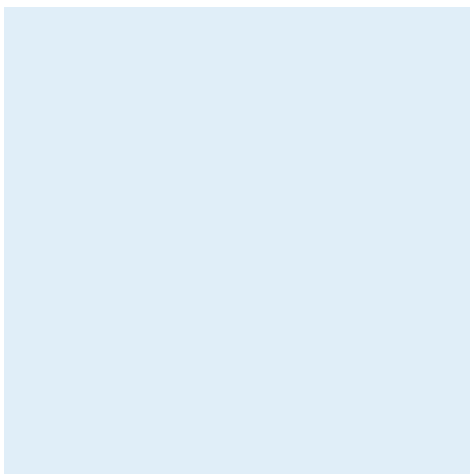


Key principles for the protection, care and rehabilitation of oiled wildlife

A technical support document to accompany the
IPIECA-IOGP guidance on wildlife response preparedness

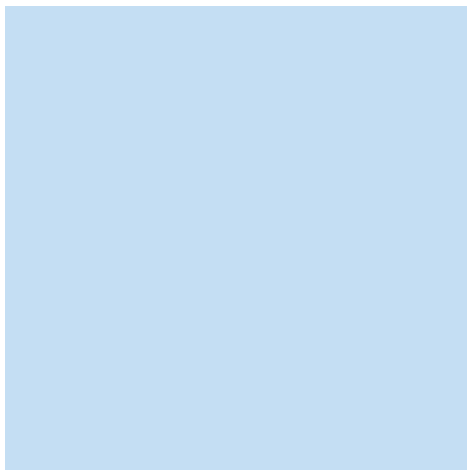


Oil spill
preparedness



THE GLOBAL OIL AND GAS
INDUSTRY ASSOCIATION
FOR ENVIRONMENTAL AND
SOCIAL ISSUES

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IOGP Report 583

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Key principles for the protection, care and rehabilitation of oiled wildlife

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IPIECA-IOGP guidance on wildlife response preparedness

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Introduction

The information provided in this document serves as a reference to illustrate what should be considered as international 'standards of practice' for animal protection and care in an oiled wildlife response.



Introduction

OVERVIEW

This technical support document, developed as part of the IPIECA-IOGP Oil Spill Response Joint Industry Project and authored by the 11 organizations comprising the Global Oiled Wildlife Response System (GOWRS) Project, serves as a reference to illustrate what should be considered as international 'standards of practice' for animal protection and care in an oiled wildlife response. While individual protocols and procedures may differ between organizations (and between incidents) depending on the species affected, number of animals present, logistical support within the country, and other factors, the details provided constitute the underlying principles of animal care that should be reflected in those protocols. Where different approaches are used by local organizations, either for cultural reasons or due to the background of those organizations, these should always be considered and respected. However, an effort should be made to explain an alternative approach and help these organizations to appreciate the benefits of a transition to international standards of care.

UNDERSTANDING AND USING THIS DOCUMENT

This document is not designed to be a complete and thorough analysis of protocols and procedures for specific oiled wildlife response activities. Rather, it is designed to give broad-based details to help response organizations engaged as part of an international response follow internationally-accepted protocols. It also complements good practices in wildlife response preparedness and aims to encourage the development of protocols and procedures that relate to each of the points listed in this document. In situations where local or regional regulations are in conflict with these guidelines, regulatory requirements should take precedence.

While the development of good practice guidance for oiled wildlife response is a key element of an effective preparedness programme, it is only one facet. Training in these practices, the acquisition of equipment and supplies necessary to follow these procedures, and integration of these methods into a broader response plan are crucial additional steps towards meeting the appropriate standards of good practice in tiered preparedness and response.

This document does not replace an oiled wildlife response plan or any level of required preparedness as described by the IPIECA-IOGP Good Practice Guide (GPG) on wildlife response preparedness¹. A wildlife response plan developed according to the guidelines in that GPG, combined with a structured multi-year programme of training and exercises in which all stakeholders participate and operational readiness is developed, is the only path to towards successful response preparedness.

¹ IPIECA-IOGP (2014). *Wildlife response preparedness*. IPIECA-IOGP Good Practice Guide Series, Oil Spill Response Joint Industry Project (OSR-JIP). IOGP Report 516. <http://oilspillresponseproject.org>

Effects of oil on wildlife

This Section describes the wide range of direct and indirect effects that oil can have on wildlife, internally and externally.



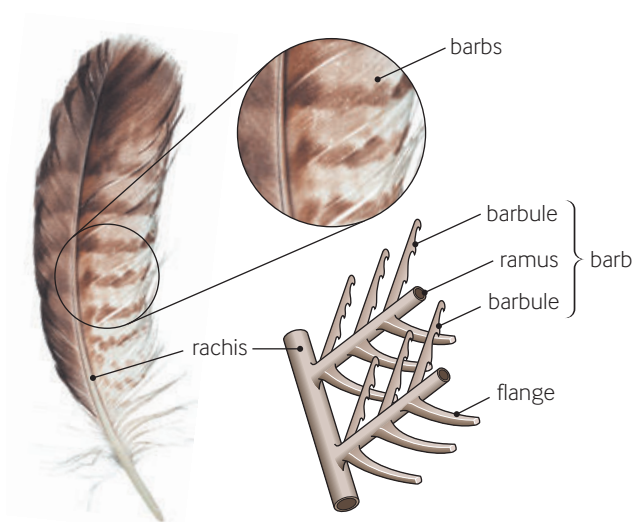
Effects of oil on wildlife

DIRECT EFFECTS OF OIL ON WILDLIFE

1. External effects of oil on wildlife

Effects on feathers, fur and skin

- Feathers are important for flight, waterproofing, thermoregulation and buoyancy. Most feathers consist of a central tapering shaft with barbs that branch out from the sides of the shaft. Barbules branch out from each of these barbs, and interlock with each other to connect the barbs together. This interlocking system repels water (resulting in waterproof feathers), promotes insulation and facilitates flight. Oil, however, is not repelled but adsorbed, and even small volumes of oil will disrupt this interlocking system, causing a loss of the waterproofing properties and insulating ability of the feathers. Water can then penetrate to the down feathers and skin, causing hypothermia and loss of buoyancy, and impeding flight and diving ability.
- Heavily furred mammals (e.g. fur seals, sea otters, polar bears) rely on their thick fur to trap air next to their skin. This layer of air provides insulation by preventing water from penetrating through to the



Above: the complex interlocking system of feathers (or fur alignment) that supports flight, movement and thermoregulation in many animals; this can be quickly disrupted by oil.

skin, and also promotes buoyancy. Exposure of fur to oil disrupts the hair alignment, destroying the air layer, and allowing water to penetrate to the skin causing hypothermia and loss of buoyancy.

- Oiled aquatic animals suffering from hypothermia, loss of waterproofing and buoyancy will attempt to move onto land. When out of the water, the affected animals will have difficulty thermoregulating (potentially leading to hypothermia or hyperthermia depending on climatic conditions). Moving onto land may also result in the oiled animals being away from their food source, and/or may inhibit foraging, potentially leading to starvation. The effects of starvation are worsened with hypothermia. Many birds also die during the attempt to reach land.
- Marine mammals without heavy fur (e.g. sea lions, cetaceans) tend not to suffer from hypothermia when affected by oil as they rely on their fat resources for thermal insulation.
- Oil in contact with the skin, mucous membranes and eyes can cause irritation, chemical burns and respiratory problems. Lighter, more refined products can cause these effects more quickly, and the impacts are often more severe.
- Petroleum products are only one type of contaminant that can have negative consequences. Food oils, natural products (algae) and other materials can have similar external impacts to those listed above.



Exposure of animal fur and bird feathers to oil can have widespread negative impacts on an animal's welfare.

Section 2

Effects of oil on wildlife

Effects on locomotion

- Disruption of the interlocking system of an animal's feathers can prevent flight and lead to loss of buoyancy; disruption of the fur alignment in mammals adversely affects buoyancy.
- Animals can become trapped in large or thick slicks of oil on water, as their ability to ambulate normally can be severely compromised. Animals can also be geographically 'trapped', such as on the shore, or on an ice shelf or iceberg.

Effects on eggs

- An oiled breeding bird may oil its eggs when nesting. The eggs of turtles and terrapins may also be exposed to oil at nesting beaches. The exposure of eggs to oil can result in embryo defects and mortality.
- It should be understood that, ecologically, it is more important to protect or mitigate the impacts on adult species than it is for eggs or juveniles when resources are limited.

Other effects

- Blocking of the nares (nose) and the oral (mouth) cavity when coming into contact with oil can result in respiratory distress.
- Oil can foul the baleen in baleen whales, reducing their ability to feed.
- Scavengers may be affected by oil when feeding on debilitated or dead oil-contaminated wildlife.

2. Internal effects of oil on wildlife

While the most obvious and short-term effects of petroleum on wildlife are those related to external effects, significant long-term damage can also occur from internal exposure. Causes include: preening or grooming oil from feathers or fur, ingestion of free-floating oil in feeding activities, or inhalation of concentrated volatile components of oil.

Table 1 on page 8 summarizes the internal effects that oil can have on wildlife, along with the most likely causes for each effect.



Bob Marshall/The Times Playune

Oiled pelican eggs in a deserted nest on an island in Barataria Bay, Gulf of Mexico.

3. Overall effects of oil on wildlife

As described on the previous pages, the potential effects of oil on wildlife are multifactorial, and can range from subtle changes in behaviour to chronic debilitation (which can lead to reduced fitness) to death. Many different factors are involved in the ultimate impacts on animals exposed to oil, including (but not limited to) underlying animal health (which, in itself, relies on many factors such as season, age, reproductive status, migratory status, existing disease, and others), product type, degree of oiling, exposure type (external versus internal) and weather state. Similarly, spills in different habitats, geographic regions, climate types and ecosystems can have a wide variety of biological impacts. Ultimately, the deployment of effective and timely recovery and rehabilitation response actions have the best chance of reversing the effects of oil on wildlife in those animals that can be saved.

Section 2

Effects of oil on wildlife

Table 1 Potential internal effects of oil on wildlife, and the likely causes for each effect

DAMAGED ORGAN/SYSTEM	INTERNAL EFFECTS	MOST LIKELY CAUSE
Red blood cells	Anaemia (or low numbers of red blood cells) can cause a decrease in oxygen moving through the body, affecting diving, movement and general animal condition.	Lack of production of cells (from poor nutrition), and/or cellular destruction (from damage to haemoglobin within the cells).
White blood cells (immune system)	Changes in white blood cell numbers (and specific cell types) can lead to increased susceptibility to disease.	Stress of captivity, decreased nutrition, and/or toxic metabolites of polycyclic aromatic hydrocarbons (PAHs).
Liver	Changes in protein levels in the blood, production of cholesterol, and/or accumulation of iron in the liver.	May be due to the activation of metabolic pathways from PAHs, or the production of toxic intermediate products.
Kidney	Changes to electrolyte levels in the blood, leading to changes in amount of blood, blood pressure, reduced blood clotting, and generalized poor health.	May be due to effects of oil or PAHs on the gastrointestinal system (leading to severe dehydration and kidney damage) and/or changes to salt glands in birds.
Gastrointestinal system	Watery faeces/diarrhoea and decreased muscle mass (even with increased food intake).	Physical presence of oil in the gut, or direct damage to the intestines.
Hormonal system	Variety of body-wide effects on all organ systems.	Direct and/or indirect effects on the adrenal gland, followed by increases in stress hormone levels. May also be due to effects of PAHs on thyroid function.
Reproductive system	Changes in reproductive behaviour, failed laying, embryo mortality or malformation, failed birthing/hatching, and increased juvenile abandonment.	Unclear, as separation of internal effects (due to ingestion) from external effects (from coating of eggs or juveniles) is difficult.
Neurological system (brain and nerves)	Changes in behaviour (e.g. lack of predator avoidance, reduced feeding, and decreased migration) and possibly brain lesions.	May be related to direct effects of smaller PAHs on the brain, changes to neurotransmitter levels, or other causes.
Respiratory system	Decreased oxygen levels in the blood and direct damage to the lungs/air sacs (e.g. pneumonia).	Inhalation of fumes, aspiration of oil at water surface, or transfer of smaller PAHs into the bloodstream.

INDIRECT (SECONDARY OR CAPTIVITY-RELATED) EFFECTS OF OIL ON WILDLIFE

1. Housing-related conditions

Pressure sores

- **Cause:** most wildlife species spend their life in and on their natural habitat. During rehabilitation, they may have to stand or lie on relatively hard, unnatural surfaces, and their state of debilitation may lead to a decrease in the fat or muscle layers that would normally protect them. This is a particular concern with aquatic bird species (e.g. divers or loons), which spend a high proportion of time on the water. Continuous pressure on the feet or bony protuberances (e.g. the keel or breast bone in birds) can quickly lead to a range of pressure sores, including foot and hock swellings or lesions directly over the bony areas.
- **Treatment:** prevention is the key for pressure sores. Proper housing/flooring that provide support can delay the development of such lesions. For aquatic birds, the use of net-bottom cages and specific protections like protective keel coverings or 'booties' on the feet can delay or prevent these pressure sores. Simple pressure sores can be treated topically, but severe lesions to the bone can be difficult. Ultimately, the time that these species are kept in captivity should be as short as possible within the rehabilitation process.

Feather/fur damage

- **Cause:** inappropriate caging or inadequate cleaning of floors can lead to the faeces and urine/urates staying in contact with the feathers or fur, leading to damage/destruction of the fur or feather structure. If severe, this can have an irreversible effect on the animal's waterproofing.
- **Treatment:** prevention is key, through the use of proper housing (like net-bottom cages for birds) and appropriate cleaning protocols for cages.

Impact damage

- **Cause:** wild animals in captivity can come into contact with the walls or edges of their confinement; if these edges are hard, sharp or otherwise damaging, significant injury can occur. For example, some bird species (like ducks and scoters) can be very agile in the cages, hitting their carpal joints against the walls and causing 'bumper' wounds. These types of impacts can cause contusions, lacerations, and/or abrasions to their skin, underlying swelling/damage to tissues, and if severe enough, arthritis and fractures.
- **Treatment:** prevention is key—the use of proper types of housing (e.g. soft-sided cages for birds) and appropriate enclosure size, and keeping animal numbers low (to reduce negative conspecific interaction and flight) can help to prevent such wounds from occurring.

Damage due to inappropriate enclosures

- **Cause:** holding wildlife in conditions that do not closely mimic the animals' natural settings can cause significant damage. For example, holding sea turtles in water that does not possess adequate salinity can cause life-threatening changes to blood chemistry. If enclosures do not match or approximate the animals' natural environments, physical, physiological and/or behavioural injuries can occur.
- **Treatment:** prevention is key—the use of appropriate enclosure types can prevent such injuries from occurring. Close association with ecological experts on the species being treated is crucial.



Oiled species that spend most of their time on or in water may be forced to rehabilitate for long periods on hard surfaces that they are not accustomed to. This can have a range of physiological and psychological impacts on the affected wildlife, and may slow or prevent their recovery.

Section 2

Effects of oil on wildlife



Michael Ziccardi/UC Davis

The use of appropriate enclosures or transport containers for captured oiled wildlife is essential for preventing further injury to the animals.



UC Davis

Proper cleaning and handling techniques are vital for reducing the stress levels and, consequently, managing the risk of infectious diseases among the captured animals.

2. Stress-related conditions

- **Cause:** suppression of the immune system, which makes animals more vulnerable to disease, can be due to intraspecific factors (e.g. aggression from different sexes or ages), interspecific factors (e.g. fear of humans, handling, aggression from other species), and/or environmental factors (e.g. being on land, use of artificial light).
- **Treatment:** prevention of excess stress through the use of appropriate housing (including natural light sources), minimization of handling, and the use of appropriate restraint techniques (e.g. use of towels to cover the head).

3. Disease-related conditions

- **General:** due to increased concentration of animals in smaller habitats, increased stress and general debilitation, the risk of infectious diseases in captive oiled animals is high.

