

CHAPTER 4

IDENTIFICATION OF SPECIES OR POPULATIONS REQUIRING RESTORATION

INTRODUCTION

The purpose of this workshop was to identify and to discuss oil spill-related *restoration options* for seabirds injured by EVOS. Our intent was not to discuss or to evaluate the procedures used by the Trustee Council (or any other oil spill trustee council) to identify which seabird species or populations were injured by the spill and, therefore, may require restoration efforts. However, the workshop steering committee decided that to address the concept of *restoration goals*, the workshop needed to discuss the kinds of data that should be collected to adequately assess spill-related injury. Furthermore, the committee found that clearly stated and objective *a priori* criteria to identify which injured seabird species or populations required direct restoration were not established by the Trustee Council. This chapter suggests criteria or guidelines to establish oil spill-related seabird injury. In presenting these guidelines, we also point out that certain kinds of baseline data need to be available prior to a spill and certain kinds of data need to be collected during a spill to adequately evaluate injury.

TRUSTEE COUNCIL'S CRITERIA FOR INJURY AND RESTORATION

The Trustee Council (1994b) listed three types of injury to biological resources: (1) mortality, (2) sublethal effects, including effects to gametes and larvae, and (3) habitat degradation. Although the Trustee Council stated that the most serious injuries result in "large population declines" (Trustee Council 1994b:29), a spill-related effect does not always have to produce a *measurable* decline to a population to be considered an injury. The Trustee Council listed four reasons why an injury may not result in a population decline, with only one reason related to the severity of the injury (i.e., the injury was not severe enough to produce a population decline: Trustee Council 1994b:30). Finally, although the Trustee Council stated that any injured resource can be considered for restoration, it focused on those species or services that have not recovered (recovery based on monitoring activities). It also decided that "priority will be given to restoring resources and services which have economic, cultural and subsistence value to people living in the oil spill area" (Trustee Council 1994b:13).

WORKSHOP RECOMMENDATIONS

The process by which species are identified as candidates for restoration activities following oil spills should include (1) an assessment of the immediate injury and compilation of baseline data,

(2) the use of *explicitly stated criteria* to determine if the population's injury is significant, and (3) the use of *explicitly stated criteria* to determine if an injured population should qualify for restoration. In other words, in order for a population to be a candidate for restoration, it must pass through injury and restoration "filters." We provide the following lists: (1) essential baseline data needed to evaluate injury, (2) initial injury assessment activities, (3) criteria to define significant injury, and (4) criteria to establish if a population requires restoration. We list issues in approximate descending order of priority. For example, total population size (pre- and postspill) and total mortality from the spill are the most important data to use in assessing injury to populations and the biological significance of mortality.

Biological Baseline Data Prior to Spill

Total population size

We emphasize that an estimate of total population size includes information on the relative proportion of the population that is at sea and at colonies or breeding sites at any given time, and includes all age classes. Furthermore, this information is essential in estimating injury and can be used for setting restoration goals, although achieving a prespill population level may not be the best goal for a restoration project (see Chapter 6).

Index plots

Index plots should be established in areas with a relatively high potential for oil spills or other disasters (this relates to the sensitivity maps discussed in Chapter 2a). Ideally, long-term and ongoing phenology and productivity, annual adult mortality, recruitment, and dietary information should be available as baseline data, to which spill effects can be compared and evaluated. The workshop recognized, however, that collecting such data can be constrained both logistically and financially. Estimating annual adult mortality is especially difficult in that it requires a long-term and concentrated banding effort and data on (or assumptions about) emigration. Because of this difficulty, we recommend that sources of mortality (e.g., gillnet bycatch) be identified as part of baseline data.

At-sea areas

To adequately estimate total population size and to help determine which populations may be affected by an oil spill, it is important to have a general idea of where individuals from specific populations forage and to determine if these foraging areas are age- and/or sex-specific. These data should be available for both the breeding and nonbreeding periods. As with long-term index-plot data discussed above, these data may be difficult to collect due to logistical, methodological, and financial constraints.

Hydrocarbon levels and blood parameters

Seabirds affected by oil spills may also have been exposed to background hydrocarbon contamination and, prior to the spill, may have experienced physiological stress affecting their blood chemistry. To adequately evaluate the sublethal or chronic effects of an oil spill, data on background hydrocarbon levels and blood chemistry parameters (e.g., total protein, packed cell volume) should be available.

Biological Data Collected During Spill

Total population size

As with the baseline data, total population size after a spill is a function of the numbers of birds at colonies or breeding sites and the numbers at sea. Attendance or status at index plots should be assessed as soon after the spill as logistics permit. Data on the total population size (and proportion of that population at sea) will help assess total mortality from the spill by modeling spill trajectory, at-sea distribution, and number (and location) of recovered oiled carcasses.

