OIL SPILL RESPONSE PLAN
FOR
POLAR BEARS
IN ALASKA

U.S. Fish and Wildlife Service
Marine Mammals Management
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POLAR BEAR RESPONSE PLAN

I. GENERAL CONSIDERATIONS

A. Authorities

The Polar Bear Response Plan is one component of the U.S. Fish and Wildlife Service (Service) *Region 7 Oil Spill Contingency Plan*. The purpose of the Polar Bear Wildlife Response Plan is to provide guidance to Service employees during an oil spill in Alaska that could affect polar bears (*Ursus maritimus*) or their habitat. The Service has responsibility for managing and protecting polar bears under authority of the Marine Mammal Protection Act of 1972 (MMPA) (16 U.S.C. 1361-1407). In Alaska, the Service's management goals are to:

* maintain polar bear populations within their optimum sustainable population level; and
* assure that polar bears remain a healthy, functioning component of the Chukchi/Bering and Beaufort seas ecosystems (U.S. Fish and Wildlife Service 1994).

Section 109(h)(1) of the MMPA authorizes the Service to take (harass, hunt, capture, or kill, or attempt to harass, hunt capture, or kill a marine mammal in the course of official duties, if done in a humane manner (including euthanasia) and if such taking is for the protection or welfare of the mammal, protection of the public health and welfare, or nonlethal removal of nuisance animals. Section 112(c) authorizes the Service to "enter into such contracts, leases, cooperative agreements, or other transactions as may be necessary to carry out the purposes of this title or title IV and on such terms as [t]he [Secretary of the Interior] deems appropriate with a Federal or State agency, public or private institution, or other person."

Title IV of the MMPA calls for establishment of a marine mammal health and stranding response program in response to unusual mortality events, including development of a working group, contingency plan, and sample collection procedures. While Title IV of the MMPA includes oil spill events as a type of unusual mortality event, it does not supersede, modify, or limit the duties and responsibilities conveyed by other laws (Wilkenson 1996). Oil spill response procedures are conducted under authority and procedures of the Oil Pollution Act of 1990, Clean Water Act, and Comprehensive Environmental Response, Compensation, and Liability Act. In Alaska, oil spill response procedures and personnel parallel those set forth in the *National Contingency Plan for Response to Unusual Marine Mammal Mortality Events* (1996). Therefore, oil spill events should be coordinated with the Alaska Marine Mammal Stranding Coordinator.

B. Current Population, Distribution, and Life History

1. Population

Polar bears move in association with the arctic ice pack. Satellite telemetry and other information indicates that two populations of polar bears occur in Alaska: the southern Beaufort Sea

population, and the Chukchi/Bering seas population (U.S. Fish and Wildlife Service 1998, Figure 1). In the Beaufort Sea, polar bears move seasonally east and west between northern Alaska and northwestern Canada (Amstrup 1995). In the Chukchi Sea, polar bears move seasonally between northwestern Alaska and eastern Russia (Garner et. al. 1990). An area of overlap occurs between Point Barrow and Point Hope (Garner et. al. 1990, Amstrup 1995).

In Alaska, accurate polar bear population estimates have been difficult to obtain because of low population densities, inaccessibility of habitat, movement of bears across international boundaries, and budget limitations. An estimate of 3,000-5,000 animals has been derived for the total Alaska population (Amstrup and DeMaster 1988). The most recent estimate for the Beaufort Sea is 1800 animals (Amstrup 1995). A reliable population estimate for the Chukchi/Bering seas population is currently unavailable (U.S. Fish and Wildlife Service 1998). A crude estimate of 1200-3200 animals has been derived by subtracting the Beaufort Sea estimate from the state-wide estimate. The IUCN Polar Bear Specialists Group most recently estimated the Chukchi/Bering seas population to be 2,000-5,000 bears (Derocher et. al. 1998). The populations are believed to be stable and increasing from levels during the 1960-70's when aerial hunting was permissible and probably discouraged bears from coming into near shore areas. Researchers, managers, village residents, and industrial operators have reported increased sightings of bears on land in recent years.

