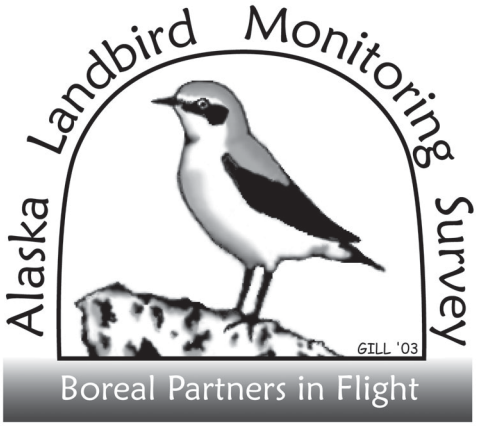
Alaska Landbird Monitoring Survey

Protocol for Setting Up and Conducting Point Count Surveys

Sponsored by Boreal Partners in Flight



Prepared by

Colleen M. Handel and Melissa N. Cady
USGS Alaska Science Center
1011 E. Tudor Road
Anchorage, Alaska 99503

May 2004

Alaska Landbird Monitoring Survey

Protocol for Setting Up and Conducting Point Count Surveys

TABLE OF CONTENTS

Alaska Landbird Monitoring Survey

Setting up Point Count Grids within Selected Sampling Blocks

OVERVIEW

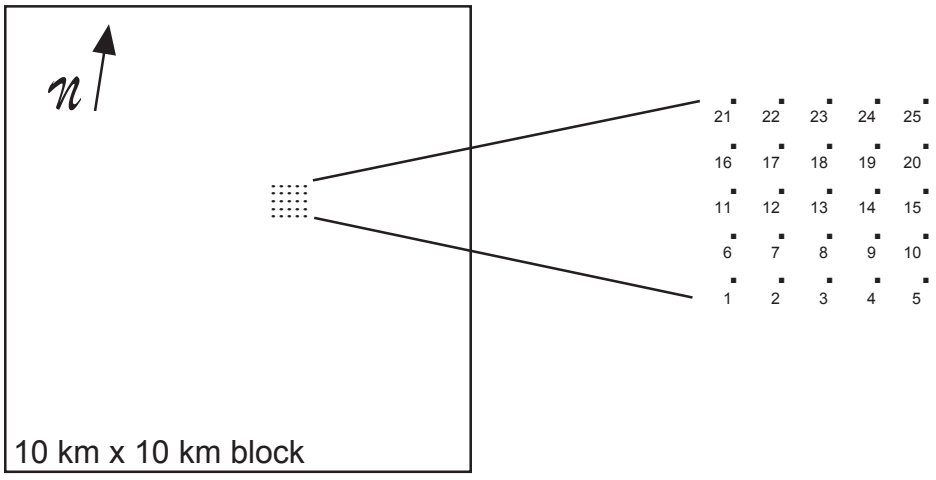
The Alaska Landbird Monitoring Survey (ALMS) has been designed to monitor long-term trends in breeding populations of landbirds (and other species) within all ecoregions of Alaska. This survey relies on surveying the exact same points every two years to monitor changes in bird populations over time.

SAMPLING DESIGN

The entire state of Alaska, except for the Aleutian Islands and some Bering Sea islands, has been overlain with a virtual 10-km by 10-km sampling grid. Each block within this grid has been assigned a unique number (AKgrid_ID) and the order of the blocks has been randomized (randomrank). A sample of blocks has been selected from within each ecoregion and federal land management unit for long-term monitoring. Half the blocks will be sampled in even years and half will be sampled in alternate years.

A starting point within each block has been randomly selected as the center point in an array of 25 points. This point is in the same relative position within every block in the state, resulting in a randomly shifted grid. The 25 points are arranged in a 5 x 5 array. Points within each block should be numbered in a standard way, with numbering beginning at the southwestern corner, proceeding west to east along each row and then northward through the rows (Figure 1). Each point, whether surveyed or not, should be numbered in its correct relative position.

Figure 1. Grid of 25 survey points within 10 km by 10 km sample block showing correct numbering system.



CHOICE OF SPACING BETWEEN POINTS WITHIN GRID

Within a given sample block, points will be spaced either 250 m or 500 m apart; these distances should not be mixed within a block. In areas dominated by open habitat, such as tundra, spacing should be 500 m. In areas dominated by tall, closed habitat, such as forest, spacing should be 250 m. If the area is a mosaic of open and closed habitats, select the spacing that corresponds to whichever type of habitat dominates (> 50%) across the area covered by the grid of points.

ORDER OF SURVEY POINTS

Points may be surveyed in whatever order is deemed most practical. Once the initial order has been determined, it is desirable but not mandatory that this order be repeated in subsequent years for monitoring. The entire grid of points should be surveyed within 2-3 mornings if possible. Daily routes should be planned (1) to accommodate travel time from camp to the first survey point of the day and (2) to have the last count of the day completed within 4-5 hours of the start.

COORDINATES OF SURVEY POINTS

Coordinates for each sample point have been provided in decimal-degree format of latitude-longitude using the NAD 27 datum and either the 250-m or 500-m spacing. These coordinates can be loaded into the GPS unit before the survey begins so that the GPS can be used to navigate to the points. Waypoints can be uniquely identified using a user-defined alphanumeric code for the sample block followed by the survey point number (1-25). Points should also be mapped on the most detailed scale map available for the area in case GPS satellites do not provide satisfactory signals for navigating to the coordinates.

If you wish to use a different datum for your coordinates (e.g., NAD 83), you will need to transform the NAD 27 coordinates accordingly. Please consult with Colleen Handel, USGS Alaska Science Center, if you wish to use a different datum. Please note that most topographic maps for Alaska are available only using the NAD 27 datum. If you use a more recent map that uses the NAD 83 datum, locations can be displaced by up to a few hundred meters. Be sure to mark on the Location Data Form which datum was used to record coordinates from your GPS.

Once you have reached the point to be surveyed, record the field-averaged GPS location of the point, the location error, and the elevation of the point plus its error. If you cannot receive a suitable reading from the GPS at the actual survey point, move to a more open location, measure the bearing and distance TO the survey point, and use the bearing-distance function of the GPS to calculate the coordinates of the actual survey point.

Use these settings for your GPS unit:

Position format:	Decimal degrees (hddd.ddddd)
Map datum:	NAD 27
Units:	Metric
Heading:	True north

POINTS IN UNSAFE TERRAIN OR UNSUITABLE HABITATS

We have selected grids for sampling that appear to have a minimum of 15 of the 25 points in suitable, accessible habitat. Points that fall in the ocean, in the middle of large lakes or rivers, or on glaciers or icefields should be considered real "zeroes" as breeding bird habitat and not surveyed.

Points that fall on cliffs, steep slopes, or other inaccessible terrestrial habitats should not be considered "zeroes" as breeding bird habitat, even if they cannot be surveyed. Points that fall within ponds or small lakes, in creeks, next to loud rivers or creeks (where hearing is noticeably impaired), or in the middle of a dense brush thicket should also be considered as samples of suitable habitat. For practical purposes, these habitats can be sampled from slightly modified locations.

If the point falls within suitable breeding bird habitat but is in an inaccessible or unsafe location, and if a suitable survey location falls within a 50-m radius of the original sampling point, use the following protocol to select an alternate sampling point. First, determine all directions from the original sampling point in which suitable sampling locations occur somewhere within 50 m of the original point. Using the random number table provided, select a suitable bearing (i.e., 0-359°) from the original point. Walk along the selected bearing to the location closest to the original point that is in habitat appropriate for sampling (safe, accessible, no excessive stream noise). Record the new coordinates as well as the distance and bearing FROM the original point. Note on the Location Data Form why the point was moved. If a small number of points lie across a major barrier (e.g., uncrossable river), note why these points were inaccessible and survey the remaining accessible points. Survey a minimum of 15 points per grid.

PHOTOGRAPHING AND MARKING POINTS

Points should be photographed for reference if possible. Use a standard or slightly wide-angle lens and photograph the view from the survey point in at least one direction. Digital cameras are preferred. Photos will be used to help relocate the survey point as well as to document habitat surrounding the point. Note the photo number and direction in which each photograph is taken.

Points may be marked with permanent or semipermanent markers, such as rebar, metal tags, or flagging. The point identification number should be the AKgrid_ID followed by the point number (1-25), separated by a dash. Note on the Location Data Form the type and placement of any markers used.

Alaska Landbird Monitoring Survey

Conducting the Point Count Survey

OVERVIEW

The Alaska Landbird Monitoring Survey (ALMS) has been designed to monitor long-term trends in breeding populations of landbirds (and other species) within all ecoregions of Alaska. This system relies on surveying the same points every two years to monitor changes in bird populations over time. During a 10-min count from a series of survey points, observers estimate distances to each bird detected and record time of detection, from which detectability functions for each species are estimated. These functions help minimize bias in estimates of breeding densities by accounting for several major factors that influence detectability of individual birds (e.g., observer, habitat, vocalization rates, etc.).

OBSERVER TRAINING REQUIREMENTS

- The observer needs to be able to identify by sight, song, and call all species likely to be encountered.
- All observers should study the visual descriptions as well as songs of the less common species.
- Acute hearing is a must, and hearing at high frequencies should be tested.
- All observers should practice measuring and estimating distances to birds in the habitats in which they will be conducting surveys.

