



California Islands

Biosecurity Program

Prepared by:

California Islands Biosecurity Program Subcommittee

June 2013

Contents

| | | |
|-------|---|----|
| I. | Mission | 3 |
| II. | Introduction to the California Islands Biosecurity Initiative..... | 4 |
| III. | Goals for California Island Biosecurity | 5 |
| IV. | Inter-Islands Communications Strategy | 6 |
| V. | Recommendations for Frequent Island Users..... | 6 |
| VI. | Recommendations for Private Vessels | 7 |
| VII. | Additional Recommendations for Agency or Concessionaire Vessels..... | 9 |
| VIII. | Recommendations for Construction and Landscaping Supplies..... | 9 |
| IX. | Current Biosecurity Programs and Goals by Island..... | 10 |
| | San Clemente Island..... | 10 |
| | San Nicolas Island..... | 11 |
| | Santa Barbara, Anacapa, Santa Rosa, San Miguel Islands | 12 |
| | Santa Cruz Island..... | 13 |
| | Farallon Islands | 13 |
| | Appendix A: Incident Report Form: To be completed when a new species is discovered on an island... | 14 |
| | Appendix B: Recommendations for Dog Entry and Exit from the Northern Channel Islands (Santa Cruz, Santa Rosa, and San Miguel) and the Navy Islands (San Clemente and San Nicolas) | 15 |
| | Appendix C: California’s Regulation of Plant and Pest Movement | 19 |
| | Appendix D: Comprehensive Biosecurity Plans by Island: | 20 |
| | San Nicolas: | 20 |
| | NPS Islands:..... | 24 |

I. Mission

The California Islands contain some of the most iconic landscapes in the state and are home to an array of species found nowhere else on the planet. Biosecurity is vital to protect these habitats and resources from the detrimental effects of invasive species. Biosecurity is a comprehensive set of protocols and actions designed to prevent the introduction and establishment of non-native invasive species. The California Islands Biosecurity Working Group, composed of entities that are devoted to conserving the natural and historic character of the Islands, have already made substantial investments in the removal of non-native species. However, there are inadequate measures to ensure that new invasions do not occur or are detected earlier enough for effective response. All of our agencies support the need for a comprehensive biosecurity programs for the islands under our care. Dedicated funding and resources are necessary to protect native biodiversity. A comprehensive biosecurity program includes the following:

- Prevent new invasions via all major vectors
- Early detection of invasives with on-island monitoring protocols
- Rapid response strategies
- Education programs created and disseminated

California Islands Biosecurity Working Group Members:

| | |
|--|---|
| Karl Bachman, National Park Service | Gerry McChesney, U.S. Fish and Wildlife Service |
| Melissa Booker, U.S. Navy* | Scott Morrison, The Nature Conservancy |
| Christina Boser, The Nature Conservancy* | Bryan Munson, U.S. Navy |
| Andrew Bridges, Institute for Wildlife Studies | Ken Owen, Channel Island Restoration |
| Alex Brodie, Island Packers Company* | Paula Power, National Park Service |
| Julie Bursek, National Oceanic Atmospheric Administration | John Randall, The Nature Conservancy |
| David Chang, Country of Santa Barbara* Agricultural Commissioner's Office | Martin Ruane, U.S. Navy |
| Don Croll, University of California Santa Barbara | Robyn Shea, National Park Service* |
| Kate Faulkner, National Park Service* | Jonathan Shore, U.S. Fish and Wildlife Service |
| Bill Hoyer, U.S. Navy | Grace Smith, U.S. Navy |
| John Knapp, The Nature Conservancy* | Valerie Vartanian, U.S. Navy* |
| Lyndal Laughrin, University of California Reserve System | Annie Little, U.S. Fish and Wildlife Service* |

* Members of the California Islands Biosecurity Program Subcommittee

II. Introduction California Islands Biosecurity

California's islands contain some of the most iconic landscapes in the state and are home to an array of species found nowhere else on the planet. Never connected to the mainland, incredible diversity and endemism have sprung from these islands. They provide a refuge for many species that may soon be extirpated from developed areas on the mainland. Not only important as a biodiversity hotspot, the islands provide important recreational opportunities and support valuable military operations.

Invasive species are considered to be a primary threat to the persistence of native species assemblages; more so on islands than most mainland ecosystems. The California Islands are particularly susceptible to introduced threats from the mainland. Their proximity to the mainland allows for increased visitation opportunities, but also increases the risk of species introductions. Over time, many non-native invasive organisms have been introduced to the islands.

Government and non-profit organizations have spent over four decades removing the most harmful of these non-native species and great conservation success has been achieved with concerted planning and collaborations between island partners. For instance, all non-native mammals have been eradicated from six of the eight islands and the most harmful species are being controlled on the remaining three islands. Following the removal of non-native golden eagles the charismatic island fox was pulled back from the brink of extinction and may soon be removed from the endangered species list. Each island has a weed management program to eradicate or stop the spread of destructive invasive plants. Island managers have worked collaboratively to pioneer conservation doctrine by implementing multi-faceted conservation plans such as strategically timing non-native species eradications, managing for success when one endangered species threatens the fitness of another listed species, and reestablishing extirpated island species.

The destruction caused by invasive species has left significant ecological scars, and restoring balance to the native ecosystems of the California Islands has come at tremendous economic cost. Moving forward, island partners have agreed to strengthen biosecurity protocols to reduce the likelihood of non-native species entering and establishing on the California Islands. We hope to establish a proactive approach to conservation and develop a culture of biosecurity and invasive species awareness that could extend outwards from the California Islands to other natural areas.

Effective biosecurity protocols require a balance between off-island quarantine and surveillance, on-island monitoring and rapid -response, and education. The most effective distribution of resources and effort may depend on the biology of the targeted species, likely vectors (mode of transport) to the island, size of the island, and probability of detection. Thus,

there is not a single strategy for island biosecurity and land managers must decide how to best allocate limited conservation resources in their unique circumstances. This biosecurity program is written to guide land managers and partners towards a united perspective on biosecurity on California's Islands.

III. Goals for California Island Biosecurity

This California Islands Biosecurity Working Group was convened to: 1) foster communication and collaboration between island managers and cooperating entities; 2) standardize expectations and protocols among island users regarding surveillance and prevention of invasive species transport; and 3) collaborate on products such as rapid response protocols, supplies, compliance, and educational materials.

To accomplish these goals, The Nature Conservancy, the National Park Service and the United States Navy have set aside funds to hire staff to implement the Biosecurity Program. It is expected that Biosecurity Staff will implement the program as designed and annually amended by the California Islands Biosecurity Working Group. Activities will include overseeing biosecurity programs with island users (e.g. inspections, educational presentations, enforcement), completing permitting and compliance and designing educational outreach.

The Biosecurity Working Group considers the following tasks to be high priority:

Early Detection:

- Develop advanced protocols and recommendations to survey for invasive species at mainland departure points; and
- Work with dock crews to implement key recommendations, including on-site inspection of boats and loads.

Rapid Response:

- Proactively create rapid response plans and complete required permitting and compliance to eliminate small mammals before they can become established.

Education and Outreach:

- Develop and disseminate educational materials, and provide training for target audiences (private boaters, researchers, tourists, island contractors and staff); and
- Work with local harbors to educate boaters and keep harbors pest-free.

Program Management:

- Develop and maintain a database and Geographic Information System of invasive species detections at embarkation points and on islands;
- Standardize biosecurity contract language to prevent invasive species introductions, and develop enforcement procedures, certifications for clean

cargo, alternatives and solutions for chronic and acute abuse of biosecurity protocols;

- Obtain funding for the California Islands Biosecurity Program; and
- Manage communications and expectations within the California Islands Biosecurity Working Group.

IV. Inter-Island Communications Strategy

The California Islands Biosecurity Working Group will convene quarterly to provide guidance and assistance for Biosecurity Staff and their supervisor(s). To facilitate communication between the California Islands Biosecurity Program Subcommittee and the biosecurity project staff and ensure reasonable progress on high priority objectives, the Biosecurity Staff will organize the following activities:

- Convene quarterly check-in calls to address progress in meeting biosecurity objectives;
- Prepare quarterly reports on activity and program status and biannual budget reports;
- Provide monthly activity updates to the Biosecurity Group chair;
- Manage the incursion database and alerts to the Biosecurity Group;
- Manage a listserv for managers – which can be used by the group to communicate on urgent issues;
- Initiate annual in-person meetings in June to report audit findings and propose annual budget; and
- Initiate annual program audits to summarize priority projects, activities accomplished, recommendations for the following year, and past-year performance reviews.