2. General Distribution

Polar bears are distributed in low densities over large areas and generally do not concentrate for extended periods of time. They prey primarily on ringed seals (*Phoca hispida*), whose distribution and availability may fluctuate with ice conditions or other factors (Stirling and McEwan 1975; Stirling and Archibald, 1977; Stirling and Latour 1978). Polar bears may be more abundant in localized areas during certain periods of the year and may be patchy or clustered in their distribution at other times of the year. For example, in spring polar bears may concentrate in areas where ringed seal pups occur, and in fall, they may aggregate in areas along the coastline where marine mammal carcasses occur. In Alaska, polar bears aggregate along the Beaufort Sea coastline during fall months in areas where bowhead whale (*Balaena mysticetes*) have been harvested by Alaska Native hunters. Specific harvest sites include Point Barrow, Cross Island, and Kaktovik.

Stirling et. al (1993) studied polar bear use of sea ice habitats during winter and spring in the Western Canadian Arctic. They determined that all sex and age class polar bears, except females with cubs-of-the-year, were most often distributed in the transition zone and moving ice habitats. Females with first year cubs were more frequently located in stable fast ice areas with pressure ridges and seal lairs.

In summer, Alaska polar bears tend to stay with the ice pack (Lentfer 1972) and are less frequently seen near shore, especially if the pack ice is well off shore.

3. Denning

Polar bears are long-lived, late maturing carnivores with relatively low reproductive rates (Amstrup and DeMaster 1988). They breed in the spring and females enter maternity dens excavated in deep snow drifts by late November. Young are born in late December or early January (Harington 1968). Females remain in their dens without feeding for at least three months after giving birth and rely on fat deposits for energy. Family groups emerge during late March and April.

Only pregnant polar bears construct dens. Terrestrial denning habitat includes coastal and river bluffs, barrier islands, and other areas of topographical relief (Amstrup and DeMaster 1988). Polar bears also den on shorefast ice and pack ice. During a study conducted in the Beaufort Sea between 1981 and 1991, 48 of 90 dens (or 53%) were located on drifting pack ice. The remaining dens were found on shorefast ice or terrestrial habitat. Researchers noted an increase in dens located on land during the latter half (1986-90) of the study (Amstrup and Gardner 1994). In the Beaufort Sea, polar bears den more frequently in the Arctic National Wildlife Refuge than in other coastal areas (Amstrup 1993). Other important terrestrial denning areas in the Beaufort Sea include barrier islands such as Pingok, Cross, Cottle, Thetis, and Flaxman, as well as the Colville, Sadlerochit, and Niguanak River drainages, Point Barrow, Point Lonely, Oliktok Point, Atigaru Point and Smith Bay.

Terrestrial denning areas in Alaska for bears from the Chukchi/Bering seas stock are less defined. Radio-telemetry studies conducted in Alaska indicate that all observed denning occurs north of Point Hope (G. Garner, pers. comm. 1995). However, traditional ecological knowledge provided by Alaska Native hunters indicates that some denning has occurred on St. Lawrence and Little Diomede Islands, as well as along the Alaskan coast between Wales and Barrow (Kalxdorff 1997). The highest density of denning known to occur in the Chukchi/Bering seas is on Wrangel Island, Russia, and the northern coast of Chukotka (Uspenski and Kistchinski 1972, Stishov 1991).

Additional information regarding polar bear habitat use is summarized in the 1995 *Habitat Conservation Strategy for Polar Bears in Alaska (Strategy).* The primary objective of the *Strategy* is to identify and conserve important polar bear habitat, thereby advancing the conservation of the species and ensuring the availability of polar bears for subsistence and other appropriate uses. The *Strategy* can be referenced for more specific information and maps regarding polar bear habitat use in Alaska.

C. Susceptibility to Oil Spills

Polar bears may be directly affected by an oil spill through oiling of fur, ingestion of oil from grooming, or by feeding on oiled prey or carcasses. Scientists have reported that polar bears will

not avoid petroleum products encountered in the wild and may actively investigate oil spills (Amstrup 1989, Derocher and Stirling 1991). Since oil production activities occur within the path of spring and fall migration routes, polar bears may pass through contaminated areas. Large oil spills from platforms, tankers, or pipelines could have a significant impact on polar bear habitat, particularly with a predominant east-to-west marine current that could move oil large distances along the floe edge and in moving ice habitats (Stirling *in* Geraci and St. Aubin 1990). Oil spills could also result in food chain effects, as well as disturbance, injury, or death from interactions with humans during a spill event.

