

Boat Survey Methodology for Oil Spill Response

C. John Ralph, Sherri Miller, and Linda Long
U.S. Forest Service, Pacific Southwest Research Station
Redwood Sciences Laboratory, Arcata, California

Introduction

Surveys for birds and marine mammals present during an oil spill can provide estimates of the potential impacts of a spill on individuals or populations in the area. Standardized protocols and skilled observers provide invaluable information for immediate evaluation and response, as well as long-term planning or mitigation for impacted species. Surveys should be started as soon as possible after a spill occurs and continue as long as needed to monitor the effects on the surveyed populations.

Survey Types

Surveys are conducted using Distance Sampling Techniques (Buckland et al. 1993). The boat travels along a transect line at speeds between 8 and 12 knots during surveys. Birds in the nearshore environment tend to be distributed relative to the depth of water, therefore transect lines are generally positioned parallel to the coastline at increasing increments away the shore. Surveys may include nearshore, offshore, or bay/estuarine components and should be adapted to the coastline or bathymetric configuration of the area being monitored to allow population or density estimates of the various species within the area. The goal in determining the transect design is to efficiently and effectively sample areas in and around the spill site which represent areas of potential impact and/or which potentially contain birds at risk of oiling.

Boat and Navigation

Boats used during an oil spill response to survey for birds and marine mammals should allow an unobstructed view of the water within a 180° arc forward of the observers. Small boats that allow observers to pick up dead and sick birds are preferred. The survey route and transect design is established just prior to the survey to accommodate the specific areas, issues, and species of concern for a particular spill. A Global Positioning System (GPS) is used for navigation and to record the boat's trackline for analysis. Transects are subdivided into 1- or 2-km segments for recording data. The positions of sick and dead birds are marked with GPS coordinates.

Data Collection

Survey methods generally follow those of Ralph et al. (1995). One or two observers stand near the bow of the boat where they have a clear view of the ocean and scan a 180° arc from port to starboard. The driver can assist observers as navigation duties permit. Observers should be skilled in seabird and marine mammal identification, and, preferably, in distance sampling techniques.

Birds and Mammals. Data are recorded on audio cassettes for later transcribing. For each individual or group of birds or mammals detected during the survey, the observers record the species, number of individuals, their perpendicular distance from the transect line, and behavior (such as diving). All birds detected are recorded, including flying birds for most species.

Oiled Birds. Birds are checked for visible oil on the plumage. For each body part (neck, head, breast, belly, back, and side) and overall, observers estimate the percent covered by oil and the degree of oiling as light, moderate, or heavy. A bird with soiled or discolored plumage is recorded as "light" oiling, while a thick, solid covering of oil would be recorded as "heavy." Behaviors such as preening, bathing, problems with diving, inability to take flight, loss of buoyancy, or a general sick appearance, are recorded as possible indicators of oiling. When possible, sick or dead birds should be picked up and the pickup location recorded on the survey data form with GPS coordinates. See Appendix for data form.

Oil on Water. Observations of oil along the transects are also recorded. Record the segment or latitude and longitude where oil is first encountered and when it is no longer present. The percentage of the water's surface with oil (where oil is present within approximately 50 m of the boat) and the character of the oil are noted, for example, "a sheen on 40 percent of the water's surface." Other categories, such as tar balls, thick mousse, oily foam, and oil mixed with eel grass are noted. See Appendix for data form.

Real Time Data Reporting

Upon returning to the dock or during surveys, summaries of bird and mammal observations are verbally reported to the Command Post. Summaries can include an estimate of the number of birds and mammals observed, the number of each species, the general location of high densities of birds and mammals, and the location of any oil.

Literature Cited

- Buckland, S.T., D.R. Anderson, K.P. Burnham, and J.L. Laake. 1993. Distance Sampling: Estimating Abundance of Biological Populations. Chapman and Hall, New York, NY. 446 p.
- Ralph, C.J. and S.L. Miller. 1995. Offshore population estimates of Marbled Murrelets in California. pp 353-360 in C.J. Ralph, G.L. Hunt, Jr., M.G. Raphael, and J.F. Piatt (Tech Eds.) Ecology and conservation of the Marbled Murrelet. Gen Tech. Rep. PSW-GTR-152, Albany, CA: Pacific Southwest Research Station Forest Service, U.S. Department of Agriculture; 420 pp.

APPENDIX. Oil spill monitoring data forms protocol

Below are some instructions on filling out the oil spill related data forms. All forms have four fields that will be used for linking the data with census data and each other: **OBSERVER**, **DATE**, **TRANSECT**, and **SEGMENT**.