V. Recommendations for Frequent Island Users

Frequent island users such as staff, contractors, researchers, and volunteers are the most likely persons to introduce non-native invasive species. Regular travel from the mainland and the nature of the supplies they carry make them likely dispersal vectors. The following recommendations are derived from existing California Islands security measures and published biosecurity plans.

For the protection of native species, all clothing, tools, equipment and supplies should be inspected and cleaned of plant propagules and soil prior to departure from the mainland or when moving between islands. **Special attention should be paid to velcro, foot wear, pant cuffs, clothing seams, sleeping pads, sleeping bags, backpacks, duffels, tents, tool joints, chainsaws, towels, wetsuits, surfboard socks/bags/leash, and duct tape rolls.**

Island users should recognize that recent exposure to invasive species on the mainland should trigger additional and more thorough inspection of gear and clothing.

Some equipment is very difficult to inspect or clean. Island users should consider leaving contaminated shoes or other hard-to-clean items on the mainland and store island-specific footwear and equipment at embarkation points.

Gear should be loaded into plastic bins with tight-fitting lids for transport to the islands. Bins containing food are especially attractive to rodents and invertebrates and extra care should be taken to ensure that pest-free transport of these items.

Biosecurity Staff Action Items:

- Require all contract managers, researchers and staff supervisors to verbally review biosecurity protocols with field staff;
- Develop and maintain invasive species education and outreach materials for concessionaire and visitors instructions at embarkation points;
- Create a small grant program for island concessionaires to enforce established biosecurity protocols;
- Conduct training with island staff to improve knowledge of island species, invasive species, and vectors, and;
- Insure that all contract managers write biosecurity protocols into contracts.

VI. Recommendations for Private Vessels

Invasive species are one of the leading threats to rare plants and animals on islands. There are a few simple things that boaters can do to reduce the risk of accidentally introducing invasive species while improving the condition of your vessel.

- **Rats and Insects** can easily slip aboard without your knowledge. Old food, bait, or garbage can attract these pests which threaten both island inhabitants and your boat. Rodents can chew wires, and wreak havoc on any boat while insects can be very difficult to get rid of. While loading stores, check boxes for ants and other hitch hikers, don't leave food out, and regularly inspect those hard to reach places. Frequently inspecting your vehicle for signs of chew marks on wiring, rope or other cargo could prevent harm to your boat and to the islands.

It is a good idea to keep rodent bait aboard for any unwanted stowaways. Use of exclusionary devices on mooring lines will reduce your risk of pest invasion.

Do not travel to the islands until your vessel is clean of rodent and vermin infestation, but if you must, do not land on the islands or tie-up your boat to the dock. If you see a rat in transit, and you're not able to dispatch it, you should not approach within 500 m of the islands.

- **Plants, Seeds and Fungus** can come aboard via dirty shoes or equipment. Washing dirt and mud off items at the mainland harbor before they come aboard will help keep your decks clean, while eliminating a vector for invasive species.
- **Aquatic plants and animals** could attach to your hull or stowaway in bilge and ballast water. A clean hull—especially below the waterline—clean anchors and line, clean propellers, keels, and rudders, and dry bilges will decrease the risk of transporting unwanted organisms while improving the performance of your vessel. Clean all mud, live material, and plant debris from your boat’s deck, hull, bilge, propeller, live well, anchors, and trailer before leaving your home port or the boat launch. Do not dump your bilge or dump or flush your ballast water nearby or at the islands.

Some boats are difficult to clean below the waterline or may transport invasive species in ballast or bilge water. Ideally, the home port, or ports that have been visited, are free of invasive species that risk introduction of invasive species to waters adjacent to the islands. Boats can reduce the risk of transporting invasive species by flushing and refilling ballast tanks with water from the open ocean before they arrive in port.

- **Pets** Even the cleanest, most well behaved dog could carry parasites or disease that island fauna has no resistance to. Inversely, your pet is also susceptible to the unique parasites on the island. For the safety of your pet and the islands, pets are not allowed on the islands owned by the National Park Service, US Navy, or US Fish and Wildlife.
- **Firewood** Don’t move firewood! You may have already heard this advice on the mainland because damaging agricultural and forests pests are being moved around the state at an unprecedented rate. Please don’t bring these very troublesome pests out to the islands with your unprocessed wood. More information is available at [“dontmovefirewood.org”](http://dontmovefirewood.org).
- **Cardboard boxes** – Cardboard boxes should not be used to transport cargo to the islands, unless those boxes are the original containers for the cargo. If no other containers can replace cardboard boxes before embarkation, 100% inspection is warranted if there is evidence of rodent or other vermin infestation and transport denied if infestations are found.

Keeping everything ship-shape is not only good for your vessel, it is also good for the islands you love to visit.

VII. Additional Recommendations for Agency or Concessionaire Vessels

- 1) Each boat should have rodent traps and/or poison on the boat, checked bi-weekly. A net and cage should remain on the boat to assist in animal capture if necessary.
- 2) Boat decks should be washed clean between cargo and passenger runs. Care should be taken not to transfer debris material from the mainland to island or among islands.
- 3) In the event an animal is discovered on the boat in transit, it must be contained before docking on an island. If the animal cannot be contained, the boat should return to the mainland.

VIII. Recommendations for Construction and Landscaping Supplies

Construction, landscaping, and nursery soils – There is a high risk of introducing invasive species to the islands with the importation of soil from the mainland. Amendments and construction soils, like mulch, topsoil, subsoil, fill, clean fill, and sand, can contain organic material that risks spread of invasive species from propagative parts, seed, spores, eggs, or cysts.

Ideally, in the process of construction, soils can be re-used, or manufactured, on-site, however, some projects may require more soils than are available on-site, or on-site manufacture of construction soils may be too expensive, not practical or not allowed, thereby, requiring the import of mainland soils and amendments.

When importing materials, be advised of the following guidelines:

- Construction materials and landscaping amendments that do not contain organic material like, pure sand, gravel and decomposed granite are low risk as the amount of organic material found therein is lower because invasive species and organic material are screened and washed out during its manufacture and the source may not contain invasive species.
- Highly processed topsoil, potting soils, potting mix, peat moss, vermiculite, fertilizer, and bark mulch sold in bags are lower risk. The cleanliness of sources of construction soils and the degree of processing should be considered during risk analysis.
- Compost, raw topsoil, manure, non-commercial bark mulch, and greenwaste mulch is too unreliable and should not be allowed onto the islands.
- Contract managers should specify in the purchase contract that the soil or gravel material will be freshly dug, from uncontaminated deposits buried 12 inches below the surface, and not stockpiled on the suppliers' site(s) prior to delivery.

- Material should be delivered to a clean site (i.e. paved and swept/washed, or equivalent) at the mainland departure point, and kept closely covered.
- Stockpiles should not be stored on the mainland for extended periods of inactivity before transport to the islands.
- Weed-Free Certification – all appropriate materials (those materials that have this type of certification) should be certified as “weed-free”.

Plants for Landscaping and Restoration should ideally be derived from the island where the landscaping or restoration is to occur. Otherwise mainland sources of plants for landscaping or restoration should be California Certified Nursery Stock or approved by Biosecurity Staff in accordance with the Biosecurity Program.

Lumber should be sourced from a responsible provider. Lumber should only be used if it is clean, new, processed lumber from California. All lumber must be certified pest-free by the distributor prior to transport.

Dumpsters and roll-off trash containers should not contain any garbage and should be steam pressured washed or thoroughly swept clean before embarkation. Garbage and roll-off trash containers should be emptied after use as appropriate and not shared between islands if garbage and remnants remain inside.

Post-construction Monitoring – Construction, landscape, and nursery sites and stockpiles on the island should be monitored for invasive species on an ongoing basis for freedom from infestation. Some sites may be amenable to the use of pre-emergent herbicides to prevent weed growth.