The effects of oil on polar bears present serious health concerns. A study was conducted to assess the affects of oil on live captive polar bears (Oritsland et. al. 1981). Results indicate that oiling of fur may lead to ingestion of oil through grooming and licking behavior, and cause thermoregulatory and metabolic stresses to occur as well. Residual oil may persist if the animal is not cleaned completely. In this study ingestion of oil also led to behavioral abnormalities such as anorexia, tissue damage from uremia and dehydration, anemia, and renal failure, eventually leading to death in two of three animals. In addition, skin damage and hair loss has resulted after contact with oil in both experimental and natural conditions (Oritsland et al 1981, Derocher and Stirling 1991). Animals such as polar bears that rely on fur to maintain heat reserves are likely to be more susceptible to oil spills than those that rely primarily on blubber (Geraci and St. Aubin 1990).

Polar bears are most sensitive to disturbance from: 1) oil spill clean up activities; and 2) oiling of female bears prior to denning (October-April). In addition, weather conditions and care of young during winter months create great energy demands on polar bears which could lead to a highly stressed physiological state if they coincide with an oil spill. Cleanup operations that disturb a den could result in death of cubs through abandonment, and perhaps death of the sow as well. In spring, females with cubs of the year that denned near or on land and migrate to offshore areas may encounter oil (Stirling *in* Geraci and St. Aubin 1990). Other family groups with yearlings or two year old cubs as well as other sex/age classes may also be exposed if feeding or traveling near shore. Oil spills occurring in areas where polar bears are concentrated, such as feeding areas, may correspondingly affect a greater proportion of the population. Areas of open water, such as leads or polynyas, and areas where beachcast marine mammal carcasses occur may concentrate polar bears. An oil spill in an area where polar bears are concentrated could have negative population effects.

In the Chukchi/Bering seas, no oil and gas exploration, development or production is currently occurring in areas on or adjacent to the Alaska coastline. In the Beaufort Sea, however, between Barrow and Demarcation Point, important polar bear habitat exists within or near areas subject to oil and gas activities. Existing oil and gas activities are centered around Prudhoe Bay but interest has expanded west into the National Petroleum Reserve - Alaska as well as into offshore areas.

D. Response Plan Training Needs

Response personnel should have or be provided with the following training:

* contents and use of Wildlife Response Plans, Contingency Plans, and the Incident Command System
* guidance on laws and regulations that apply to handling or "taking" of marine mammals
* guidance on the roles and responsibilities of federal and state agencies as well as the responsible parties, coordinators, and their contractors
* HAZWOPER (Hazardous Waste Operations and Emergency Response) training
* standard first aid
* Arctic survival
* Natural Resource Damage Assessment (NRDA) training, including chain-of-custody protocol for collecting carcasses or samples
* bear deterrence training
* bear capture, immobilization, handling, and transport training (tertiary response only, see Section II.C below).

II. RESPONSE STRATEGIES

In event of an oil spill, the Incident Command System is the on-scene management structure that will guide response efforts. A Federal On-Scene Coordinator (FOSC), designated by the U.S. Coast Guard (for spills occurring in marine waters) or the Environmental Protection Agency (for inland navigable waters or wetlands) will be appointed to lead response actions. The FOSC, through the Department of the Interior's Regional Environmental Officer (REO), will work with a Regional Response Coordinator (RRC) representing Service trust resources, including polar bears. The RRC will contact the Service's Marine Mammals Management Office (MMM) for technical and planning response activities relating to polar bears. The RRC may designate a Wildlife Response Coordinator (WRC) to help manage spill response efforts. All MMM response activities must be conducted in coordination with the Service's RRC, as identified in Section III of this document.

Several factors must be considered when developing a response strategy for polar bears, including:

* location of spill
* magnitude of spill
* oil viscosity and thickness
* accessability to spill site
* spill trajectory
* time of year

* weather conditions (wind, temperature, precipitation)
* environmental conditions (presence and thickness of ice)
* number of polar bears that are (or likely to be) affected
* degree of contact
* importance of affected habitat
* cleanup proposal
* likelihood of bear-human interactions.