Audio-cassette tapes, compact discs, and computerized training programs are available for study. Rangefinders (especially laser rangefinders that are accurate to 300 m) are particularly helpful for measuring distances. An observer should practice and measure his or her pace so that it can be used to estimate distances accurately.

NUMBER OF OBSERVERS

The standard protocol is for each point to be surveyed by a single observer. If more than one trained observer is available for a grid, observers should be rotated randomly among the points. Different sections of a grid may be surveyed simultaneously by different observers.

Only birds detected by the official observer for a given point count should be recorded. A second person may be present but must not interfere by asserting his or her own detections. However, the companion MAY help with species identification if the observer has detected a bird but needs help identifying it. It is best for the observer to record his or her own observations on the forms, since relaying the information to

another person could result in making transcription errors or missing other birds during the conversation.

An alternative protocol that can be used if two trained observers are available is the double-observer method. In this protocol, two observers conduct point counts simultaneously on separate data sheets. If the double-observer method is used, it is important that detections of birds be independent, i.e., that one observer does not influence which birds are detected by the second observer. Observers should not discuss any sightings until the count has been completed. After the count, birds detected by both observers should be circled. No additions or deletions should be made to the data sheets after the count. It is expected that all observers will miss some birds; how many are missed is immaterial as long as we can estimate the proportion being detected. Having both observers count simultaneously will allow us to estimate detection functions and also determine for each species the outermost distance within which most observers detect a large proportion of the individuals.

PLANNING SURVEY ROUTE

Each grid of survey points should contain 15-25 points that fall within breeding bird habitat and are suitable for surveying. These points should be visited and marked, if possible, before the official survey is conducted so that the most efficient route between them can be selected. Scouting ahead of time will also allow alternate points to be designated for those that occur in unsafe locations or areas with excessive stream noise.

Points may be surveyed in whatever order is deemed most practical. Once the initial order has been determined, it is desirable but not mandatory that this order be repeated in subsequent years for monitoring. An accurate GPS pre-programmed with the locations of the points in the proper order can be helpful in assuring correct locations.

SEASON

In Alaska we will be running most of our survey routes between 10 June and 30 June. Surveys can be conducted as early as 25 May in the Aleutian Islands, Prince William Sound, and southeastern Alaska. Early July is too late and should be avoided. The most suitable period is that which will be most stable from year to year in detections of breeding birds and during which both resident species and late migrants can be readily detected on breeding territories. In addition, a date as near as possible to the previous survey's date is most preferable.

TIME OF DAY

The first count of the day should be started no earlier than 0300 Alaska Standard Time in the Arctic and within 30 min after sunrise if possible elsewhere in the state. A later start time may be necessary if the terrain cannot be traversed safely before sunrise.

The last count of the day should be completed no later than 4-5 hr after the first count began, since bird activity declines markedly after that time in most areas.

ACCEPTABLE WEATHER

Routes must be run only under conditions of good visibility, little or no precipitation, and light winds. Occasional light drizzle or a very brief shower may not affect bird activity but fog, steady drizzle, or prolonged rain should be avoided. See the data sheets for weather codes. Remember to record weather data at the beginning and end of the count each day. Note any points at which detectability of birds seemed to be affected by weather (e.g., wind, precipitation).

RECORD-KEEPING

For each survey grid the observer should fill out the following forms:

- Location Data: 1 per grid, when grid initially set up;
- Bird and Mammal Summary Checklist: 1 per grid, compiled at the end of each survey day;
- Survey Details, Daily Weather and Route: 1 per grid per observer, filled out at beginning and end of each survey day;
- Map and List of Birds Detected during Survey: 1 per point per observer, completed during each point count survey;
- Habitat Block Data: 1 per grid, first when grid initially surveyed and periodically in subsequent years;
- Habitat Point Data: 1 per point per habitat type, first when grid initially surveyed and periodically in subsequent years.

Data forms can be copied onto waterproof paper for use in the field. Use dark pencil to record. Observations of birds should be recorded as soon as they are detected; do not wait until survey interval is complete. At the end of each day species codes should be verified for accuracy against the list; several species have codes similar to each other and could cause confusion.

DURATION OF COUNT AND TIME INTERVALS

Standard counts are to be precisely 10 min long. Please denote the time interval in which each bird is first detected: 0-3 min, 3-5 min, 5-8 min, or 8-10 min. This will allow us to compare detection rates with roadside BBS surveys, which are 3-min counts, and with our previous 5- and 8-min off-road counts. It will also allow us to estimate detection probabilities based on time of detection.

CONDUCTING THE POINT COUNT

The survey point should be approached with as little disturbance to the birds as possible. Immediately upon arriving at the survey point the observer should take a compass bearing, start a stopwatch, and begin the count. A stopwatch with interval alarms is helpful. A second person can also be the timekeeper.

Birds should be recorded as soon as they are detected. Those occurring in obvious associations (flocks, pairs, family groups) within the same distance interval should be recorded as a single observation. Record the species, time interval, behavior code, and distance interval as soon as possible. It may help to map the approximate locations of counter-singing males first and then determine distance interval of each.

DISTANCE ESTIMATION

For each observation, measure or estimate the HORIZONTAL distance to the bird when it was first detected. Note that this is NOT the angular distance to the bird itself, which can be much greater than the horizontal distance if the bird is at the top of a tall tree or on a steep slope. If a bird is flushed by the observer, either when the observer arrives or during the count, distance should be recorded according to its take-off position.

Denote distances in 10-m bands out to 100 m from the survey point, in 25-m bands from 101-150 m, and in 50-m bands from 151-400 m; birds detected at farther distances can be denoted as > 400 m. In areas with closed habitats or very high densities of birds, the same initial distance bands will be used out to 150 m. Then, birds from 151-400 m will be lumped as > 150 m and those beyond 400 m will be listed as > 400 m.

The most important observations are those closest to the observer; effort should not be wasted trying to identify or measure distance to individuals far away if it means that closer individuals are being missed. Most observations at greater distances will be truncated during analysis.

Birds that are not actively using the survey area but are only flying over should also be recorded. The horizontal distance to the point at which they were first detected should be estimated.

Distances can be determined by using a rangefinder focused on the bird, a reference tree, or hummock, or by measuring paces to the location after the count is over. Flagging can be used to mark a subset of the distance bands for quick reference when the points are initially set up.

WHICH BIRDS TO COUNT

Count all individuals of all species seen or heard at any time during the survey period. Do not attempt to guess what species or numbers you may be missing. Be careful to

keep track of any individuals known or strongly suspected to have been previously counted at another survey point. Please mark birds that have been previously counted as "P" on both the map and the list. Birds detected at more than one point can be used in distance analysis.

A bird that is detected during the count but not identified may be identified after the count if more careful observation is required, the bird is still present, and time permits. A flock that is present at some time during the count may also be followed after the count to determine its species composition and size. Visual identifications should be made whenever possible, and are always preferable to identification by song or call alone. Absolutely no method of attracting birds should be used during the count.

EXCLUDING SPECIES FROM COUNT OR RESTRICTING RADIUS

In some areas of the state, certain non-landbird species (e.g., geese on the Yukon-Kuskokwim Delta or seabirds on nesting cliffs) may be so abundant that to count them completely would lead to inadequate surveys of landbirds. In such cases you may choose one of two alternatives: (1) count the abundant non-landbird species only within a restricted radius (e.g., < 50 m) and ignore those beyond that distance or (2) exclude the abundant species completely from the point count surveys. If either of these alternatives is used, it should be noted on the survey details form and the entire grid should be surveyed the same way. The first alternative is preferable, since we can still estimate densities of these species. If a species is excluded from the survey completely, at a minimum note whether it is present or absent at each point in the notes section.

SPECIES DETECTED ONLY BETWEEN SURVEY POINTS

Any species that are detected only BETWEEN the survey periods should be listed in the notes section underneath the circular map. At the end of each day, include these observations on the summary checklist. This way we will have a complete list of species along the entire route.

USING THE CIRCULAR MAP

Use the circular map and the list of symbols provided to minimize the probability of counting the same bird twice during a count. The center of the circle is the position of the observer (the survey "point"). Concentric circles represent distances of 50, 100 and 150 m around the observer. As soon as you arrive at the survey point you should take a compass bearing and record it in the box at the top of the circular map. (An alternative is to note the direction of north and always orient your map with north at the top of the circle.) Record the start time for each survey point. Then immediately set a stopwatch and begin recording the birds detected, sketching the position of individuals on the circular map. Write the 4-letter species code with the appropriate behavior code or symbol at the approximate position of the bird.

Please use the 4-letter codes provided on the summary checklist form; if the species is not listed, spell out the name completely. Identify subspecies that are easily distinguished by plumage, such as Slate-colored and Oregon Juncos, and Myrtle and Audubon's Warblers. If a bird is unidentified to species, spell out the closest identification, e.g., unidentified sparrow. If you are fairly certain but not positive about a species' identification, place a question mark after the species code.

Next to each species' alpha-code, indicate the time interval and the distance band in which it was first detected. Time intervals should be denoted with a superscript of ^{3}, ^{5}, ^{8} or ^{10} for the 0-3, 3-5, 5-8, and 8-10 min intervals, respectively. Distance should be denoted by the OUTER distance of the band in which it was first detected. For example, if you see a Varied Thrush at 4:05 min at a distance of 24 m, it should be denoted as VATH$^{5\text{-}30}$, since it was heard in the 3-5 min interval and within the 21-30 m distance band.