Consider, for example, aspergillosis in birds:

- **Cause:** aspergillosis is a fungal infection and one of the most significant infectious diseases in birds. Birds that suffer from malnutrition, injuries and immune suppression are particularly vulnerable to the disease. Aspergillosis may be related to housing and stress issues, or may be an issue on its own.
- **Treatment:** there is no simple cure for aspergillosis in birds. It is generally not treated in aquatic birds in a rehabilitation setting. Prevention is key through proper housing, adequate ventilation, minimization of stress, and/or the use of prophylactic drugs administered orally, subcutaneously or via medicated nebulization.

Overarching principles of wildlife response

The principles and requirements listed below are essential for an effective wildlife response, and are described in detail in this Section:

- Health and safety of responders
- Triage
- Euthanasia
- Documentation
- Facilities
- Communications
- Response Team organization



Overarching principles of wildlife response

HEALTH AND SAFETY OF RESPONDERS

1. Mandatory regulations and guidelines

Pre-mobilization

- Explore specific in-country laws and regulations related to health and safety employer/employee requirements and responsibilities.
- Identify potential risks and ensure that appropriate prevention measures (e.g. vaccinations, health insurance) are taken.

Note: Exposure to natural catastrophes, security issues and threats are not covered in this document and should be covered in the individual organization's procedures.

During mobilization

- Review the existing Safety Plan (if present):
 - Work with the Safety Officer to ensure that oiled wildlife-specific hazards are covered appropriately.
 - Ensure that oiled wildlife response risks and response information are integrated into the wider effort (e.g. activities referenced and detailed in an Incident Action Plan).
- Ensure that all parties have access to general health and safety documents, including those relevant to oiled wildlife responders.
- Ensure that human medical resources are available for responders (e.g. hospitals, first-aid kits, medical support/supplies).
- Ensure the security of all responders.
- Contact local government officials and secure contracts for waste management and disposal of hazardous waste.
- Ensure minimal exposure to infectious and non-infectious diseases, especially highly pathogenic, reportable and zoonotic diseases.



NOAA/FWCC (Blair Witherington)

Recovering a turtle from emulsified oil; the use of appropriate personal protective equipment is of paramount importance in all situations (see also page 15).

2. Management control

Pre-mobilization

- Ensure that Response Team members have incident-required health and safety certification, general oiled wildlife response safety training, and response organization-specific (employer-mandated) training.

During mobilization

- Ensure that the incident Safety Officer (or delegated oiled wildlife Safety Officer/Team) can deliver additional safety training and induction courses to responders and volunteers as required.
- Issue PPE for each individual and ensure that responders understand the appropriate use of the various items.
- Identify the management control team:
 - Identify/contact the incident Safety Officer (if present) to confirm the existence of a Safety Plan.
 - Identify the oiled wildlife Safety Officer/Safety Team with skills to undertake the responsibility, and liaise with the incident Safety Officer/implement safety and health management.

- Conduct the initial site assessment with an emphasis on developing a suite of controls required for hazards, and on the clarity of mitigation measures:
 - Complete site assessment sheets.
 - Complete daily safety briefing sheets.
- Undertake regular safety briefings with the Safety Team, and regularly update the Safety Plan.

3. Develop a Site Safety and Health Plan (SSHP)

Pre-mobilization

- Fill out an SSHP template for the incident, entering all known information, for initial distribution to the Response Team.
- Conduct an initial safety briefing with the Response Team.

During mobilization

- Develop/modify the existing SSHP to add oiled wildlife-specific information in accordance with local and national plans and regulations.
- The SSHP should address the following fundamentals:
 - Site layout plan showing key safety elements and hygiene facilities.
 - Fire and evacuation procedures.
 - First-aid stations, critical contact lists and access to medical facilities.
 - Health and safety hazard analysis for tasks conducted and equipment used by personnel.
 - Comprehensive operation plan for each section.
 - Personnel training requirements.
 - Task-specific fitness requirements.
 - Personal protective equipment (PPE) selection criteria.
 - Systems to deliver and record usage of hazardous or dangerous substances.
 - Provision of site facilities (e.g. food/water, sanitation and personal hygiene).
 - Environmental records and personnel tracking information.
 - Management of data relating to results and mitigation measures from the above activities.

4. Risk assessment

Pre-mobilization

- Identify potentially hazardous chemicals and equipment to be used by the Response Team, and include information in the initial SSHP/safety briefing.

During mobilization

- Revise the initial assessment of tasks, equipment and known hazards, and update the SSHP as necessary.
- Categorize levels of risk (low, medium, high), hazard types (biological, chemical, physical), control measures, and mitigation (training, equipment and PPE).
 - Hazard types (dependent on specific tasks or methodology) include:
 - (a) Physical hazards effecting field activities: Weather (hypothermia or hyperthermia, sunburn); working at night; water-associated (tide, sea conditions); soil-associated (rock falls, quicksand, bank collapse); vehicle-associated (vehicular accidents); aircraft-associated (crash, rotor injury); pyrotechnic-associated (e.g. propane cannon misfire); and general slips, trips and falls.
 - (b) Physical hazards effecting facility activities: Heat stress; lifting; electrical; scalding water; blenders and knives; and general slips, trips and falls.
 - (c) Chemical hazards: Oil exposure; volatile fumes in confined spaces; disinfection liquids; oil on gavage tubes/syringes; medications; formalin.
 - (d) Biological hazards: Animal pecks/bites; zoonotic disease; vector-borne diseases; hazardous animals (snakes); fatigue; stress.

- Hazard mitigation:
 - (a) Ensure that a written and signed Site Safety Plan is in place.
 - (b) Require individual responders to be accompanied by another person.
 - (c) Provide background safety training (e.g. avoid touching the mouth, eyes, nose and other exposed areas of the body; wash hands well with disinfectant soap and water after work).
 - (d) Carry out task-specific safety briefings based on the species being targeted and the task being assigned (e.g. use of pyrotechnics, treatment of dangerous animals, use of aircraft).
 - (e) Use appropriately-designed equipment and facilities (e.g. well-ventilated facilities and vehicles; appropriate capture/holding equipment).
 - (f) Carry out daily safety briefings.
 - (g) Schedule regular check-in times and locations, and keep records of data.
 - (h) Adhere to an effective communications plan and ensure the use of appropriate communications equipment.
 - (i) Ensure the provision of adequate first-aid support.

Anchorage Daily News/Getty Images



A typical recovery scenario: risks in the field can include slips, trips and falls on oily and uneven surfaces, as well as the chemical and biohazard risks presented by spilled oil and the handling of oiled wildlife.

5. Working environment and safety during operations

Pre-mobilization

- Include a fatigue management plan (recommending time limits on Response Team activities) in the initial SSHP/safety briefing.
- Include a psychological support (compassion fatigue) plan in the initial SSHP/safety briefing.

During mobilization

- Ensure that oiled wildlife response risks and response information are integrated into the incident SSHP.
- Implement the SSHP.
- Maintain a safe and healthy working environment, which should identify areas of slips, trips and falls, manual handling and equipment lifting.
- Establish procedures to ensure that plant, machinery and equipment are regularly tested and maintained, and are safe for use by response personnel.
- Establish procedures for the safe use and storage of hazardous or restricted substances; this should include safety provisions for the transport and disposal of hazardous materials and waste.
- Utilize checklists to ensure that safety measures are observed with regard to all unplanned variables that the Safety Team may encounter during an oil spill, such as weather, environment or night operations.
- Maintain site facilities for food/water, sanitation and personal hygiene.
- Conduct daily safety briefings.
- Plan for rotation of shifts, time off and the replacement of debilitated/injured staff/volunteers.

6. Personal protective equipment

Pre-mobilization

- Provide a checklist to the Response Team to ensure that the necessary PPE is used for each functional spill area (e.g. body protection, eye protection, skin protection, feet protection).
- Ensure that additional personal clothing kit that may be required by responders in changing environmental conditions or for assigned tasks (e.g. waterproof boots, survival suits or inclement weather gear) is either brought in by the responders or is available on site.

During mobilization

- Obtain PPE from local sources.
- Identify appropriate protection for the specific task or methodology:
 - Field activities:
 - Personal gear for rugged terrain.
 - Task-specific safety items (e.g. heavy gloves, eye/ear/head protection, personal flotation devices).
 - Closed, waterproof and (where appropriate) safety footwear.
 - Waterproof and insulated (cold climates) or breathable (hot climates) clothing.
 - Support for environmental conditions (e.g. sunscreen/hat, drinking water).
 - Additional equipment based on the Site Safety Plan (e.g. safety vest).
 - Torches/flashlights if working in poor light.
 - Maps.
 - Animal handling activities:
 - Standard, species-dependent safety equipment (heavy gloves, gauntlets, herding boards).
 - Animal care activities:
 - Nitrile gloves.
 - Eye protection (safety glasses, face shield).
 - Appropriate oil-resistant clothing (coverall).
 - Closed-toed, skid- and water-resistant footwear.
 - Additional equipment based on the Site Safety Plan (e.g. safety vest, long washing gauntlets or heavy rubber/nitrile gloves over sleeves).



The use of appropriate personal protective equipment (PPE) is an important control measure for helping to ensure the health and safety of response personnel in the field.

TRIAGE

1. Definition

- Triage is defined as the prioritization and sorting of animals for treatment on the basis of each individual animal's health status/condition, resource availability, conservation value/status, and reduction of animal suffering.
- Triage is an important tool at intake, but should also be performed throughout the response. Increasing (or decreasing) demands on resources may allow for lesser (or greater) intensiveness of care provided to each individual animal.
- 'Quality of life' issues should always take priority; the undue suffering of animals in crisis should always be minimized.
- A wildlife veterinarian and/or rehabilitator with experience caring for oiled animals should always be involved in the decision-making process.

2. Animal health-related decisions

- Certain biological and clinical findings at intake and throughout the rehabilitation process will require either:
 - prioritization of care (increased or decreased based on caseload); or
 - euthanasia because the normal treatment is either not compatible with the eventual release of a 'normal' animal or the time required to recover from an injury puts the animal at significant risk of succumbing to a secondary problem.

Specific criteria and details are presented in the section on *Euthanasia* (pages 17–18).

Section 3

Overarching principles of wildlife response



UC Davis

Accurately determining each individual animal's health status/condition is key to an effective triage process.



OWCN, UC Davis

Threatened or endangered species should be prioritized when resources are limited.

3. Resource-related decisions

- Resources are always a factor when making triage-related decisions. Triage can often be used to place emphasis on those areas/resources that benefit the greatest number of animals, as well as to justify the need for increasing resources. Triage as it relates to resource availability is an ongoing process throughout the event. Decision makers need to be made aware of the trade-offs between available resources and triage requirements.
- Resource types (and examples):
 - **Facilities:** should be appropriate for holding the species being collected, and of adequate size for the number of animals; expandability is important in case the size becomes inadequate and more areas become necessary for animal care.
 - **Personnel:** the number, skill level and type (field vs. facility) should be available to meet the needs of the response.
 - **Supplies/equipment:** timely acquisition is critical, and should include specific types (e.g. safe capture equipment, appropriate food items, etc.).
 - **Funds:** should be available for all aspects of the response, including up to the point of release.

4. Species-related decisions

Triage criteria can be based on species status, including:

- **Invasive/feral species:** may have to be euthanized at intake if they cannot be rehabilitated and released/ placed according to in-country laws or regulations.
- **Threatened or endangered species/high conservation status:** should be prioritized when resources are limited.

5. Intraspecific-related decisions

Triage criteria can be related to animal status when resources are limited, and efforts should be focused on those animals with the highest likelihood of survival and/or successful recruitment to the population.

Examples of intra-species-specific decisions include:

- **Age classes:** nestlings or juveniles might have less chance to survive the rehabilitation process than adults. Additionally, there is an increased chance of natural mortality in juveniles versus adults.
- **Reproductive status:** adults in certain long-living species can be prioritized based on their effectively adding to the population if released (e.g. albatross species).
- **Sex:** in certain species, females may be prioritized due to the excess number of males in existence and the fact that females produce offspring (e.g. polygamous seal species such as sea lions). Conversely, in some species, adult males may be prioritized to preserve genetic diversity.

EUTHANASIA

1. Definition

- The term 'euthanasia' is derived from the Greek terms *eu* and *thanatos* meaning 'good death'. Euthanasia is the act of inducing death in a dignified and humane manner, with the minimum of pain, fear or distress to the animal(s) involved.
- It is used to end the suffering of animals that cannot be saved (due to their condition/injuries) or should not be saved (due to issues concerning their quality of life in captivity or survival in the wild).
- Euthanasia is part of the triage process, and is critical for 'herd health' management (e.g. providing an average treatment regime to large numbers of animals, and/or removing animals that are less likely to survive so that resources can be directed towards those most likely to survive) and for the welfare of animals involved in oil spills. It is used as a tool to protect the healthier members of the population undergoing treatment, as emaciated and immune-compromised patients are prone to acquire and transmit infectious diseases, including zoonoses. It can also be used as a management tool when resources are inadequate to attempt the rehabilitation of all, or a portion, of the affected animals.



istock.com/bbszabi

2. Euthanasia policy

- Having an agreed-upon euthanasia policy is critical for reducing the suffering of wildlife and maximizing the welfare of personnel involved, but is also important in view of the psychological impacts of the decisions being made and the potential for community opposition. As a policy, it should be understood that euthanasia may be an appropriate outcome of triage decisions during an oiled wildlife response. This policy will need to be agreed upon both within the Response Team as well as between the Response Team and the incident managers/government/wildlife agencies.
- The euthanasia policy should provide for a selection of methods, with an emphasis on the following:
 - Safety of personnel.
 - Ability to induce loss of consciousness and death with the minimum pain and distress.
 - The time required to induce loss of consciousness.
 - Compatibility with species, age and health status.
 - Reliability (e.g. is the approach guaranteed to cause humane death whenever employed?).
 - Irreversibility (e.g. will the approach be certain to cause humane death versus severe debilitation?).
 - Legal requirements.
 - The emotional effect on observers or operators.

3. Euthanasia methods

- The 'gold standard' method of euthanasia used in oiled wildlife response is the intravenous injection of barbiturates.
- If this is not achievable, other acceptable methods can be used following local legislation; in all cases the policy issues listed above should be considered.

Intravenous injection of barbiturates is generally considered to be the 'gold standard' method of euthanasia.

4. Euthanasia criteria

- Some of the criteria commonly used to establish survival prognoses based on the findings from physical examination of oiled wildlife include the following:
 - Body condition.
 - Severity of wounds.
 - Severe burns and fractures (pain).
 - An inability to maintain body temperature for extended periods (more than 48 hours).
 - Attitude and blood results.
- The ultimate decision to euthanize an animal based on health status should be made on the grounds that the animal is considered unlikely to be able to return to its 'normal status'. Conditions that may compromise the potential for release, and which may lead to euthanasia, include the following:
 - Poor blood results.
 - Agonal breathing/gasping.
 - The presence of severe muscle/skeletal lesions (pressure sores) leading to pain, changes in behaviour and general attitude (e.g. severe bumblefoot, hock lesions, keel lesions, large and/or severe skin lacerations and fractures).
 - Emaciation (severe degree of weight loss).
 - The presence of suspected infectious disease which threatens the health of the population in care and/or wild populations.
 - Permanently impaired vision.
 - Long-term waterproofing problems in species where that factor is necessary to survive (e.g. in birds, a high percentage of missing body feathers, chemical burns, feather rot and other factors that adversely affect waterproofing).
 - A combination of conditions which, together, may cause long-term debilitation or undue animal suffering.
- In certain instances, animals that might otherwise be euthanized (especially those with high ecological value) may be transferred and placed in captivity, with care being provided off-site by alternative providers.
- In certain instances, animals that might otherwise be saved may need to be humanely euthanized due to regulatory issues (e.g. invasive species) or if they present a high risk to humans (e.g. venomous snakes).



Following a thorough examination, the ultimate decision to euthanize an animal should be based on the likelihood of it being able to return to its normal status.