Depending on these factors, the RRC and MMM representative(s) shall determine the potential risk to polar bear populations and recommend appropriate response action to the FOSC. Response efforts will be conducted under a three-tier approach characterized as: a) **primary response** - involving containment, dispersion, burning, or clean up of oil; 2) **secondary response** - involving hazing, herding, or additional methods to deter wildlife from affected or potentially-affected areas; and 3) **tertiary response** - involving capture, cleaning, treatment, and release of wildlife. If the decision is made to conduct response activities, primary and secondary response options should be vigorously applied since little evidence exists that tertiary methods will be effective for cleaning oiled polar bears.

A. Primary Response

1. General Considerations

Primary response strategies should be emphasized for this species. Primary response for protecting polar bears from an oil spill is to prevent the oil from reaching sensitive areas such as denning sites, feeding sites, or areas where animals are concentrated. Known den sites should be avoided by all personnel at all times to minimize disturbance.

2. Oiled Carcass Collection

Oiled carcasses and other debris from open water or the shoreline should be collected regularly. Debris removal will minimize the potential for oiling of polar bears through scavenging or contact with contaminated flotsam. Polar bear carcasses should be retrieved and delivered to collection or morgue sites as directed by the Service's RRC to prevent oil from remaining in the food chain. Carcasses should be kept cool, but not frozen during transport to the nearest collection or morgue site. Each carcass should be accompanied by a form containing the date and location where the carcass was found and the name of the person who found it. If the carcass is not retrieved a form should still be completed and submitted to the Service resource trustee at the collection or morgue site. Resource trustees designated as NRDA specialists will be responsible for maintaining a chain of custody record for collected specimens.

3. Skimming

The initial response for recovering spilled oil is generally to mechanically collect it with **skimmers**. Skimming vessels may be capable of recovering oil in open water over large geographic areas in the spill zone. These vessels should be positioned to recover oil before it reaches sensitive areas. Skimmers must be careful to maintain an appropriate distance from polar bears to avoid unnecessary disturbance.

Heavy pack ice conditions limits effective mechanical cleanup. In addition, oil spilled in waters with ice concentrations greater than 50 percent ("broken ice") could not be effectively collected (U.S. Army Engineer District 1998). If spilled under winter ice, oil tends to accumulate at the ice edge, in leads, polynyas, and seal breathing holes. In addition, some oil may freeze to and move with the underside of the ice (Neff *in* Geraci and St. Aubin 1990). Therefore, oil should be prevented from moving under the pack ice. To recover oil that has been spilled under ice, **trenches** may be cut in the ice to concentrate oil, which, in turn, can be recovered by skimming or suction techniques. A series of **holes** can be drilled with ice augers into subsurface pockets with trapped oil and then pumped into storage containers (Alaska Clean Seas 1998). Ice thickness must be adequate to support the weight of vehicles and equipment.

4. Booms

Protective booms and **sorbent materials** may be used as containment measures to minimize contamination in confined areas (polynyas and ice leads) or to protect shorelines and ice edges where polar bears and their prey may be found.

Polar bear sensitive areas may be boomed using **shoreline exclusion techniques** which involves anchoring one or more lengths of boom between two or more stationary points to prevent oil from entering an area occupied by polar bears. **Shoreline diversion booming** is used to divert a spill headed toward an area occupied by polar bears to a less sensitive area, such as toward a skimmer or open water. However, polar bears, if disturbed, may move out of an un-oiled area into an oiled area. If possible, booms should be placed in a manner that minimizes disturbance to polar bears.

5. Dikes/Berms

For on-land or on-ice spills, snow or earthen **berms** may be constructed to contain oil around the leak, if terrain permits. **Dikes** filled with excelsior or sorbent materials may be used on spills in smaller streams.

6. In-situ Burning

In-situ burning is the combustion of spilled oil into the atmosphere. It is a technique that can potentially remove large quantities of oil from the water's surface in a short period of time. To be effective, burning must be initiated soon after the spill before highly volatile (flammable) hydrocarbons vaporize. Burning causes by-products such as carbon particles and gases to be

released into the environment. The main disadvantage of burning is that the pollution generated my have human health impacts from breathing air in the vicinity of the spill.