Please use the behavior codes provided. These are simple characters that help us determine the age and sex of each bird detected. If an individual exhibits several behaviors during the count period, you may record the behaviors in the order observed. In the final tally, please record only the behavior that best indicates the age and sex of the bird (e.g., singing rather than calling).

In the final data compilation the only important position factor is the actual distance band, but sketching within the four quadrants of the map is helpful when high numbers of birds are present. Recording movements can also be helpful, but be very careful to only COUNT one time a bird that has moved. You should familiarize yourself with the 4-letter species and detection codes before the actual survey.

TRANSFERRING OBSERVATIONS TO LIST

As soon as each survey point has been completed, the species, time interval, number of individuals, behavior code, and distance interval (outer band) should be transcribed from the map to the list. You should tally the position and time interval of each bird when it was first detected, regardless of its subsequent movements during the survey. For cases where a bird is mapped exhibiting several behaviors, please tally only the behavior that best indicates the age and sex of the bird. For example, if you first detect a Yellow Warbler calling and later hear it sing, you would record it as singing since this behavior allows us to classify this individual with certainty as an adult male. Keeping track of the type of detection will help us monitor the number of breeding pairs better.

If the list alone is used, enter each observation on a separate line as each bird is encountered. You should be careful that individuals are not recorded more than once if they have moved during the count period.

COMPILING AND SENDING FORMS

Please staple all data forms for a particular survey grid together. Make sure all forms have been filled out completely and proof all data for errors, paying particular attention to species codes. Make a copy of the data sheets and send the originals to Colleen M. Handel, USGS Alaska Science Center, 1011 E. Tudor Rd., Anchorage, AK 99503, as soon as possible after completion of the count. You should keep a copy of your data in case there are problems with the mail.

PROCESSING OF RESULTS

Upon receipt of the forms, the list of bird observations will be checked against the circular maps. Data will be entered into the computer and run through an edit program. Original data will be archived and copies of your computerized files can be sent to you upon request. Data will be mapped and summarized for each route and will be available on the Boreal Partners in Flight website: <www.absc.usgs.gov/research/bpif/bpif.html>.

Alaska Landbird Monitoring Survey

Location Data Form

HEADER INFORMATION

GPS type and number: Assign each GPS unit for your land management area a unique identification number for storage and retrieval of waypoints. Record the type (model) and number of the GPS unit used for each sample block.

GPS datum: Coordinate locations (latitude-longitude) for the sample points are all given in the NAD 27 datum. This datum should be used unless other arrangements were made previously with Colleen Handel, USGS Alaska Science Center. If so, then record the datum in which coordinates have been recorded (e.g., NAD 83).

Land unit: Identifiable name or abbreviation of your land management unit (e.g., Tongass NF-HRD, Kenai NWR, WRST).

Dates: Dates the survey point locations were recorded (set-up date or actual survey date, whenever GPS locations were recorded).

Block number: Alaska grid identification number (AKgrid_ID from ArcView file).

Block name: User-assigned name for the block, noting some recognizable geographic feature.

SURVEY POINT INFORMATION

Waypt #: Waypoint number of actual survey point location stored in GPS unit. Use this as reference for downloading data to computer.

Pt: Number of survey point within 25-point grid according to standard numbering protocol. Point 1 is at southwestern corner of grid; points are numbered sequentially from west to east along each row and then northward through the rows. See Figure 1 in protocol for setting up point count grids. In many blocks some points will not be surveyed because they do not fall in breeding bird habitat (e.g., ocean, river, icefield) or are in unsafe habitat (e.g., steep cliffs). In these cases, leave data fields blank and put reason for not surveying in notes column.

Latitude and longitude: Record field-averaged coordinates of the ACTUAL SURVEY POINT in decimal degrees from GPS unit in whatever datum is listed in header (in most cases, NAD 27). Be sure to circle E longitude for Aleutian Islands west of the international dateline. Note that the ACTUAL survey point is where the observer stands during the survey. This location might not be exactly the same as that designated as

original survey point, if special conditions require it to be moved (e.g., to avoid obstruction at original point, to move from unsafe terrain, to stand on shore of pond instead of in middle of it).

If it is not possible to get suitable coordinates from the actual survey point (e.g., cannot obtain suitable satellite signal because of dense canopy or other obstruction), attempt to obtain them from a location within 50 m of the point. Obtain the azimuth (bearing) and horizontal distance from the "offset" location to the point. Some GPS units have a built-in function to compute the coordinates of the survey point using this information (e.g., PLGR Rng-Calc function). If another type of GPS unit is used, record the azimuth and horizontal distance TO the actual survey point in the notes.

Coordinates may be collected farther than 50 m away from the actual survey point if a laser measuring device is used to determine the horizontal distance from the "offset" location to point. Again, if available, use the built-in function in the GPS to compute the coordinates of the point. If another type of GPS unit is used, record the azimuth and horizontal distance TO the actual survey point in the notes.

Location error (m): Record error in meters listed on GPS unit for field-averaged coordinates. Try to reduce error to less than 5 m if possible.

Elevation (m): Record estimated elevation (in meters) at actual survey point from barometric-pressure-corrected altimeter, GPS, or topographic map. Record code for method used (A, G, or M, respectively).

Moved FROM original point: Use this field ONLY if actual survey point was moved away from original assigned location for reasons of safety, accessibility, or stream noise. Record distance (in meters) and bearing FROM original assigned point to the actual survey point.

Photo: Record the photo number(s) and direction(s) in which photos were taken from the survey point. Reference a roll and frame number if film used; use card and frame number if digital camera used.

Alaska Landbird Monitoring Survey

Bird and Mammal Summary Checklist

Complete one form for each grid of points surveyed. Include observations of all species of birds and mammals from all team members during their stay within the 10-km x 10-km survey block. This checklist will provide the basis for an atlas. At the end of each day, compile information on all birds and mammals detected within the survey block during point-count surveys; while traveling to, from, and between points; and during time at camp. For each species that has been positively identified by sight or sound, use the list of codes to describe evidence of occurrence and possible or confirmed breeding.

Land unit: Record identifiable name or abbreviation of your land management unit (e.g., Tongass NF-HRD, Kenai NWR, WRST).

Block number: Record Alaska grid identification number (AKgrid_ID from ArcView file) for the survey block.

Block name: Record your user-assigned name for the block, noting some recognizable geographic feature.

Dates: List dates during which any observations of birds and mammals were recorded within the block, including official survey days and camp set-up and take-down days.

Observers: List all observers who contributed to summary checklist.

Total effort: Record estimated number of party-hours actually observing birds during and between counts (including time at camp) and total linear distance traveled (km) by all parties within the survey block.

Alaska Landbird Monitoring Survey

Survey Details Form

Complete one form for each grid of 25 points surveyed per observer.

SURVEY DETAILS

Length of count (min): Circle the total duration of each point count (in minutes). The standard length will be 10 min.

Spacing between pts (m): Record the spacing between survey points in the grid for that sample block. Spacing should be the same within a block, 250 m in predominantly closed habitats and 500 m in predominantly open habitats.

Observers rotated among points: If more than one trained observer surveys different points on this grid, circle yes. Fill out a separate form for each observer.

Double observer method used: If two observers conduct counts simultaneously at the same points on this grid, circle yes. Fill out a separate form for each observer. Weather information should be identical.

Species counted within restricted radius: List non-landbird species or groups that are counted only within a restricted radius because they are too numerous to allow adequate count of landbird species (e.g., geese on Yukon-Kuskokwim Delta or seabirds nesting on cliff). Record distance of outermost distance band used in meters.

Species excluded from survey: List non-landbird species or groups that are completely excluded from point counts because they are too numerous to allow adequate count of landbird species, even with restricted-radius count. In the notes section on the map form for each point, record presence of each species that is detected at that point.

OBSERVER INFORMATION

Give full name, affiliation, mailing address, telephone number, and email address of the observer conducting this survey.

SURVEY EXPERIENCE

Record the number of years experience this observer has conducting point-count surveys (including BBS), using distance-estimation techniques, and birding in Alaska (i.e., familiar with birds in area being surveyed).

CONTACT INFORMATION

Give full name, affiliation, mailing address, telephone number, and email address of the person responsible for long-term management of data for land management unit or study area (e.g., biologist or manager). If same as observer, leave blank.

DAILY WEATHER AND ROUTE

Land unit: Identifiable name or abbreviation of your land management unit (e.g., Tongass NF-HRD, Kenai NWR, WRST).

Block number: Alaska grid identification number (AKgrid_ID from ArcView file).

Block name: User-assigned name for the block, noting some recognizable geographic feature.

Date: Record date for each day points on grid were surveyed (in month-day-year format).

Time: Record in 24-hr format the start time of the first point count and the end time of the last point count conducted each day.

Temp: Record the ambient air temperature at the start and end of point counts each day. Circle whether recorded in degrees Celsius or Fahrenheit.

Wind: Record Beaufort code for wind speed at the start and end of point counts each day. See code sheet.

Sky: Record code for sky condition at start and end of point counts each day. See code sheet.

Daily route: Draw a line showing path traveled between survey points each day. This will indicate order in which points were surveyed and can illustrate approximate distance and path taken from camp and around any obstacles. Thus, it can provide an estimate of effort and distance traveled for recording species between points. If trained observers travel together but rotate as counters among points, show common route traversed but circle which points were surveyed by each observer on separate sheets.