All Island-bound Cargo should be stored in a pest-free space, e.g. a secure storage unit if possible. All megabags should be secured shut with zip ties if loaded and left overnight. If supplies are not stored in a sealed container, then they must be inspected by staff prior to loading on mainland and immediately after arriving on the island.

IX. Current Biosecurity Programs and Goals by Island

San Clemente Island

Assessment of high risk vectors and species: Vehicles, footwear, untreated gravel or soil imported for construction and/or road maintenance, unauthorized boaters accessing southern beaches (in marine environment- marine debris). Invasive grasses, San Diego fairy shrimp, canine diseases, bagrada bug and other agricultural pests.

Vessel and point of entry surveillance: Prior to coming to San Clemente Island (SCI), staff will be asked to conduct a brief check for visible plant material, dirt, or mud on equipment and shoes. Any visible plant material, dirt or mud should be removed before leaving for San

Clemente Island. Tactical ground vehicles will be washed of visible plant material, dirt and mud prior to embarkation for San Clemente Island. But lack of enforcement means that boots and vehicles could introduce new invasive species. No plants are allowed to be brought onto the island and all restoration work at SCI is conducted using plants grown from SCI seed at the SCI greenhouse. Only military working dogs are allowed on island (no other animals) and there is a strict policy on their access. Imported gravel is supposed to be treated for weed seed, but there is a lack of enforcement.

Early detection methods: Opportunistic sightings: biologists on island reporting any incidental observations of new arrivals. *Goals:* Regular surveys at the most likely introduction points (i.e. barge landing).

Rapid response capacity: Opportunistic detection and treatment of new plant infestations near roads and training areas. On-site biologists are capable of trapping or hunting invasive mammals or reptiles.

Summary of responsibilities of staff and partners:

Volunteer coordinators for biosecurity concerns:

Audit and review schedule: Annual review of strategies, budget and contracts needed to complete goals.

San Nicolas Island

Assessment of high risk vectors and species: Air cargo from Point Mugu, barged cargo from Port Hueneme, direct flights to island (infrequent), cargo on passenger flights. *Rattus* spp., squirrels, raccoons, opossums, cats, snakes.

Vessel and point of entry surveillance: Mammal traps set on barge, barge cargo checked for stowaways before transported. Occasional mammal traps set at barge and cargo plane staging areas. Staging areas surveyed for current or new threats. There are brochures and posters on Bio-security with information on prevention and reporting located at passenger terminals and supply and shipping facilities. Presentation on bio-security is required to be viewed by all shipping staff.

Early detection methods: Invasive snail monitoring program in progress. Opportunistic sightings: biologists on island reporting any incidental observations of new arrivals.

Rapid response capacity: Annual funds for weed treatment that may be re-focused on new invasive weeds if required. Staff biologists setting traps for new mammalian species (effort may not be sufficient dependent upon threat) Annual bio-security monitoring funds can be re-directed at new arrivals.

Summary of responsibilities of staff and partners:

Volunteer coordinators for biosecurity concerns:

Audit and review schedule: Annual review of strategies, budget and contracts needed to complete goals.

Santa Barbara, Anacapa, Santa Rosa, San Miguel Islands

Assessment of high risk vectors and species: Rats, New Zealand mud snail, *Undaria pinnatifida* (algae), raccoons, opossum, gold spotted oak borer, Argentine ants, arundo, pampas grass, European honey bees.

Vessel and point of entry surveillance: NPS staff is responsible for themselves, their volunteers and contractors in checking for non-native biological agents on their person or in their gear and equipment. Random inspections are performed voluntarily by an NPS staff member on transportation days at the Harbor prior to boarding any vessel (varies depending on availability). Responsibility also extends to boat and landing craft captains and deckhands, specifically during transportation of cargo.

Early detection methods: A comprehensive weed map developed in 2014 for Santa Rosa Island. Comprehensive vegetation maps to be completed 2012-2015 (ANI, SRI, SMI). Opportunistic surveys for new weed populations conducted during vegetation mapping (SRI, SMI, ANI), by sea-bird crews (SBI) and by biological technicians and researchers (ANI, SBI, SCZ, SRI, SMI). *Goals:* Create a reference handout of the most at-risk species including most threatening non-native plant species and make it available on island in housing for staff and “visitors” to review.

Rapid response capacity: NPS staff available part-time to mobilize and confirm presence of invasive mammal species. Currently have a rat rapid response monitoring kit located on the mainland. *Goals:* One NPS point- person responsible for compliance permitting and contracts in place for rapid mobilization and implementation of a non-native mammal eradication effort.

Summary of responsibilities of staff and partners: NPS staff is responsible for communicating concerns and prevention methods with their volunteers and contractors. Park concessionaires - CIA, IPCO and Aspen are responsible for maintaining clean, pest free vessels during transportation of NPS staff and visitors to the islands. Kayak companies are responsible for their clients and gear. *Goals:* As part of an education campaign, CSU Channel Islands will implement “decontamination” protocols, under the advisement of NPS staff, for all of their staff, students and researchers coming out to the islands. NPS will enforce strict guidelines for CIA and Aspen for clients to check their gear before embarking to any of the islands.

Volunteer coordinators for biosecurity concerns: Dirk Rodriguez, Robyn Shea, Sarah Chaney.

Audit and review schedule: Annual review of strategies, budget and contracts needed to complete goals.

Santa Cruz Island

Assessment of high risk vectors and species: Rats, New Zealand mud snail, *Undaria pinnatifida* (algae), raccoons, opossum, spotted oak borer, Argentine ants, arundo, pampas grass, European honey bees.

Vessel and point of entry surveillance and prevention: Volunteer staffers of Island Packers Co. (IPCO) and NPS perform surveillance when gear and people are loading. *Goals:* IPCO is working towards an established station where all visitors would weigh and check baggage prior to loading. Kayak companies would work with their clients to check gear and boats for invasive species prior to departure from mainland. Improved educational signage distributed to the public on Island Packers boarding cards and around local harbors. Gear locker for on-island and IPCO staff at NPS and IPCO docks, designed so the staff maintain dedicated shoes for island-use.

Early detection methods: Remote camera surveillance performed within 500 m of island coast to target invasive mammals. Opportunistic surveys for new weed population during regular weed treatment. *Goals:* Annual training opportunities for island users in identification of invasive species detection. Establish a camera phone documentation program to record suspicious plant or animal sightings.

Rapid Response Capacity: Limited ability to confirm an invasive mammal sighting (rat rapid response kit). *Goals:* Compliance permitting and contracts in place to instigate a non-native mammal elimination program within a few weeks of a confirmed sighting.

Summary of responsibilities of staff and partners: TNC and NPS staff responsible for their own staff and contractors. IPCO and kayak companies are responsible for their clients and gear. Volunteer coordinators for biosecurity concerns: Christie Boser and Kate Faulkner.

Audit and review schedule: Annual review of strategies, budget and contracts needed to complete goals.

Farallon Islands

Assessment of high risk vectors and species: *Rattus spp.*, *Mus spp.*, plants and insects.

Vessel and point of entry surveillance: Plastic containers with no holes used to transport gear. *Goals:* Eliminate all cardboard. Rat/mouse kits available on patrol boats.

Early detection methods: Casual surveillance of plants during normal invasive plant control efforts, and pulling or spraying all non-native plants. *Goals:* Regular arthropod monitoring.

Rapid response capacity: Herbicide and equipment located on island. *Goals:* Rat traps on island ready to be deployed.

Summary of responsibilities of staff and partners:

Volunteer coordinators for biosecurity concerns:

Audit and review schedule: Annual review of strategies, budget and contracts needed to complete goals.

Appendix A: Incident Report Form: To be completed when a new species is discovered on an island.