5. Euthanasia Plan

- A written Euthanasia Plan should be developed for each event, and should follow established criteria in accordance with local legislation and authorities. The Plan should be discussed and agreed upon by the veterinary staff before rehabilitation operations commence.
- The Euthanasia Plan should be made available for responders, response planners and interested sections of the Incident Command Structure.
- The Plan will include relevant approvals and associated conditions, including the following:
 - Details of authorized personnel (both to authorize as well as conduct euthanasia procedures).
 - Legal requirements.
 - Detailed criteria for decision making.
 - Storage methods prior to disposal (based on ability and timeliness of necropsy/post-mortem).
 - Methods/contacts for the appropriate disposal of carcasses in accordance with the waste management plan for the response.

DOCUMENTATION

1. Introduction

Systematic documentation is critical for:

- guiding response actions;
- gaining understanding of short- and long-term consequences of the impact of oil spills on wildlife populations (e.g. damage assessment);
- post-incident research purposes; and
- learning lessons from each particular incident to improve future efforts.

2. Procedures

- **General requirements:** euthanasia procedures should include individual animal identification, standardized forms/data entry formats, and protocols.
- **Standardization:** procedures should standardize on the following:
 - The required language (recommendation: English).
 - Measurement standards (recommendation: metric).
 - The means to correct information should it be transcribed incorrectly (recommendation: strikethrough with initials).
 - Timelines for reporting key data (recommendation: once daily for key data).
- **Training:** all responders should be trained in these methods to reduce the likelihood of incomplete or erroneous information being recorded.
- **Integrity of samples:** samples (including carcasses) should be tracked and secured at all times:
 - It is important to maintain the integrity of samples, from collection through to the point of data reporting, and onwards to final disposition.
 - Proper chain-of-custody procedures should be followed, if necessary and if required by legal regulations and investigative procedures.

- **Quality assurance:** it is vital to ensure that data are collected in a scientifically valid manner:
 - All supervisors should understand the importance of collecting and documenting complete information.
 - During large-scale spills, it is recommended that a Data Coordinator (or Registrar) is appointed to regularly review the collected information and to:
 - (a) ensure that approved documentation protocols are followed;
 - (b) suggest additional training needs should gaps occur; and
 - (c) compile data into a single source for easy review.

3. Methods

- Documentation most often takes the form of paper records.
 - Paper forms (with key blank data fields pre-printed on the paper) allow for low-cost, highly adaptable data to be collected systematically.
 - Computer-based records systems have some challenges:
 - (a) Technology can be challenging in an emergency situation.
 - (b) Data loss can result from power cuts, lack of internet access and hardware crashes.
 - (c) Paper records can still be required, with key data transcribed into spreadsheet software for distribution.
- Data collection
 - Collect only those data that are essential to the response effort.
 - Use categorical data wherever possible to reduce time and error.
 - Use scribes whenever possible to collect data to increase efficiency and keep records cleaner.
- Data distribution
 - Key information (e.g. animal numbers, species, status) should be reported to incident managers in accordance with a regular, agreed-upon timeline.

4. Forms

Forms may differ between organizations depending on their specific procedures, but should include at least the following general categories:

- **Search Form:** records all pertinent information on field searches and collected animals.
- **Animal Logs:** records key data from each live and dead animal arriving at the facility to allow for quick review by managers.
- **Intake/Admission Form/Card:** records the findings of physical examinations and details of the initial treatment plan.
- **Animal Care Form:** records data on ongoing treatments, results of examinations, issues that arise in care, history of feedings, and diagnostic test results.
- **'Batch' Animal Care Form:** records data collected from a group of animals prior to transcribing them to the Animal Record, including weight checks, blood values, feeding results, waterproofing checks, and similar group-based activities.
- **Necropsy Report:** records the results from complete necropsies, including pertinent findings and all tissue samples.
- **Chain-of-Custody Form:** documents the transfer of animals/samples from one individual to another.



Provision of training in documentation methods and procedures is essential to reduce the likelihood of incomplete or erroneous information being recorded by responders.

FACILITIES

1. Introduction

- Facilities are critical components of a successful and effective response effort.
- Delays in the establishment of appropriate facilities can lead to an increased chance of mortality.
- While most regions do not have pre-established facilities, a fully comprehensive plan for the rapid establishment of a temporary facility should be a critical element of any response plan.

2. Types of facilities

Permanent

- **Purpose-built:** constructed specifically to support oiled wildlife activities during an oil spill event.
- **Modifiable:** used for other purposes but has the innate capacity to be quickly converted and modified to allow for oiled wildlife rehabilitation.

Temporary

- **Mobile:** developed using modular tent-like structures and/or containers.
- **Contained:** constructed within a warehouse-type enclosure.



An example of a permanent bird rehabilitation facility.

Choice of facility types

- In most situations, a permanent facility dedicated to oiled wildlife care is considered to be ideal because of the almost immediate response capability.
- In the absence of a permanent purpose-built facility, (a combination of) other types of facilities can provide excellent support for animal care operations if:
 - careful thought and planning is invested in the process;
 - the facility can be rapidly deployed for rehabilitation; and
 - the infrastructure is sufficient to support the necessary operations.

3. Utility requirements

Water

- Animal cleaning requirements:
 - A supply of fresh water should be available.
 - Water should be heated to normal body temperature (40–41.1°C in birds).
 - Adequate volume should be available (up to 1,200 litres of water per bird for washing and rinsing).
 - Water pressure should be sufficient to penetrate feathers/fur during rinsing (40–60 psi or 275–413 kPa in birds).
 - Ideally, water should be softened (2–3 grains of hardness or 30–50 mg CaCO₃/l).
- Outdoor pools and aviary requirements (as species dictate):
 - Fresh water and salt water will be required, as applicable.
 - Adequate initial volumes will be required (e.g. 13,000 l for a 3.7 m diameter pool at 1.2 m deep).
 - A continual overflow of water will be required (the volume will be dependent on the numbers of animals in pools, filtration system and selected food items).
- Other freshwater needs include food preparation, laundry, decontamination of items, and general cleaning.

Electricity

- **Needs:** lighting, animal dryers, laundry facilities, heating/ventilation systems (including air conditioners/swamp coolers if ambient temperatures are high), pool pumps, etc.
- **Design:** ideally, a supply of at least 800 amps (220 v/ 3 phase) should be available. However, portable generators can be used to supplement power capability.

Propane/natural gas

- **Needs:** air heating to maintain ambient temperature at 18–29°C in wildlife holding areas in view of ventilation needs (see below); and water heating using on-demand heaters (see above).
- **Design:** supply lines built into a permanent facility, or appropriate containers sited in a safe and secure manner adjacent to a temporary facility.

Ventilation

Adequate ventilation important for reducing irritating petroleum fumes as well as reducing the potential for birds to develop aspergillosis.

- **Needs:** ideally, a minimum air exchange rate of 10 volumes/hour for animal areas.
- **Design:** ideally built into heating systems but can be supplemented with fans and open windows if the temperature can be maintained.

Waste

- **Needs:** a comprehensive waste plan (and associated equipment), including procedures for the containment and disposal of oiled water, oiled solid waste, standard waste and biological waste (including carcasses and 'sharps').

4. Other facility design requirements and critical components

Accessibility

Facility locations should be chosen based on the following:

- Maximal convenience for animals to be dropped off.
- Maximal convenience for personnel to travel to the site.
- Proximity to larger urban areas for ease of obtaining necessary equipment, supplies and support materials, both for personnel and animals.
- Minimal security issues.
- The ability to be scalable should the incident increase in size.

Scalability

Facilities should be scalable if at all possible. Options include the following:

- Developing an initial facility within just a portion of the building's 'footprint'.
- Pre-identifying adjacent structures into which the facility can be expanded.
- Bringing in additional temporary/modular capabilities.

Timing

The development and expansion of facilities should take place based on when certain aspects of the rehabilitation operation are needed. The inherent delays due to the necessary construction and acquisition of equipment should be borne in mind.

- **Initial emphasis:** intake, holding, general support (food preparation and volunteer/staff areas).
- **Secondary emphasis:** wash, rinse and drying areas, with associated water and electrical needs.
- **Tertiary emphasis:** outdoor pools and pens.

Facility areas

Specific discrete areas must be established, or planned for, in a facility. Each particular area will require certain specific design elements:

- **'Hot zone' animal care areas:** intake; pre-wash holding; intensive care unit (ICU)/isolation; and morgue/necropsy.
- **'Warm' zone animal care:** animal cleaning; decontamination areas.
- **'Cold' zone animal care:** drying; post-wash care; outdoor pools/pens/aviaries.
- **'Cold' zone support:** food preparation; supply storage; animal food freezers; medical laboratory; laundry; electrical/mechanical; personnel training and rest; office; restrooms; and carpentry/workshop.



A remote rehabilitation facility constructed in the Tristan da Cunha islands using supplies and trained personnel from South Africa.

Section 3

Overarching principles of wildlife response

Effective flow

The facility should utilize a design that maximizes the efficient flow of animals and people through the rehabilitation process, while minimizing the possible spread of disease.

Zoning

The different areas within the facility should be designated as follows:

- 'Hot' zones—'dirty' areas, or areas where oiled animals/materials are present).
- 'Warm' zones—areas where there is a transition from 'hot' to 'cold'.
- 'Cold' zones—'clean' areas, or areas where no oil is present).

When designing a facility, the layout should be planned to facilitate an efficient flow between zone types; this can enable personnel to move between the different areas without frequent donning and doffing of PPE.

Security

All facilities should have a security plan which identifies a means to keep animals and personnel safe at all times, as well as excluding people that are not part of the event itself. Temporary fencing around the facility with discrete, manned gates for entry/exit can often suffice for temporary sites.



Scott Buhl/UC Davis

Bottle-feeding a California sea lion in one of the 'cold' post-wash care areas of a rehabilitation facility.



International Fund for Animal Welfare

This rehabilitation facility for captured birds was established following the *Treasure* oil spill off the coast of South Africa in June, 2000.

COMMUNICATIONS

1. Introduction

- Effective communication is critical to ensure that:
 - there is a continuous exchange of information and ideas;
 - there is clear understanding of each person's role and responsibilities;
 - cooperation and harmony is maintained among the Response Team;
 - objectives are achieved efficiently;
 - challenges are mitigated;
 - standards of animal care are understood and followed;
 - individuals have an opportunity to express their needs and challenges; and
 - stakeholders are continuously informed.
- Poor communication can result in harm being caused to the animals, people, the organizations involved, as well as to the environment; this can lead to public outrage and potentially to financial loss or ruin.
- Communication should be quick, accurate, clear, courteous and consistent. It is important that communication reflects the overall plan. Language and cultural differences need to be taken into account when communicating.



Michael Ziccardi/UC Davis

Example of an internal briefing between members of the oiled wildlife Response Team.

2. Types of communication

Internal communication

- Communication between members of the oiled wildlife Response Team:
 - Upward communication (e.g. Staff to Manager).
 - Downward communication (e.g. Manager to Staff).
 - Horizontal/peer-to-peer (e.g. within the oiled wildlife team).
- Communication between the Response Team and the Wildlife Branch Director/Incident Management Team (e.g. Safety Officer, Joint Information Centre, Environmental Unit).
- Communication between the Response Team and the Strategic Team.

External communication

- Between the Oiled Wildlife Facility/Wildlife Branch Director and other organizations or individuals such as governments, media, boards and other stakeholders.
- All external communications should follow approved protocols developed by the Incident Management Team (e.g. Joint Information Centre and/or Information Officer).

3. Information to be shared

- **Internal:** duty roster, daily action plan, incident action plan, safety protocols, animal data (dead and alive, species, status of animals in care and disposition), media reports, operational activities, species/numbers at risk, resource needs, logistics, financial information, meeting times, etc.
- **External:** incident action plan, animal data (dead and alive, species, status of animals in care and disposition), daily report, media reports (which can include information from internal communications), resource requirements.



All external communications should follow approved protocols developed by the Incident Management Team.

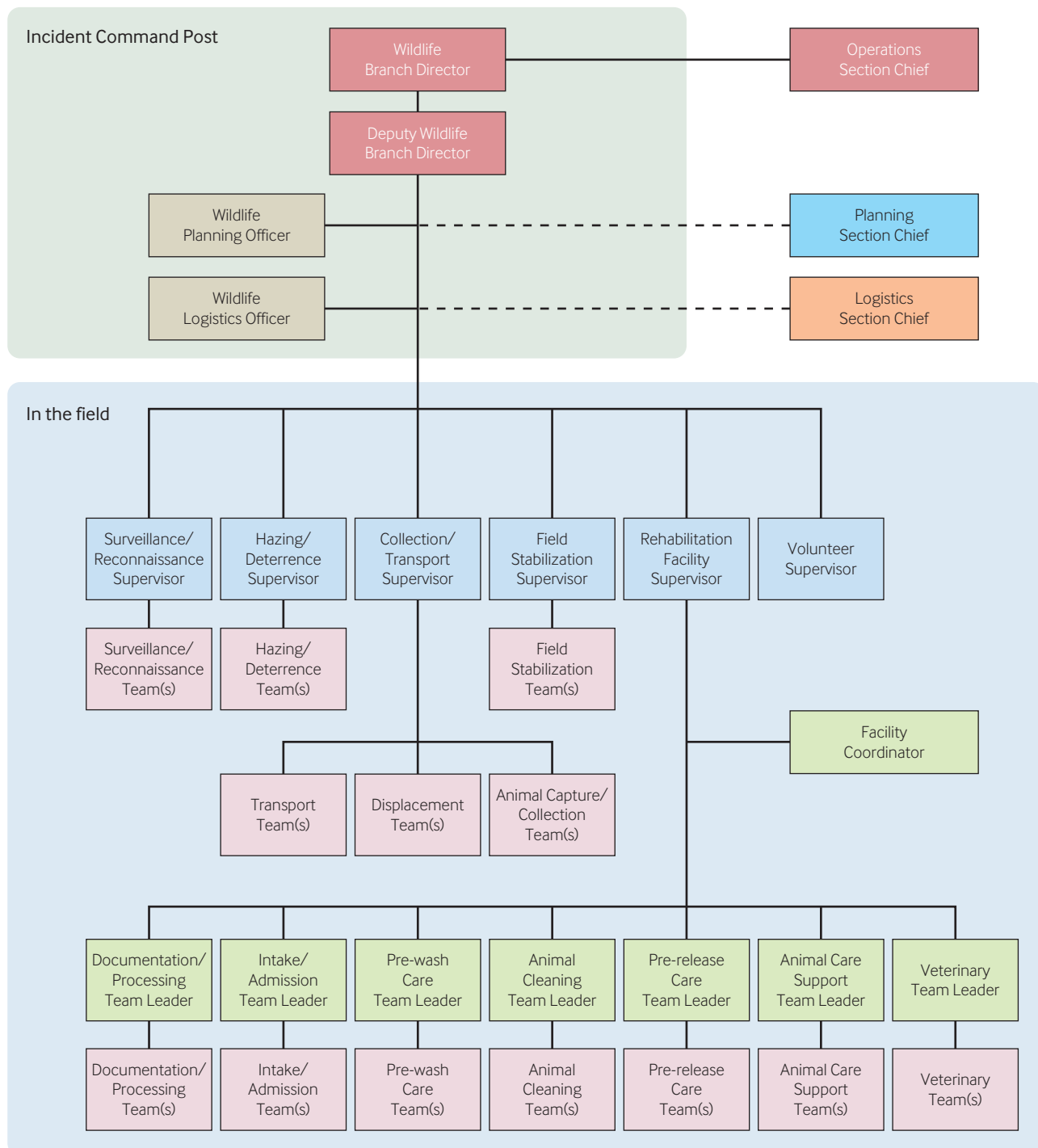
4. Communications tools and policies

- Communication methods:
 - Two-way radios, telephones, intranet, internet, face-to-face, notice boards, screens, press releases, memos, communication packs and reports.
- Communication policy:
 - Guidelines for the use of the available tools (e.g. social media) should be established and implemented during the response.
 - Primacy of communications belongs to the Incident Management Team.
 - In the absence of clear guidance from the Incident Management Team, professionalism and discretion should be exercised to guide all communications with external stakeholders (including via social media avenues).