Alaska Landbird Monitoring Survey

Map and List of Birds Detected at Point

Complete one form for each point surveyed per observer.

MAP OF BIRDS DETECTED DURING SURVEY

Block #: Record the Alaska grid identification number for the survey block (AKgrid_ID from ArcView file).

Point #: Record the number (1-25) of the point being surveyed.

Observer: Give name or initials of observer conducting survey. Make sure complete name and contact information are given on Survey Details form.

Date: Record date on which point is surveyed.

Time start: Record time to nearest minute in 24-hr format at which point count started.

Direction: Record a compass bearing (degrees from true north) from the point and use it to orient approximate locations of birds and their movements.

Circular map: Map the approximate locations of all birds detected using 4-letter species codes and behavior symbols provided on code sheets. The center of the circle is the position of the observer (survey point). Distance bands are shown for 50, 100, and 150 m. Note distance and time interval for first detection of each bird.

Species between this and previous point: List species observed between this and previous point that have not yet been detected during a point count.

Non-landbird species present but not counted: Note the presence of any non-landbird species detected during the count that are not being enumerated during the standard count because their extreme abundance precludes adequate landbird counts (see Survey Details form).

Mammals: Note any mammals detected during counts or between points as well as type of detection (visual, tracks, sign, dam).

Notes: Record any information pertinent to bird survey, such as inclement weather or wind. Note any nests, downy or newly volant young, mate-feeding, adults carrying food or fecal sacs, or any other behavior that confirms or suggests breeding of birds in the area.

LIST OF BIRDS DETECTED DURING SURVEY

Complete one entry for each individual, pair, or flock of birds detected during count.

Species: Record 4-letter code of species detected. Identify birds to subspecies if they are easily distinguished by plumage (e.g., Slate-colored Junco or Myrtle Warbler). If a bird is not identified to species, spell out the closest identification you can make, such as unidentified dabbler, unidentified thrush, or unidentified woodpecker. Do not make up your own codes, since there are many confusing possible combinations. If you are fairly certain but not positive about a species' identification, place a question mark after the species code.

Time: Record time interval during which bird was first detected.

#: Record number of individuals detected.

Beh: Use behavior codes to note how bird was detected. If bird is detected by more than one method, use the code that gives the best information about the age and sex of the bird (e.g., a male that calls and then sings should be listed as singing). Birds flying on a direct heading high over the survey area that are not actively using or associated with the habitat near the point should be listed as flyovers. If bird is known or suspected to have been counted from a previous point based on its position, record it on the map and the list with the detection code of "P" for previous point. Detections of the same individuals from multiple points can be used in distance analysis.

Dist: Record distance interval in which bird was first detected during count. If bird was flushed from point as observer approached, record the distance between the survey point and the original position of the bird. Note that the intervals are designated as the outermost bound of the interval (e.g., 0-10 m is recorded as 10).

For closed habitats or very common species in open habitats, record distance interval for each individual detected within 150 m and use "> 150" for those observed from 151-400 m. For open habitats or rare species in closed habitats, try to record distance interval for each individual detected within 400 m. Use "> 400" for any birds detected beyond 400 m.

Alaska Landbird Monitoring Survey

Collecting Habitat Data

INTRODUCTION

Please fill out one set of habitat forms for each grid of points that you survey. Habitat data should be collected during June or early July. This information can be collected on the same day that the bird survey is conducted, but habitat data collection should not interfere with the bird survey. For example, the grid can be surveyed for birds in one direction and habitat data can be collected on the return hike.

The information collected on these forms will enable us to characterize habitat according to classifications outlined by Cowardin et al. (1979), Kessel (1979), and Viereck et al. (1992). We will be using data collected by cooperators across the state to analyze patterns of bird distribution.

GEOREFERENCED PHOTOGRAPHS

Take one photograph of the center point including background habitat from each cardinal direction, approximately 5 m away from each point. Have your field partner stand at the survey point for a scale of reference. To reduce mislabeling of photographs, it may also be useful to have that person hold a clipboard or dry-erase board at the center point with the block number, point number, direction, and date clearly labeled. Photographs should be taken with a wide angle lens, using the highest resolution possible for digital photos given the disk space available (minimum 2-3 megapixels per sq in). Set digital cameras to date- and time-stamp each photograph. If photos and GPS locations are taken at about the same time, the photos can later be linked to the locations in a GIS database. Make sure you mark waypoints using a GPS at your survey locations as soon as possible relative to the time when photos are taken. Set your GPS to record the date and time that waypoints are marked.

DATA FORMS

For the habitat data, you will need to fill out the following forms:

- Habitat Block Data: one form per grid of 25 points
- Habitat Point Data: one form per survey point
- Habitat Description: one form per habitat type per point.

DETERMINING THE NUMBER OF HABITATS TO DESCRIBE AT A POINT

You will be recording data on habitat **within a circle with a *radius* of 50 m** around each survey point (Fig. 1). You will get some information about the area by walking through it during the survey, but you will also need to walk around the circle to get an unbiased view of the habitat that it contains.

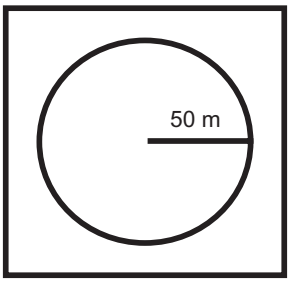


Fig. 1. Diagram of 50-m radius circle in which habitat is to be characterized.

The HABITAT QUESTIONNAIRE on the Habitat Point Data form will help determine whether the habitat within the circle should be classified as one or more types. It will help you distinguish among unvegetated, wetland, and different non-wetland habitats. Based on your answers, follow the instructions provided, which will indicate how many Habitat Description Forms you should fill out (usually only one per point). Each distinct habitat type should be described on a separate Habitat Description Form. Each habitat should be numbered and the percent of the 50-m radius circle occupied by that habitat should be estimated.

The first step in determining the number of habitats within the survey circle is to view the area in the context of the surrounding landscape. Look at the size of each "patch" of habitat that occurs at least partly within the circle. The minimum size a patch must be to be considered a separate habitat will depend on several factors: (1) whether or not it is a wetland, (2) whether it can be considered an understory of a higher canopy layer, and (3) whether or not it is part of a larger, regularly occurring mosaic.

- Any wetland at least 10 m wide in any dimension should be considered a separate habitat.

- A non-wetland patch must be at least 400 m^2 in size (circle of 11-m radius; 0.1 acre) before it should be described as a separate habitat.

- Shrub or herb layers under sparse tree canopy layers should NOT be described as separate habitats. If woody plants are present, the habitat should generally be named by the tallest canopy of woody plants present.

- A habitat "mosaic" is "a fairly regular pattern of two cover types interspersed together at a fine enough grain that it seems inappropriate to classify it as two separate things" (Hutto et al. 2002:16). Such a mosaic should be classified as a single habitat and named by the highest canopy layer that meets the minimum percent cover criterion for each classification system.

- When there is a clear boundary between two habitat patches that are large relative to the survey circle and large enough to host a different bird community, these should be described as separate habitats.

IDENTIFYING WETLAND HABITATS

Habitats will be classified as wetlands according to criteria of the National Wetland Inventory (NWI) Classification (Cowardin et al. 1979). Use the separate NWI Key provided on the NWI Reference Sheet to determine the wetland classification. Wetland presence is determined by frequent or persistent saturation or inundation with water. In the absence of visible bodies of water, wetland status will be determined by the presence or lack of obligate and/or facultative wetland indicator plant species.

As defined by NWI (USFWS 2004), obligate wetland indicator plant species almost always occur in wetlands (estimated probability > 99%). If there is no other evidence of wetland habitat, an NWI designation can be made based on the presence of obligate wetland indicator plants alone. Facultative wetland indicator plants usually occur in wetlands (67–99% estimated probability), but are occasionally found in non-wetland areas. Presence of a few facultative wetland indicator plants alone is not enough to warrant wetland designation. If facultative wetland plants are very abundant, or if there are several facultative wetland species occurring together, then it is *likely*, but not certain, that a wetland is present.

Observers will have to use their best judgment in the field to determine whether or not wetland habitats are present. The obligate and facultative wetland indicator plant lists provided on the NWI Reference Sheet are in no way comprehensive lists, but provide the most common species likely to be encountered. These lists were derived from the 1988 list of regional wetland indicators for Alaska (FWS 2004).

HABITAT MOSAICS VS. DISTINCT HABITATS

The following figures illustrate various distributions of two different vegetation types. These should be used as a guide to determine when to lump versus when to split vegetation types into different habitats. The larger circle outlined in black represents the 50-m radius circle inside which habitat data are collected. The white background represents meadow habitat in these examples. The grey circles in these figures represent patches of trees. The grey circles are proportional to the minimum patch size that can constitute a separate habitat, and these figures are drawn to scale.

The 50-m radius circle depicted in Fig. 2a should be described as two separate habitats because the patch of trees meets the minimum patch size requirement for terrestrial habitats, falls at least partly inside the circle, and is not part of a larger landscape mosaic of interdigitated habitats. While the forest habitat type in Fig. 2b meets the minimum patch size requirement, none of it falls within the 50-m radius circle, so only the meadow habitat represented in white inside the circle should be described. Similar to Fig. 2a, the grey forest habitat in Fig. 2c meets the minimum patch size, and part of it falls within the circle, so this circle should be described as two separate habitat types.