Invasive Species Incident Report: California Islands

Island of sighting:

Date sighted:

Reported by: Name

Status: Contractor Visitor Staff Resident

Verified by agency staff: Yes No Name

Species detected:

Number of individuals or populations detected:

Description of sighting location: Place Name, reference point

Location of Sighting: UTM coordinates or lat/long

Description of verification process: Tools used, number of biologists involved,

Duration of verification effort:

Anticipated response to incursion:

Other Notes:

Please send form to caislandbiosecurity@TNC.ORG

Appendix B: Recommendations for Dog Entry and Exit from the Northern Channel Islands (Santa Cruz, Santa Rosa, and San Miguel) and the Navy Islands (San Clemente and San Nicolas)

Northern Islands:

Pre-Movement Quarantine

All dogs destined for shipment must be placed in a quarantine facility for 30 days before transport to any of the Northern Channel Islands. The purpose of this quarantine facility is to prevent infection of the dogs after they have been tested and treated for parasites and infectious diseases. The facility should be: 1) isolated from contact with other carnivores, and 2) an all-in/all-out facility (no entry of new animals during the 30 days). If possible, the dogs should be individually housed and the substrate should be concrete or other surface that can be disinfected.

Vaccination

All dogs will have a current vaccination for the following:

DHPP(LC)- Modified Live Virus Vaccines

Canine distemper virus

Canine infectious hepatitis (canine adenovirus)

Canine parainfluenza virus

Canine parvovirus

Leptospirosis

Coronavirus

Killed Vaccines:

Rabies

Bordetella (kennel cough)

Canine influenza H3N8

The entire vaccination series will be completed at least one month, but no more than six months, prior to the dog's arrival on the island. Dogs vaccinated less than one month prior to transport may shed modified vaccine virus or viruses acquired through natural exposure before being protected by vaccines. Dogs remaining on the island must be vaccinated annually with killed or subunit vaccines only (if available). If modified live vaccines must be used, the dogs should be kept in quarantine for 30 days after vaccination.

Parasites

All dogs must be negative for heartworms (*Dirofilaria immitis*) by *DiroCheck*[®] or *SNAP*[®] tests and be screened for microfilaria six months before being transported to the island. Dogs must then be placed on an appropriate heartworm preventative and kept on preventative treatments while on-island. Recommended preventative treatments are *Heartgard Plus*[®] or *Interceptor*[®].

All dogs must test negative for endoparasites prior to transport to the island. Three consecutive fecal samples over a 5 day period must be tested for endoparasites using both zinc and sugar floatation methods. Dogs with positive fecal tests should be treated with appropriate anthelmintics and then re-tested until they have three consecutive fecal samples test negative. If dogs are not individually

housed, then all contact animals must also be treated and retested. Dogs should be rechecked by the same protocol annually.

During quarantine, all dogs must be checked for ectoparasites, including *Sarcoptes*, *Demodex* and *Otodectes* mites. If positive for any mite, the dogs should be appropriately treated and rechecked until negative. If dogs are not individually housed, all contact animals should also be treated and retested. Once negative for ectoparasites, the dogs should be placed on an appropriate preventative before being transported to the island. Recommended preventative treatments are Interceptor® or Frontline®.

Health Certificate

All dogs must be given a complete physical exam by a licenced veterinarian to confirm that they are in good general health and free of evidence of any infectious diseases within ten days of being transported to the island. The examination should include confirmation of vaccination status, confirmation of negative heartworm, endoparasite, and ectoparasite tests (including ear mites) and a negative Lyme disease test.

Post-transport Quarantine

Vaccinated animals can still be subclinically infected with infectious agents, such as canine distemper, and can therefore act as a source of infection for island foxes. Most dogs that mount an effective immune response to canine distemper virus clear the virus from their system within two weeks of exposure and cease to shed the virus. Also, most subclinical diseases caused by other agents usually become apparent within three weeks. Therefore all dogs transported to the islands must be quarantined on-island for three weeks in a location and facility that is inaccessible to island foxes. Dogs should be physically assessed by a veterinarian if possible before being released from quarantine. Feces and urine from quarantined dogs should be disposed of in such a manner that foxes are not exposed to either feces or urine or the effluent from the disposal areas (see facility recommendations below).

Periodic fecal parasite checks should be done every 3 – 6 months while dogs are on the island.

Inter-Island Travel and Re-entry Requirements

The requirements for vaccination, parasite screening and quarantine are triggered each time a dog travels from the mainland to an island or travels between islands.

Dog Holding/Quarantine Facility Recommendations

Dog holding pens should be constructed in such a way as to have both inner fences and an outer perimeter fence separated from the dog holding pens by at least a 30 foot buffer space to prevent aerosol exposure to island foxes. In addition, multiple strands of electrified wire should be strung on the top of the fence to further discourage foxes from climbing into the facility. This fence design incorporates features that have been successful in keeping wild foxes from entering the Santa Catalina Island fox breeding facility.

Storage of food and equipment should be in a secure off-site location to further deter foxes from attempting entry into the dog holding facility.

Rubber boots should be worn inside the perimeter fence and a shoe bath and brush should be provided to step in as leaving to avoid carrying feces outside the perimeter on shoe bottoms.

All fecal waste from dog holding pens will be collected and disposed of in a waste digestion tank or sewage system. Effluent from digestion tanks will discharge underground into the earth. No effluent

from the digestion tank will be discharged above ground. Pens will periodically be washed down with water.

If no concrete trough is present to catch runoff from runs, especially during rains, a ditch should be dug around the outside of the dog runs (inside of perimeter fence) to prevent rain runoff from carrying dog waste through or under perimeter fence.

Recommendations for dogs leaving the island:

Because domestic dogs residing on any of the northern Channel Islands may have acquired intestinal parasites from the foxes that may not have been controlled by routine monthly parasite preventatives, and might not be detected by routine fecal parasite checks, it is recommended that the dogs have pre-departure precautionary parasite treatment.

Treatments listed are by parasite type.

For Spirocerca:

Doramectin 10 mg/ml (1%) strength injectable (Dectomax or generic)

Dose = 0.4 mg/kg subcutaneously every 2 weeks beginning 6 months before departure from the island

Examples: A 20 kg (44 lb) dog would get 0.8 ml (ml's are the same as cc's) each dosing.

25 kg – 1.0 ml each dose

30 kg – 1.2 ml each dose

35 kg – 1.4 ml each dose

Ivermectin is the alternative treatment if doramectin is not available, but

DO NOT GIVE BOTH DORAMECTIN AND IVERMECTIN:

Ivermectin 10 mg/ml (1%) strength injectable (Ivomec or generic)

Dose = 0.3 mg/kg every 2 weeks on same schedule as above.

Examples: A 20 kg (44 lb) dog would get 0.6 ml each dosing

25 kg – 0.75 ml each dose

30 kg – 0.9 ml each dose

35 kg – 1.05 ml each dose

Certain dogs are overly sensitive to Doramectin or Ivermectin, and can have symptoms of toxicity after dosing. Symptoms can be mild to severe (from mild lethargy or GI symptoms to seizures and collapse). A veterinarian should be consulted immediately if any significant symptoms occur with these or any of the drugs outlined.

For Mesocestoides:

Praziquantel 56.8 mg/ml strength injectable (Droncit or generic)

Caution - avoid giving this drug on the same day as Doramectin or Ivermectin because both may cause lethargy, GI upset, or other symptoms in some dogs

Dose = 0.2 ml / 2.3 kg (5 lb) body wt subcutaneously (to a maximum of 3 cc) – give 3 doses, 3 weeks apart.

Examples: A 20 kg (44 lb) dog would get 1.8 ml subcutaneously.

25 kg – 2.2 ml each dose

30 kg – 2.6 ml each dose

35 kg – 3.0 ml each dos

For Coccidia (Isospora, possibly others):

Sulfadimethoxine 500 mg tablets (Albon or generic)

Dose = 50 mg/kg the first day orally, then 25 mg/kg daily.

Treatment should start 3 weeks before departure and continue daily till 2 weeks after arrival.