RESPONSE TEAM ORGANIZATION

1. Organizational chart

Note: this is an example only, as each incident will require a specialized personnel structure.



Section 3

Overarching principles of wildlife response



An example of a typical oiled wildlife response command post.

2. Personnel requirements

Personnel in each area of the response will be dependent on that area's specific tasks or methodology. However, general command and control structures include the following:

- **General requirements:** knowledge of species behaviour, the geographical area and the spill situation is essential. Field activities require good physical condition and the ability to work long hours in inclement weather. Facility activities require good general health (e.g. not immunocompromised) and ability to work long hours.
- **Specific area positions:**
 - A supervisor, with specialist experience in the required tasks will be required. This person should also have an understanding of oil spill response strategies and tactics (e.g. resourcing), experience in management skills, and the ability to plan forward to the next operational period.
 - In addition, teams of experienced and volunteer personnel will be required, consisting of:
 - Staff: experienced personnel trained in the tasks required for the species in question.
 - Support personnel: personnel that provide key logistical support (e.g. pilots, boat captains).
 - Supervised volunteers: personnel not previously trained/experienced in response activities, but who can provide assistance (e.g. collecting data).

General principles of wildlife response

This Section summarizes the aims, personnel requirements and operational details relating to the wide range of activities that take place in a wildlife response, from the initial survey and capture through to the release and monitoring of rehabilitated animals.



General principles of wildlife response

SURVEILLANCE/RECONNAISSANCE

1. Aims/objectives

- Collect and/or collate ephemeral and historical data on animals affected or at risk as a result of an oil spill to initiate animal recovery and care operations.
- Categorize the collected data based on the physical method by which it is being collected, i.e. aerial, terrestrial or aquatic.

2. Personnel requirements

- **General area requirements:** knowledge of species behaviour, the geographical area and the spill situation. Personnel conducting non-terrestrial surveys may require additional client-specific training and certification prior to deployment.
- **Specific area positions:** no additional positions are required beyond those listed for surveillance and reconnaissance in the organizational chart on page 26.



A biologist documents wildlife impacts at Refugio State Beach in the early days of the Refugio oil pipeline spill in May 2015.

3. Operational details

Tasks

- Determine the extent of the damage, i.e. numbers of animals, geographic extent, affected species.
- Record animals at risk, i.e. unoled animals that may become oiled.
- Collect data for animal operations, i.e. assess site accessibility and prioritize the capture of animals (depending on locations, tide, external aspects such as weather, etc.), and compile a list of relevant experts and pertinent contacts.
- Collect historical data (e.g. references, species lists, details of existing surveys and lists of relevant experts and pertinent contacts).

Methods to conduct tasks

Data collection techniques should be combined or run concurrently if possible.

- **Aerial:**
 - Platforms: helicopters; fixed winged aircraft; unmanned aerial systems (UAVs or drones).
 - Techniques: use of defined flight paths; defined target areas (e.g. transects); search patterns based on the specific needs of the response.
- **Terrestrial:**
 - Platforms: off-road vehicles; on-road vehicles; and on foot.
 - Techniques: targeted approach to high-risk areas; repeated surveys of areas over time.
- **Aquatic:**
 - Platforms: motor-powered vessels; human powered vessels.
 - Techniques: similar to terrestrial (above).
- **Literature based:**
 - Review existing information from literature, regional governmental agencies/NGOs, local experts and other sources.

Equipment and supplies

- **Specific:** dependent on platform.
- **General:** PPE; vehicle/vessel/aircraft; maps; GPS (global positioning system) units; data forms; communications equipment; species identification guide; binoculars; camera.

Facilities/working environment

- Wholly dependent on platform.

Data elements

- **Search information:** time and date; search type; search pattern; total time of search; personnel involved; visibility; weather conditions.
- **Animal information:** numbers and species observed/affected; locations; oiling status; access to animals.

Reporting structure

- **External:** reconnaissance data should feed into the management system (upwards to the Wildlife Branch Director and laterally to other Group Supervisors) to direct animal collection planning/deployment. Reporting to the appropriate wildlife agency may also be necessary depending on the location.
- **Internal:** peer-to-peer within the surveillance/reconnaissance teams.

UC Davis



Response personnel learning about visual hazing methods.

HAZING/DETERRENCE

1. Aims/objectives

- Prevent oiled animals from getting oiled by actively or passively discouraging the animals from visiting the oiled areas, or by encouraging them to move into unoiled, lower-risk areas, thereby preventing them from coming into contact with the oil.
- Care must be taken to ensure that hazing efforts do not make the situation worse by inadvertently moving animals into the oiled area or causing oiled animals to scatter.
- If the use of pyrotechnic devices is selected, it should be carefully controlled due to the risk of flammability.
- The likelihood of success depends on the specific animal taxa: the effectiveness of techniques can be high for some bird species, moderate to low for marine mammals, and low for reptiles.

2. Personnel requirements

- **General area requirements:** knowledge of species behaviour, the geographical area, the spill situation and/or the different hazing techniques (e.g. familiarization with pyrotechnics).
- **Specific area positions:** In general, no additional positions are required beyond those listed under hazing/deterrence in the organizational chart on page 26. Wildlife agency participation may be required depending on the region and permitting requirements.

3. Operational details

Tasks

- Determine potential species at risk: consider the numbers and species of animals, the geographic extent, and the animals' behaviour (seasonal, feeding, breeding). These data may be acquired during reconnaissance.
- Conduct site assessment for hazing operations: consider site accessibility and the prioritization of locations (accessibility, tide, weather).
- Collect historical/reference data for the area: include references, species lists, details of existing surveys, and lists of experts and pertinent contacts.

Section 4

General principles of wildlife response

- Determine likely effective hazing techniques: include prioritization of species/areas, necessary permits, and local experts/help.
- Determine and resolve legalities of use: request approval from the Incident Management Team, and obtain approval/permits from local governmental wildlife authorities as required.
- Set up appropriate hazing techniques.
- Collect data on hazing operations: include numbers and species of animals approaching and fleeing, and the prospective assessment of success/failure.
- Adjust techniques and the prioritization of areas as necessary.

Methods to conduct tasks

Techniques may need to be altered to prevent habituation by the target animals/species.

- Hazing examples:
 - Visual: reflectors; human effigies; kites; lasers; lights.
 - Auditory: predator sounds; propane cannons; cracker shells.
 - Sensory: all-terrain vehicles; aircraft; falcons.
- Exclusions:
 - Fencing: to keep animals from entering an area.
 - Traps: to temporarily confine animals and prevent them from entering an area.
- Attractants:
 - Food items set up in unoiled, lower-risk areas.

Equipment and supplies

- **General:** PPE; vehicle; maps; GPS; data forms; communications equipment; species identification guide; binoculars; camera.
- **Specific hazing tools:** flares; guns; balloons; falcons; buoys; etc.

Facilities/working environment

- Hazing at sea is more difficult than on land, especially with drifting oil.
- Hazing works best in small, well-defined spill areas (bays, harbours, narrow inlets, etc.) which can be surrounded by a variety of scaring devices.

Data elements

- **Hazing information:** time and date; hazing type; total time of hazing; personnel involved; visibility; weather conditions.
- **Animal information:** numbers and species observed/affected; locations; oiling status; access to animals.

Reporting structure

- **External:** data should feed into the management system (upwards to the Wildlife Branch Director and laterally to other Group Supervisors) to direct animal collection planning/deployment. Reporting to the appropriate wildlife agency may also be necessary depending on the location.
- **Internal:** peer-to-peer reporting within the hazing teams.



Training wildlife responders to use a propane cannon for bird hazing.



An example of visual hazing equipment deployed from a moored buoy.

DISPLACEMENT

1. Aims/objectives

Displacement (or pre-emptive capture) involves removing at-risk wildlife from the spill environment, thereby preventing it from being oiled and requiring capture and rehabilitation. Typically, pre-emptive capture is conducted by a subset of Collection/Transport Teams. Two types of displacement activities can occur, as follows:

- Being held in captivity until the risk of oiling has passed.
- Being relocated to an alternative habitat where no risk exists, or far enough away so that the species with site fidelity only return after the risk has been eliminated.

2. Personnel requirements

- **General area requirements:** knowledge on species behaviour, the geographical area, the spill situation and/or the different capture techniques. Displacement operations may or may not be conducted in the spill area, so the need for PPE and any necessary health and safety training should be clarified. Personnel conducting boat-based captures may require additional client-specific training and certification prior to deployment.
- **Specific area positions:** displacement activities may occur under Collection/Transport as shown in the organizational chart on page 26, either as a discrete Task Force or via specifically assigned Capture Teams.

3. Operational details

Tasks

- Logistical considerations:
 - Determine the need for approval/licences from wildlife agencies and response organizations.
 - Develop and implement an appropriate capture plan (e.g. techniques and personnel) to ensure animal welfare.
 - Arrange for appropriate captive care (including housing, husbandry and personnel expertise).
 - Plan for appropriate relocation solutions (such as determining: release locations; transport logistics; concerns over animal site fidelity; the predicted time for relocated animals to return to the area; and the energetic costs of return).



Maritime New Zealand

The New Zealand dotterel—an endangered species for which a pre-emptive capture effort was undertaken in response to the *Rena* oil spill that took place off the coast of Tauranga in 2011.

- Decision making:
 - Decisions related to pre-emptive capture should be taken with extreme care, and the risks of oiling being weighed against the risks of injury, disease or the death of the animal during such activities.
 - Decisions should be based on the likelihood of animals becoming oiled; in situations where the probability of oiling is high and hazing is not an effective option, the advantages of pre-emptive capture may outweigh the risks.
 - Delayed decision making can be a limiting factor, as there is often a narrow temporal window during which pre-emptive capture can take place.

Methods to conduct tasks

Capture techniques will be specific for the species being displaced.

- Capture Plan:
 - A Capture Plan should solicit the safe and swift retrieval and containment of species at risk while minimizing disturbance of non-target animals and avoiding sensitive areas.

Section 4

General principles of wildlife response

N. McGrouther



Specially-designed holding cages were constructed to accommodate the endangered New Zealand dotterel during the 2011 *Rena* oil spill.

- **Capture:**
 - Live animal recovery can be initiated using a variety of techniques (e.g. hand nets, drive nets, noose poles, etc.) dependent on the species in question.
 - Target animals are unoiled and presumably healthy. Capture is therefore likely to be more difficult than for affected animals and should be performed only by experienced personnel.
 - In some circumstances, night capture may be ideal for species at risk (i.e. 'spotlighting' of marine birds). However, this should only be done when it is safe for response personnel, and upon approval by incident managers.
 - In the case of nest/egg relocation, a transport/ husbandry plan should be pre-established.
- **Handling and confinement:**
 - Animals should be transferred from the capture equipment to suitable containers. Responders should take care to avoid dangerous body parts and not allow the animals to escape.
 - Methods should be secure and avoid further injury or distress to the animal.
 - Temporary containers (pillowcases or hessian sacks) can be used as means of confinement on remote shorelines, but the captured animals should be transferred as quickly as logistically possible to more suitable containers.
 - Containers should be waterproof and provide adequate ventilation.

Equipment and supplies

See *Capture of live oiled animals* and *Transport* on pages 35–37 and 41–42, respectively.

Facilities/working environment

See also *Capture of live oiled animals* and *Transport* on pages 35–37 and 41–42, respectively.

- Animals held in captivity should be kept in enclosures which are separate from those used for animals being rehabilitated due to oiling. This will ensure that the risk of disease transfer and intraspecific aggression is minimized.

Data elements

- All pertinent information on captures, e.g. collection date and time, locations (ideally GPS coordinates), collector's names, animal ID/species (if assigned in the field), and health status.

Reporting structure

- **External:** data should feed into the management system (upwards to the Wildlife Branch Director and laterally to other Group Supervisors) to direct animal collection planning/deployment. Regular reporting to the capture/collection teams, transportation teams and rehabilitation facility supervisor is recommended to ensure that everyone is kept apprised of progress. Reporting to the appropriate wildlife agency may also be necessary depending on the location.
- **Internal:** peer-to-peer reporting within the displacement teams.

CAPTURE OF LIVE OILED ANIMALS

1. Aims/objectives

To initiate humane, safe, rapid and effective oiled wildlife recovery and confinement.

2. Personnel requirements

- **General area requirements:** knowledge on species behaviour, the geographical area, the spill situation and/or the different capture techniques. Personnel conducting boat-based captures may require additional client-specific training and certification prior to deployment.
- **Specific area positions:** no additional positions are required beyond those listed under Collection/Transport in the organizational chart on page 26.

3. Operational details

Tasks

- Determine resource needs/management:
 - The demand for resources and personnel is determined by species types and numbers, the extent of the geographical/environmental response, and the potential need to upscale or downscale as the situation dictates.
 - Personnel should have local knowledge and appropriate expertise.

- Establish a staging area/collection point:
 - These should be strategically placed to minimize the distance to and from contaminated zones, as well as to optimize collection efforts by personnel without compromising health and safety. Personnel should be present at all times for security and animal welfare—this may be accommodated by use of a tented shelter, a building or a collection of vehicles.
 - A stabilization/first-aid area is required to provide a point where animals can be assessed and receive initial fluids or first aid by trained responders, and where permissible humane euthanasia may be performed by authorized and qualified personnel.
- Establish effective communication channels:
 - The chosen communication systems (e.g. mobile telephones, radios, satellite telephones) should be field tested prior to deployment.
 - All team members should understand deployment tactics and emergency procedures in case of accidents.
 - An open dialogue with maritime and coastguard agencies and wildlife facilities is imperative.
- Maintain accurate documentation:
 - Digital or written information should be kept on all aspects of capture and location for each live animal. This information will follow the individual animal throughout the response. Information on the different phases and variations in the spill response will also be recorded.



CDFW-OSPR



Kim Bettom/US Fish and Wildlife Service

Above: fisheries biologists prepare to rescue an oiled brown pelican from the Gulf of Mexico in June, 2010.

Left: using a hand net to capture a live oiled seabird.

Methods to conduct tasks

Capture techniques will be specific for each species.

- Capture Plan:
 - A live animal Capture Plan should be developed to solicit safe and swift retrieval and containment. This should go hand in hand with the Safety Plan.
 - The Capture Plan should include procedures to minimize disturbance of non-oiled animals, and to avoid sensitive areas such as breeding colonies or sea mammal rookeries.
- Search and capture:
 - A systematic approach should be taken to repeatedly cover all accessible areas of a contamination zone, including areas within the dispersal pattern of affected animals.
 - Live animal recovery operations should be initiated using a variety of techniques (e.g. hand nets, drive nets, noose poles, etc.).
 - In some circumstances, night capture may be ideal for species at risk (i.e. 'spotlighting' of marine birds). However, this should only be done when it is safe for response personnel, and upon approval by incident managers.
- Handling and confinement:
 - Animals should be transferred from the capture equipment to suitable containers as soon as practicable. Responders should take care to avoid dangerous body parts, and should not allow the animals to escape.
 - Methods of confinement should be secure and avoid further injury or distress to the animal.
 - Temporary containers (pillowcases or hessian sacks) can be used as means of confinement on remote shorelines, but the captured animals should be transferred as quickly as logistically possible to more suitable containers.
 - Containers should be waterproof if exposed to the elements, and should provide adequate ventilation.

Equipment and supplies

Regular maintenance and cleaning of equipment is essential due to the high levels of contamination from oil, salt and biological materials. Specialized equipment should only be used by trained and authorized personnel.