In situ burning can assist in the removal of oil from the water, thus reducing the time that polar bears would likely come into contact with the spilled oil. The Service concurs with in-situ burning as a response strategy if impacts from burning are less harmful to humans and wildlife than impacts of the non-burned oil. If oil is released in the Arctic environment it will persist due to slow weathering processes. In most instances, in-situ burning of spilled oil is preferable to potential oiling of fish and wildlife. Short-term effects associated with burning are preferable to long-term effects associated with oiled polar bears and additional wildlife, as well as the potentially damaging effects of shoreline cleanup in biologically sensitive areas.

The Service's RRC and MMM representative shall determine the potential risk to polar bear population(s) specific to the spill zone. All wildlife in the proposed burn area must be identified as quickly as possible prior to Service concurrence of the in-situ burn permit. The request for a burn permit is approved by the FOSC.

7. Dispersants

Dispersants are water surface-active chemicals that enhance the movement of oil from the surface into the water column. To be effective on an open water oil spill, the dispersant must be able to reach the oil slick, mix with the oil, be at the proper concentration, and cause the oil to disperse into droplets. Dispersants work best within the first 24 hours of a spill, on lighter oils, and when a moderate amount of wind exists. Dispersants are toxic to varying degrees to marine biota but toxicity may be of short duration if the dispersant is diluted quickly in an open water environment. Low water temperatures may also affect the effectiveness of the dispersant.

In general, the Service supports dispersant use as a response strategy if associated impacts are less harmful to humans and wildlife than impacts of the non-dispersed oil. The *Dispersant Use Guidelines* have been developed by the Alaska Regional Response Team in an effort to apply dispersants with the least amount of deleterious environmental effects. Dispersants may be used in marine waters where water depth and currents are sufficient to disperse and dilute oil rapidly to low concentrations, i.e. deep, off shore waters. Dispersant use is not recommended immediately in or around sensitive areas where trust species or their critical habitat occur, i.e. lagoons, wetlands, or other nesting spawning, breeding , and nursery areas (Regional Response Team Oil Dispersant Guidelines for Alaska 1989). The dispersants themselves must be approved by the Environmental Protection Agency. The request for a dispersant use permit is approved by the FOSC pending completion of the *Dispersant Use Checklist*. All wildlife in the proposed use area must be identified prior to Service concurrence of the permit.

Dispersants are not effective in a broken ice environment because ice may prevent dispersants from mixing into the water column. The use of dispersants in broken ice is of concern because wildlife may be exposed to residual toxins that adhere to ice rather than disperse in open water.

The decision of whether or not to use dispersants will be made on a case-by-case basis by the FOSC. MMM staff should ensure that concerns for polar bears or their habitat are passed on to the FOSC through the RRC.

B. Secondary Response

1. General Considerations

Secondary response is to deter or haze polar bears from the area of the oil slick or contaminated habitat. This response is appropriate under all circumstances and may be incorporated with primary response activities. The degree of risk associated with the animal actually contacting oil before secondary response strategies are initiated should be considered. If the spill occurs when polar bears are believed to be present, an aerial survey should be conducted to locate potentially affected animals.

2. Detection

A deterrent is any method or device used to keep bears away from a particular location. The best deterrent requires **early detection** to be effective. Bear **monitors** are people whose specific responsibility is to watch for bears and bear sign and warn others of approaching bears. Bears may be difficult to see in Arctic Alaska, due to fog, darkness, or blowing snow. **Dogs** may also be trained to signal approaching bears. **Trip wires** have been used successfully on Alaska's North Slope to detect approaching polar bears in small, temporary, or portable camps. Electrical wire fence is placed at sufficient distance (30-100 feet) from the camp's perimeter to allow personnel time to retreat to a safe location once the bear is detected. One to three strands of 30-gauge wire are strung on posts securely anchored in ice and snow. The lowest strand should be strung at approximately 20 inches from the ground's surface to prevent Arctic foxes from tripping the system (Hechtel *in* Truett 1993). The wire fence is attached to an alarm that is set off when a bear walks through the fence. A gate may be necessary to allow humans and/or vehicles to access the camp. This detection system provides a 24 hour alarm system but can be set off inadvertently by non-target species, people, strong winds or snow.

Motion sensors are a microwave motion detection system that create an "invisible fence" around a camp. An alarm is sounded when an object passes through the microwave beam between the transmitter and the receiver (BP Exploration 1993). The number of transmitters and receivers necessary to protect a camp is dependent on the size of the camp. Motion sensors are also tripped by people, vehicles, or non-target species but are automatically reset and may be more suited to larger, semi-permanent facilities (Hechtel *in* Truett 1993).