Examples: A 20 kg (44 lb) dog would get 1,000 mg (2 of the 500 mg tablets) the first day, then 1 tablet (500 mg) each day thereafter

25 kg – 1,250 mg (2 ½ tablets) the first day, then 625 mg (1 ¼ tabs) each day

30 kg – 1,500 mg (3 tablets) the first day, then 750 mg (1 ½ tabs) each day

35 kg - 1,750 mg (3 ½ tablets) the first day, then 875 mg (1 ¾ tabs) each day

For Uncinaria, Toxocara / Toxascaris:

Fenbendazole 100 mg/ml oral suspension (Panacur)

Dose = 50 mg/kg orally once a day for 3 days, then repeat the 3 day course

3-day treatment should be given 3 times prior to departure from the island at 3 week intervals

Examples: A 20 kg dog would get 1,000 mg (10ml) orally daily for 3 days each dosing

25 kg – 1,250 mg (12.5 ml)

30 kg – 1,500 mg (15 ml)

35 kg – 1,750 mg (17.5 ml)

The suggested schedules above are approximate. Multiple drugs should not be given on the same day, so scheduled treatments should be staggered. An exception is that the daily dose of sulfadimethoxine (Albon) can be given at the same time as any one of the other drugs.

Associated fecal parasite analysis:

A set of 3 fecal samples should be collected over a 5 day period for analysis by both zinc and sugar flotation methods prior to initiation of treatment. A second 3 sample set of fecal samples should be collected and analyzed ~7 days (to allow for analysis time) before the dogs leave the island.

After departure of dogs from the island, options for sterilization of dog housing areas for the purposes of reducing or eliminating parasite eggs are:

The top 6 inches of soil can be removed and buried below 18 inches of normal soil.

The area can be protected from foxes – because parasite eggs are very persistent in the environment, the area should be kept protected for 10 years.

The soil (or other surface) can be steamed with a steam pressure cleaner – this works well for hard surfaces like wood or concrete, and can be effective with soil, but depth of penetration of the steam is difficult to determine with certainty.

Hydrated lime or sodium borate may be mixed with the soil to kill parasites with desiccation and heat. Concrete areas can be treated with bleach or ammonia.

Movement of Working Military Dogs on and off the Navy Islands (Nicolas & Clemente):

It is recognized by the fox health group that military operational considerations are sometimes at odds with previously recommended protocols for dogs entering the islands, especially requirements for quarantine periods. If quarantine periods are not possible, we recommend that all feasible measures should be taken so that there is no direct exposure of foxes to working dogs and their waste materials. We also recommend that all military working dogs taken to the islands be current on their vaccines and currently on a monthly parasite preventative.

We also strongly recommend that no military working dogs come to the island within 2 months of any overseas deployment. This is to make it more likely that any infectious diseases acquired during a deployment will have been detected clinically or through testing prior to entry to the island.

Appendix C: California’s Regulation of Plant and Pest Movement

The California Department of Food and Agriculture and the agricultural commissioners regulate the export, import, and intra-state transport of plants and pests for California. Services are performed and are available that can assist in Channel Islands biosecurity. Ornamental plant nurseries, including native plant nurseries, are subject to standards of quality to prevent the introduction and spread of agricultural pests through nursery stock and to protect agriculture and the consumer against economic losses resulting from the sale of inferior, defective, or pest-infested nursery stock. While the Channel Islands are not a politically separate entity, they are a distinct ecosystem that can benefit from California’s certification and inspection system. For instance, nurseries that ship plants to Canada may be required to be free from European brown garden snail, and other snail and slug pests. Additionally, there are restrictions on the intra- and interstate movement of plant hosts of sudden oak death, a fungal disease of oaks and other plants. There are many regulated pests that are potential threats to the Channel Islands, like the gold-spotted oak borer, gypsy moth and red imported fire ants. The CDFA and the agricultural commissioners work in cooperation with the California Department of Fish and Wildlife to prevent the introduction of some invertebrate pests like zebra mussels and vertebrate pests, such as coqui frogs and pythons. More information is available from the California Department of Food and Agriculture and from the local agricultural commissioner.

| | | |
|---|--|--|
| CA Dept of Food and Agriculture (916) 654-0466 www.cdfa.ca.gov | Agricultural Commissioner County of Santa Barbara (805) 681-5600 www.agcommissioner.com | Agricultural Commissioner County of Ventura (805) 933-2926 www.countyofventura.org |
|---|--|--|

Appendix D: Comprehensive Biosecurity Plans by Island:

San Nicolas:

Full plan can be viewed at:

Instructions:

NAVBASE VENTURA COUNTY INSTRUCTION 5090.XXXX

Subj: BIOLOGICAL RESOURCES SECURITY (BIO-SECURITY)
REQUIREMENTS FOR AIR AND BARGE TRANSPORT OF ALL
CARGO TO NAVAL BASE VENTURA COUNTY (NBVC), SAN NICOLAS
ISLAND (SNI)

Ref: (a) Endangered Species Act
(b) Federal Noxious Weeds Act
(c) Alien Species Prevention and Enforcement Act
(d) National Invasive Species Act
(e) Sikes Act
(f) OPNAVINST 5090.1C

Encl: (1) Bio-Security Requirements for All Cargo Being
Transported to NBVC San Nicolas Island Via Barge or
Aircraft (For distribution to shipping parties)
(2) NBVC San Nicolas Island Bio-Security Plan

1. Purpose. To establish policy, guidelines, and responsibility for reducing potential introduction of ecologically harmful non-native flora or fauna to NBVC SNI via barges or aircraft flights.

2. Cancellation. This does not cancel any previous instruction.

3. Background. When non-native species are introduced into new areas there are almost always detrimental effects to the ecosystem. Impacts are usually more severe when introduced to island environments. These detrimental effects can have an adverse effect to Navy mission by damaging property and reducing mission capabilities, impacting training areas, introducing human and animal disease, contaminating food, impacting federally endangered or sensitive species, and destroying habitat and ecosystem diversity and function.

4. Policy. To comply with references (a-f) and in support of the Navy's environmental program set forth by reference (f) and the Integrated Natural Resource Management Plan for Naval Base NBVC SNI. To support these policies, protective measures are being enacted by the Commanding Officer of NBVC to reduce the potential of introductions. These measures will support ecosystem and mission protection on SNI.

5. Definitions

- a. Non-native species - A species that is not found naturally on SNI.
- b. Bio-Security - Measures used to protect an area from biological invasion of non-native species.
- c. Red-tagged - Any equipment not allowed to be transported to SNI following an inspection, as it has a likely potential to introduce non-native species to SNI.
- d. Shipping Party – Any Navy Command, Department, contractor, government employee, or other individual shipping materials to SNI via barge or aircraft.
- e. Other transport methods - Any federal agency or other party utilizing alternative methods to move cargo to SNI, such as small aircraft, landing craft, and helicopters.
- f. Stowaway – A living creature that was not purposefully placed on board a ship or plane, hiding in cargo, containers within the vessel or aircraft.
- g. Invertebrate – Animal species that do not have a backbone, such as insects, spiders, snails, pill bugs, scorpions, etc.

6. Responsibilities and Actions.

a. NBVC Environmental Division

(1) Responsible to check staged cargo for aircraft or barge to ensure equipment and materials are free of plant or animal species. This will be attempted during every barging event and less frequently for cargo flights (as threats are lower in comparison to barge). Environmental Division may also spot-check cargo on passenger flights (This will not involve opening any personal bags).

(2) Responsible to red-tag equipment suspected of harboring plant or animal species and contact shipping party immediately, so party can remedy to allow for shipment. This includes potential seed materials, fungus, disease, etc. that may be transported in soils or mud clinging to equipment. Environmental Division will contact the appropriate shipping staff to alert them of any red-tagged cargo that should not be loaded for transport to SNI.

(3) Support the bio-security educational effort by providing the Bio-security presentation and Bio-security Plan to required parties. Keep bio-security presentation and SNI's Bio-Security Plan current. Print and maintain bio-security posters and handouts. Ensure handouts available at both SNI and Point Mugu air terminals.

(4) Coordinate or participate in setting traps and biological surveys in barging and aircraft cargo staging areas on island and mainland to determine any potential threats or recent arrivals.

(5) Provide footwear cleaning stations and associated signs for placement at Point Mugu and San Nicolas Island terminals.

b. Shipping Party

(1) Required to review the Bio-Security Requirements (enclosure (1)) and ensure requirements are met and followed.

(2) Clearly mark cargo with a contact number, so they can be contacted in the event their equipment is red-tagged.