- Animal capture tools:
 - Nets (hand, long-reach, hoop, drive, mist and cannon nets).
 - Ventilated cardboard and waterproof pet carriers/boxes; hessian sacks; towels; pillowcases.
 - Swan hooks and swan bags.
 - Airline 'vari-kennels' of various sizes.
 - Mammal slings; stretchers; carts; field anaesthetic equipment.
 - Reptile hooks/bags.
 - Remote delivery systems (e.g. dart gun, only under specific authorization).
 - Bait.
- Vehicles:
 - Aquatic capture: motor-powered or human-powered boats.
 - Terrestrial capture: all-terrain vehicles (quad bikes, mules); four-wheel drive vehicles.
 - Transport vehicles.
- Other items:
 - Communications: mobile telephones; VHF radios; satellite phone.
 - Documents: maps; data forms; species identification guide.
 - Durables: binoculars; camera; GPS; heavy outer gloves; eye protection.
 - Disposables: disposable coverall suits; nitrile gloves; bath and hand towels.
 - Rehydration supplies: syringes; tubes; isotonic fluids.
 - Miscellaneous: permanent marker pens; labels; waste bags; duct tape; cable ties.

Facilities/working environment

The capture of live oiled animals presents a highly variable, unpredictable risk of physical hazards, highlighting the need to ensure that robust safety and operational systems are in place before committing personnel to these activities.

- Recovery zone: this will be a predominantly external/outdoor environment, and will possibly be ephemeral at the location.
- Staging area/collection point: this will be a designated point that acts as a hub for recovery activities. It may be a suitably equipped vehicle, internal/indoor building or temporary shelter, and should provide:
 - shelter from extremes in weather conditions; and
 - decontamination, ablution and toilet facilities.

Data elements

- This will include all pertinent information on captures, e.g. collection date and time, locations (ideally GPS coordinates), collector's names, initial animal ID/species (if assigned in the field), and health status.

Reporting structure

- **External:** data should feed into the management system (upwards to the Wildlife Branch Director and laterally to other Group Supervisors) to direct animal collection planning/deployment. Regular reporting to displacement teams, transportation teams, the field stabilization supervisor and the rehabilitation facility supervisor is recommended to ensure the accurate accounting of affected animal numbers as well as to modify existing animal care protocols as necessary. Reporting to the appropriate wildlife agency may also be necessary depending on the location.
- **Internal:** peer-to-peer reporting within the collection teams.

COLLECTION/EVALUATION OF DEAD OILED ANIMALS**1. Aims/objectives**

The carcasses of animals (birds, mammals, reptiles, amphibians and other species if warranted and requested) that have succumbed due to an oiling event will be collected by the Collection/Transport Teams, and will be evaluated by the Documentation/Processing Teams. The collection and evaluation of dead animals is a critical part of the oiled wildlife response, to:

- estimate the size of the oiling event;
- estimate the environmental impact;
- estimate the biological impact on the wildlife affected;
- improve understanding of the effects of oil on the individuals affected;
- provide evidence required for cost recovery and prosecution;
- prevent predation of the carcasses; and
- assist in removing the oil from the environment, and to remove the potential hazards associated with decomposing carcasses.

2. Personnel requirements

- **General area requirements:** knowledge on species physiology, general pathological techniques, effects of oil exposure on wildlife, and proper tissue sampling/handling methods. Personnel conducting boat-based collection may require additional client-specific training and certification prior to deployment.
- **Specific area positions:** collection of dead animals is typically conducted through the activities of the Collection/Transport Teams in the field, and evaluation accomplished by the Documentation/Processing Teams at the facility after transport. Activities are distributed in each of those areas as shown in the organizational chart on page 26. In addition to the positions listed, this area requires a:
 - Pathologist: an experienced prosector of wildlife, often a veterinarian or expert with an advanced degree.

3. Operational details

Tasks and methods

- A Carcass Collection Plan should be developed prior to deployment of personnel.
 - The plan should define whether or not samples are required for chemical analysis; samples should not be stored in plastic bags.
 - A 'Defined Carcass Collection Form' should be used, noting the date, time and location.
 - Individual carcasses should be labelled/identified and potentially photographed.
 - Chain of Custody forms may also be required.
 - Carcasses should be appropriately stored (refrigerated if necropsy is to be performed within 48 hrs; frozen if not).
- Collect dead animals and either transport them to the facility for necropsy or prepare for sampling in the field.
 - Teams should consist of a minimum of two persons, possess carcass collection kits (see page 39), and be assigned defined search locations.
 - Search locations should be specifically defined so that they can be easily found for repeat searches.
 - Damage or disturbance to healthy habitats should be avoided. It may be necessary to limit the search to include as much of the affected area as possible without incurring an impact on the environment.
 - If there are oiled carcasses within colonies, experienced animal capture experts/colony managers should be consulted to assess the possibility and feasibility of removing the carcass(es) without causing undue disturbance to the colony.
 - If live oiled animals are found, appropriate search and collection teams should be contacted or, if personnel on-site are capable, capture should be attempted.
- Conduct necropsies on fresh dead animals whenever possible (e.g. on fresh carcasses; if a veterinarian/skilled prosector is available; and if permitting allows necropsy to take place).
 - Definition of necropsy: the examination of an animal after death; also known as a post-mortem examination. A necropsy can be a visual examination (gross necropsy), microscopic evaluation of tissues (histopathology), or both.



Gayle Uyehara, OWCN

Responders wearing appropriate PPE search a oiled shoreline for deceased or stranded wildlife.

- A necropsy should be performed as soon as possible after collection to limit autolysis of the carcass (destruction of the organism's cells by enzymes produced by the organism itself), prevent accumulation of carcasses in the storage area, and to provide timely information on the causes of the deaths.
- If large numbers of carcasses are received it may be necessary to select a sample of carcasses for necropsy. Selection criteria should include the region where a carcass was collected, requests for specific samples, and the date and time of collection.
- A standardized approach should be taken for all necropsies to ensure comparability of results across the response.
- As necropsy results become available, this information should be disseminated to the incident command and those involved in the event who would benefit from the information, e.g. a rehabilitation hospital treating oiled animals.
- Basic data should be recorded when conducting a necropsy on an oiled animal carcass, including species, date, place found, amount of oiling, body condition, sex, age and any identification such as rings, transponders and satellite trackers. Collection of oil samples for evidence may also be required.
- If more detailed necropsies are requested, bacterial cultures, viral isolation, and histopathology may be required. Researchers may request that the stomachs and intestines from carcasses be removed and frozen for diet studies if they are not required for diagnostic purposes.

Equipment and supplies

- Carcass collection kit:
 - Sample collection materials, including: paper bags; aluminium foil; small, medium and large plastic bags; elastic bands or something suitable to tie the plastic bags; and carcass identification bag tags.
 - Data collection materials: permanent pen; carcass collection forms; chain of custody forms.
 - PPE: nitrile gloves; oil protective clothing and boots; eye protection.
 - Field search materials: search area maps; GPS units; camera; communication devices.
 - Marking equipment (e.g. spray paint or flags)—needed if carcasses must be left due to size, condition, etc.
 - Collection equipment: rope or hooks for animals that are difficult to reach.
- Post-mortem equipment:
 - Sample collection materials: knives and knife sharpeners; scalpel blades and handles; scissors; forceps; saws and axes.
 - Sample storage materials: formalin tissue sample bottles; empty tissue sample bottles; swabs with culture medium for bacterial sampling; tubes for blood and urine collection; microscope slides and cover slips; aluminium foil and plastic bags.
 - Data collection materials: pens; necropsy forms; camera; measuring tape/ruler; labels; scales.
 - Diagnostic supplies: microscope; Diff-Quik® rapid staining kit.
 - PPE: nitrile gloves; oil protective clothing and boots; eye protection.

Facilities/working environment

- The facilities required for necropsies can be fairly simple, or may be purpose built if such facilities are available near to the oil spill event. Post-mortem examinations should preferably be conducted in a pathology laboratory.
- The same facilities can be utilized to conduct the necropsies of carcasses received from the field and those animals that have died at the rehabilitation hospital.
- The necropsy facility may be in proximity to the rehabilitation facility, but should be separate from the rehabilitation facility.
- There should be an area for refrigerated carcass storage, with enough space to accommodate all of the carcasses that need to be stored. If refrigerators are unavailable, this will increase the need to carry out the necropsies as soon as possible to limit autolysis.
- The necropsy facility should be easily accessible so that heavy bags/carcasses can be easily brought into the facility. Vehicle access may even be required.
- Workbenches may be required at standing height for smaller necropsies.

Deceased birds collected during the *Prestige* oil spill in 2002 are examined prior to necropsy.



Section 4

General principles of wildlife response

- If necropsies need to be conducted on the floor, impermeable floors should be used with drains that run to a collection point for disposal of biological fluids and oily waste.
- It may be necessary to cover the work surfaces and floors with plastic sheeting to prevent contamination by oil. If oil is required for forensic testing, it should be sampled before coming into contact with the plastic.
- Hot and cold running water will be required, with an interceptor in the drainage system to pick up oily waste.
- The room should have good lighting and be well ventilated.
- Measures should be put in place to prevent staff contracting zoonotic diseases, or spreading diseases to the environment or to animals in rehabilitation.
- If a detailed necropsy is required, tools, tables and other contaminated objects will need to be disinfected after each necropsy. If only a basic necropsy is required, disinfection should occur at least at the end of each working shift.
- All waste generated during the post-mortems, such as the carcass remains, general waste and blades, should be appropriately disposed of according to country law. In countries where there is no legal requirement, best practice should be adhered to.



Adequate necropsy facilities will be necessary to enable the effective assessment of pathological findings.

Data elements

- A Carcass Collection Form should be completed for every carcass recovered.
- Each bag containing a carcass (or the carcass itself if large) must be individually tagged. The tag should carry at least the following details:
 - sequential number;
 - incident name;
 - location (GPS coordinates or physical description);
 - date/time;
 - species (if possible—if not, record the closest group/type); and
 - collector's name and surname.
- Each individual bag from a collection area can be placed into larger bags and tagged with the following information:
 - sequential number;
 - incident name;
 - date;
 - general location (beach name);
 - time collection stopped;
 - individual tag numbers within the bag; and
 - person responsible (name and surname).

Reporting structure

- **External:** data should feed into the management system (upwards to the Wildlife Branch Director and laterally to other Group Supervisors) to direct animal collection planning/deployment. Regular reporting to incident managers, transportation coordinators and the rehabilitation facility supervisor is required to ensure the accurate accounting of affected animal numbers, as well as to enable the modification of existing animal care protocols as necessary. Reporting to the appropriate wildlife agency may also be necessary depending on the location.
- **Internal:** peer-to-peer reporting within the necropsy teams.

TRANSPORT

1. Aims/objectives

To ensure the safe transit of oiled wildlife, both live and dead, from capture teams to stabilization/first-aid centre or wildlife rehabilitation centre, and the subsequent transport of clean wildlife for release.

2. Personnel requirements

- **General area requirements:** knowledge of the area, the spill situation, background to stabilization techniques and biology of the species, and safe practices for loading and transport as listed below. Personnel conducting aircraft- or boat-based transport may require additional client-specific training and certification prior to deployment.
- **Specific area positions:** no additional positions are required beyond those listed for Collection/Transport in the organizational chart on page 26.



Cages (top) and stretchers (bottom) are used for the transportation of oiled wildlife.

3. Operational details

Tasks and methods

- **Fatigue management:**
 - The time and distance of the journey should be factored into the roster. Night transport may be required to reduce thermal stress on animals, so appropriate roster management is essential.
- **Loading and unloading of containers with live animals:**
 - Each container should carry a label listing the species and any relevant safety information. Cardboard containers should not be stacked on top of each other. Wet boxes should be discarded and replaced with dry containers.
 - Aquatic animals in open crates/slides (such as turtles and cetaceans) should be protected from sunlight and kept wet at all times.
 - The acceptable numbers of animals per container is dependent on:
 - the species (e.g. gregarious vs. solitary);
 - animal condition (e.g. avoid putting injured animals into containers with 'healthy' ones);
 - logistics (e.g. numbers of available containers, transportation space); and
 - whether legal requirements dictate keeping animals separated until sampled.
- When required (and if personnel have been trained/are appropriately equipped), oral fluid support should be provided, e.g. if journeys exceed two hours in duration.

Equipment and supplies

- **Vehicles:**
 - Ensure the use of well maintained, type-specific (truck, van, boat) vehicles.
 - All vehicles should be sufficiently well equipped to undertake the required tasks.
 - Consider the use of four-wheel drive vehicles in off-road situations.
 - Ensure that animal areas have adequate ventilation and appropriate temperature control.

Section 4

General principles of wildlife response

- Other items:
 - Communication devices: two way radios; hands-free/mobile telephones.
 - Documentation: area maps; GPS data; transit forms; vehicle log.
 - Durables: 'vari-kennels'/transit boxes for clean and oiled birds, and other species-appropriate containers as needed.
 - Disposables: standard PPE; disposable flat pack cardboard boxes; substrate materials such as newspaper, sheets and towels; supply of hand and bath towels; and supply of syringes, tubes and isotonic fluids.
 - Miscellaneous: permanent marker pens; duct tape; cable ties.

Facilities/working environment

Highly dependent on location and method being utilized.

Data elements

- Field data to accompany the animals.
- Completion of chain of custody forms if necessary.

Reporting structure

- **External:** data should feed into the management system (upwards to the Wildlife Branch Director and laterally to other Group Supervisors) to direct animal transportation planning/deployment. Regular reporting to incident managers, capture/displacement teams, the field stabilization supervisor and rehabilitation facility supervisor is required to ensure that everyone is kept apprised of progress and the estimated times of arrivals and departures. Reporting to the appropriate wildlife agency may also be necessary depending on the location.
- **Internal:** peer-to-peer reporting within the transportation team.



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Oiled wildlife in suitable containers loaded onto a transport vehicle for delivery to the rehabilitation centre.

FIELD STABILIZATION/FIRST AID

1. Aims/objectives

- Field stabilization/first aid ensures that the condition of captured oiled animals does not worsen, and that they remain 'stable' (e.g. normal body temperature, obvious injuries addressed) before transportation to the wildlife rehabilitation centre.
- Initial aid is provided as early as possible in the care process will increase the likelihood of survival to the point of release.
- Field stabilization is not always performed at all stages of an oiled wildlife response, but is most commonly utilized when transport time to the wildlife rehabilitation centre exceeds two hours or when animals are particularly debilitated during a response.
- The activation of a field 'first aid' station depends on the situation—a variety of variables, such as species, weather, location, available resources, etc. will direct this decision.

2. Personnel requirements

- **General area requirements:** knowledge of species ecology, the spill situation, and the stabilization techniques listed below. Personnel available at a remote stabilization facility will be required to have the training and experience necessary to make appropriate decisions concerning triage and the euthanasia of severely debilitated individuals.
- **Specific area positions:** no additional positions are required beyond those listed for Field Stabilization in the organizational chart on page 26.

3. Operational details

Tasks and methods

The goals of field stabilization/first aid are to combat the initial effects of oil, stabilize animals to increase the probability of survival in transport, implement triage practices when applicable (see pages 15–16) and to reduce the long-term toxic effects of oil exposure. This may include the following techniques and procedures (dependent on capabilities, personnel and logistics):

- Removal of excess oil from the eyes, nostrils, mouth and glottis.
- Stabilizing body temperature—the correction of abnormal body temperatures can be achieved employing a variety of methods:
 - Hypothermia can be addressed using hot water (in nitrile gloves or other containers placed adjacent to the skin) or electric heat sources.
 - Hyperthermia can be addressed using cool air or water.
- Reversing dehydration:
 - Oral hydration fluids warmed to the animal's core body temperature is the most common method if safe for the animal and personnel (e.g. if the animal is not neurologically impacted or not likely to bite if it becomes necessary to employ a gavage tube).
 - Parenteral fluids (intravenous or subcutaneous) should be administered if severely debilitated. Guidelines for volumes and delivery methods should be overseen by a veterinarian.

- Treatment for wounds:
 - Bandaging, wrapping injured appendages, and other first-aid techniques for traumatic injuries (wounds, fractures and other injuries requiring immediate attention) may be required.
- Decreasing/minimizing stress to the animals:
 - Once the stabilization procedures and necessary handling have been completed, the animals should be placed in quiet, well-ventilated boxes or cages, with minimal interference to allow for recovery to occur.
- Maintaining documentation:
 - All relevant information should be documented and incorporated into individual records, including capture details. These records should accompany the animal to the central rehabilitation facility.

