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Standard Guide for Ecological Considerations for the Use of Oil Spill Dispersants in Freshwater and Other Inland Environments, Ponds and Sloughs[1]

This standard is issued under the fixed designation F1209; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

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

1.2 Spill responders have available several means to control or clean up spilled oil. Chemical dispersants should be given equal consideration with other spill countermeasures.

1.3 This is a general guide only. Oil, as used in this guide, includes crude oils and refined petroleum products. Differences between individual dispersants or between different oil products are not considered. The dispersibility of the oil with the chosen dispersant should be evaluated.

1.4 The guide is organized by habitat type, for example, small ponds and lakes, rivers and streams, and land. It considers the use of dispersants primarily to protect habitats from impact (or to minimize impacts).

1.5 This guide applies only to freshwater and other inland environments. It does not consider the direct application of dispersants to subsurface waters.

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

1.7 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

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

1.9 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

F2532 Guide for Determining Net Environmental Benefit of Dispersant Use

3. Significance and Use

3.1 This guide is meant to aid local and regional response teams who may use it during spill response planning and spill events.

3.2 This guide should be adapted to site specific circumstance.

4. Environment Covered—Ponds and Sloughs

4.1 Ponds and sloughs are small isolated water bodies that are not part of major water systems. They have a dynamic ecology, and a wide mixture of animal and plant species. In northern regions, these water bodies may freeze to the bottom and do not sustain a wide variety of aquatic species.

4.2 While most of these bodies are naturally occurring and exist throughout the year, some may be man-made. In arid climates, the existence of these bodies may be seasonal.

4.3 The characteristics of these water bodies are:

4.3.1 Open water area of less than 10 hectares,

4.3.2 Shallow water with a maximum depth of 1 m to 1.5 m,

4.3.3 Soft bottom with a high organic content,

4.3.4 May have alkaline or acidic water,

4.3.5 No well defined inlet or outlet, and

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

4.3.6 Poorly defined shoreline consisting of floating mats of vegetation.

5. Background

5.1 The effects of oil and dispersed oil on these aquatic environments have been the subject of numerous studies. The studies have involved both intentional experimental spills and studies undertaken during actual spill situations (**1-6**).[3]

5.2 There have been a number of studies on the impact of oil and oil/dispersant mixtures on microbiological systems and plankton (**7-16**).

5.3 The principal biotic components of such water bodies are a variety of fauna and flora. The aquatic flora include algae (planktonic and attached) and floating or submerged vascular plants. Terrestrial flora include grasses, moss, lichens, herbs, forbs, and woody plants.

5.4 The fauna include invertebrates (molluscs, crustaceans, worms), fish, a variety of waterfowl and seabirds (ducks, loons, gulls, terns, and herons), mammals, such as beaver and muskrat, and in many areas, significant human activity. There have been some studies on the effects of oil and oil/dispersant mixtures on fauna (**17, 18**). The distribution and composition of species is a function of climate, local geography, season, and soil type, and human use of the area (**19**).

5.5 Studies of the effects of oil on vegetation include laboratory work on the effects on willows, moss, lichen, black spruce, and sedge. These studies showed that the pouring of oil directly on the vegetation was lethal to willow and moss, and caused some nonpermanent damage to the other species (**20-29**).

5.6 Floating leaves are wetted and penetrated by oil from slicks while younger floating leaves whose cuticles are intact are more resistant to penetration by oil. Penetration occurs most readily in areas where there is damage to the leaf caused by insects or mechanical abrasion.

5.7 Oil is retained in areas of dense vegetation and is released slowly. Dispersants applied soon after a spill appear to speed the movement of the slick through the vegetation if there is some water movement. Only the oil that contacts the leaves causes some damage. Leaves and stems that are subsurface are not damaged by the presence of oil. Oil slicks that are restricted to contact of the stem areas near the water surface are not very injurious.

5.8 Field studies in northern environments have shown little long term effects of spilled oil. There have been few studies on the effects of dispersed oil in these environments.

5.9 Although oil may cause extensive damage to vegetation growing in low-lying wetlands and shorelines of bog lakes, plants that grow from rhizomes or healthy portions of aerial tissue (sedge and willow) have a high recovery potential. Long-term damage to root systems could, however, slow recovery of the vegetation in impacted areas. This may be of less importance in areas with an elevated water table (bog lakes).

5.10 Laboratory studies of the foliar damage to moss, lichen, willow, black spruce, and sedge by dispersants indicate some damage, but this is generally not lethal. Plants treated with dispersants recover in most cases. However, foliar damage may increase the plant's susceptibility to pathogens.

5.11 Field studies on the effects of the direct spraying of plants with dispersants indicated that the short-term effect of dispersants to individual plants was less than that incurred through natural causes. No long-term effects were found and seasonal growth was not affected.

5.12 Studies of the effects of dispersants and dispersed oil on the microbiological community show that the characteristics of the dispersant are critical. The dispersant should have no residues or components toxic to microbes or microbial processes.

6. General Considerations for Making Dispersant Use Decisions

6.1 The dispersant use decision is, in this case as most others, one of trade-offs. The use of dispersants can reduce the adverse effects of spilled oil on certain biological species at the expense of other components of the ecosystem.

6.2 Guide F2532 should be followed before making a decision to use dispersants in a pond or slough.

6.3 In most cases, one should focus on minimizing impact on the habitat. The repopulation of areas after the spill will occur naturally when an area becomes a suitable habitat for a given species.

6.4 Sufficient water energy is necessary to assist in the dispersion process.

7. Recommendations

7.1 Dispersant use in ponds and sloughs, and their bordering vegetation, should be considered if a spill poses a significant threat to indigenous wildlife or its habitat. In evaluating the potential for dispersant use, consideration should be given to the alternatives of leaving the oil untreated or the use of mechanical recovery equipment. In many cases, a spill response operation can cause serious damage to a pond or slough habitat, or a disruption of nesting and breeding activities.

8. Keywords

8.1 dispersants; environmental sensitivity; freshwater; inland; oil spill; oil spill dispersants; ponds; sloughs

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