(3) When shipping via non-regularly scheduled aircraft or barge, the shipping party must contact Environmental Division in advance to schedule any necessary inspections.

c. Barge Operations (NAVAIR, NBVC, and contracted barge company)

(1) Responsible for reporting any plant or animal species observed on barge during transport, loading, and unloading or observed in staging areas.

(2) NAVAIR staff associated with barge must forward the Bio-Security Requirements (enclosure (1)) with each barge shipping request form sent to shipping party, so party will be aware in advance of requirements. The Barging company must allow the placement of traps on the barge, ensure rodent barriers are in place along mooring lines when docked on mainland and alert Environmental Division if traps capture any animals.

(3) The Barge Operator and loading staff will not allow any cargo that is red-tagged to be placed on the barge.

(4) Any staff involved in barge loading, unloading, maintenance must review the Bio-Security presentation.

d. Base Operations (NBVC and Tenants involved in transport to SNI)

(1) Responsible to ensure cargo planes are free from plant or animal species and report any observations to the Environmental Division.

(2) For SNI non-regularly scheduled flights, Base Operations will provide Bio-Security Requirements (enclosure (1)) in advance to staff requesting to land on the island. Base operations must contact Environmental Division before allowing approval to land on SNI, to confirm party communicated with Environmental Division to discuss cargo being transported and potential inspection upon arrival.

(3) Any staff involved in cargo plane loading, unloading, maintenance and flights must review the Bio-Security presentation.

e. Air Terminal and Air Terminal Shipping Staff

(1) Report any observations of animals seen in cargo staging area to the NBVC Environmental Division.

(2) Ensure staff monitoring X-ray scanners also watch for evidence of plants or animals in baggage.

(3) Responsible to ensure all staff working in terminal and shipping office review bio-security presentation.

(4) Ensure Bio-Security posters are prominently displayed on Mugu and SNI terminals.

(5) Terminal shipping staff will not allow any cargo that is red-tagged to be placed on cargo plane.

(6) Ensure there are foot-wear cleaning stations with instructional signs placed at entrances to Mugu and San Nicolas terminals.

f. NAVSUP FLC

(1) Responsible to ensure packed items going through supply are free of plants, soil, stowaway insects, or animals before sealed and before taken to terminal.

(2) Contact NBVC Environmental Division if shipping material does not meet bio-security requirements.

(3) Responsible to put in a service call and contact NBVC Environmental Division if any pests observed in supply staging area/building.

(4) Ensure bio-security poster is prominently displayed in their supply staging area.

(5) Responsible to ensure all staff working in supply department review bio-security presentation.

(6) Provide bio-security requirements (enclosure (1)) to all shipping parties bringing in cargo, to increase awareness and requirements for subsequent arrivals of cargo by individuals to be packaged by office.

7. Requirements Process

a. Shipping party will have received bio-security requirements before bringing cargo for shipment (during most cases).

b. If plants or animals are observed in cargo by any of the parties referenced in this document, cargo should not be shipped and NBVC Environmental Division should be immediately notified.

c. If staged shipping items are searched by NBVC Environmental Division staff and not deemed safe for transport as they harbor or may likely harbor plants and animals, they will be red-tagged and not allowed to be transported to SNI. NBVC Environmental Division will contact the shipping party to determine what is required to remedy situation at the shipping party's time and/or cost.

d. After concerns are resolved and threat removed, NBVC Environmental Division will be contacted to re-inspect cargo and remove the red-tag only if the problem is considered remedied by the NBVC Environmental Division.

e. After red-tag is removed, the shipping party can then re-schedule cargo for shipping.

f. If no contact information is available (even though required), the NBVC Environmental Division will attempt to determine shipping party.

g. If the shipping party cannot be identified, cargo will remain at the staging area until shipping party is determined and threat associated with cargo is resolved.

BIO-SECURITY REQUIREMENTS FOR ALL CARGO BEING
TRANSPORTED TO SAN NICOLAS ISLAND VIA BARGE,
AIRCRAFT, OR OTHER TRANSPORT METHODS

NBVC Bio-Security Program Information

The below requirements are set forth under Naval Base Ventura County Instruction (5090.XXXX) to establish policy, guidelines, and responsibility for reducing potential introduction of ecologically harmful non-native flora or fauna to San Nicolas Island (SNI) via barges or aircraft flights. When non-native species are introduced into new areas there are almost always detrimental effects to the ecosystem. Impacts are usually more severe when introduced to island environments. These detrimental effects can have an adverse effect to Navy mission by damaging property and reducing mission capabilities, impacting training areas, introducing human and animal disease, contaminating food, impacting federally endangered or sensitive species, and destroying habitat and ecosystem diversity and function.

To reduce chances of accidental introductions, cargo will be inspected for bio-security threats (presence of plants, animals, invertebrates, and soil) at Point Mugu or Port Hueneme staging areas before transport, or for non-regular cargo, inspections may occur on San Nicolas Island (SNI) prior to offloading. This may involve lifting of tarps or some movement of material if view obstructed. If the below bio-security requirements have not been met by the shipping party, cargo will be red-tagged and will not be allowed to be loaded on barge or aircraft, or will have to immediately be taken off SNI. The shipping party will be contacted if below requirements are not met and cargo red-tagged and determined a threat to bio-security. The shipping party must then ensure all bio-security requirements below are met and bio-security threat removed before Environmental Division will authorize for transport to SNI. After noted threats are remedied, cargo will then be re-inspected by the Environmental Division and if the threat is removed, cargo will be authorized for transport to SNI. All of the below requirements must be completed by all shipping parties.

Any costs incurred by delays due to cargo being unfit for transport or from required cleaning or pest extermination are the sole responsibility of the shipping party.

Shipping Party Requirements

1. A contact information tag (or written on, if boxed) must be prominently displayed on barge shipping materials. Information must include name of shipping party, general description of cargo being shipped, and a contact phone number.
2. All cargo shipped to SNI must be inspected by shipping party to ensure no stowaway plants, animals, or invertebrates are present before taken to staging area. If insects are found (ants, spiders, snails, etc), they must be removed or sprayed with insecticide. Any animals must be removed from cargo. Flashlights should be used to search in dark corners for eye-shine of mammals or presence of animal droppings. All cargo must be clean and free of soil, plant material, or debris, as soil may harbor plant seeds. Cargo must be clean (ie. dumpsters or heavy equipment buckets must be swept out).
3. Vehicles and heavy equipment must be power-washed throughout, including underneath frame and wheel wells to remove excess dirt that may harbor invasive seeds.
4. All base material such as gravel for road or airfield repair projects must be certified "weed free", with no soil/sediment allowed to be transported to the island.
5. Cargo material openings must be closed if feasible, so no animals may find refuge while awaiting transport in staging areas.
6. If feces are found (such as mouse droppings) during inspection and/or cleaning by shipping party, Environmental Division must be notified ((805) 989-3808, or (805) 989-4740) so an intensive search of cargo can be completed at staging area to ensure cargo is free of any stowaway animals.
7. The shipping party is responsible for contacting Environmental Division to arrange for a re-inspection of cargo that has been red-tagged, once issues are remedied.
8. Shipping via non-regularly scheduled barges or cargo flights must be arranged in advance with Environmental Division to arrange inspection on or before transport to SNI.

NPS Islands:

Non-Native Species Prevention Plan for the
Channel Islands National Park, California

Prepared by:
Gregg Howald and Eileen Creel

Island Conservation NorthWest
Kelowna, BC, Canada

Island Conservation
University of California,
Santa Cruz, California

Goal of Plan

Provide recommendations to prevent the accidental or deliberate transportation and introduction of non-native species to the islands of Channel Islands National Park.

Introduction

Islands, such as the islands of Channel Islands National Park, are important for the conservation of biodiversity because they are:

1. critical habitat for seabirds, pinnipeds and sea turtles; top marine predators and herbivores that can play an important regulatory role over thousands of kilometers of ocean;
2. rich in endemic species (islands make up about 3% of the earth's surface, but are home to 15-20% of all plants, reptiles, and birds).

Unfortunately, islands have been disproportionately impacted by humans. About 70% of recorded animal extinctions have occurred on islands and most of these extinctions were caused by introduced species. Despite this impact, island ecosystems are a unique opportunity for conservation because:

1. whole functioning ecosystems can be preserved in small protected areas;
2. introduced species can often be removed allowing ecosystems to recover.