The percent of the 50-m radius circle occupied by the forest habitat will be very small, since only a tiny portion of it falls inside the circle where habitat is to be described.

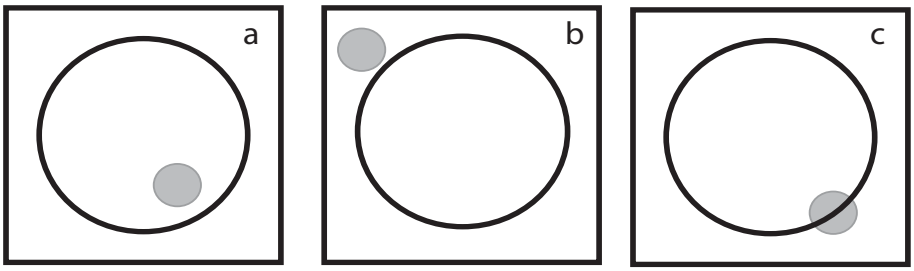


Fig. 2. Examples of discrete patches of forest in large tract of meadow in relation to 50-m survey circle. See text for which should be characterized as separate habitats.

Fig. 3 depicts different configurations of two vegetation types. Fig. 3a represents what Hutto et al. (2002) describe as a "habitat mosaic," where two vegetation types are interdigitated at a fine scale to form a mosaic across the landscape. Such mosaics should be described as one habitat. Fig. 3b represents a similar situation where two vegetation types (e.g., patches of trees and meadow) are heterogeneously distributed

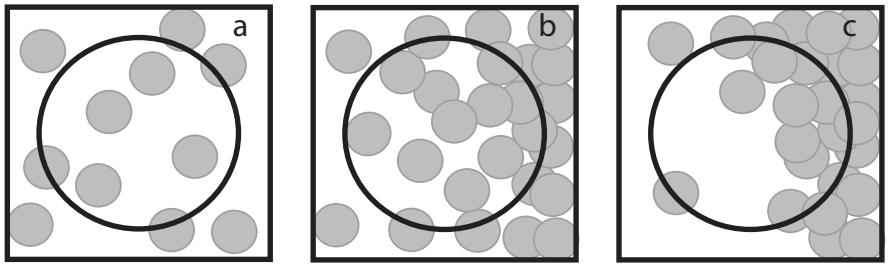


Fig. 3. Examples of two vegetation types forming a single habitat mosaic (a-b) or an edge between two separate habitat types (c), shown in relation to 50-m survey circle.

along a gradient between two different habitat types (forest and meadow). Because there is no clear boundary between the two types inside the 50-m radius circle, this mosaic should be described as one habitat type. Fig. 3c depicts a clearer boundary between forest and meadow and should be described as two separate habitats.

Some wetland habitats and disturbed areas pose particular problems when designating separate habitats within a circle. Wide shorelines (such as large tidal flats or lakes with marshy edges) should be classified as separate habitats if they are at least 10 m wide. A disturbed area (such as road margin, logged forest, or area affected by a fire) should be classified as a separate habitat if it is at least 400 m^2 in size (circle of 11-m radius; 0.1 acre). Several examples are given below.

Fig. 4 depicts water bodies that fall within the 50-m radius circle. If a water body comprises two distinctly different wetland types that are > 10 m wide, then the parts should be described separately. Therefore Fig. 4a would be assigned three different habitats (the water itself, its vegetated margin, and the surrounding non-wetland habitat). Fig. 4b would be assigned only two habitat types because the vegetated wetland associated with the water body is < 10 m wide.

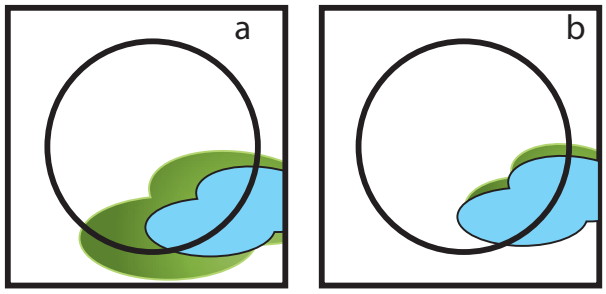


Fig. 4. Examples of water bodies with vegetated margins of varying widths in 50-m survey circle.

Fig. 5 depicts a similar situation in which a stream with associated wetlands runs through a 50-m radius circle. The associated wetland in Fig. 5a is > 10 m wide in some areas and should be described separately, leading to three habitat descriptions for this circle (water, streamside vegetation, surrounding non-wetland vegetation). The wetlands along the stream in Fig. 5b are less than 10 m wide, so should be lumped in with the riverine habitat description, resulting in two habitats for this circle.

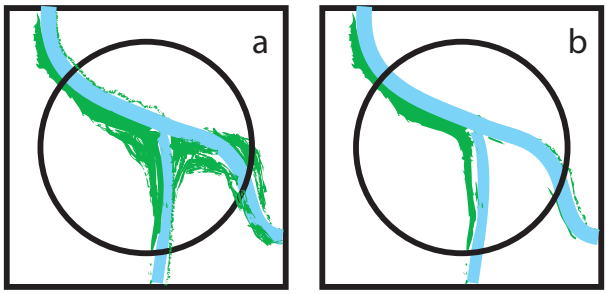


Fig. 5. Examples of streams with vegetated wetlands along banks crossing 50-m survey circle.

Fig. 6 depicts a road crossing the 50-m radius circle. The disturbed area associated with the road on either side has markedly different vegetation, and meets the minimum patch size requirement (> 400 m^2) for non-wetlands, so should therefore be described separately from the surrounding habitat. If the canopy is broken, the road itself will be one habitat (unvegetated bare soil), the roadside vegetation will be a second, and the remaining vegetation will be a third. A small trail cutting through the circle should NOT be described as a separate habitat.

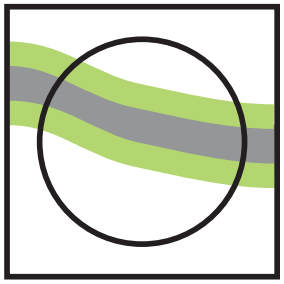


Fig. 6. Example of roadside with disturbed vegetation crossing 50-m survey circle.

Only in instances when there are distinctly different vegetation types, when there are large unvegetated surfaces, or when a wetland is present, should more than one habitat be described. When in doubt, lump rather than split and describe as few habitats as possible. If you are consistently recording more than one habitat per point, and are not in a disturbed or wetland area, then you are probably assessing habitat at a finer scale than we intended. Step back and try to assess the habitat at a grosser scale.

Alaska Landbird Monitoring Survey

Habitat Block Data Form

HEADER INFORMATION

Land unit: Identifiable name or abbreviation of your land management unit (e.g., Tongass NF-HRD, Kenai NWR, WRST).

Dates: Dates on which the habitat data were collected.

Block #: Alaska grid identification number (AKgrid_ID from ArcView file) for the survey block.

Block name: User-assigned name for block, noting recognizable geographic feature.

Topo map quad: Name of the 1:250,000 scale topographic map on which the grid of points occurs. If the points fall on more than one map, choose the quadrangle that contains the southwest corner of the grid.

PHOTOS

Indicate whether photographs taken at each point were digital, slide, or print film. If digital, indicate whether locations were interfaced with GPS using date-time stamp.

OBSERVER INFORMATION

Give name, affiliation, mailing address, telephone number and email address of primary observer collecting the habitat data. List names of additional observers.

CONTACT INFORMATION

Give name, affiliation, mailing address, telephone number, and email address of person at land management unit responsible for maintaining data long-term (e.g., biologist or manager), if different from observer.

EXOTIC PLANTS

Note the presence of any exotic plant species found at or between points on the block.

MISCELLANEOUS FIELD NOTES

Note any pertinent information about points, including how points are marked, specific types of disturbance, or other data that may be important to bird distribution.

Alaska Landbird Monitoring Survey

Habitat Point Data Form

Complete one form for each point surveyed.

HEADER INFORMATION

Fill out this information on every sheet. If possible, avoid duplexing when printing data sheets to allow for ease of organization later.

Land unit: Identifiable name or abbreviation of your land management unit (e.g., Tongass NF-HRD, Kenai NWR, WRST).

Date: Date the habitat data were collected for this point.

Observers: Names or initials of those collecting habitat data. Make sure full name of each observer is listed on the form for the block.

Block #: Alaska grid identification number (AKgrid_ID from ArcView file) for the survey block.

Point #: Survey point number (1-25, in standard order; see set-up instructions).

TOPOGRAPHY

Elevation: List the elevation in **meters**, at the survey point itself. This can be measured with an altimeter or GPS or estimated from a topographic map. You can record elevation in feet and convert later but be sure to LABEL units.

Aspect: List the direction in degrees from true north that the slope at the survey point is facing. If it is flat, write NA. Do not leave blank.

Slope: Estimate or measure with a clinometer or a compass the slope in **degrees** at the survey point. You should estimate slope over a distance of about 20 m. Some laser hypsometers are also equipped with a slope function. If it is flat, slope = 0; do not leave blank.