Equipment and supplies

- General: animal logs; communications equipment; species identification guide; camera.
- Disposables: standard PPE; disposable flat-pack cardboard boxes; substrate materials (newspaper, sheets, towels); large supply of hand and bath towels; supply of syringes, tubes, isotonic fluids.
- Durables: 'vari-kennels'/transit boxes and other species-appropriate containers as needed; tents or containers for shelter if not setting up in permanent structures/buildings.
- Miscellaneous: permanent marker pens, duct tape, cable ties, tables and chairs.

Facilities/working environment

The basic requirements for a first-aid station in the field comprises heat control, ventilation, shelter, privacy, electricity, light and hydration fluids. Adequate spaces for holding boxes or cages of animals before transport will also be required, together with an animal treatment area. For more specific details see the subsection on *Facilities* on pages 20–23.

Data elements

This includes all pertinent information required on arrival at the field station, e.g. numbers and species admitted, arrival date/time, locations, collector's names, initial animal ID, and health status.



Responders undergoing field stabilization training.

Nancy Anderson, UC Davis

Reporting structure

- **External:** data should feed into the management system (upwards to the Wildlife Branch Director and laterally to other Group Supervisors) to direct animal stabilization planning and deployment. Regular reporting to incident managers, the collection/transport supervisor and the rehabilitation facility supervisor is required to ensure that everyone is kept apprised of the status of stabilized animals. Reporting to the appropriate wildlife agency may also be necessary depending on the location.
- **Internal:** peer-to-peer reporting within the field stabilization teams.

INTAKE/ADMISSION

1. Aims/objectives

- Intake and initial evaluation consist of performing a comprehensive clinical examination and evaluation of every individual animal to accurately assess their condition. The results will provide indicators for the likelihood of survival and may be used in performing triage.
- The level and degree of evaluation (i.e. the time spent on each examination) will be dependent on animal numbers, species, available personnel and other factors. However, all animals should be spared an examination that would negatively affect the animal's welfare.



An oiled seabird admitted to the rehabilitation centre following the Cosco Busan oil spill in 2007.

- At this stage, each animal should receive an individual identifier (if not done previously) to track progress throughout the rehabilitation effort.
- In the absence of field first-aid, this stage will serve as the initial stabilization phase.

2. Personnel requirements

- **General area requirements:** knowledge of species ecology, the spill situation, and intake/admission techniques will be required, as listed below. Management personnel will also be required to have the training and experience necessary to make appropriate decisions concerning triage and the euthanasia of severely debilitated individuals.
- **Specific area positions:** no additional positions are required beyond those listed for the Rehabilitation Facility in the organizational chart on page 26. Assistance to Intake/Admission will be provided by the Veterinary and Animal Care Support Team(s) as indicated.

3. Operational details

Tasks and methods

- Upon arrival, field data should be examined and validated, and a prioritization process developed to determine the order in which the animals should be examined (e.g. based on animal health status, time from capture, species sensitivity, and other key factors).
- While animals await their intake examination, the boxes and cages containing them should be placed in a defined reception area, which should be quiet, temperature-controlled, and well-ventilated.
- To assess the overall condition of an animal, a full and careful examination should be conducted. This should always be done consistently and follow an agreed procedure so that the examination is the same for each animal and the time spent is optimized.
 - In many species, examinations can be accomplished while the animals are manually restrained by experienced handlers (with numbers of handlers dictated by the safest practices relating to each species being examined). However, larger or more fractious animals may require sedation or anaesthesia prior to a full examination.

Section 4

General principles of wildlife response

- All findings (normal or abnormal) should be recorded. Indicators of an animal's general condition include the degree of alertness, its body condition and the degree of dehydration.
- Intake procedures and goals should be focused on the following:
 - Conducting triage practices, including determining whether humane euthanasia on intake is the most appropriate action (i.e. if there is low likelihood of survival in care or following release of a normal animal at its conclusion).
 - Registering capture, species and age information into the Live Intake Log.
 - Creating individual animal care records.
 - Providing individual temporary identification (plastic tags or other suitable methods for the species in care).
 - Performing a thorough physical examination:
 - (a) This includes recording:
 - body mass (weight);
 - hydration status;
 - degree of alertness;
 - core body temperature;
 - presence of lacerations, fractures or chemical burns; and
 - lung sounds auscultation.
 - (b) The time and intensiveness of the physical examination will largely be dictated by the numbers of animals awaiting evaluation and the stability of the patient.
 - Collecting a blood sample and performing an analysis for, at a minimum, packed cell volume (PCV—an indicator of anaemia) and total protein (TP—an indicator of nutritive status and generalized organ health). Complete blood counts (CBC), serum/plasma chemistry panel or other specialized tests will be conducted at the discretion of the veterinarian in response to clinical findings and/or dependent on the species being evaluated.
 - Assessing oiling status and sample collection:
 - (a) Required data include the type and degree of oiling (superficial, moderate, deep) and the location at which the animal had become oiled.



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An oiled brown pelican undergoes a comprehensive clinical examination to accurately assess the animal's condition.

- (b) Samples should be collected at this time if necessary for legal purposes—this may include taking individually identified photographs, and sampling oiled feathers or fur. These samples must be wrapped in aluminium foil, adequately labelled and frozen for storage. If required, sampling may need to be accompanied by following proper documentary processes and legal tracking (chain of custody).
- Determining appropriate treatment:
 - (a) Combat the initial effects and minimize the long-term toxic effects of oil exposure by treating hypothermia, hyperthermia, dehydration and anaemia.
 - (a) Routine administration of preventive treatments such as antifungals may be started during this phase (after hydration).
- Establish husbandry plan, including feeding plan, nutritional supplements and housing options.

Equipment and supplies

- General: communications equipment; logs and animal care forms; supplies for temporary identification of animals; species identification guide; white board for individual photos; and camera.
- Disposables: standard PPE; disposable flat-pack cardboard boxes; substrate materials (newspaper, sheets, towels; large supply of hand and bath towels; supplies for blood sampling, such as needles, haematocrit tubes, clay trays, other blood sampling tubes (e.g. vacutainer with and without anti-coagulant) and glass slides; sharps containers; syringes, tubes and isotonic fluids; nutrition and special diets for hypoproteinaemia; and drugs for veterinary treatment (e.g. prophylactic medications, drugs for euthanasia, and pain treatments).
- Durables: haematocrit centrifuge and refractometer.
- Miscellanea: permanent marker pens; duct tape; cable ties.

Facilities/working environment

The basic requirements for admitting animals coming from the field comprise heat control, ventilation, shelter, privacy, electricity, light, hydration fluids and nutrition. There should be adequate space for holding boxes arriving from the field and awaiting intake, as well as space for setting up examination tables in the animal admission/treatment areas. Cages will be required for animals admitted (for use during the stabilization phase). For more specific details see the subsection on *Facilities* on pages 20–23.

Data elements

This includes all pertinent information required on admission, e.g. numbers and species admitted, arrival date and time, locations, examiner's names, health status and clinical information.

Reporting structure

- **External:** data should feed into the management system (upwards to the Wildlife Branch Director and laterally to other Group Supervisors) to ensure accurate animal numbers are reported. Regular reporting to incident managers and the rehabilitation facility supervisor is required to ensure that everyone is kept apprised of the status of incoming animals. Intake managers will need to report during daily briefings to the pre-wash care coordinator on the numbers of animals expected

to arrive. Reporting to the appropriate wildlife agency may also be necessary depending on the location.

- **Internal:** peer-to-peer reporting within the intake/admission teams, ICU/isolation unit, pre-wash care and morgue/necropsy personnel.

PRE-WASH CARE**1. Aims/objectives**

- Pre-wash care provides oiled animals with appropriate nursing (e.g. nutrition, fluids, preventive treatments) and specific care for individuals as needed to improve their condition until they are ready to be cleaned.
- Providing the best possible pre-wash care will decrease the potential risk of indirect effects of the oil while moving oiled animals through the rehabilitation process.

2. Personnel requirements

- **General area requirements:** knowledge of species ecology, the spill situation and rehabilitation techniques as listed below.
- **Specific area positions:** no additional positions are required beyond those listed for the Rehabilitation Facility in the organizational chart on page 26. Assistance with pre-wash care procedures will be provided by the Animal Care Support and/or Veterinary Teams as indicated.

3. Operational details*Tasks and methods*

The goals of pre-wash care are to further stabilize the animals and improve their general condition to prepare them for the cleaning process. This can include the following (dependent on capabilities, personnel, and logistics):

- Stabilizing body temperature: correction of abnormal body temperatures can be achieved employing a variety of methods:
 - Hypothermia can be addressed using hot water in containers or electric heat sources.
 - Hyperthermia can be addressed using cool air or water.

Section 4

General principles of wildlife response

- Treatment for dehydration:
 - Oral hydration fluids warmed to the animal's core body temperature is the most common method if safe for both the animal and personnel.
 - Parenteral fluids (intravenous or subcutaneous) should be administered if severely debilitated. Guidelines for volumes and delivery should be overseen by a veterinarian.
- Follow up on the treatment for wounds, if initiated in earlier stages.
- Continue with the aim of decreasing/minimizing stress to the animals: once the stabilization procedures and necessary handling have been completed, the animals should be placed in quiet, well-ventilated boxes or cages, with minimal interference while they recover.
- Feed the animals—using forced feeding if appropriate—with the appropriate nutritious foods to increase the general body condition.
- Monitor trends in body mass (weight): this can be a good indicator of overall health, particularly if the average weight for the species is already known. It is important to consider that age, sex and the individual's seasonal changes can also have an impact on an animal's body mass.
- All relevant information should be documented and incorporated into individual records. These records should accompany the individual throughout rehabilitation facility.

Equipment and supplies

- General: PPE; newspapers; towels; data files.
- Medical: syringes; subcutaneous/intravenous fluids; prophylactic medications.
- Nutritional/hydration: good quality food (fresh, fresh-frozen, pellets); rehydration fluids; nutritional liquids; feeding tubes.
- Species-specific caging: net-bottom cages or other suitable containment.



Michael Ziccardi, UC Davis

Example of a pre-wash care area within a rehabilitation facility.

Facilities/working environment

- The pre-wash care area can be one of the largest floor areas of the response facility. Due to potential fluctuations during the response, it is useful if this area can be easily extended or reduced as the circumstances require.

Data elements

- All data that were collected at intake that support the follow-up of the status of the animal (body weight, blood parameters, etc.) are collected and followed on a regular basis.

Reporting structure

- **External:** regular reporting to incident managers and the rehabilitation facility supervisor is required to ensure that everyone is kept apprised of progress and needs. Pre-wash managers should report during daily briefings to the animal cleaning coordinator on the numbers of animals ready to be cleaned.
- **Internal:** peer-to-peer reporting within the pre-wash teams and between pre-wash and intake, ICU/isolation unit and morgue/necropsy personnel.

ANIMAL CARE SUPPORT

1. Aims/objectives

Animal care support focuses on providing the basic elements necessary for the effective husbandry of animals in care.

- Providing the best quality and quantity of food and fluids helps to enable the animals to return to optimal/normal/pre-spill health status.
- The facility should be maintained as a clean and biosecure environment.

2. Personnel requirements

- **General area requirements:** knowledge of species ecology, the spill situation, and rehabilitation techniques as listed below; especially as they relate to nutrition and biosecurity/disinfection measures.
- **Specific area positions:** no additional positions are required beyond those listed for the Rehabilitation Facility in the organizational chart on page 26.

3. Operational details

Tasks

- Prepare materials necessary for fluid therapy.
- Prepare materials necessary for nutritive therapy.
- Prepare materials necessary for oral medications.
- Provide facility-wide cleaning/disinfection.



Ingrid Overgard, ©The Marine Mammal Center

Methods

- Animal husbandry:
 - An animal husbandry support plan should be developed and updated in concert with other area leaders based on the specific needs of the animals in care, but also based on maximizing efficiency of operations. To ensure that no untimely delays occur when animals are due for treatment, clear and effective communication should be established between the lead staff of the food preparation area and the intake and pre-wash care personnel, and an operational timeline established that all parties can follow.
- Fluid therapy:
 - Oral administration is typically the preferred route in most animals, with oral gavage administration taking place up to four times daily for oiled birds in care. The timely and organized preparation of gavage tubes by the food preparation team, and a means to support fluid delivery (e.g. larger syringes or modified pumps) as well as a large quantity of warmed isotonic fluids, should be on hand for use when necessary in accordance with the established hydration plan.
- Nutritive therapy:
 - Pre-wash:
 - (a) Most oiled wildlife entering a rehabilitation facility will be experiencing a nutritional deficit, and will therefore need to be provided with quality and easily-digested food items shortly after arrival (after hydration).
 - (b) The internal effects of ingested oil (as well as stress) can decrease the ability of affected animals to absorb nutrients.
 - (c) Nutrition is often provided to animals via gavage feeding of a nutritive slurry, alternated with fluid administration. Whole foods may be offered in pre-wash care if the animals are stable, able to successfully digest food items, and if presentation of items does not lead to additional health issues (i.e. presentation of fish on ice leading to hypothermia in severely depressed birds).

A seal being tube-fed a special fishmash formula that is highly nutritious.

-
- Post-wash:
 - (a) Once animals are cleaned and reintroduced into a more natural environment (e.g. pools or aviaries), food and fluid needs often shift to more natural presentations where possible.
 - (b) It is essential that personnel have a knowledge of the ecology of the species being cared for, as the provision of food items closest to their natural diet will best support their recovery back to normal health.
 - (c) Most wildlife historically affected by marine spills have been piscivorous in nature. Piscivores should, ideally, be provided with fresh, human-grade or 'individually quick frozen' (IQF) fish, with careful attention paid to storage, thawing and handling. Frozen fish loses its nutrients over time, so the freshest product possible should be identified. Similarly, thawing frozen fish in standing water or under running water can remove essential nutrients, hence it is better to thaw it under refrigeration.
 - (d) In many circumstances, the use of high-fat fish such as herring is not recommended, as the fish oils from the fish themselves, or in faecal material, can re-foul feathers or fur when introduced to pools. The use of lower-fat fish (such as night smelt), while not as high in calories, can prevent the need to re-wash affected animals.
 - Medications:
 - (a) The administration of oral medication is typically incorporated into the daily feeding schedule (usually at the first and last feeding of the day) to minimize handling. Medications that cannot be administered with food, or which need to be administered at staged intervals from other medications, can be given when the animal is handled for other reasons.
 - (b) Seabirds in a captive environment are often given an oral antifungal suspension to help prevent aspergillosis.
 - (c) Salt and multivitamin supplementation may be necessary depending on the animal's natural ecology, the conditions of the facility, and the availability of fresh quality food items. Lastly, additional specific supplementation may be prescribed to individual animals at the discretion of the attending veterinarian.
 - Cleaning/disinfection:
 - Animal Care Support is often responsible for implementation of the facility-wide disinfection plan (versus 'spot cleaning' of areas by that area's response personnel).
 - Standard food preparation/handling protocols should be followed, including frequent hand washing, rotation/date labelling of food stocks, monitoring the temperature of refrigerators/freezers and ensuring that they are properly maintained, and separating oiled and unoled supplies.
 - All disinfectants are impaired when applied in the presence of organic material. Therefore, regardless of the disinfectant used, mechanical removal of all contamination with water and a detergent should be performed prior to application of the disinfectant.
 - Different types of disinfectants require varying contact times for maximum effectiveness. Chemical disinfectants can be rendered inactive over time and by exposure to light, extreme temperatures, and the presence of organic material, detergents or other chemicals. It is therefore essential to follow the manufacturer's guidelines for using a selected disinfectant.
 - Food preparation utensils, food containers and all gavage materials should be thoroughly disinfected between each use. Gross contamination should be washed away with warm soapy water, and the items thoroughly rinsed and then soaked in a dilute disinfectant solution for at least 10 minutes. A cleaning solution should be drawn into feeding tubes using a catheter-tip syringe to ensure that the solution makes contact with the interior of the tubes, after which the syringes themselves should be disassembled for cleaning and disinfection. Once disinfected, all materials should be rinsed thoroughly with water and dried before use.
 - Foot baths filled with disinfectant solution should be used at the entrances to animal areas if at all possible, but their use is strongly encouraged in areas when the risk of spreading infectious disease is considered high. The baths must be deep enough to completely cover shoe treads, and should be changed as scheduled or if noticeably soiled before a scheduled change.