The Channel Islands National Park has invested a great amount of effort and funds into restoring and protecting the islands, however, the threat of re-introduction of non-native species is high – either from the mainland or species moving between islands.

The single greatest ecological threat to the biodiversity in the Channel Islands National Park is non-native species. Without an alien species prevention plan, further introductions and continued degradation of the diverse ecosystems in Channel Islands National Park are imminent. Since the costs of repairing damage done by non-native species can be exorbitant, preventing introductions from occurring is the most cost-effective and prudent action for protecting the islands.

This prevention plan analyzes the pathways by which non-native species travel to the islands and provides specific recommendations to prevent their transport and introduction to Park islands. The plan focuses on minimizing risk of introduction via particular pathways rather than addressing individual invasive species issues. When incorporated into a management plan, the recommended actions will intercept a diverse group of non-native species including weeds, invertebrates, vertebrates and pathogens and reduce or eliminate the risk of them from being transported to Park islands.

History of Invasive Species in the Channel Islands National Park

Non-native species on islands of the Channel Islands National Park have proven to be devastating to the ecosystem and very costly to eradicate, relocate or control. Sheep, goats, pigs, cattle, deer, elk, horses, and rabbits were brought out intentionally, and are directly responsible for more than twenty plant species being federally listed as threatened or endangered. Costs of restoration can be prohibitive; for example, it will cost an estimated \$80,000 to restore around two acres of Island Oaks on Santa Rosa Island that were impacted by non-native pigs and cattle. Relocating the sheep from Santa Cruz Island cost the NPS an estimated \$2,200,000. Removing rats from Anacapa Island has been an enormous task, and has an estimated cost \$1,600,000. Rats on San Miguel, numerous noxious weeds on all islands, and Argentine ants on Santa Cruz are all species that were accidentally introduced to the islands and still require eradication, removal, or control.

Pathway of Introductions

There are two major pathways by which non-native species may be transported to the islands: **natural processes** (e.g. birds dispersing weed seeds from the mainland; rafting from the mainland or between islands) or assisted by **human related activities** (e.g. onboard boats or aircraft (Table 1).

Natural Processes

Natural processes present a real and potentially high threat for introduction of certain non-native species to Park islands. The islands are relatively close (Anacapa is <20 km from Ventura) for many mobile species. However, the distance to the islands, tidal currents and sometimes rough seas in the Santa Barbara Channel provide a natural barrier, preventing many species from reaching the islands on their own. Despite the natural barrier, there is an obvious risk of invasive species reaching the islands without the deliberate or inadvertent assistance of human activity (i.e. by natural processes).

Non-native species can make their way to or between the islands either *actively*, (i.e. unassisted and under their own power), or *passively*, such as drifting on air or ocean currents, transportation by another species (e.g. weed seeds deposited in droppings on island after transport by granivorous birds), or rafting on debris washed offshore from the mainland or other islands. For example, *Arundo* is a highly invasive weed that is regularly washed offshore during periods of high rainfall on the mainland. Its ability to survive saltwater immersion allows it to drift to Channel island beaches, where it is known to establish sprouts. Unfortunately, the colonization rate of non-native species on the Channel Islands via natural processes is unknown and difficult to quantify. However, as the threat of such introductions is potentially great, any comprehensive management strategy must incorporate plans to detect and respond to invasions by natural processes.

Human Related (Anthropogenic) Pathway

Anthropogenic (human related) introduction pathways are responsible for the greatest number of non-native species reaching islands as well as the greatest number of potential invasions by any one species (Table 1). The risk of non-native species being transported to the islands increases with higher amounts of island:

1. human use (i.e. staff, contractors and tourists);
2. boat and aircraft traffic; and
3. activity

(see Aycart and Hernandez 2003; Heydenrych and Jackson 2000; Chown and Gaston 2000; Chown et al. 1998).

The islands of Channel Islands National Park are extremely vulnerable to introduced species through a variety of pathways (Table 1). The Park frequently uses a multitude of transport vessels, each of which has the potential to carry non-native species. Each time helicopters, small fixed wing aircrafts, or boats (Park, concession, or private) transport people, equipment and supplies between islands and to and from the mainland, the chances of

introducing non-native species to the islands increase (Table 1). As more non-natives are introduced and established on islands, the risk that they will be transported between islands grows even larger. People, clothing, equipment, supplies and inter-island transport vessels are all potential vectors by which non-natives can be introduced to islands (Table 1).

Table 1. Source, Vectors and Modes of Transporting Non-native Species to the Islands of Channel Islands National Park, California.

| Source of Non-Native Species <i>Global, Regional and Local Community Harbors and Airports</i> | Potential Vector <i>Equipment and Supplies, People, Animals and Plants</i> | Transport to Islands <i>Boats and Aircraft</i> |
|---|--|--|
| NPS HQ | Vehicles | NPS Boats |
| Ventura Harbor | Construction Equipment | Concession Boats |
| Channel Islands Harbor | Miscellaneous Equipment and Supplies | Contract Boats |
| Port Hueneme Harbor | Foodstuffs | Commercial Boats |
| Santa Barbara Harbor | Clothing, Shoes and Human Waste | Dive Boats |
| LA Harbor | Animals and Plants | Private Boats |
| Camarillo Airport | | Contract Helicopters and Fixed Wing Aircraft |
| Santa Barbara Airport | | |
| Oxnard Airport | | |

Reducing Risk of Introducing Invasive Species

To reduce the risk of introducing non-native species to the islands, we recommend the potential introduction pathways be closed or narrowed through a combination of:

1. Monitoring and controlling potential non-native species at boat and aircraft departure points.
2. Implementing guidelines for potential vectors, including:
 - a. Storing supplies and equipment destined for the islands in a safe storage area
 - b. Inspecting and cleaning all supplies and equipment, boats and aircraft before loading and departure to the islands.
3. Prohibiting high-risk materials from being transported to the islands.
4. Educating staff, contractors/cooperators, and the public about the risk of invasive species and the ways in which they can minimize the introduction risk.
5. Monitor and Control Non-native Species at Departure Points

The mainland harbors, airports, and island landings provide potential habitat for a variety of non-native weeds, invertebrates, rodents and other mammals, all of which could carry potential pathogens. Local populations of non-native species near departure points may increase the risk of introductions by boarding the aircraft, boats, and ships or by becoming attached to or getting in to any gear or supplies destined for the islands prior to departure. Thus, an intensive program to monitor and control invasive species at departure points, and reduce quality of

habitat for some species (such as rodents) should be implemented. Specifically, we recommend that the Channel Islands National Park:

- 1) Routinely inspect and control non-native weeds growing in close proximity to the dock areas on the mainland and island landing areas. Seeds may become airborne or if they are in close proximity to equipment they may be inadvertently attached to gear and transported to the islands. In addition, docks and landing areas provide food and cover habitat for invertebrates, rodents and other non-native species.
- 2) Keep the island airstrips weed free to prevent aircraft from picking up weed seeds and/or plants and transporting weeds to other islands. Or, alternatively, adjust flight plans so that there is no inter-island travel.
- 3) Control non-native rodents at NPS headquarters, docks and vessels. Bait stations, traps, and tracking boards should be placed in the harbor at headquarters and on all NPS and concession vessels.

Bait stations armed with a wax-based bait serves two purposes. First, the bait would intercept and kills any rat or mouse that may be in the area. Second, incisor marks on the bait blocks would be left behind indicating that rodents were in the area. Bait stations, traps, and tracking boards should be checked on a weekly basis, and the bait stations should be rearmed depending upon how fast bait is removed. The cost of supplying bait stations and rearming them is relatively low (Table 3).

Bait stations can be managed by NPS staff or by a local pest control company. Table 3 compares the cost of using a pest control company versus the National Park Service implementing their own bait stations (assuming that NPS Headquarters needs twenty bait stations based on a 10m standard spacing around buildings and facilities and thirteen bait stations on NPS and concessionaires’ boats).