If polar bears are detected near a spill area or response operation, all personnel in the area should move to a **designated safe location.** Procedures for retreating and designated safe places should be established as soon as the response operation is initiated.

While detection methods are useful to signal the approach of polar bears that are still some distance away, they should not be considered deterrent methods. If use of deterrents is warranted, responders should identify an appropriate **escape route** should the deterrent fail. Bears should also be given access to an escape route, preferably one that is in the direction from which they came, or towards the sea ice.

3. Deterrents

There are no data indicating that **visual or olfactory deterrent methods** are effective in keeping polar bears away from specific sites. **Artificial light**, such as the electric lighting system at industry sites, may deter some bears at night but may not be effective in fog or white out conditions and should not be relied on solely as a deterrent.

The following section on deterrents, unless otherwise cited, is based on information presented by Dick Shideler, Alaska Department of Fish and Game, in *Guidelines for Oil and Gas Operations in Polar Bear Habitats* (1993). The reader is referred to this document for a more extensive review of deterrents and deterrent methods.

Use of **auditory deterrents** such as the firing of propane cannons or warning shots is effective for short-term deterrence, but the animals may habituate to this method. Starting and revving a vehicle engine may be sufficient noise to deter bears from entering or moving toward a spill site. Vehicles should not be used to chase a bear unless people or the bear(s) are in immediate danger. If a bear is pursued, attempts should be made to minimize stress to the animal and avoid the possibility of injury or overheating. In Canada, test results indicated that polar bears may be deterred by electronically synthesized polar bear aggressive "roars" broadcast at over 120 decibels from loudspeakers. These sounds may be incorporated into an alarm broadcast system at the spill site or on mobile (security patrol) vehicles. The noises must be broadcast with adequate volume (otherwise it may attract curious bears) and in a direction that allows the bear a safe escape route.

Additional **noisemakers**, such as cracker shells, screamers, firecrackers, sirens, and air horns are designed to produce a loud noise that will scare a bear. **Cracker shells** are deterrents used in a 12-gauge shotgun that explode at approximately 82-110 yards (75-100 meters) **Screamers** are deterrents used with a special .22 caliber blank pistol that make a screaming noise and emit a bright light from the muzzle at approximately 110 yards (100 meters). **Firecrackers** are loud explosives that must be thrown or propelled from a slingshot.

These noisemakers, as well as sirens and air horns, can be effective on some bears but not others. In addition, some bears may habituate to noise, especially if used repeatedly without an

accompanying physical deterrent. Adverse weather such as high winds or cold temperatures may minimize the effectiveness of noisemakers. Response personnel should not rely on noisemakers for personal protection.

Firing **warning shots** with lethal rounds such as rifle and shotgun slugs is discouraged because of the potential to harm the bear or humans in the area. This deterrent technique should be used only if people are in danger. Response personnel should never fire lethal rounds at a bear unless they intend to kill the bear in defense of life.

If auditory deterrents are deemed ineffective, **physical stimuli,** such as projectiles, may be necessary. Auditory deterrents used in combination with physical stimuli enhance the effectiveness of deterrent action. **Projectiles,** such as plastic bullets (usually fired from a 12-gauge pump shotgun) and rubber batons have been successfully used to deter polar bears. Plastic bullets are accurate up to 44 yards but affected by wind. No bears have been known to respond aggressively to being hit by plastic bullets; however, at close range they may be lethal to both bears and humans. Improper use of the weapon could potentially kill a bear and training is necessary to use the gun correctly. Weapons must be cleaned and maintained regularly. Plastic bullets and cracker shells should not be used with autoloaders because they may jam. Rubber batons require the use of a specialized, single-shot gun, project a heavier load, and are effective at a range of 32-55 yards. They are less accurate than rubber bullets, require considerable training, and may only be used by enforcement or security personnel. More accurate models are being developed.

Herding or hazing (dispersal of) polar bears with vehicles, boats, and aircraft has been successfully demonstrated. These methods may be effective when oil is confined to a small area and can be regularly patrolled. Individuals conducting the techniques must be trained and advised to avoid putting wildlife into additional jeopardy when using a deterrent designed to move an animal away from or toward a specific site. All bears may be marked with dye so returning bears can be identified (Schweinsburg et al. 1985). However, this action warrants consideration since it may place bears and humans in close proximity, increasing risk and stress to both bears and humans.