Topographic position: Record the position of your point relative to the largest topographic features in your area. Features should be recorded at a scale such that they will be recognized on a topographic map with 200-ft contour intervals. See Topography Reference Sheet for details.

Local features: Record notable local topographic features within the 50-m radius circle you consider important enough to affect bird occurrence. See Topography Reference Sheet for definitions.

PHOTO

Roll/frame or Digital ID #: Record roll and frame numbers of slide or print film or digital photo reference numbers for all photos taken at the point. See Habitat Data Collection instructions for more information on providing georeferenced digital photographs.

DISTURBANCE

Note the type and severity of any disturbances detected in the 50-m radius circle that meet the minimum patch size requirement of 400 m^2 (or a circle of 11-m radius or 0.1 acre) if any part of the disturbed area falls in the 50-m radius circle. Use the disturbance severity codes provided to distinguish between mild and severe disturbances. If no disturbance is detected in a plot, be sure to mark "NONE." You may want to record more detailed notes about disturbances and their history in the miscellaneous notes for the block. If an area has been logged, describe the stage of regrowth that has occurred. Mark a time category (greater or less than two years) for the estimated time since the disturbance occurred. If the exact year of a major disturbance is known, record the years since the disturbance occurred in the blank provided; otherwise, leave blank. If any part of a road passes through your circle, the road bed and right-of-way where road-associated disturbance is evident should be classified as one or more separate habitats, depending on how large of an area each covers. Minimum patch size for a separate habitat is 400 m^2 (circle of 11-m radius; 0.1 acre). Other types of disturbance need not be described as a separate habitat type unless they have significantly altered the vegetation.

COARSE WOODY DEBRIS

Check the boxes that indicate the numbers of coniferous and deciduous snags in the 50-m radius circle. Also check the box that indicates the percent cover of downed logs inside the circle. A **snag** is defined as any tree, dead or alive, having ≥ 1.5-m (5-ft) length of dead wood ≥ 10 cm (4 in) diameter at breast height (Husch et al. 2003). **Logs** are defined as dead downed wood, ≥ 1.5 m (5 ft) long and ≥ 10 cm (4 in) in diameter. All dead wood meeting minimum size requirements, including snags leaning at less than 45 degrees from horizontal, should be counted as downed logs (Husch et al. 2003). This includes large exposed root disks of uprooted trees. Logs should not be counted if they are (1) completely in contact with the ground **AND** (2) decayed to the degree of crumbling or covered with moss.

HABITAT QUESTIONNAIRE

Complete this questionnaire to determine the number and types of habitats present within the 50-m radius circle. See Collecting Habitat Data for more details regarding the use of this questionnaire.

Alaska Landbird Monitoring Survey

Habitat Description Form

Complete one form for each unique habitat described within the 50-m radius circle.

HEADER INFORMATION

Fill out this information on every sheet. If possible, avoid duplexing when printing data sheets to allow for ease of organization later.

Land unit: Identifiable name or abbreviation of your land management unit (e.g., Tongass NF-HRD, Kenai NWR, WRST).

Block #: Alaska grid identification number (AKgrid_ID from ArcView file) for the survey block.

Date: Date habitat data were collected for this point.

Observers: Names or initials of persons collecting habitat data. Make sure full names are listed on the form for the block.

Point #: Survey point number (1-25, in standard order; see set-up instructions).

Habitat #: If you are describing more than one major type of habitat for the 50-m survey circle, indicate which one you are describing here among the total number of habitats described for this circle.

% of circle: Record the percent of the 50-m radius circle occupied by this habitat. If there is only one habitat present, record 100. If more than one habitat is present in the circle, the percent recorded at each habitat should sum to 100 for all of the different habitats at the point. An aerial photo may help you estimate the coverage.

CLASSIFICATION

Indicate which one of the five categories best fits the habitat being described on this sheet. If necessary, collect data on vegetation layers before completing this section.

NWI: If this is a wetland habitat, provide National Wetlands Inventory (NWI) classification code based on the NWI key provided.

Kessel: Indicate the alphanumeric code for Kessel's (1979) habitat classification based on key provided.

Viereck: If you are familiar with the Viereck et al. (1992) classification system, provide the alphanumeric code down to the lowest level possible.

VEGETATION

Complete this section for a habitat if the vegetation cover is > 2%. List species in descending order of dominance. Use scientific names where possible to indicate species. If you abbreviate, use the first three letters of the genus and the species name; give a master list of species in the notes.

Note that some variables require that you estimate the % cover to the nearest 5% whereas others request the cover class codes from the scale provided on the data sheet. This scale (Table 1) is modified from the Braun-Blanquet cover-abundance scale, and fits the National Vegetation Classification guidelines (Jennings et al. 2004).

Table 1. Modified Braun-Branquet cover-abundance scale used to describe cover of vegetation within each layer.

Cover class code	Cover-abundance
0	None
1	Rare, one or few individuals, << 1% cover
2	More than a few individuals, < 1% cover
3	1-5% cover
4	6-25% cover
5	26-50% cover
6	51-75% cover
7	76-100% cover

SINGLE-STEMMED TREES > 3 m

In this section, record information about trees > 3 m tall that are primarily single-stemmed in growth form (e.g., include birches but exclude most species of alders and willows).

% tree canopy cover: Estimate canopy cover for all single-stemmed trees greater than 3 m in height. Canopy cover is defined as the vertical projection of the perimeter of a tree canopy to the ground, ignoring small gaps between foliage on each tree. This can be measured with a densiometer and should be expressed as a percentage. If cover is > 5%, round to the nearest 5%. If none, indicate 0%.

% coniferous: Estimate the proportion of the canopy cover above 3 m that is coniferous (needleleaf), rounding to the nearest 5%. Note that this is the relative percent, not absolute percent, of the canopy cover. For example, total canopy cover could be 25%, and 90% of this might be coniferous.

Tree layer species: List, in descending order of percent canopy cover, up to four species of single-stemmed trees taller than 3 m that dominate the tree canopy layer. Trees are defined here as woody plants that generally grow from a single stem, have a more or less definitely formed crown of foliage, and have a height of at least 3 m (Viereck and Little 1972, Viereck et al. 1992). Willows or alders of tree size but with multiple trunks should be described below in the *Shrubs* section. For each species, estimate tree canopy cover to the nearest 5%. Check the box showing the average height of the canopy. If a single species forms two distinct sublayers, list it twice, with that contributing the greater canopy cover listed first. Tree layer height may be estimated using a clinometer or hypsometer. Also estimate the size class (diameter at breast height, DBH) into which the largest tree of each species falls. List the cover class code to describe the percent cover of the largest trees within this habitat.

SINGLE-STEMMED SAPLINGS, SEEDLINGS or DWARF TREES < 3 m

Mature trees with a single stem but less than 3 m in height are considered dwarf trees (e. g., black spruce in a bog or mountain hemlock at timberline). Saplings are defined as young woody plants with a single stem ≤ 13 cm in DBH. For up to two distinct layers, in descending order of height, list the dominant species in each, the percent cover of the layer (to the nearest 5%), the average height (to nearest 0.1 m), and the average DBH class.

SHRUBS (Multiple-stemmed, woody plants)

Shrubs are defined as woody plants with multiple stems. For each shrub layer in descending order of height, give the average height (to 0.1 m), cover class, and dominant species in the layer. Several species of dwarf shrubs have multiple growth forms across their range and thus may be difficult to categorize as shrubs or herbs. Please consult Table 2 to determine under which growth form to categorize some of the more common Alaska species (following Viereck et al. 1992).

NON-WOODY PLANTS

List the cover class code to indicate the percent ground covered by graminoids, herbs, ferns, and horsetails. List up to three dominant species for each, if known.

GROUND COVER

List the cover class code to indicate the percent ground covered by mosses and hepatics, lichens, litter, ephemeral snow or ice, or bare (unvegetated) ground. As

indicated in the HABITAT QUESTIONNAIRE, any patch of unvegetated substrate > 400 m^2 in size should be recorded and described as a separate habitat. If vegetation is covered by ice or snow, observers should differentiate between persistent ice or snow cover (that will stay in place for many years), versus ice or snow that is ephemeral and not likely to be present year round.

Table 2. Default growth form to record for species with multiple growth forms.

Scientific Name (synonym)	Common Names	Growth Form
Artemisia tilessi	Tilesius' wormwood	Herb
Cornus canadensis	dwarf dogwood, bunchberry	Herb
Dasiphora floribunda (*Potentilla fruticosa*)	shrubby cinquefoil	Shrub
Dryas octopetala	eightpetal mountain-avens, Alaska mountain-avens, Kamtschatca mountain-avens	Shrub
Linnaea borealis	twinflower	Shrub
Lycopodium sp.	clubmoss	Herb
Rubus arcticus	dwarf nagoonberry	Herb
Rubus chamaemorus	cloudberry	Herb
Rubus pedatus	five-leaved bramble, strawberryleaf raspberry, creeping raspberry	Herb

REFERENCES

Colorado State University, Range Measurements course (RS332) website. www.cnr.colostate.edu/class_info/rs332/5%20Cover.ppt. Accessed 5-27-2004.

Cowardin, L. M., V. Carter, F. C. Golet, and E. T. LaRoe. 1979. Classification of wetlands and deepwater habitats of the United States. U. S. Department of Interior, Fish and Wildlife Service. FWS/OBS-79/31.