Oiled Birds Data Form

The aim of this data sheet is to detail the amount of oiling on the bird populations in Humboldt Bay and on the ocean. Each line of the data sheet represents a bird or group of birds within a flock of the same species with the same amount of oiling (see Fig. 1). This may lead to several lines for a flock of birds since some flocks have individuals with different amounts of oiling. Observation numbers (**OBS. NO.**) are used to link together all the birds of one flock that have been recorded on separate lines. These numbers are

sequentially entered on the form, with the same number for all members of a flock, as data are transcribed. For example, the observer comes upon a flock of 10 Western Gulls, 5 of which have 15% of the breast (and none elsewhere) with oil on it, 2 have no oil, and 3 were not checked (see first two lines of Fig. 1). The observer would record on the first line **OBS. NO.** = 1, **SPECIES** = WEGU, **FLOCK SIZE** = 10, **NO. CHECKED** = 5, and oiling as "15" under **BREAST**. He would record on line 2: **OBS. NO.** = 2, **SPECIES** = WEGU, **FLOCK SIZE** = 10, and **NO. CHECKED** = 2, and oiling is recorded as "0" under **OVERALL**. The remaining 3 unchecked birds are not recorded. Further examples are given on Fig. 1 of recording oiled birds. **DEGREE** of oiling refers the density of oil on the bird: L = light oiling, such as staining, M = moderate, and H = heavy oil, including matted feathers. The code U = unknown. If the observer looks at the bird, but cannot determine if there is oil, then this code is used.

BEHAVIOR is recorded which may reflect the effects of oiling, including: excessive preening (PR), excessive bathing (BA), buoyancy loss (BU), quick diving (submerging shallowly and resurfacing quicker than a normal dive) (DI), looking sick and unwell (SI), or normal behavior (NO), bathing and flying problems (BF), problems flying- getting off the water (FL), Rapid and much flapping of wings (FW), preening and much flapping of wings (PW), shaking head (SH), tail sticking up out of the water- when normally down in or on top of the water (TA). If there are any other behaviors noted, enter 'OT' and describe in the notes. If the bird is sitting in or amongst oil, then "Y" is recorded in **OIL ON WATER**.

Dead and sick birds and mammals that were picked up should also be recorded on this form. The following codes should be entered under **BEHAVIOR** and further information on location, such as latitude and longitude, should be recorded in the notes.

DE = Dead bird, not picked up,

DP = Dead bird, picked up,

SP = Sick bird, picked up and taken in to the Wildlife Care Center.

Oil On Water Data Form

This database will be used to describe the oil on the water along a transect. Data to be taken will include the location of the oil, as well as describe how much of the water surface was covered with oil. Data will cover the entire length of the transect, including areas without oil, so data recording begins with the start of a new transect (see Fig. 2). Divisions along the transect formed by the changes in degree or type of oiling on the water are referred to as "partitions."

Location

In addition to **TRANSECT**, **TIME**, and **SEGMENT**, the direction of travel is recorded under **TRAVEL DIRECT**. Location is given for each change in the oil on the water surface, such as change of proportion of open water to patches of tar balls. Location is determined by one of two methods: distance traveled along a 2-km segment or latitude and longitude coordinates.

For the first method, distance traveled along a segment is estimated by the observer by the time traveled in comparison to the beginning and end of a segment. For example, if the segment started at 1210 and ended at 1220, then at 1215 you would have traveled 1 km, or halfway, along the segment, which is recorded under **KM TRAVELED** as "1.0." **KM TRAVELED** is usually estimated to the nearest tenth of a km (100 m). However, if a small patch is encountered, the distance traveled can be estimated down to hundredths of a km (10 m).

The second method of **LATITUDE** and **LONGITUDE** will be the most reliable means of estimating location for partitions in the bay or ocean. These data can also augment the data from the first method. If latitude and longitude was not recorded from electronic instruments, then maps of the bay will be available for sketching in the transect and marking locations of the oil. Locations can be estimated by either time (for distance traveled) or landmarks. From this, the latitude and longitude may be estimated and later digitized.

Composition of partitions

Data recorded reflects the composition of the partition based on the percent of the surface area viewed covered by each oil type, for a total of 100% of the surface area.

Each percentage is recorded in the appropriate oil type under **PCT. OF SURFACE COVERED WITH** as follows.

OPEN WATER - area within the partition not covered by oil.

GAS SHEEN - a thin, gasoline-like sheen,

TAR BALLS - small balls of very thick oil,

THICK MOUSSE - a viscous, thick oil, like mousse, most commonly seen early in the oil spill before dispersal,

OILY FOAM - a brown or black foam, sometimes in conjunction with mousse, and

OIL W/EEL GRASS - patches of oil associated with eel grass, the total area covered by oil and eel grass is recorded.

If there is no oil on the water, then fields in **PCT. OF SURFACE COVERED** are left blank.

The **Partition Width** is the distance from the boat that the observer feels confident about determining presence or absence of oil without going off of transect.

When the end of the transect is reached, the last location is recorded, and a "Y" is placed under **END**. Otherwise, **END** is left blank. Any further notes should be recorded on the back of the data sheet, and numbered under **NOTE NO**.

