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Standard Guide for Ecological Considerations for the Use of Chemical Dispersants in Oil Spill Response—Bird Habitats[1]

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ε[1] NOTE—Section 7 was added editorially in December 1992.

1. Scope

1.1 This guide covers recommendations for the use of chemical dispersants to assist in the control of oil spills. This guide is written with the goal of minimizing the environmental impacts of oil spills; this goal is the basis upon which recommendations are made. Aesthetic and socioeconomic factors are not considered, although these and other factors are often important in spill response.

1.2 Each on-scene coordinator has available several means of control or cleanup of spilled oil. In this guide, use of chemical dispersants is not considered as a last resort after other methods have failed. Chemical dispersants are to be given equal consideration with other spill countermeasures.

1.3 This is a general guide only assuming the oil to be dispersible and the dispersant to be effective, available, applied correctly, and in compliance with relevant government regulations. Oil, as used in this guide, includes crude oils and fuel oils (No. 1 through No. 6). Differences between individual dispersants or between different oils or products are not considered.

1.4 This guide covers one type of habitat, bird environments. Other guides, similar to this one, cover habitats such as rocky shores. The use of dispersants is considered primarily to protect such habitats from impact (or minimize impacts) and also to clean them after the spill takes place.

1.5 This guide applies to marine and estuarine environments but not to freshwater environments.

1.6 In making dispersant-use decisions, appropriate government authorities should be consulted as required by law.

1.7 *This standard does not purport to address all of the safety problems, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Significance and Use

2.1 This guide is meant to aid local and regional spill response teams during spill response planning and spill events.

3. General Considerations for Making Dispersant-Use Decisions

3.1 The decision of whether or not to use dispersants in a given spill situation is always one involving trade-offs. Dispersing a slick at one site temporarily introduces more oil into the water column at that site than would be there if a surface slick floated over it. Therefore, adverse effects on water column organisms may be increased at the site so that adverse effects can be decreased or eliminated at other sites.

3.2 Dispersant use is primarily a spill-control method, not a cleanup method. Such use can give spill-response personnel some control over where the impacts of a spill will occur and what types of impacts they may be. Since some evironments are known to be more vulnerable to the longer lasting impacts of spilled oil, an acceptable trade-off may be to protect those environments by dispersing an oil slick in a less sensitive or less productive environment. In general, the trade-off that must be evaluated is between the impact of the relatively long residence time of spilled oil that strands on shorelines versus the short-term impact of dispersed oil in the water column.

3.3 In this guide, environments that are most vulnerable to the longer-term impacts of oil contamination are identified. Protection of these habitats is recommended as a high priority, by means of dispersants and other methods.

4. Environments Covered—Bird Habitats

4.1 Birds are present, at some time during the year, in practically every area of the world. This guide emphasizes protecting the most important bird habitats.

4.2 Important bird habitat, regardless of the latitude, is defined as follows:

4.2.1 Wintering concentrations of birds or staging sites for large numbers of migrating birds,

4.2.2 Breeding colony sites,

4.2.3 Coastal areas that support dense concentrations of birds all year,

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4.2.4 Important coastal wetlands, or

4.2.5 Endangered species habitat.

5. Background

5.1 Avian mortality from oiling is well documented **(1-5).**[2] Birds that spend much of their time on or in the water (for example, sea ducks, auks, penguins) are the most vulnerable species to surface oil. Oil disrupts feather structure and causes feathers to mat together. This destroys the ability of the feathers to insulate the bird and to keep it afloat; birds may die from exposure or drowning **(6-8).**

5.2 Oiled bird rehabilitation is reasonably effective for saving small numbers of oiled birds, but it has very limited potential for offsetting the population level effects of mortality from surface oil **(9, 10).** However, endangered species or colonies of uncommon species may be aided significantly by rehabilitation efforts.

5.3 Methods developed for moving birds out of the path of surface oil may be species specific or work only under a given set of circumstances; each situation must be evaluated separately **(11).**

5.4 Studies of oil ingestion have been inconsistent in design but have generally shown that short-term ingestion can cause detectable changes in avian physiology and behavior **(12-19, et al),** and chronic ingestion can cause a variety of systemic effects **(20-29, et al).**

5.5 Eggs of breeding birds can be lethally oiled as a result of oil transfer from the plumage of oiled adults **(29-31).** Only minute amounts of oil are needed to produce a significant impact on hatching success **(32-35,** et al). The magnitude of the impact of oil ingestion and egg oiling on bird populations is unknown.