Because of the insular value of snow, ice, and thick fur of the bear, no **electric fence** design has been effectively employed to deter polar bears on snow or ice. Electric fences may be used in a snow-free environment but must be grounded in order to operate properly. Wires should be situated so that a bear is unable to crawl under, through, or over the fence. The shock should be strong enough to cause an involuntary muscle contraction without burning the skin or affecting heart function.

4. Pre-emptive Capture, Handling, and Transport

Pre-emptive capture should only be initiated if all other methods under the secondary response strategy are ineffective in deterring bears from a spill site. The main problems affecting the

feasibility of polar bear capture operations are logistical constraints. Pre-emptive capture and relocation of polar bears is only feasible if small numbers of animals are in danger of being oiled and suitable relocation sites are nearby. The potential for polar bears to be oiled should be high before this technique is initiated.

Use of **baited culvert traps** is the least invasive method for capturing polar bears. However, this technique has greater application limitations than does the use of **immobilizing drugs**. The Service will determine whether pre-emptive capture of polar bears is necessary on a case-by-case basis. Capture operations should only be conducted by or with oversight from a MMM representative. Personnel safety is a priority during polar bear capture, holding and release operations. Capture and release operations will not be conducted when weather, ocean, or other conditions jeopardize human safety.

Transport can be accomplished using aircraft or vehicles. If polar bears are drugged and transported by aircraft swingload, they should be insulated from the cold. A forklift may be necessary to move caged bears to transport vehicles/aircraft. Cage enclosures used to transport polar bears should be large enough to provide sufficient space for the bear to turn about freely and lie in a natural position. Polar bears should not be transported in the same enclosure with another bear except cubs with mothers or siblings. Transport of each bear should be accompanied by a form containing (at minimum) the following information (see Attachment 1):

* capture aircraft and personnel
* date, time and location of capture
* amount of oil in area and whether the bear was observed or captured in the oil
* behavior at capture, i.e. aggressive, lethargic, comatose
* technique used to capture the animal
* drug(s) used to immobilize animal and dosage
* description of bear, i.e. sex, age, distinguishing marks
* body measurements (total body length, straight-line body length, axillary girth, neck girth at shoulders and at axis, skull length and width, weight)
* presence of ear tag, tattoo, or collar
* recovery time from drug and reaction of animal during recovery.

Upon capture the bear should immediately be examined by an attending veterinarian or other qualified personnel. A tooth and blood samples should be taken, and the bear should be affixed with a plastic ear tag and a tattoo to monitor movements after release. Polar bears must be regarded as dangerous in a captive situation and should be handled as little as possible during response operations. A veterinarian should be on site.

5. Other

No other secondary response strategies that have been demonstrated effective are currently available.

C. Tertiary Response

1. General Considerations

Tertiary response is the treatment of polar bears contaminated with oil. The components of tertiary response are the **capture, handling, transport, treatment, holding**, and **release** of polar bears. While this response may be feasible on a small scale, little is known about the potential effects of capturing oiled polar bears. Standard techniques used during helicopter capture operations may cause already stressed polar bears to overheat (Hurst et al. 1982). Handling or drugging weakened or stressed polar bears could be detrimental to the animal. Repeatedly immobilizing an animal (for treatment, cleaning, drying, etc.) may have serious health effects which should be weighed against the animal's chances of survival PRIOR to the animal's capture. Logistical and monetary constraints may further limit the feasibility of this response.

Decisions regarding the health of each polar bear will be made by the attending veterinarian in consultation with the MMM representative. There are presently no veterinary standards identified to counteract oil toxicity in polar bears. In some cases it may be necessary to euthanize bears. Polar bears should be euthanized by injection when the attending veterinarian decides that the damage to the bear is irreversible and the animal is suffering.

2. Capture

Oiled polar bears should not be captured unless a rehabilitation facility is available for their care and treatment (see section 5 below). **Capture** of bears should be conducted by qualified personnel as described in section II.C. Use of traps may not be effective if the animal is sick or occupied with grooming.

3. Handling

Handling should be conducted by qualified personnel as described in section II.C.

4. Transport

Transport should be conducted by qualified personnel as described in section II.C.