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- After each use, transport cages and restraint equipment should be disinfected by scrubbing with hot water and detergent, then rinsed and allowed to dry before applying disinfectant.
- Cage surfaces and the newspapers/plastic used under pens should be discarded (newspaper) or cleaned and disinfected daily. Net bottoms from animal cages should be cleaned at least once daily, either by steam cleaning, pressure washing, or laundering.

Equipment and supplies

- General: PPE, face masks.
- Nutritional/hydration: syringes; prophylactic medications; good quality food (fresh, fresh-frozen, pellets); rehydration fluids; nutritional liquids; food trays.
- Disinfection/cleaning: mops; buckets; spray bottles; scrub brushes; appropriate disinfectants.

Facilities/working environment

- Typically, animal care facility support occurs in the food preparation area, in other areas in the facility, or outside. As such, specific hazards/risks are associated with the tasks in question.

Data elements

- Data collection in animal care support is typically limited compared to other areas. Keeping track of numbers of fluids and nutritional syringes prepared in each feeding can help to determine the needs for the next feeding. Keeping track of food items, freshness and quantities used/in stock can help when planning for replenishment.

Reporting structure

- **External:** regular reporting to the rehabilitation facility supervisor is required to ensure that everyone is kept apprised of progress and needs. The support coordinator should report during daily briefings to all other area coordinators on capabilities to support the overall operation.
- **Internal:** peer-to-peer within the support teams and between support and all other areas.

UC Davis



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A cleaning and disinfection plan that covers all areas of the facility is essential to ensure the well-being of the animals and response personnel.

ANIMAL CLEANING (WASHING, RINSING AND DRYING)

1. Aims/objectives

- Washing is required to remove oil or other contaminants from the feathers, fur, skin or other parts of the affected animal's body.
- Washing, rinsing and drying is a stressful procedure, and the animals need to undergo pre-wash care and meet important criteria before being selected for washing. The washing, rinsing and drying procedure needs to be carried out with care, and undertaken in a timely manner to limit stress in the animal. Experienced washers, rinsers and handlers are important as they are able to complete the process more efficiently and are able to provide training to new staff and volunteers. The goal is for the animal to experience the lowest stress levels possible while being washed, rinsed and dried, and to be free of the contaminating substance and any detergent at the end of the cleaning process.
- It is important to ensure the availability of suitable personnel, equipment and facilities (including electricity), appropriate water conditions (pressure, volume, temperature, hardness), and pool and pen capacity. These factors will determine the number and species of animals that can be washed per day.
- Wastewater (combined with oil, dirt and detergent) should be disposed of according to best practices and according to the incident's waste management plan (if present). A wastewater management system and containment method should be in place before washing is started.
- A protocol for the cleaning process needs to be developed in advance, and appropriate training provided to the relevant personnel.

2. Personnel requirements

- **General area requirements:** knowledge of species ecology, the spill situation, and washing/rinsing/drying principles.
- **Specific area positions:** no additional positions are required beyond those listed for the Rehabilitation Facility in the organizational chart on page 26. Assistance to the Animal Cleaning Teams will be provided by the Veterinary Team(s) as indicated.



Joe Proudman, UC Davis

An oiled pelican undergoes cleaning at the hands of experienced personnel wearing appropriate PPE.

3. Operational details

Tasks and methods

- Pre-wash evaluation:
 - Before being washed, animals should be clinically assessed and will need to meet pre-established and written washing criteria to ensure their survival during the cleaning, washing, rinsing and drying processes, i.e.:
 - (a) Blood values (PCV and TP) should be appropriate to minimize the likelihood of animals having medical issues during or immediately following cleaning.
 - (b) Animals should exhibit normal behaviour for the species (taking their current environment into account).
 - (c) Animals should be bright, alert and responsive.
 - (d) Body weight should be stable or increasing, and be adequate for the species.
 - To clean some species (e.g. marine mammals), sedation or general anaesthesia may be necessary. This can carry associated risks, including but not limited to hypothermia or hyperthermia during washing. Only stable and strong animals should undergo sedation or general anaesthesia.

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- Correction of nutritional deficits and hydration status is required before a wash is undertaken to mitigate the issue of hypoglycaemia.
- Occasionally, animals may need to be 'fast-tracked' to the washing facility before they have been deemed to meet the necessary pre-wash criteria. This should only take place if recommended by a qualified veterinarian, or if a highly toxic product (e.g. diesel or jet fuel) needs to be washed off quickly. A 'quick wash' can be carried out to reduce skin damage in animals that have been exposed to refined products; however, a full wash will still be required later in the rehabilitation process.
- Pre-treatment:
 - In certain circumstances, where there is stubborn or tarry oil, pre-treatment of the oil on the feathers, fur or skin using alternative substances may be required. Substances can include warmed vegetable oil or other mild emulsifying agents.
- Washing:

Species-specific washing techniques are varied and follow important principles:

 - Water temperature needs to be within the high end of normal body temperature range of the animal being washed to prevent hypothermia as well as maximize cleaning efficiency.
 - Handling techniques should be appropriate for the species being cleaned, depending on their size, strength, ability to inflict injury to humans, and their fragility.
- If sedation or general anaesthesia is required, induction by a veterinarian and health monitoring by an experienced veterinary technician are essential while cleaning.
- Clipping of feathers contaminated with oil or tar is not recommended; this will interfere with the waterproofing process and delay release.
- Washing and rinsing of the animals is complex and should be completed in an expedient manner. The washing process should be long enough to completely remove all of the contaminant, and short enough to limit stress in the animal.
- A liquid dishwashing detergent should be used for removing contaminants.
- It is essential to monitor stress in the animal during the washing, rinsing and drying process. If signs of stress are noted, the procedure should be suspended while the animal is re-evaluated. Typical signs of stress are:
 - (a) gasping for breath;
 - (b) breathing exceedingly heavily (more than is expected during a washing procedure); and
 - (c) abnormal behaviour for the species (e.g. the animal becomes lethargic, or displays panic movements).
- Prolonged washing time should be avoided as this decreases the survival rate of animals.
- A systematic approach to washing should be adhered to by staff to ensure that no area on the animal's body is missed or is not completely cleaned.
- When tubs/containers are used for cleaning (e.g. for birds and smaller mammals), the animal's body (except the head and neck) should be immersed in soapy water to maximize efficiency and maintain warmth. When water with detergent loses efficiency or is visibly oily, the animal should be transferred to the next clean water tub.
- The animal should be kept in a normal position to limit stress.
- Only required personnel should be present, and noise levels should be kept to a minimum.
- Lead personnel should be highly trained and experienced with the species being cleaned.



Rescued seabirds in pre-wash care await clinical assessment to ensure that they meet the required criteria prior to cleaning.

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- Rinsing:

Effective rinsing is critical to regaining waterproofing in most oiled animals, in particular those with a structural means of maintaining normal body temperature (e.g. the feathers in birds). Rinsing removes the soap and residue which can interfere with the animal's natural waterproofing. Techniques for rinsing follow a number of important principles:

- The rinsing process should last long enough to completely remove all of the detergent, but should be short enough to limit stress in the animal. Prolonged rinsing decreases the survival rate of the animals.
- To avoid hypothermia, as well as maximize rinsing efficiency, water temperature should not exceed the high end of normal body temperature range of the animal being rinsed.
- Water pressure should be as high as possible to completely rinse the detergent from the animal's skin while minimizing damage to the feathers, fur and skin. An adjustable pressure rinsing nozzle with a maximum of 3.5 bar (50 psi) pressure and adequate volume to completely clean an animal is recommended. Particular care should be taken around the eyes, nares/nostrils, cloaca/anus, and other sensitive tissues.
- Water hardness of 3 grains per gallon (or 51 ppm) is preferred. If the water is too soft, the detergent will not be washed off adequately. Water that is too hard will result in the minerals in the hard water binding to the detergent, causing calcium carbonate crystals, which form in the feathers and disrupt the animal's waterproofing.
- Do not spray water directly into the animal's eyes, mouth/beak, or rectum/cloaca.
- To reduce stress on the animal, remain calm, keep noise levels down and, when possible, cover the animal's eyes with your hands.
- A pattern of rinsing and visual checks should be adopted to ensure that no areas on the body are missed when rinsing.

The water spraying process exposes the skin and, in birds, after a thorough rinsing, downy under feathers can be seen to take on their natural fluffy appearance. The presence of fluffy down feathers and water beading up and rolling off the feathers is a good indication that the feathers have been efficiently rinsed.



International Bird Rescue

Rinsing animals thoroughly after washing is essential in helping them to regain their natural waterproofing.

- Drying:

Birds and heavily-furred mammals will need to be dried after cleaning. Animals that have been washed and rinsed should be taken to a designated drying area. Appropriate clean accommodation should be available, such as net-bottomed pens, and should be suitable for the size and species. Experienced staff should monitor the drying area at all times. The following principles should be observed when drying washed animals:

- The temperature in the pens should be sufficient to maintain normal body temperatures, and encourage preening/grooming, if applicable. The temperature should be monitored with thermometers at all times.
- Continuous monitoring of the animals is required to ensure that overheating and burns do not occur. In birds, increased respiration, open-mouth breathing, nervousness, spreading of wings, and collapse can all indicate overheating.
- There should be sufficient ventilation to reduce humidity and promote drying.
- Animals can be dried passively (i.e. left to dry over time in an appropriately heated pen) or actively (e.g. using infrared heating lamps or pet driers, or dried manually using towels), dependent on species, size and restraint methods used. Stationary heat lamps should not be used with recumbent animals.
- If heat lamps or driers are used, they should be placed at a sufficient distance from the animals to avoid contact, and there should be sufficient space for the animal to move away safely if it experiences overheating.

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Animals that need to be dried after cleaning are placed into net-bottomed pens and warmed with air from external fans.

Michael Ziccardi



Massey University's mobile wash-water facilities include water heaters and a water softening system installed in an intermodal container for easy transportation.

Equipment and supplies

- A sturdy surface on which the tubs/containers can be placed at a height that is appropriate to enable personnel to stand while holding/washing the animals.
- Supplies necessary to wash and rinse animals (tubs, liquid dishwashing detergent, cups/jars, nozzles, hoses, etc.).
- Equipment for fine cleaning (toothbrushes, gauze, Waterpik®, etc.).
- Rubber mats can be used to prevent birds from sliding around on a wet surface during rinsing.
- PPE consisting of waterproof covering (e.g. oilskins) over clothes, long-sleeved rubber oil-resistant gloves, goggles or face protection, oil-resistant boots.
- Documentary supplies, e.g. pens, permanent markers, paper, clipboard and washing record file (if not electronic).

Facilities/working environment

- A clean water supply will be required. The volume, application pressure, temperature and hardness of the water supply will need to be appropriate for the species being cleaned.
- An adequate source of energy will be needed for animal dryers, lighting, ventilation, heating water, etc.
- The working environment should be adequately protected from the elements (i.e. from wind, rain, heat and cold).
- The washing and rinsing area should be scalable to accommodate varying numbers of animals that need to be washed. The layout should be designed so that animals can be easily moved between washing stations, or from a washing station to the rinsing or drying areas.
- There should be adequate ventilation to prevent a build-up of humidity (to prevent aspergillosis occurring and to promote drying once washed and rinsed) and toxic fumes.
- The temperature of the working area should be managed carefully to help prevent hypothermia and hyperthermia during the washing, rinsing and drying process.
- A waste plan should be in place to ensure that oiled washing and rinsing water, and oiled solid waste, are disposed of appropriately.
- Laundry facilities will also need to be provided.

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An oiled pelican being cleaned in a washing bay after having been rescued from a remote island off southern Louisiana in 2010.

Data elements

- A designated person should be responsible for ensuring that animals are correctly identified, and for recording events (e.g. the success of washing and rinsing, any clinical observations, and treatments and fluids administered to the animals).

Reporting structure

- **External:** regular reporting to the rehabilitation facility coordinator is required to ensure that everyone is kept apprised of animal cleaning progress and needs. The cleaning coordinator should report during daily briefings to the pre-release care coordinator on numbers of animals able to be cleaned, as well as to the pre-release care coordinator on how many animals might be expected to pass through.
- **Internal:** peer-to-peer reporting within cleaning teams and between cleaning and pre-wash and pre-release care.

PRE-RELEASE CARE/CONDITIONING

1. Aims/objectives

- It is important to provide species-appropriate environments and husbandry (food items, etc.), to allow animals to return to comparable levels of fitness and behaviour as observed in their counterparts in the wild.
- Regular and systematic assessments of clean animals should be carried out to ensure that they meet defined, species-specific release criteria. Clean operations should be maintained in defined zones.

2. Personnel requirements

- **General area requirements:** knowledge of species ecology, the spill situation, rehabilitation techniques, waterproofing principles, and facility/equipment maintenance.
- **Specific area positions:** no additional positions are required beyond those listed for the Rehabilitation Facility in the organizational chart on page 26. Assistance to Pre-Release Care will be provided by the Veterinary Team(s) as indicated.

3. Operational details

General

- Daily briefings between the washing section, pre-wash holding section and transport/release coordinator are essential for providing feedback on progress within cohorts of animals in pre-release care. Expected release dates and times should be communicated to the Facility Manager.
- Construction and installation:
 - The pre-release care area should be available to use as early as possible or, if resources are limited, no later than two days prior to any oil spill event. Provision of sufficient space, and allocation of the time required to construct temporary or semi-permanent facilities, are priority considerations due to the potential variables in construction and performance of utilities. Scalability, species specificity and the availability of utilities (especially the supply of water for aquatic animals) are important considerations when selecting a location for the establishment of a pre-release care area.

- Construction of pens, pools and functional support should be coordinated by the Facility Manager in conjunction with the section heads and maintenance teams.
- Maintenance:
 - Manufacturers' instruction manuals should be available for all equipment.
 - Information about resource shortages and daily requirements will need to be logged and passed on to the relevant line manager.
 - Systems and procedures should be in place to provide maintenance and repair of all in-situ equipment and plant.
 - A continuous clean water supply is a priority: pools for aquatic birds need to be deeper than 50 cm, and require the water surface to be skimmed continuously.



Common murrelets or guillemots in a pre-release conditioning pool becoming accustomed to a more natural environment as they recover prior to release.

Tasks and methods

- General:
 - Emphasis should be placed on high levels of hygiene, clean PPE and avoiding contact with contaminants, surfactants or other organic material. Written procedures for all tasks should be available prior to the incident.
- Feeding:
 - Animals should be supplied with high quality, appropriate food throughout the day using suitable presentation (e.g. in pools).
- Handling:
 - When handling animals, use clean, unoled materials (e.g. non-powdered gloves, clean coveralls, clean dry towels) to avoid recontaminating the fur/feathers/skin. Once permanently housed outside, physical handling of the animals is typically dramatically reduced.
- Cleaning pens and pools:
 - Pools need to be cleaned regularly (dependent on water quality, numbers of animals in pools, species) by a combination of draining and refilling, maintaining and servicing of filtration equipment, netting out large debris, siphoning out fine debris, and through the use of other relevant techniques and equipment.
 - Pens, aviaries and holding areas should be similarly cleaned when necessary to reduce recontamination and secondary damage.
 - All materials used in pre-release care should be kept separate from oiled areas to prevent cross-contamination.
- Waterproofing checks:
 - Once cleaned, the majority of birds and furred mammals will need to be regularly tested for waterproofing and fitness by placing into clean, freshwater pools. Waterproofing is assessed through observation and manual examination.
 - The duration of stay in the pools will be dependent on an individual's performance and release scheduling. For animals that do not achieve waterproofing criteria, rewashing may be necessary.
- Veterinary/rehabilitation assessment:
 - Animals in outdoor enclosures should be monitored to observe behaviour, and should undergo regular weighing and physical examinations.