5.6 The contamination of an area by a large oil spill is often followed by a reduction of bird life in the vicinity of the spill **(36, 37).** The causes of this exodus are unknown, but oil fumes and feeding difficulties are likely candidates. The effects of this displacement of birds from one location to another are unknown, but they would probably be most severe during the breeding season or in the winter.

5.7 Contamination of prime bird habitat, even during times of low use, may pose problems for the future; recovery from the effects of oil on marshes and intertidal habitat may take years **(38, 39).**

5.8 The effects of chemically dispersed oil on birds in the wild are not well known. Recent studies have shown that dispersant alone or dispersed crude oil had no greater impact on weight gain, organ weights, corticosterone levels, or plasma thyroxine levels to herring gull and Leach's storm petrel chicks than did crude oil alone **(19, 23, 40).**

5.9 The degree of protection from oiling provided by chemical dispersants is uncertain. Mallard ducks exposed to dispersant in water were less buoyant and remained wet longer than control birds or oil-exposed birds **(16).** Ducks exposed to dispersed oil were just as soaked as birds exposed to dispersant alone, and their plumage was just as matted as the oil-exposed ducks. Oil-exposed and dispersed-oil-exposed ducks exhibited significantly increased basal metabolic rates when placed in a cold chamber immediately after 1 h of exposure. Dispersant concentration in the water was 6.7 ppm and the oil:dispersant ratio was 30:1. However, dispersants applied remote from bird habitats should prevent oil, dispersed oil, and dispersant from reaching them.

5.10 Laboratory studies showed that chemically dispersed crude oil more effectively reduced mucosal water and Na^+ transfer in the intestines of mallard ducklings than undispersed crude oil **(41)** and that dispersant alone or mixed with crude oil, in an egg oiling experiment, was at least as toxic to bird embryos as crude oil **(42).** Dispersant sprayed on water did not affect mallard incubation or hatching success, and mallards exposed to partially dispersed crude oil (less than 25 % dispersion) had about the same hatching success as those exposed to undispersed crude oil **(43).** Ingested dispersant (150 ppm in diet) and ingested dispersant mixed with crude oil (150 ppm dispersant and 1500 ppm oil in diet) had less of an effect on the weight gain and blood chemistry of young mallards than crude oil alone (1500 ppm in diet) **(44).**

6. Recommendations

6.1 The primary effects of an oil spill on birds (plumage oiling, egg oiling, oil ingestion, habitat disruption) are caused by the floating oil. These effects can be reduced by moving the birds, mechanically removing surface oil, or dispersing the oil into the water column before it reaches birds or their habitat.

6.2 Dispersants can be considered for use even after the oil nears or enters habitat categories described in 4.2.1, 4.2.3, or 4.2.5 because dispersed oil is unlikely to be as hazardous to birds as floating oil. Since the effect on birds of external applications of concentrated dispersant is unknown, applications should be made with caution to avoid unnecessary aerial spraying of birds. Birds out of the oil or in very light surface oil should not be sprayed. Dispersants should not be sprayed on habitat category (4.2.2). There is concern in the scientific community about the use of dispersants in coastal wetlands (4.2.4). This concern, with respect to birds, presently lacks a strong scientific basis. Decisions about the use of chemical dispersants to protect birds in wetlands will have to be made on a case-by-case basis.

6.3 Cleanup of contaminated islands, beaches, or coastal wetlands is recommended only if breeding colonies are not disturbed and if mechanical damage to the site can be minimized.

6.4 Government environmental agencies should be involved in any decisions about the use of chemical dispersants to protect birds because of the international treaties or intranational regulations dealing with migratory or endangered species.

7. Keywords

7.1 bird habitats; birds; chemical dispersants; ecological considerations; habitat; oil spill response

[2] The boldface numbers in parentheses refer to the list of references at the end of this guide.