Driscoll, R.S., D.L. Merkel, D.L. Radloff, D.E. Snyder, and J.S. Hagihara. 1984. An ecological land classification framework for the United States. U.S. Forest Service Miscellaneous Publication 1439. U.S. Forest Service, Washington, DC. 56 pp.

Grossman, D.H., D. Faber-Langendoen, A.S. Weakley, M. Anderson, P. Bourgeron, R. Crawford, K. Goodin, S. Landaal, K. Metzler, K.D. Patterson, M. Pyne, M. Reid, and L. Sneddon. 1998. International classification of ecological communities: terrestrial vegetation of the United States. Volume I. The National Vegetation Classification System: development, status, and applications. The Nature Conservancy, Arlington, VA. 126 pp.

Husch, B., T. W. Beers, and J. A. Kershaw, Jr. 2003. Forest mensuration. 4th ed. John Wiley and Sons, Inc. Hoboken, New Jersey. 443 pp.

Hutto, R. L., J. Hoffland, J. S. Young, and A. Cilimburg. 2002. USDA Forest Service Northern Region Landbird Monitoring Program Field Methods. Ongoing revisions from the Division of Biological Sciences, University of Montana, Missoula, MT 59812. http://biology.dbs.umt.edu/landbird/methMan.htm.

Jennings, M., O. Loucks, R. Peet, D. Faber-Langendoen, A. Damman, M. Barbour, D. Glen-Lewin, D. Grossman, R. Pfister, S. Talbot, J. Walker, G. Hartshorn, G. Waggoner, M. Abrams, A. Hill, D. Roberts, D. Tart, M. Rejmanek, and M. Walker. 2004. Guidelines for describing associations and alliances of the U. S. National Vegetation Classification. The Ecological Society of America Vegetation Classification Panel. Draft Version 3.1, March 24, 2004.

Kessel, B. 1979. Avian habitat classification for Alaska. Murrelet 60:86-94.

Kessel, B., and D. D. Gibson. 1978. Status and distribution of Alaska birds. Stud. Avian Biol. 1.

The Nature Conservancy and Environmental Systems Research Institute. 1994. NBS/NPS Vegetation Mapping Program: field methods for vegetation mapping. Report to the National Biological Survey and the National Park Service. Arlington, VA and Redlands, CA. Available: http://biology.usgs.gov/npsveg/fieldmethods/index.html.

USDA, NRCS. 2004. The PLANTS Database, Version 3.5 (http://plants.usda.gov). National Plant Data Center, Baton Rouge, LA 70874-4490 USA.

U.S. Fish and Wildlife Service. 2004. National Wetlands Inventory Homepage, http://www.nwi.fws.gov/. Last updated 5-14-2004.

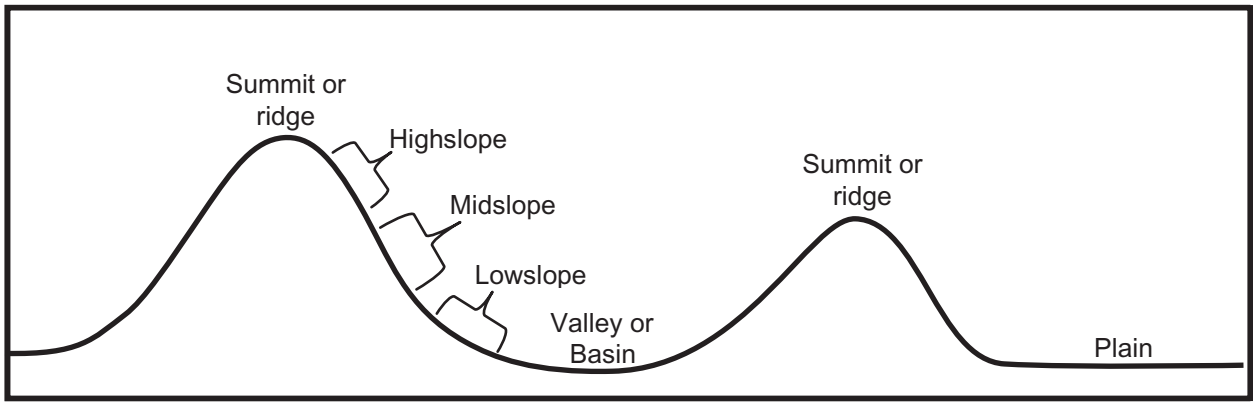
Viereck, L. A., C. T. Dyrness, A. R. Batten, and K. J. Wenzlick. 1992. The Alaska vegetation classification. Gen. Tech. Rep. PNW-GTR-286. U. S. Dept. Agriculture, Forest Service, Pacific Northwest Research Station, Portland, OR.

Viereck, L. A., and E. L. Little, Jr. 1972. Alaska trees and shrubs. Agriculture Handbook No. 410. U. S. Dept. Agriculture, Forest Service, Washington, DC.

Alaska Landbird Monitoring Survey

Topography Reference Sheet

TOPOGRAPHIC POSITION



Topographic position	Description
In hills or mountains	
Summit	Top of hill or mountain.
Ridge	A long, narrow elevation of the land surface forming an extended upland between drainages.
High slope	Geomorphic component that forms the uppermost inclined surface at the top of slope. Surface profile is generally convex.
Midslope	Intermediate slope position.
Lowslope	Gently inclined surface at the base of a slope. Surface profile is generally concave.
Basin	A depressed area with no or limited surface outlet. Nearly level to gently sloping bottom surface between mountains or hills.
Valley	An elongate, relatively large, externally-drained depression of the earth's surface that is primarily developed by stream erosion and is positioned between hills or mountains.
No hills or mountains present	
Plain	An extensive lowland area that ranges from level to gently sloping or undulating. A plain has no prominent hills or valleys, and occurs at low elevation with reference to surrounding areas. Local relief generally less than 100 m.

LOCAL FEATURES

Feature*	Description
Step in slope	Nearly level shelf interrupting a steep slope on a mountain or hill.
Cutbank	A steeply sloping embankment of exposed soil as formed through erosion or road construction.
Dunes	Mounds, ridges, or hills of loose, windblown granular material, usually sand, either bare or covered with vegetation.
Flood plain	The nearly level, sometimes terraced alluvial deposit that borders a stream and is subject to inundation under flood-stage conditions, built of sediment deposited during overflow and lateral migration of the stream.
Cliff/rock face	Very steep to perpendicular or overhanging face made of rock.
Alluvia/moraine	Unvegetated alluvial deposits or glacial deposits of gravel, sand, and silt.
Other	Define other local topographic features sparingly and only as necessary.

* Adapted from Driscoll et al. 1984

Alaska Landbird Monitoring Survey

National Wetlands Inventory Reference Sheet

NATIONAL WETLANDS INVENTORY (NWI) KEY

1. Water is dominant factor determining the nature of soil development and the types of plant and animal communities living in the soil and on its surface. This area is at least periodically saturated with or covered by water. This includes shorelines where no vegetation occurs due to erosion or wave action. If soil is not covered or saturated at this time, presence of obligate wetland plant species indicates presence of a wetland. (See below for list of obligate and facultative wetland indicator plants.) This IS a wetland. Go to 2.
1. Above is not true. This is NOT a wetland. NWI=NA.

2. Saltwater or tidal influence is present. Go to 3.
2. Saltwater or tidal influence is not present. Go to 4.

3. Saltwater is not substantially diluted by freshwater at this location. SYSTEM=MARINE (NWI=M).
3. Saltwater is substantially diluted by freshwater runoff from the land, especially at the mouth of larger streams and rivers. SYSTEM=ESTUARINE (NWI=E).

National Wetland Inventory Codes*	
System	**Code**
MARINE	**M**
ESTUARINE	**E**
RIVERINE	**R**
LACUSTRINE	**L**
PALUSTRINE	See below

* Modified from NWI Codes (USFWS 2004)

4. Water flows and is contained within a channel. SYSTEM=RIVERINE (NWI=R).
4. Water is not contained in a channel, and appears to flow very slowly or not at all. This includes dammed rivers or streams. Go to 5.

5. Persistent emergent vegetation cover ≥ 30%. SYSTEM=PALUSTRINE (See PALUSTRINE CLASSES for NWI code).
5. Persistent emergent vegetation cover < 30%. Go to 6.

6. Area > 8 ha or water depth > 2 m or wave-formed or bedrock shoreline present. SYSTEM=LACUSTRINE (NWI=L).
6. Area < 8 ha and water depth < 2 m and no wave-formed or bedrock shoreline present. SYSTEM=PALUSTRINE (See PALUSTRINE CLASSES below).