Seabirds in the pre-release section of a rehabilitation care facility.

- Blood testing and biometrics will determine when individual animals are ready for release. In certain species/taxa, more specific criteria may be required.

Equipment and supplies

These will be highly dependent on the species being cared for. For more specific details see the subsection on *Facilities* on pages 20–23.

- Enclosures:
 - Pools should be large enough to allow natural behaviour to occur and to facilitate observation prior to release, but not so large that regular capture of the animals, cleaning of the pool and meeting other logistical needs become difficult. Pools may be temporary or permanent. If a flight risk is present, pools should be covered by netting or other materials. Pumps and filters should be fitted to keep the water clean and accommodate water overflows.
 - Aviaries should be large enough to allow natural behaviour to occur and to facilitate observation prior to release, but not so large that regular capture of the animals, cleaning the aviaries and meeting other logistical needs becomes difficult. It is vital to ensure that aviaries are escape-proof and protected from access by predators.

- Pens that contain pool space as well as non-aquatic haul-out areas will need to be provided for certain species (i.e. pinnipeds) that do not remain exclusively in water. These areas should be constructed of materials that facilitate disinfection and regular cleaning.
- Indoor space will be needed for smaller species or those that do not require observation in outdoor enclosures prior to release. These spaces should nevertheless mimic the animals' natural habitats as closely as possible.
- Capture equipment: hand nets, herding boards, towels, crates and other materials that facilitate the capture and holding of animals within enclosures.
- Cleaning equipment: for cleaning pools, capture equipment, enclosures, materials, etc.
- Substrates and feeding equipment.
- Examination equipment.

Facilities/working environment

- The pre-release section will consist of indoor and outdoor areas. The site should be as level as possible and have adequate water and electrical sources, and effective provision for drainage. There should be room to expand the areas to accommodate upscaling during a major oil spill.

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- Pre-release areas should be separated from the pre-wash area by a physical barrier to prevent re-contamination by oil.
- Areas around enclosures should be screened off to avoid disturbance; they should not be situated near buildings, busy walkways or thoroughfares.
- Enclosures should be designed and built with materials that minimize the risk of injury.

Data elements

Information about each individual animal should be maintained wherever possible, along with pool activity log sheets.

Reporting structure

- **External:** data should feed into the management system (upwards to the Wildlife Branch Director and laterally to other Group Supervisors) to direct animal release planning and deployment. Regular reporting to the rehabilitation facility supervisor is important to ensure that everyone is kept apprised of the status of animals to be released. Reporting to the appropriate wildlife agency may also be necessary depending on the location.
- **Internal:** peer-to-peer reporting within pre-release care teams and between pre-release and cleaning teams.



Smaller pools containing warmed water can allow birds to remain in water for longer periods of time without becoming hypothermic.

RELEASE AND POST-RELEASE MONITORING

1. Aims/objectives

- Rehabilitated animals will need to be fully recovered before they can be considered for release. When assessing animals for release, it is important to use all available knowledge of each species' natural history, and to be fully aware of the treatment undergone by each individual animal.
- Post-release monitoring is essential for determining the long-term effectiveness of the rehabilitation of oil-affected wildlife. Knowledge gained from this type of study can help to:
 - improve rehabilitation methods and release criteria;
 - develop improved triage procedures that balance animal welfare issues with quality of life after release; and
 - provide a deeper understanding of the role that exposure to oil has on both physiological and behavioural aspects of animal ecology, such as short-term and long-term survival and breeding status.

2. Personnel requirements

- **General area requirements:** knowledge of species ecology, the spill situation, and release methods/techniques. Release of rehabilitated animals can be accomplished by the Pre-Release Care personnel as indicated in the organizational chart on page 26, or by technical specialists with the expertise and permits to allow for release.
- **Specific area positions:** technical specialists on species ecology/biology; response personnel capable of providing details of safe locations for the release of animals; and other experts called upon to provide additional data as necessary. Assistance will be provided by the Veterinary Team(s).

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Justin Cox, UC Davis



Justin Cox, UC Davis



After a full recovery, the rehabilitated animals are finally released from captivity.

3. Operational details

Pre-release assessments

All animals thought to be ready for release should be given a complete physical examination to rule out any abnormalities. Release of animals should be based on the following minimum criteria:

- Behaviour:
 - The animals should display normal behaviour for the species (such as flying, swimming, diving, feeding and resting).
- Weight and body condition:
 - The animal's condition should be close to normal (e.g. within 10% of a lower bound of the normal range) for the species, sex, life stage and season.
- Blood testing:
 - A blood sample should be tested to verify that values for PCV and TP fall within normal ranges. Anaemia is a particular concern, as red blood cells are needed to carry enough oxygen for the animals to undertake normal activities such as diving and hunting for food.
- Physical examination:
 - Animals should be examined to ensure that:
 - (a) the animal's lungs are clear of abnormal sounds;
 - (b) moulting, if present, does not interfere with the animal's ability to regulate its body temperature or flee from predators; and
 - (c) all wounds and burns have healed sufficiently to ensure that they will not worsen, cause pain, impair normal behaviour or affect waterproofing.
- Waterproofing:
 - Species that are dependent on their feathers or fur for insulation should be confirmed as being 100% waterproof by carrying out species-specific tests.

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Justin Cox, UC Davis



A pair of rehabilitated pelicans are released into a safe and appropriate natural environment.

Other considerations

- Salt glands in pelagic birds:
 - Caution should be exercised regarding pelagic birds that have been out of salt water for a long period of time, as the glands may have atrophied. The birds may require salt supplementation or may need to be placed in salt water for several days before release. Salt supplementation should be administered gradually, while monitoring for signs of salt toxicity if the individual has been housed on fresh water for a long period of time.
- Other diagnostics:
 - Additional tests, for example a complete blood count (CBC) and serum/plasma chemistry panels, blood smears, radiographs and auditory assessments may be necessary depending on species, regions and specific protocols.
- Disease:
 - Screening for diseases which may be of particular local or regional concern should be carried out as appropriate to prevent the introduction or spread of disease into wild populations.
- Local permits and legislation:
 - All local permits and legal requirements will need to be addressed, and any specific legislation regarding the release of rehabilitated wild animals will need to be complied with.
- Release site selection:

Working with local and response experts, the release teams should ensure that the selected release sites are:

 - free of ongoing oil contamination;
 - close to the area where the animals were rescued, whenever appropriate and available;
- chosen with consideration given to the needs of resident and migratory species;
- at a distance which minimizes transport time;
- capable of providing an appropriate habitat for the species;
- able to provide an appropriate food source is readily available;
- relatively free from predators; and
- able to provide protection from disturbance.
- Timing of release and time of day:
 - Timing can affect the survival of rehabilitated animals, e.g. with regard to food availability. Most species should be released early in the morning, giving them a chance to orient themselves, forage and find safety before their normal resting period. Crepuscular and nocturnal species should be released at dusk. It is important to use all available local/regional knowledge of the species' natural history and behaviour to give the animals the best chance of survival.
- Weather conditions and tides:
 - Knowledge of tides and predicted weather patterns is vital to ensure that the release of animals occurs in periods of good weather, allowing them to orient themselves and become familiar with the area.
- Caging for transport:
 - Overcrowding should be avoided during transport, and all cages should be well ventilated by following guidelines pertaining to the numbers of animals per box and per vehicle.

Post-release monitoring techniques

- Permanent bands/rings/tags:
 - This method is relatively simple and comparatively low-cost. However, due to the very small proportion of returns (typically less than 1% of all released birds in North America), it yields sparse data. Animals tagged in this way cannot be monitored remotely, and neither can this method provide information on behaviour. Data collected by researchers, bird clubs, hunters, beach walk programmes, or individuals discovering live or dead animals in the wild can be compiled for analysis. Permanent markers should be placed on all animals immediately prior to release. In some instances, and for some species, the insertion of Passive Integrated Transponder (PIT) tags into the animals can be used for identification should they later be found and scanned.
 - Depending on the country in which the rehabilitation occurs, permits may need to be obtained from the wildlife trustee agency.
- Auxiliary markers:
 - Placement of coloured bands/rings/tags on legs, feet or flippers of animals, and the implementation of an active visual observation programme can be used effectively to identify animals that remain close to land or which do not migrate. Due to the considerable effort required for observation, and the potential requirement for banding permits, the use of auxiliary markers is not usually a cost-effective or practical tool for large-scale follow-up of oiled species. Auxiliary markers can provide valuable information in certain species (such as shorebirds) or where other studies are already taking place.
- Coloured dyes:
 - In certain instances, coloured, persistent, organic dyes can be sprayed or applied directly onto the feathers, skin or fur of rehabilitated animals. Similar to the application and use of auxiliary markers, coloured dyes can be useful in monitoring animals that are close to where they were found, and may be more visible than coloured bands/rings. However, dyes wear off over time and can be lost during the moult.
- Freeze branding/shaving:
 - Freeze branding may be considered for furred mammal species. It enables passive monitoring and identification of animals from a distance, and can help to determine whether the animals have successfully completed rehabilitation.
 - Animal welfare and public acceptance of such methods will need to be considered.



An example of identification bands attached to a bird's legs prior to release after rehabilitation.



A reading being taken from an implanted microchip (i.e. a passive integrated transponder, also known as a 'PIT tag') prior to the animal being released.

- **Telemetry:** placement of a transmitter onto or into animals prior to release can be a useful technique. The transmitter can be attached using a sling or harness, attached to leg bands or neck collars, attached to feathers in some species, surgically attached externally, or surgically placed into the animal. Once activated, these transmitters emit a specific signal that is detected by receivers onboard aircraft or satellites. Animals may then be tracked over a period of months to years. Currently, three main types of telemetry are available to wildlife professionals:
 - **VHF:** the signal is produced by the instrument on the animal using radio waves, and received by a person on the ground or in the air with a receiver or with an automated data logger. Such a system is comparatively low-cost, reasonably accurate, and can be long-lived. However, the technique is labour intensive and somewhat weather dependent. Geographical features may interfere with VHF signals.
 - **GPS:** a tag containing a radio receiver picks up signals from dedicated satellites and uses an attached computer to calculate its location. The tag transmits data back to the satellites, or sends data on a programmed schedule directly to biologists in the field. This technique is highly accurate and well suited where intensive and frequent data are needed. However, GPS systems have high initial costs, and are often heavier than other systems. The tags eventually drop off the animal and are a relatively short-lived method of tracking.
 - **Satellite:** a high-power 'platform transmitter terminal' (PTT) is placed on the animal. This broadcasts a signal that is received by satellites, which then send the animal's location to a computer. The main advantages of this system are that it allows data to be collected with no field personnel, and it is usually lighter than a GPS system. However, PTTs incur a much higher initial cost, require ongoing costs for satellite time, are much less accurate than GPS or VHF systems, and are often shorter-lived than VHF systems.

Selection of post-release monitoring method

When selecting a method of post-release monitoring, it is advisable to consider the following:

- Availability of adequate funding.
- Available personnel.
- If telemetry is selected, the trade-off between the device weight and the battery life:
 - The larger (and heavier) the battery, the longer the transmitter will function.
 - Birds are typically limited to wearing devices that are <3% of their total body weight.
 - If PIT tags are to be inserted into the animals, trained personnel will need to be available to undertake the procedure.



Attaching a satellite transmitter to the back of a Western Grebe.

Kyra Mills-Parker, UC Davis

Section 4

General principles of wildlife response

Planning for post-release studies

It is important to plan ahead for post-release studies to ensure that there is a clear vision for how and why the studies are to be undertaken. The following aspects should be considered:

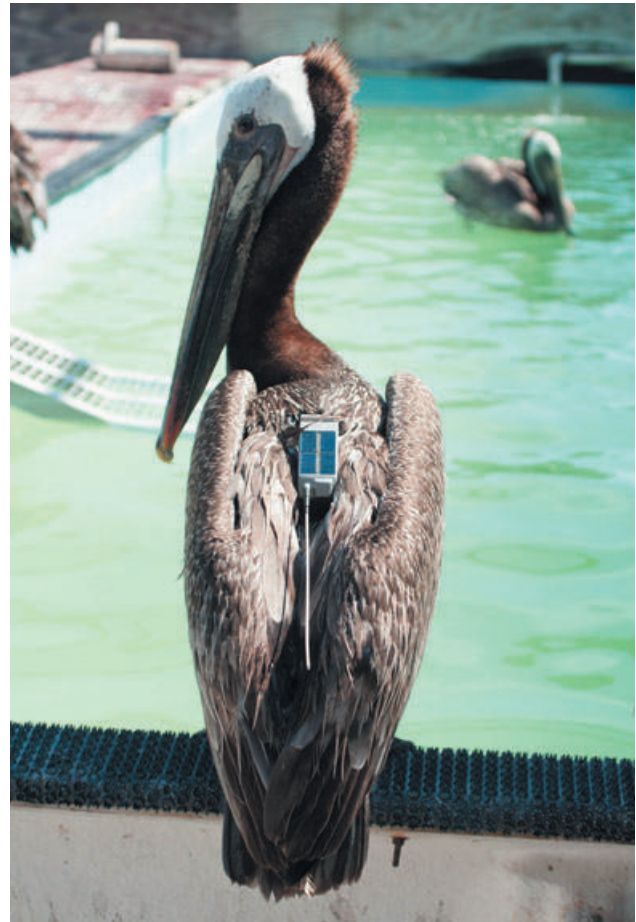
- Available resources for information:
 - For example, this may include wildlife agencies, biologists, researchers, rehabilitation organizations, product/equipment consultants, scientific literature, etc.
- Available funding:
 - It is essential to consider the potential costs of bands/rings/tags and telemetry devices, as well as the costs of response and follow-up personnel.
- The study design should:
 - establish defined questions to be addressed;
 - determine the numbers of animals to be used (and the study's power if possible);
 - explore the availability of controls for a comparison group;
 - define the specific data/analyses needed;
 - ensure that the requirements for permissions/permits to conduct work are met; and
 - ensure that the equipment and personnel required to conduct the study will be available.

Data elements

Information on each individual animal, such as log information, identification of age, sex and species, post-release identifiers (e.g. band/ring number, VHF frequency) should be collected and stored prior to the animal's release.

Reporting structure

- **External:** Data should feed into the management system (upwards to the Wildlife Branch Director and laterally to other Group Supervisors) to direct animal release planning/deployment. Regular reporting to incident managers, transport teams and the rehabilitation facility supervisor is required to ensure that everyone is kept apprised of animal release numbers and status. Reporting to the appropriate wildlife agency may also be necessary depending on the location.
- **Internal:** Peer-to-peer reporting within the pre-release care and release teams.



A pelican bearing a satellite transmitter awaits release after rehabilitation.

List of abbreviations

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CBC	Complete blood count
GOWRS	Global Oiled Wildlife Response System
GPS	Global positioning system
ICU	Intensive care unit
IQF	Individual quick frozen
JIP	Joint Industry Project
NGO	Non-governmental organization
PAH	Polycyclic aromatic hydrocarbons
PCV	Packed cell volume
PIT	Passive integrated transponder
PPE	Personal protective equipment
PTT	Platform transmitter terminal
QA	Quality assurance
SOP	Standard operating procedure
SSHP	Site safety and health plan
TP	Total protein
UAV	Unmanned aerial vehicle
VHF	Very high frequency

IPIECA

IPIECA is the global oil and gas industry association for environmental and social issues. It develops, shares and promotes good practices and knowledge to help the industry improve its environmental and social performance, and is the industry's principal channel of communication with the United Nations.

Through its member-led working groups and executive leadership, IPIECA brings together the collective expertise of oil and gas companies and associations. Its unique position within the industry enables its members to respond effectively to key environmental and social issues.



IOGP represents the upstream oil and gas industry before international organizations including the International Maritime Organization, the United Nations Environment Programme (UNEP) Regional Seas Conventions and other groups under the UN umbrella. At the regional level, IOGP is the industry representative to the European Commission and Parliament and the OSPAR Commission for the North East Atlantic. Equally important is IOGP's role in promulgating best practices, particularly in the areas of health, safety, the environment and social responsibility.

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