5. Treatment

Treatment facilities for rehabilitating oiled polar bears should include: 1) portable bear cages (and the mechanics to move them); 2) an accommodation and treatment center, including separate areas for triage and sedation, cleaning, rinsing, drying, recovery, and holding; 3) a veterinary laboratory and equipment storage area; and 4) staffing accommodations, including restrooms, sleeping and dining areas. The treatment facility should be located near a lake or

where large quantities of snow can be melted, and also in proximity of an airstrip. Consideration must be given to disposal of cleanup waste. If necessary, wastewater permits must be obtained from federal and state authorities.

In Alaska, the closest facility that may be able to handle the treatment of oiled polar bears is maintained by Alaska Clean Seas, a private oil spill response organization. Alaska Clean Seas maintains a warehouse (two conex trailers) and equipment in Prudhoe Bay that is deployable in an emergency situation. On-site equipment includes a *Polar/Brown Bear Cleaning, Treatment and Necropsy Kit,* three temporary holding cages, and a 2400 gallon tank (Mike Collins, pers. comm. 1998). The Alaska Zoo in Anchorage has temporary holding facilities capable of supporting emergency treatment for a small number of polar bears (John Seawell, pers. com. 1998). The Alaska Sea Life Center has pool space, dry areas, rehabilitation and veterinary facilities available for the treatment of cubs, but no closures available for holding adult bears (Susan Engels, pers. comm. 1998). MMM staff would be responsible for coordinating with and providing personnel support to rehabilitation facilities.

Only qualified personnel shall be admitted into treatment facilities. Public media relations should minimize disturbance to polar bears; no cameras with flashes will be permitted in the facility, and press conferences should be held outside and away from captured bears.

Once a polar bear is brought into a treatment facility, a qualified veterinarian will perform **assessment and triage** and oversee the animal's care and recovery. Treatment will require immobilizing the animal. Dosages will vary according the animal's weight, body condition, and purpose for immobilization.

Warm water, liquid detergent and sawdust are the only known non-toxic agents proven effective in **cleaning** oiled polar bears but may not remove deeper oil next to the skin. Some oil may be ingested during grooming and may require stomach pumping (Schweinsburg et al. 1985). A cleaning room equipped with abundant sawdust and a 200 gallon rinse tank filled with 30 degree Celsius water may be used to clean polar bears. Bears should be immobilized and eyes covered for protection.

Cleaning involves working sawdust into the fur and brushing out the oiled material. This procedure may be followed by application of a 15% "Sunlight" soap solution lathered over the entire body, which, in turn, is followed by application of a warm water rinse to remove as much of the soap as possible. The bear can then be lowered into the rinse tank to remove remaining soap. Application of more sawdust and brushing will remove excess water and help dry the fur. The animal's vital signs should be closely monitored throughout the process and when drying is completed, the animal should be moved to a holding cage containing a sawdust bed.

Polar bears should be fed seal meat or blubber obtained from nearby village communities. If such meat is not available, commercial dog food or other substitutes may be used.

In extreme cases it may be necessary to euthanize severely oiled bears. This decision should be made by a qualified veterinarian in consultation with the Service. An autopsy should be performed to increase knowledge on the effects of oil on polar bears.

6. Holding

Polar bears should be held for as little time as is possible. Clinical parameters should be monitored and risks of disease transmission and stress minimized. **Holding cages** made from steel tubing may be used while animals are in captivity. Holding cages should be elevated from the floor to prevent accumulation of feces. Each polar bear will be examined by a qualified veterinarian to determine health status of the animal prior to release into the wild or transfer to a zoo.

7. Release

The purpose of release is to return treated polar bears to the wild as soon as possible in areas where they have the best chance of survival, as determined by the Service. The Service will work closely with rehabilitation personnel to develop an appropriate release plan. Every attempt will be made to release polar bears where they were originally captured or in the near vicinity. This will depend on the degree of contamination risk present at the release site. The Service retains responsibility for determining the location of potential **release sites.** Decisions will be made on a case-by-case basis by the MMM representative. Any indication of infectious disease or the animal's inability to sustain itself precludes release into the wild. If unable to be released into the wild, every attempt will be made to place these animals in zoos, aquaria, or research facilities. Monitoring should occur after release to determine survivorship and bear movements.

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