Table 3. Expected costs of installing bait stations at NPS Headquarters.

| Pest Control Company | | National Park Service | |
|----------------------|-----------------|-----------------------|-----------------|
| Service/Equipment | Estimated Price | Service/Equipment | Estimated Price |
| Bait Stations (33) | \$511.50 | Bait Stations (33) | \$250.47 |
| Monthly rearming | \$99.00 | Monthly rearming | \$51.15 |

- 4) Establish a buffer zone on the island landings to intercept non-native rodents. The buffer zone should close off all possible escape routes to the islands. Gear and supplies should be unloaded and inspected in this area before transport to the rest of the island. Traps and/or bait stations could be armed during critical periods to intercept any rodents that may escape initial detection. For example, traps and stations could be armed just prior to the offloading of gear, remain armed for up to 72 hours and de-armed to minimize risks to non-target mice or other animals.
- 5) Monitor and control invertebrates at NPS Headquarters, docks and vessels.
- 6) Work with the concession vessel owners and airports to implement the above recommendations.

2.0 Guidelines for Potential Vectors

To prevent the introduction of non-native species, all equipment, supplies, vehicles and boats should be:

- a. stored or managed in a “safe” manner to protect against contamination by non-native species before being transported to or between the islands;
- b. inspected and treated to intercept non-natives before being loaded onto boats or aircraft and subsequently transported to the islands.

The goal of “safe” storage is to protect all gear and equipment from becoming contaminated with non-native species before it departs the mainland for the islands or between islands. To be considered safe, storage facilities must be protected against invasion of vertebrates, invertebrates, weeds, and pathogens. The objective of the “safe” zone is to prevent highly invasive species from gaining access to equipment and supplies and subsequently being transported to the islands. A detailed outline of the conditions of “safe” storage is in Appendix A.

The goal of inspections is to detect and intercept any non-native species that may have infiltrated equipment or supplies either while in storage or having arrived in the supplies and equipment. This is a second-layer of protection, which provides an added buffer in case the storage facilities are not effective or not used. Inspections are crucial to the success of any prevention plan, especially for high-risk materials such as construction materials, wheeled vehicles, and pallets of equipment that have many places for species to hide and cannot be easily stored safely. The level or scale of inspection will vary for different materials and is dependent on the risk of the material harboring non-native species.

The type of treatment or cleaning will vary depending on the equipment and supplies being transported. The goal is to reduce the probability that a non-native weed, pathogen, vertebrate or invertebrate escapes detection on inspection and is inadvertently transported to the islands. We suggest that the Park develop a risk index that outlines amount of inspection and treatment effort for different types of material (Appendix B). Generally, equipment and supplies can be classified into three categories of risk for potentially transporting non-native species: low, moderate, and high. Low risk materials, such as personal backpacks can be simply visually inspected and anything found can be removed, while moderate risk materials (such as bulk supplies) should be taken apart and visually inspected and possibly treated. High-risk materials (such as palletted materials) should be taken apart, inspected, and aggressively treated if necessary. If it is not feasible to take apart high-risk materials or they cannot be cleaned, they should be assumed to contain the suite of invasive species and treated appropriately (Appendix A).

The following are recommended guidelines for specific potential vectors.

2.1 Heavy Equipment and Vehicles

Earth Moving and Construction Equipment

- Includes vehicles, tractors, shovels and associated tools for use in construction. All vehicles should be washed and inspected prior to departure, especially earth moving and heavy equipment such as vehicles, tractors, shovels, and associated construction equipment. In particular, equipment should be cleaned of soil and vegetative matter before being allowed on the boats and transported to islands.
- Construction earth moving equipment should not be allowed to move between islands without being transported first to the mainland and cleaned.

Yellow star thistle, a highly noxious weed, was introduced onto Santa Cruz Island, transported inadvertently by a vehicle.

A high-risk pathogen called Sudden Oak Death has recently been discovered in Northern California and is destroying stands of native California oaks. The pathogen can be transported in soil and will decimate endemic island oaks should it be introduced onto the islands. It is easy to transport soil especially on vehicles as caked on mud, in tires, on shovels, or saws. It is imperative all equipment be cleaned of soil and vegetation to prevent the spread of this disease.

- All vehicles should be washed and inspected to ensure no transport of soil or vegetative matter.
- Weeds, vertebrates, invertebrates can be transported in the least likely places such as under the hood of a vehicle.

2.2 Equipment and Supplies

- Equipment (large and small) should be stored and transported in a manner which prevents the attraction or transport of seeds, invertebrates, vertebrates and pathogens. Wherever possible, gear should be loaded into, stored and transported in containers with tight fitting lids, that can prevent access by mobile species such as invertebrates and vertebrates (such as rodents).
- Gear and equipment should not be left where it is at risk for attracting and harboring potential non-native species prior to departing. For example, leaving large equipment that provides cover and food for rodents and insects in the open is a dangerous practice. Gear that is left out in the open may also be exposed to potential weed seeds blown around or carried by other species. Currently, gear is left out overnight or longer prior to departure allowing time for vertebrates, invertebrates, and weed seeds to infest the gear or equipment. Types of safe storage units include plastic or metal containers with tight fitting lids, conex boxes, inside park buildings, or cold (freezer) storage.
- During the loading and unloading process all containers used in transport should be cleaned of any item that may have spilled, especially foodstuffs and soil. This practice will reduce the risk of attracting insects, rodents or other pest species
- Know the source of equipment to protect against taking supplies that have come from areas that are infested with non-native species. If the source is not known, equipment should be treated as high-risk.
- Current hot spots that are infested with non-native species or dangerous pathogens should be known, and that information should be available for employees and visitors.

For example, reports of Sudden Oak Death range from Sonoma County in the north to Big Sur County in the south. This pathogen is severe in Marin, Santa Cruz, and Monterey Counties. Also, Red Imported Fire Ants have been reported in almost every county south of Los Angeles County. These ecosystem-altering species are getting dangerously close and equipment coming from these areas should be given special attention.

- Only clean, new, and processed lumber from California should be used for projects on the islands.
 - Wood can harbor invertebrates, weeds and pathogens; wood from other states or countries can be especially dangerous. In particular, wood from the Southeastern United States should never be taken to the islands because of the risk of introducing foreign pathogens and invertebrates. All wood should be processed and ideally treated, with no traces of bark or soil.
 - Under no circumstances should firewood or any unprocessed lumber with bark be allowed on the Channel Islands. Bark can provide habitat to many invertebrates and could carry pathogens.

- Bundled lumber should be taken apart, inspected thoroughly, and restacked before leaving the mainland as it could harbor animals and/or seeds.

Small equipment and gear should be packed and transported in plastic or metal containers with lids that form a tight seal to prevent seeds, insects, or rodents from infesting gear and being inadvertently transported to the islands.

- Acceptable containers: thick plastic or metal containers with tight fitting lids, e.g. Action Packers or Rubbermaid containers.
- Unacceptable containers: corrugated cardboard boxes. Cardboard may harbor seeds and invertebrates, which cannot be easily found or removed. If cardboard must be used for transporting equipment, the cardboard must be new, not corrugated, inspected, and fumigated before departure. No open containers, such as open boxes and loose bags, should be allowed to carry gear to the islands.

Bulky or large amounts of equipment should be loaded into, stored, and transported in containers that the Park has on hand such as the large plastic white boxes, with the lids on. However, when it is not feasible to use the white containers, clean mega bags may be used under the following conditions:

- The mega bags are clean and disinfected, and have been stored in a protected container.
- The equipment is being loaded on the day of departure. Mega bags should never be used to store gear for any amount of time.
- Gear with the potential to leave material behind that is difficult to clean (e.g. soil on equipment) should not be transported in mega bags. This applies especially to gear such as shovels and other earth moving equipment.

Bulk Cargo that cannot be packed in appropriate containers should be:

- **Stored in a designated area** where there is a low probability of attracting or providing habitat for seeds, invertebrates, vertebrates or pathogens.
- **Fumigated and inspected** before it departs from the mainland to the islands.
- **Taken apart and inspected** before going out to the islands.

In 1984 Anacapa Island received a non-native rabbit that was hiding in lumber materials to replace the dock. The rabbit did not live long after its journey, but is a good reminder of how easily some species can make it out to the Channel Islands.

Bulk cargo includes:

- Construction material
- Paletted equipment
- