

SOP 1: At-Sea Surveys

Version 1.0

Revision History Log:

Previous Version #	Revision Date	Author	Changes Made	Reason for Change	New Version #
	August 2013	S. Hoekman, W. Johnson, B. Moynahan, C. Sergeant	Initial version		1.0

Summary

At-sea line transect surveys are conducted to collect data for estimating species-specific on-water density, abundance, and spatial distribution of murrelets. The Boat Pilot, Observers, and Data Recorder work as a team to occupy transects, record observations, and ensure data security during field operations. This SOP details the equipment necessary to successfully perform the surveys, specific duties for each team member, and research vessel management.

Personnel, Platform, and Equipment

Boat-based line transect surveys are performed annually during early July with a minimum standard crew size of four, including the Boat Pilot, Data Recorder, and two Observers. Although suboptimal, one Observer may be used when necessary. SOP 9 discusses details of office and field training for Observers. The GLBA Ecologist assists with park logistics leading up to surveys and processes the park research permit. No other permits are necessary, but each year the Ecologist should check whether special one-time exemptions are required, such as entering John Hopkins Inlet for occupying permanent transects when a motorized vessel closure due to seal pupping has been extended into the survey period. GLBA Visitor Information Services (VIS) manages float plans for the at-sea survey crew each day.

Surveys should be conducted from boats 8 to 10 m long that provide an open bow platform with room for at least two Observers, a viewing height of approximately 2.5 m above water, a covered cabin with suitable space and power supply for data recording equipment, and the capability to maintain a relatively constant bearing at approximately 10 km/h. The *R/V Fog Lark*, an 8.5 m long Munson landing craft with large front deck, is currently the primary survey vessel because of its large covered cabin, bow deck, and twin outboard motor configuration (which improves straight-line transect tracking). The *R/V Capelin* is the first alternate vessel.

Packing the appropriate and properly functioning equipment and supplies (Table SOP 1.1) should begin by early June to allow time to replace or repair equipment. Permitting logistics may need to be started much earlier and may vary annually based on transects in the current year's survey panel. The Project Leader and relevant GLBA staff should communicate to determine an appropriate schedule for permitting.

Table SOP 1.1. Packing checklist for at-sea surveys.

☐	60 blank Observer data forms
☐	30 blank Distance Calibration – Observer and Session Sergeant data forms
☐	Pencils
☐	Clipboard
☐	Notebook
☐	Hardcopy of protocol package
☐	GPS with transect waypoints loaded
☐	Backup GPS with transect waypoints
☐	12vdc GPS cord
☐	Serial GPS cord
☐	External antenna
☐	Spare AA batteries
☐	Hardcopy coordinates of transect endpoints
☐	Hardcopy map of the year's closed areas
☐	Hardcopy of relevant permits
☐	2 laminated hardcopy maps of the year's transects
☐	Tested laptop with ArcMobile, ArcMap, stand-alone license, and NPTransect application configured for the current year
☐	Backup laptop
☐	2 32GB thumb drives
☐	2 power bricks
☐	Port replicator
☐	USB/serial converter and driver
☐	Hardcopy NPTransect documentation
☐	2 laser rangefinders
☐	2 spare CR2 batteries
☐	3 binoculars (or more)
☐	Anti-fog wipes
☐	4 park radios
☐	Park radio charger
☐	Spare radio batteries
☐	Tripod
☐	Angle board with appropriate tripod mounting hardware
☐	6 to 10 calibration buoys
☐	Extra infrared retro-reflective tape
☐	Dip net
☐	Personal flotation devices
☐	Boat safety/survival gear
☐	Boat GPS with transect waypoints loaded
☐	SEAN-provided sleeping bags and pads
☐	Cooler / ice

Preparing the Data Acquisition Facility

Before commencing field work, the Data Recorder or other qualified staff ensures that the main handheld, backup, and boat-mounted GPS units are properly configured and that the NPTransect application is installed and tested on appropriate laptop computers.

1. Prepare NPTransect application before fieldwork commences

- a. If needed, operating and troubleshooting procedures are detailed in Appendix F: NPTransect-KIMU Operating Manual.
- b. Prepare an NPTransect package to be used for installing the application on laptops.
 - i. The Data Manager must coordinate with AKRO GIS support well before each field season to determine if the latest NPTransect package needs to be revised to meet current requirements.
 - ii. If updates are needed, they should be built into a complete NPTransect package in order to fit with the standard installation steps listed below.
 1. The package should be developed based in the prior version package which includes application, ESRI system software, required features classes (*e.g.*, TRANSECT), imagery, file geodatabase structure, and other items.
 2. The final package should be stored for use at [\\inpglbafs03\data\SEAN_Data\Work_Zone\KM\yyyy\NPTransect\KIMU_yy_yy_starting_copy](\\inpglbafs03\data\SEAN_Data\Work_Zone\KM\yyyy\NPTransect\KIMU_yy_yy_starting_copy), where 'yyyy' is the calendar year of the survey.
 - iii. If software updates are not required, then just copy the prior end of season NPTransect package into [\\inpglbafs03\data\SEAN_Data\Work_Zone\KM\yyyy\NPTransect\KIMU_yyyy_starting_copy](\\inpglbafs03\data\SEAN_Data\Work_Zone\KM\yyyy\NPTransect\KIMU_yyyy_starting_copy), where 'yyyy' is the calendar year of the survey.
- c. Adjust package to work in the current year
 - i. Enable transect panel for current year
 1. Open [\\inpglbafs03\data\SEAN_Data\Work_Zone\KM\yyyy\NPTransect\KIMU_yy_yy_starting_copy\Murrelets.mxd](\\inpglbafs03\data\SEAN_Data\Work_Zone\KM\yyyy\NPTransect\KIMU_yy_yy_starting_copy\Murrelets.mxd) using ArcMap.
 2. Right click the Transects feature class and select "Properties" from the menu.
 3. Select the "Definition Query" tab and edit the query.
 - a. It must contain the string <"Sample"=0 OR "Sample"=4> in order to recognize the fixed and alternate transects.
 - b. It should also contain either < OR "Sample"=1> to recognize the 2010-based panel, or < OR "Sample"=2> for 2011, or < OR "Sample"=3> for 2012.
 4. Edit the exact same definition into the Murrelets (sync).mxd file. If the definitions do not match in the 2 MXD files, data may be permanently lost.
- d. Clear any data from prior years out of the package
 - i. While the geodatabase is capable of holding multiple years of data, we deliberately start each season with empty observations so the displays are not cluttered with extraneous data during collection and editing.

- ii. Use Windows Explorer to copy ...\\Murrelets_Empty.gdb to ...\\Murrelets.gdb
- iii. Use Windows Explorer to delete any files left in the \\BACKUP folder.
- iv. Use Windows Explorer to delete any files left in the \\CSV folder.

2. Install and test NPTransect on laptops before going to the field

- a. The full installation must be performed twice: once for the primary laptop and once for the backup.
- b. Minimum laptop requirements
 - i. Windows 7
 - ii. DB-9 serial port via port replicator and/or reliable USB converter
 - iii. ESRI ArcMap version that is compatible with current NPTransect application
 - iv. ESRI ArcMobile version that is compatible with current NPTransect application
 - v. ESRI stand-alone licenses (which are valid when disconnected from network)
- c. ESRI software installation
 - i. ArcMap
 - 1. Follow latest instructions from AKRO GIS group, most recently at http://inpakroms03web/rgr/akgis/documents/GIS%20Help%20Desk/Cheat%20Sheets/Installing_ArcGIS_10.pdf.
 - ii. ArcMobile
 - 1. The ArcMobile version successfully tested with the application is contained in the NPTransect package. Copy [\\inpglbafs03\data\SEAN_Data\Work_Zone\KM\yyyy\NPTransect\KIMU_yy_yy_starting_copy](\\inpglbafs03\data\SEAN_Data\Work_Zone\KM\yyyy\NPTransect\KIMU_yy_yy_starting_copy) (where 'yyyy' is the calendar year of the survey) to the laptop's C:\KIMU directory – replacing any existing content.
 - 2. Log into the destination laptop as an administrator. The laptop must be connected to the NPS network.
 - 3. From C:\KIMU\ArcMobileDVD, execute the ESRI.exe installer program.
 - 4. Select the option for Arc Mobile (not Arc Mobile Windows Application) and run the installation package.
 - iii. ESRI stand-alone license
 - 1. Follow latest instructions from AKRO GIS group, most recently at http://inpakroms03web/rgr/akgis/documents/GIS%20Help%20Desk/Cheat%20Sheets/Installing_ArcGIS_10.pdf.
 - 2. "Borrowing" licenses is currently detailed in section 8 of the instructions.
 - 3. Verify the stand-alone license works by disconnecting the network cable from the laptop and starting up ArcMap. Contact AKRO GIS support if there's a problem.
- d. NPTransect application installation
 - i. If not already done in the process of installing ArcMobile, copy [\\inpglbafs03\data\SEAN_Data\Work_Zone\KM\yyyy\NPTransect\KIMU_yyyy_starting_copy](\\inpglbafs03\data\SEAN_Data\Work_Zone\KM\yyyy\NPTransect\KIMU_yyyy_starting_copy) (where 'yyyy' is the calendar year of the survey) to the laptop's C:\KIMU directory.

- ii. Run C:\KIMU\Scripts\1)InstallOrUpdateMachine.bat as an administrator (right click the file and select Run As Administrator). Verify it reports no errors and dismiss the window.
- iii. Run C:\KIMU\Scripts\2)InstallOrUpdateUser.bat while logged in as the data recorder user (**not** as administrator).
- iv. Run C:\KIMU\Scripts\3)SyncUser.bat under the data recorder userid.
- v. Make a shortcut or quick launch icon for the application, most recently called C:\program files (x86)\ArcGIS\Mobile10.0\bin\ArcGisMobile.exe.
- vi. Test that the application comes up when the shortcut is invoked. Be aware it is normal to see error messages when no GPS is connected.

3. Configure GPS for the season

- a. Data recorder and backup data recorder portable GPS units
 - i. Replace existing AA batteries with fresh ones to assure continuity during field operations.
 - ii. Configuration of GPS
 1. Use the Setup / Interface function
 - a. Serial data format "NMEA In / NMEA Out"
 - b. Baud rate "4800"
 2. Use the Setup / Heading function
 - a. Set North Reference to TRUE
 3. Use the Setup / Units function
 - a. Set Map Datum to WGS84
 - iii. Replace transect waypoints with copies generated from the prior year's file geodatabase feature class named "Transect".
 1. A combination of ArcMap, XTools, Excel, and DNRGarmin may be needed to accomplish this.
 2. The waypoints marked in the field will constitute the year's KM_I deliverable.
 - iv. Boat GPS
 1. A hardcopy listing of transect endpoint coordinates is used to hand enter navigation waypoints for the season.

4. Run an end to end test before operations start

- a. The data collection application and equipment are complex, a number of things can go wrong, and, due to its extensive reliance on location information, the application can only be fully tested within the physical bounds of the park.
- b. A test transect should be executed on initial arrival to Glacier Bay and in advance of any real data capture.
 - i. A test transect must not coincide with a real transect being covered that season. A transect ID "TST" has been established for this purpose.

1. Actual testing may take place anywhere in the park and does not require being near the actual TST transect.
2. Test data should not be collected in the physical vicinity of a real transect: test data icons could obscure real data points on the NPTransect screen.
- ii. The test should consist of interconnecting all equipment, activating the application, entering several dummy observations, saving the work, refreshing the cache, generating the CSV, and creating the backup ZIP.
- c. Any fault must be remedied before field work commences, as the raw data collection process may not be accurately recording observations.

Line Transect Procedures

For each transect, the Observers and Data Recorder collect information on existing environmental conditions (weather and Beaufort sea state), actual observed transect start and end points, and location of murrelet groups relative to the boat. While on transect, the crew should generally use parknet digital radios on a project channel using low power.

Boat Pilot methods

Before beginning each transect, the Boat Pilot confirms identity and location of the selected transect with the Data Recorder. The Boat Pilot uses the onboard GPS/chart plotter to approach the preferred transect start point. Direction of travel along the transect can be selected to minimize travel time or based on considerations such as ease of approach, wind, currents, hazards, etc. The approach path and speed should minimize disturbance to murrelets near the transect prior to commencing sampling.

Approximately 500 m before the transect start point, the Boat Pilot slows down to no wake speed and assists Observers in determining whether murrelets are leaving the area near the transect center line (see 'Observer Methods' below for additional details). At 200 m from the transect start point, the Boat Pilot begins counting down the distance in 50 m increments to the Observers. The Boat Pilot then indicates the start of data recording when the boat reaches the start point and is on the correct bearing. When approaching within 200 m of the start point, Observers should be prepared to survey according to methods outlined in 'Observer Methods' below.

Transects typically run from shoreline-to-shoreline. When starting at the shoreline, the approach should be slow and as close to the shoreline as practical, with a decisive turn onto the transect line. The best approach will depend on conditions, such as wind, currents, and tidal stage. If current is strong, the boat may need to begin turning into the transect 20 or 30 m before the start point. Slow approach speeds (<5 km/hr) help ensure accurate positioning. If the transect start point is in open water, the Boat Pilot may approach the start point along the same bearing as the transect. Upon crossing the transect start point at the correct bearing, the Boat Pilot should indicate commencement of data collection.

Speed on transect should generally be 10 km/hr but may be reduced to as low as ~5 km/hr when high densities of observations occur or to preserve data collection quality (e.g., computer interruption, etc.). Depending on current, ferrying the bow in an up-current direction may help maintain the desired bearing. Zooming in to a small scale on the GPS/chart plotter and using a bearing line function will aid navigation.

Maintaining as consistent a bearing and heading as possible will benefit Observers; corrections to steering should be gradual rather than sharp. On zigzag transects, the Boat Pilot should notify observers when approaching (e.g., ~50 m), beginning, and ending the turn.

If the transect ends in open water, at ~500 m the Boat Pilot begins counting down distances to the end point in ~100 m increments. For transects ending at shoreline, the Boat Pilot ends the transect as shallow as practical. Typically, end points occur once water depth is less than ~10 m, but this rule of thumb is dependent on shoreline configuration and bathymetry. Pay close attention to sills and points that may become shallow far from shore. In poor visibility, end points should be conservatively determined to avoid any potential underwater obstructions. Upon reaching an end point, cut the throttle and wait for Observers to complete observations. When Observers declare completion the Data Recorder makes any immediate required corrections while at the transect endpoint. Once the Data Recorder announces completion, slowly maneuver off shore.

When navigating around small obstructions on-transect (e.g., ice), prefer long, gradual turns minimizing deviation from the transect bearing to shorter, sharper turns. When encountering larger obstructions (e.g., islands), cease sampling at the obstruction, navigate around the obstruction, and resume sampling beyond the obstruction using standard methods for starting transects.

Observer Methods (Note: Observer training procedures are detailed in SOP 9.)

Observers should detect groups initially located on or flushing from the water along the transect, estimate distance and angle to the group, count group size, and transmit records to the Data Recorder. Groups are associations of same-species murrelets separated by < ~5 m.

Data collection should strive to meet critical assumptions of distance sampling methods: 1) all groups are detected near (i.e., within ~50 m) the transect center line (hereafter “center line”), 2) groups are recorded at initial locations, 3) distances from the center line are accurately estimated, and 4) species are correctly identified. Estimation methods account for minor violation of assumption 1 (see Appendix A).

As the Boat Pilot slows when within ~500 m of the transect start point, Observers should don PFDs, collect binoculars and radios, occupy the forward deck, set up the angle board, and check radio transmission. While approaching the transect and prior to start of normal data collection (below), Observers should note groups flushing from ± 50 m from the center line. These groups should be recorded upon commencing data collection. Because angle likely cannot be accurately estimated, Observers should estimate perpendicular distance of the group from the transect center line and use the 90° (left/port side of boat) and 270° (right/starboard side of boat) observation angles for these records.

The Boat Pilot will indicate the start of data collection after the boat reaches the transect start point and appropriate bearing. Observers may scan for groups using the naked eye and binoculars. Observed groups are recorded within a strip extending 200 m from the center line, with the surveyed strip extending to the shore for transects intersecting land or, in open water, to a line perpendicular to the transect extending 200 m from the transect end point. Observations typically are recorded for groups ≤ 200 m forward of the boat, with exceptions for observations ≤ 300 m for groups that 1) are moving rapidly away from the center line (to fix groups at their initial location), 2) flush from the water within ~50 m of the center line (to meet assumption

of complete detection near the center line), or 3) lie within the surveyed area but are unlikely to be recorded later (e.g., because of large numbers of concurrent groups).

With two Observers, each should be primarily responsible for scanning waters to one side of the boat. To maximize detection near the center line, both Observers should scan near the center line (i.e., $\pm 30^\circ$ around boat heading), with each giving gradually decreasing attention to waters further from the center line. To facilitate angle estimation (below), it may be convenient for each Observer to focus on the side of the boat opposite their deck location.

However, Observers may record observations from either side of the boat and should frequently communicate to optimize data collection. In particular, Observers should communicate to ensure all groups near the center line are recorded once. With only one Observer, attention should be focused along the center line, with gradually decreasing attention to waters further from the center line on both sides of the boat. Binoculars can increase detection of inconspicuous groups, but the reduced field of vision can result in missing groups that would otherwise be detected. Two Observers judiciously alternating between scanning with binoculars and the naked eye may increase detections without compromising detection near the center line.

For each group detected in the survey area, Observers should estimate angle relative to the boat heading ($0-359^\circ$ using angle board, 180° is dead ahead) and distance from the boat (ocular estimate to nearest 10 m) to group's initial location. Angles $<10^\circ$ from the center line ($171-189^\circ$) should be estimated to nearest 1° , with others to the nearest 5° . Observers should also count group size and classify each individual to 1 of 3 species classes: K (Kittlitz's murrelet), M (marbled murrelet) or, U (unidentified *Brachyramphus* murrelet). Because there is much greater risk of bias in population estimates associated with misidentified relative to unidentified murrelets, Observers should classify groups to species only when confidence in identification is high ($>80\%$). See SOP 9 for identifying characteristics of each species.

Observers transmit observations to the Data Recorder via hand-held radios using standardized order and codes (Table SOP 1.2). Each transmission begins with the word "record", followed by angle, distance, group size, and species class. Observers may correct prior records. When making corrections, Observers should give pertinent information to help the Data Recorder identify the record along with the corrected data. If species identity is uncertain, Observers may transmit other information and indicate species class as "pending." Species class will be updated if subsequently provided, but otherwise is recorded as U (unidentified). In cases where >1 groups share the same location (i.e., different species classes associated by $< \sim 5$ m), the transmission may include a group size and species class for each group (e.g., "Record, nine zero degrees, five zero meters, 2 M and 2 U").

Where a zigzag transect approaches/departs a waypoint along shore, there will be overlap in the surveyed area on the approach and departure legs. One Observer should continuously monitor groups before and after a turn to avoid double-counting groups. Observers should attempt to estimate distance/angle to each group should when initially located, with the stipulation that these data should not be estimated while the boat is turning.

When encountering high densities of groups, Observers may ask the Boat Pilot to reduce survey speed ($\leq \sim 5$ km/hr) to maximize time to record groups. If groups are encountered faster than they can be recorded, Observers should prioritize recording groups nearer to the center line and counting group sizes over species identification. When encountering large numbers of individuals, it may be necessary to lump loosely aggregated individuals of the same species class into a single “group” in order to ensure individuals are recorded in a timely manner.

Table SOP 1.2. Data transmission order and codes for each data category. The order of reporting to the Data Recorder is as follows: “Record,” angle, distance, group size, species class (e.g., “Record, one-three-zero degrees, nine-zero meters, 2, K”)

Reporting Category	Category Unit or Choice	Definitions
Angle	Degrees	Angle relative to heading of boat (180°)
Distance	Meters	Distance from Observer to group
Group size	Number	Count of individuals
Species class	K	Kittlitz's murrelet
	M	Marbled murrelet
	U	Unidentified <i>Brachyramphus</i> murrelet

Data Recorder Methods

The Data Recorder is responsible for multiple duties at once, including entering observations into NPTransect, communicating with Observers over park radio, and communicating with the Boat Pilot regarding transect locations and straight-line tracking. Due to the large number of tasks, Data Recorder methods below are presented in numbered list form to obviously delineate each set of tasks throughout a sampling day.

At the start of each day, before occupying any transects, the Data Recorder ensures the following items are completed:

1. Be certain the portable GPS is either turned off or disconnected from the laptop.
2. Power up laptop and log in with the userid NPTransect has been set up in.
3. Turn on the GPS and plug serial cable into the laptop if not already connected.
4. Check that GPS and laptop are running off of boat power; if not, either could fail on the transect.
 - a. Synchronize cache to be certain the cache matches the cumulative geodatabase.
 - i. Start up Windows Explorer (not Internet Explorer!)
 - ii. Navigate to the folder C:\KIMU\SCRIPTS
 - iii. Double click on the entry labeled “3)SyncUser.bat”
 - iv. The program may take several minutes to complete
 - v. If an error message appears, stop and take corrective action. Any error indicates the laptop is not in a position to correctly record observations.
 - vi. Dismiss the script's black command window by clicking on it and pressing any key
 - b. Prepare paper field observer form with header information
 - c. Start application
 - i. Verify GPS has acquired satellites – application will not work until the GPS is ready.

- ii. If not already running, start NPTransect with the quick-start icon or under All Programs / ArcGIS/ ArcGIS Mobile/ ArcGIS Mobile.
- iii. If the application complains it can't find the GPS, force a retry
 1. Click the upper right icon that looks like a satellite
 2. Click the menu item GPS Status
 3. Fill the Serial Port dropdown with AUTO
 4. Set the Baud Rate to 4800
 5. Press the green connect button
 6. Once the GPS is reporting, click the white BACK button to show the GIS screen
- iv. Verify the imagery reflects the approximate location of the boat.

While approaching the beginning of a transect, the Data Recorder ensures the following items are completed:

1. At about 200 meters from the transect start, press NPTransect's green TASKS button and select from the menu "Collect Information"
2. Data entry fields will appear for defining the initial header information.
3. Note that the Transect dropdown only reflects transects visible on the screen. Press the BACK button and zoom out if necessary to bring the target transect into the range of the screen.
4. Leave the ON TRANSECT box unchecked
5. At about 100 meters, press the green START RECORDING button. At this point trackpoints get written to the file geodatabase at the rate of 30 per minute.
6. Notify the Observers that recording has begun.

While on transect, the Data Recorder performs the following:

1. Mark the ON TRANSECT check box when this is announced by the Boat Captain.
2. Write the start time on the field data sheet.
3. As conditions change revise visibility, weather, and Beaufort.
 - a. Use the combo boxes and check boxes near the top of the screen.
 - b. These are only visible when no observations are outstanding.
 - c. Also write the change on the field data form.
4. If other header data, such as observer name, needs correction while on transect:
 - a. Be certain no observations are outstanding; incomplete observations will be lost.
 - b. Press the ESC key to display the header data field screen.
 - c. Revise the field(s).
 - d. Press the green START RECORDING button to resume.
 - e. Be aware that no tracklog data are captured while the header fields are being revised, so do this quickly.
5. Whenever the transect is interrupted and resumed, record the fact by toggling the ON TRANSECT check box; note observations cannot be entered unless ON TRANSECT is checked.
6. When an observation is radioed in:

- a. Open new record by pressing the green NEW OBSERVATION button, typing CTRL-N, or hitting the enter key.
- b. Record Angle, Distance, Group Size.
- c. If species class is included:
 - i. Record it and close out the record by pressing the green SAVE button (or keyboard shortcut CTRL-S).
 - ii. Acknowledge record by keying microphone.
- d. If species class is not immediately known:
 - i. Then leave record open.
 - ii. Enter/acknowledge species class when it is later radioed in and save the record.
 - iii. If an intervening observation comes in, use CTRL-N to record it while leaving the incomplete prior record in the background for subsequent completion. Multiple records may be open simultaneously, though the recorder must keep track of which records correspond to which observations of particular observers.
 - iv. If multiple open records become too complex to track, enter tab id of one or more open records on field sheet and save those incomplete open records; write eventual species and other corrections on paper form in appropriate row. These will be applied at a later stage.
- e. If Observers report corrections after record is saved, record them on field sheet using record key timestamp obtained by clicking on its observation icon. Do not attempt to edit existing observations while on transect as new observations may be lost while involved in the cumbersome editing process.
- f. If an observation must be deleted, it may be done while on transect as deletion is much quicker than editing.
 - i. Click the screen icon of the observation.
 - ii. A message box appears with three buttons: click on the one marked DELETE.
- g. In the event the application fails during a transect
 - i. Record a waypoint for each incoming observation using the attached GPS, taking the default sequential numeric ID assigned to each waypoint by the GPS.
 - ii. Mark each waypoint number and observation details on a row of the field sheet.
 - iii. Complete the transect using this manual process.
- h. In the event the GPS fails during a transect
 - i. Uncheck ON TRANSECT.
 - ii. Notify the team recording has paused.
 - iii. Request boat operator holds position.
 - iv. Immediately swap in the backup device.
 - v. If the backup starts recording trackpoints properly, check ON TRANSECT and notify team of resumption.
 - vi. If the backup cannot be made operational, notify team that the transect must be aborted.
- i. When Observers call end of transect:
 - i. Uncheck ON TRANSECT but do NOT stop recording.

- ii. Write the stop time on the field data sheet.

After completing a transect, the Data Recorder does the following:

1. Perform any outstanding edits listed on the field log sheet:
 - a. Click on the observation's icon based on record key time.
 - b. When the message box appears, click the edit button.
 - c. Be certain the timestamp matches the record key on the form; it may take several attempts to find the correct one.
 - d. Make the edits and resave.
 - e. Check off the item from the field log sheet.
 - i. Click the red STOP RECORDING button. Once stopped, it is not possible to further edit/delete observations on the transect.
 - ii. Be aware the application does not support creating new observations manually. New observations have to be applied to the KM_D corrected observations deliverable at the end of the field effort.

End-of-day Field Data Management

Since KIMU survey data requires long days during short seasonal time windows, it is important that each day's data is properly backed up and reviewed each day, as feasible.

1. In the event automated recording failed during the day and manual recording was performed:
 - a. Remedy any equipment or software problems so there will be backup facilities for the next survey day.
 - b. Have data recorder take any necessary actions to ensure data on the two machines used during the day are both merged into the geodatabase without any loss.
2. Synchronize cache information collected that day to the cumulative geodatabase.
 - a. Start up Windows Explorer (not Internet Explorer!)
 - b. Navigate to the folder C:\KIMU\SCRIPTS
 - c. Double click on the entry labeled "3)SyncUser.bat"
 - d. The program may take several minutes to complete
 - e. If an error message appears, stop and take corrective action. Any error indicates the laptop is not in a position to record further observations.
 - f. Dismiss the script's black window by clicking on it and pressing any key
3. Generate a fresh CSV file for the current year.
 - a. From Windows Explorer, double-click 4)ExportToCSV.bat
 - b. Any errors should be diagnosed and repaired. An error at this point, however, does not necessarily mean the laptop is no longer usable.
 - c. Dismiss the script's window.

4. Review appearance of CSVs for gross errors, optionally using Excel to aid by its sorting and searching.
 - a. If Excel is used, DO NOT SAVE the file because it will no longer meet the CSV format specification required by ESRI.
 - b. Diagnose the nature of any errors and determine corrective action.
 - c. If any subsequent corrections are edited in using the application, the synchronization and CSV generation processes will have to be repeated.
5. Create a backup file containing all original data by executing 5)SnapshotToZip.bat.
6. Back up the C:\KIMU folder and its subsidiary contents to a thumb drive under a folder named for the current date (e.g., "KIMU_2011-07-15").
7. If the evening is spent on land, store all completed field sheets in a secure location – do not return them to the boat where they may be lost or damaged. Also, leave the latest thumb drive on land and take the second drive into the field for the same reasons.

Vessel Management

Good vessel management is essential for completing KIMU surveys safely and efficiently. This section specifically discusses management of the *R/V Fog Lark*, the primary survey vessel.

Before the surveys begin, a general overview float plan should be prepared in a Word document and provided to the VIS, GLBA Ecologist, and relevant protection rangers. This will give park staff a general idea of when float plans will be filed, day-to-day locations of the Fog Lark, and days when non-motorized or critical habitat exemptions will be activated. Before each survey, check with the VIS for the most current float plan protocols.

Each survey morning, the Boat Pilot activates a float plan with the VIS that includes information on time of departure, number of crew onboard (including assigned crew numbers, if available), planned survey areas for the day, potential access exemptions, and time and place of return. Throughout the course of the day, it is wise to check-in with the VIS to update float plan timing or location changes. At the end of the day, once the Fog Lark is moored in its evening location, the VIS is contacted for closing the float plan and is given an approximate time for the next morning's float plan activation. These general float plan principles apply to any vessel used during at-sea surveys within GLBA. When in doubt whether to contact the VIS regarding a boating update, the rule is to always make contact.

At the beginning of each day, after preparing the vessel for departure and warming up the outboard motors, the Boat Pilot should complete a log book entry that includes the same float plan information given to the VIS, the hour meter reading for each motor, and fuel consumption since refueling. The log book should be located near the driver's side console. Throughout the day, it is useful to log travel times and fuel consumption to distant locations to help gauge when the next refueling may be necessary. The Fog Lark has

a 200-gallon fuel capacity and hence large range. But, because Glacier Bay is prone to rough weather and long travel distances, fuel consumption needs to be closely monitored. Typically, a full tank allows travel from Bartlett Cove, up both arms of the bay, and back to Bartlett Cove.

