage of this segment's Supratidal edge length that is armored (protected from erosion) by vertical bulkheads/ riprap, is:	
		none	
		less than half	
		more than half	

F9	**Artificial Muting of Tidal Prism**	Compared to historical conditions, does any tidal part of the segment receive tidal water less frequently, or with a time delay of minutes to hours, as a result of human alterations either within the segment or downgradient, e.g., berms, dikes, inadequate culverts, tidegates? Or, the daily tidal prism within the segment is now more muted (less amplitude than historically, delayed inflow outflow) as a result of human alterations?	
		no	
		yes, and alternating feature was installed more than 10 years ago	
		yes, and alternating feature was installed recently (<10 years ago)	
F10	**Potential Disturbance of Wildlife by Boats**	During late summer (waterbird molting time), motorized boat traffic in the vicinity of the segment is:	
		infrequent (few or none daily) and mostly distant (>300 ft) from the segment.	
		intermediate	
		frequent (multiple incursions per day) and/or within the segment.	
F11	**Woody Diameter Classes**	Mark all the classes of woody plants within the segment's 100-foot buffer, but only IF they comprise more than 5% of the woody canopy or subcanopy within the buffer.	
		evergreen 1-4" diameter and >3 ft tall	
		deciduous 1-4" diameter and >3 ft tall	
		evergreen 4-9" diameter	
		deciduous 4-9" diameter	
		evergreen 9-21" diameter	
		deciduous 9-21" diameter	
		evergreen >21" diameter	
		deciduous >21" diameter	
F12	**Alder & Sweetgale Cover**	What percentage of the segment's 100-foot buffer contains alder or sweetgale?	
		<1%	
		1-24%	
		25-49%	
		50-75%	
		>75%	
F13	**Berry Producers**	What percentage of the segment's 100-foot buffer contains blueberry, salmonberry, or other woody plants with fleshy fruit?	
		<1%	
		1-24%	
		25-49%	
		50-75%	
		>75%	

F14	**Wildlife Sign**	Does the segment have cliffs or structures used by nesting seabirds, kingfishers, or swallows? Or are there signs of bear or deer visiting the segment, e.g., trails, scat, tracks, or sighting? Enter **1** if either is true, **0** if none observed.	
F15	**Salinity**	At or near high tide, the salinity of water at the segment's subtidal edge, in parts per thousand, is: [keep it blank if no measurement possible]	
F16	**Notable Bird Concentrations**	Enter a "1" for each of the following bird species if you know they have been documented at these levels by qualified wildlife biologists or your own survey in the segment, or in subtidal waters within 100 m, or in the upland buffer. Do not speculate. Exclude birds that only fly over and do not land in this segment.	
		Sandhill crane >10 individuals	
		Scoters >250, Goldeneye >150, or Harlequin Duck >100 individuals	
		Loons & Grebes >20 individuals	
		Snow Goose >100, Canada Goose >500, or Mallard >150 individuals	
		Shorebirds >100 individuals or any nesting Black Oystercatcher	
		Short-eared Owl (any)	
		No information available	

Appendix C. Data Summaries for Calibration Segments

- database statistics (all 80,000 segments)
- survey site representativeness
    - comparison with NOAA sites (BC class tables etc.)
- sampling effort
- flora and fauna
    - comparison with NOAA sites
    - partial vs. complete IDs
- data normalization
- score distribution histograms
- site photos? with scores