Beached bird surveys and modeling

The number and composition of dead and oiled beached birds recovered by spill responders are among the most essential data collected during the injury assessment phase of spill response. The number of birds recovered for each species, the geographic area from which they were recovered, and the date of recovery, along with information on the spill trajectory, distribution of birds at sea, and real-time drift experiments, are used to estimate the total mortality from the spill (see Ford *et al.* 1996 for EVOS example). Other data that should be collected from the carcasses are (1) age and sex composition of each species, to estimate the *demographic impact* of the spill; (2) genetic and/or morphometric analyses, to help determine the *origin* of birds; (3) the degree of oiling; and (4) the stomach contents, to determine *diet*.

Hydrocarbon levels and blood parameters

Hydrocarbon levels of dead birds and hydrocarbon levels and blood parameters of injured and recovered birds will help evaluate the sublethal or chronic effects from the spill.

Seabird species list

The seabird species list will help guide the injury assessment by determining which species should be emphasized in data collection activities. Furthermore, the vulnerability of each of these populations can be assessed using historical data on their distribution and real-time oil spill trajectory data.

Criteria for Injury Determination

The criteria used to determine whether a species or population has been injured should be similar to the biological criteria used in the Ramsar Convention to identify wetlands of international importance to water birds. Under this approach, a species or population that meets any *one* of the following criteria³ should be “flagged” for concern about possible injury. This filter is conservative, and seeks only to identify all species and populations that merit further consideration for possible restoration activities. It can help focus restoration planning for seabirds because it will remove many species from further consideration while highlighting those that may have suffered serious injury.

Species and population criteria

- Species is threatened, endangered, or globally rare.
- One percent (or some other percentage, determined *a priori*) of the breeding population in the general area was killed by the spill.
- A colony or population was extirpated by the spill.
- A population's range was reduced by the spill (i.e., extirpation of colony at edge of range).
- Species has a significant biological or ecological role (e.g., “keystone” species).
- Species is of socioeconomic importance (e.g., tourism, food supply).
- Breeding success or some other population parameter is depressed (the absolute change in the affected parameter must be beyond the 95% confidence interval for a control or baseline population).
- One percent (or some other percentage, determined *a priori*) of the population's food supply or habitat was injured by the spill.
- The spill caused a significant hydrocarbon load affecting productivity or survival (the absolute change must be beyond the 95% confidence interval for a control or baseline population).

Finally, a species that has a high vulnerability index (*sensu* King and Sanger 1979) and is present in the spill area should be included. Thus, natural resource trustees should assume at this stage of the analysis that such a population experienced injury even if no carcasses were recovered. Such a population might be removed from further consideration in the steps we recommend below.

³ Some of the criteria assume that prespill baseline data are available. The workshop did not address the issue of what should be done in the absence of such data, although this clearly represents a critical issue in the oil spill damage assessment process. We emphasize the importance of collecting prespill baseline data and developing contingency plans for assessing injury to those resources for which there is little or no potential for collecting baseline data.

Criteria for Restoration Determination

Once a species or population has been flagged as a possible candidate for direct restoration activities using the criteria listed above, it can be established as a priority candidate for restoration if it meets the following criteria. These criteria can be used to establish a priority list of seabirds for restoration activities.

1. The loss was biologically significant.

or

The injured population had high socioeconomic or public interest value.

and

2. Restoration is practical in terms of methods, logistics, and cost.

Biological significance

To determine if a specific mortality is of biological significance, resource managers and trustee councils should consider, at a minimum, data collected during the injury assessment, the quality of those data, whether a significant percentage of a species was killed during the spill, demographic information about the populations that were affected (e.g., sex and age), and the population's "distinctiveness" (i.e., endemic, rare, genetically distinct).

Socioeconomic or political value

If the injury to a species or population is not biologically significant, a secondary factor to consider is the population's socioeconomic value. Colonies that are regularly visited by tourists (i.e., colonies with high educational value), are important research sites, or are used by indigenous people for subsistence, for example, should be considered as candidates for restoration.

Feasibility

If a species or population is identified as a candidate for restoration because it is biologically significant or has high socioeconomic or public interest value, restoration managers must still consider the practicalities of restoration. Each species or population may have only a small set of possible restoration options or techniques available. These options or techniques must be logistically feasible, affordable (based on the terms of the settlement and the policies set forth by

Chapter 4

the Trustee Council), and, most importantly, have a high probability of producing a positive effect for the population. In considering the practical aspects of restoration, trustee councils must also determine the probability that a population is likely to recover naturally without implementation of hands-on activities.