PALUSTRINE CLASSES

Vegetation	**Name**	**Description**	**Code**
Persistent emergent vegetation cover ≥ 30%	Forested Wetland	Trees (> 6 m tall) cover ≥ 30% of area.	**PFO**
	Scrub-shrub Wetland	Trees (> 6 m tall) alone cover < 30% of area, but with shrubs cover ≥ 30% of area.	**PSS**
	Emergent Wetland	Emergent vegetation dominated by graminoids or forbs.	**PEM**
	Moss-Lichen Wetland	Emergent vegetation dominated by mosses or lichens.	**PML**
	Aquatic Bed	Vegetation submerged or floating on surface of water.	**PAB**
Cover < 30%	Unvegetated Shore/Bottom	Substrate of shore or bottom predominantly covered by rock, stones, organic material, or other unconsolidated matter.	**PUB**

Obligate Wetland Indicators (WETLAND LIKELY PRESENT)

Family	Scientific Name (synonym)	Common Name
Brassicaceae—Mustard	*Cardamine pratensis*	Meadow bitter-cress
Cyperaceae—Sedge	*Carex aquatilis*	Water sedge
	Carex pauciflora	Few-flowered sedge
	Carex pluriflora	Several-flowered sedge
	Carex rostrata	Beaked sedge
	Carex sitchensis	Sitka sedge
	Eriophorum angustifolium	Narrow-leaf cottongrass
	Trichophorum caespitosum	Tufted bulrush
	Scirpus microcarpus	Small-fruit bulrush
Droseraceae—Sundew	*Drosera spp.*	Sundews
Ericaceae—Heath	*Andromeda polifolia*	Bog rosemary
	Kalmia microphylla	Alpine bog laurel
	Vaccinium oxycoccos	Small cranberry
	(Oxycoccos microcarpus)	Bog cranberry
Hippuridaceae—Mare's-tail	*Hippuris vulgaris*	Common mare's-tail
Lentibulariaceae—Bladderwort	*Pinguicula villosa*	Hairy butterwort
Menyanthaceae—Buckbean	*Menyanthes trifoliata*	Buckbean
Myricaceae—Bayberry	*Myrica gale*	Sweetgale
Ranunculaceae—Buttercup	*Caltha palustris*	Common marsh-marigold
	Ranunculus lapponicus	Lapland buttercup
	Ranunculus pallasii	Pallas' buttercup
Rosaceae—Rose	*Comarum palustre*	Purple marshlocks
	(Potentilla palustris)	Marsh cinquefoil

Facultative Wetland Indicators
(WETLAND MAY BE PRESENT, ESPECIALLY IF MORE THAN ONE SPECIES OCCURS)

Family	Scientific Name (synonym)	Common Name
Asteraceae—Aster	*Petasites frigidus*	Arctic sweet coltsfoot
	Senecio congestus	Marsh groundsel
Cyperaceae—Sedge	*Eriophorum vaginatum*	Tussock cottongrass
Ericaceae—Heath	*Chamaedaphne calyculata*	Leatherleaf
	Kalmia polifolia	Pale laurel
	Ledum decumbens	Narrow-leaf Labrador tea
	Ledum groenlandicum	Greenland Labrador tea
Juncaceae—Rush	*Juncus spp*	Rushes
Menyanthaceae—Buckbean	*Nephrophyllidium crista-galli*	Deer-cabbage
	(Fauria crista-galli)	
Onagraceae—Evening primrose	*Circaea alpina*	Small enchanter's nightshade
Pinaceae—Pine	*Larix laricina*	American larch
	Picea mariana	Black spruce
Ranunculaceae—Buttercup	*Ranunculus occidentalis*	Western buttercup
Rosaceae—Rose	*Rubus chamaemorus*	Cloudberry
	Sanguisorba canadensis	Canada burnet

Alaska Landbird Monitoring Survey

Kessel Habitat Classification (excluding offshore waters)

This classification system has been developed specifically in relation to habitats used by birds in Alaska. Generally, a habitat with woody vegetation should be classified based on the tallest canopy of woody plants present in sufficient amounts to attract birds from the local breeding community, even if the canopy cover is sparse.

I. Fresh or brackish waters
   a. LACUSTRINE WATERS AND SHORELINES (lakes, ponds, and shorelines)
   b. FLUVIATILE WATERS AND SHORELINES (streams, rivers, and shorelines)

II. Marine waters
   a. NEARSHORE WATERS (protected coastal waters)
   b. INSHORE WATERS (exposed coastal waters)

III. Unvegetated substrates
   a. ROCKY SHORES AND REEFS (boulders, rocks, rubble)
   b. BEACHES AND TIDAL FLATS (gravel, sand, silt, mud)
   c. BARRIER ISLANDS (usually with sparse or no vegetation)
   d. ALLLUVIA AND MORAINES (unvegetated alluvial and glacial deposits)
   e. CLIFFS AND BLOCK-FIELDS (sea stacks, tors, screes, lava flows, etc.)
   f. SUBTERRANEAN SOIL (soil substrate, cut-banks)

IV. Meadows (dominated by herbaceous plants, mostly graminoids)
   a. WET MEADOW (wet; includes small ponds and vegetated pond margins)
   b. DWARF SHRUB MEADOW (mesic; shrubs < 0.4 m present)
   c. GRASS MEADOW (relatively dry; mostly graminoids)
   d. SALT GRASS MEADOW (periodically tidal; graminoids)
   e. TALL FORB MEADOW (forbs ≥ 0.4 m)

V. Shrubbery (< 5 m; multiple-stemmed shrubs or young trees)
   a. DWARF SHRUB MAT (dry; shrubs < 0.4 m dominant)
   b. LOW SHRUB THICKET (0.4-1.1 m)
   c. MEDIUM SHRUB THICKET (1.2-2.4 m)
   d. TALL SHRUB THICKET (2.5-4.9 m)

VI. Forests and woodlands (woody plants ≥ 5 m)
   a. DECIDUOUS FOREST (≥ 90% deciduous)
   b. CONIFEROUS FOREST (≥ 90% coniferous)
   c. MIXED DECIDUOUS-CONIFEROUS FOREST
   d. SCATTERED WOODLAND AND DWARF FOREST (canopy < 20%)

VII. ARTIFICIAL HABITATS

Source: Kessel, B. 1979. Avian habitat classification for Alaska. Murrelet 60:86-94.

Alaska Landbird Monitoring Survey

Random Bearings (0-359)

93	263	329	23	130	277	243	353	299	312	116	209	255	155	260
230	196	234	202	242	24	115	198	196	240	356	158	287	253	101
124	33	120	308	196	216	30	129	30	167	262	235	278	16	160
100	90	159	283	121	4	38	116	69	353	30	325	319	156	200
78	66	200	327	181	140	330	53	233	79	185	15	334	309	21
104	300	15	271	17	11	170	154	26	4	2	116	123	297	34
91	246	333	306	32	100	176	36	316	218	181	254	289	107	143
125	116	63	7	341	148	43	187	161	70	320	51	162	330	168
95	112	264	236	333	301	12	199	339	227	48	251	230	191	356
52	28	186	179	15	299	41	67	37	300	60	287	269	96	324
298	30	84	34	321	212	85	16	121	340	75	97	353	102	204
4	253	62	35	349	9	43	118	302	357	302	15	316	166	40
68	145	38	351	95	141	210	174	231	98	149	342	113	341	41
225	98	103	327	174	53	80	229	190	57	171	88	238	9	226
234	215	192	18	245	156	65	5	162	316	165	142	254	160	176
153	159	254	101	30	266	154	103	81	105	109	52	274	69	260
33	270	61	61	213	171	2	81	272	6	125	105	162	220	256
234	155	124	21	161	348	28	247	20	148	294	266	192	274	1
60	334	108	293	248	144	51	345	357	296	103	310	297	282	296
249	336	244	3	354	100	46	359	59	291	303	16	357	323	253
126	297	4	203	35	108	137	228	230	321	150	174	68	172	286
337	224	59	159	99	33	171	266	41	80	340	277	284	21	345
38	155	154	68	14	223	3	315	66	285	304	340	63	257	42
53	300	271	315	194	240	286	296	297	136	297	157	188	128	54
199	326	286	114	156	183	174	312	2	76	268	246	220	80	36
346	274	354	310	146	298	103	186	85	114	315	101	233	131	170
350	83	106	347	332	330	49	69	3	120	149	244	112	298	89
210	118	130	292	277	272	18	344	210	22	224	318	117	327	130
218	356	52	122	309	181	320	95	56	104	125	88	11	307	36
224	2	149	339	357	133	90	344	26	228	135	120	198	220	144
97	125	67	207	30	355	125	272	164	299	285	90	45	19	114
325	2	294	210	131	276	105	330	23	236	94	7	40	43	157
286	257	92	284	166	0	288	187	206	140	251	177	357	164	236
132	87	146	240	69	60	258	326	191	305	194	217	69	73	336
194	263	219	110	166	271	254	131	264	207	329	225	41	185	339
154	358	246	73	99	194	352	290	324	331	312	328	72	131	61
126	186	356	108	170	100	48	123	180	88	301	122	254	266	243
241	73	118	312	324	310	232	25	80	145	331	345	125	138	335
323	153	290	305	178	295	101	163	164	315	8	36	359	228	175
194	321	315	298	281	219	237	99	121	305	91	338	264	93	111
282	17	315	38	232	67	198	106	253	93	31	50	346	88	67
251	201	144	148	50	101	5	43	277	36	181	331	25	346	260
152	13	83	291	140	259	147	136	281	165	136	87	252	183	294
123	145	334	128	150	14	155	214	57	337	15	287	176	342	73
352	339	349	140	16	188	100	321	62	169	242	0	117	201	241
264	176	165	290	89	195	191	209	168	256	328	10	42	320	58
242	23	94	17	0	301	175	342	167	243	116	235	230	222	276
255	266	120	182	326	152	349	300	220	135	350	156	262	88	312
180	109	54	62	193	69	343	94	66	342	284	249	277	94	279
297	195	7	306	291	146	135	270	80	78	286	158	256	125	315
264	348	189	69	211	157	190	86	195	38	120	166	269	209	74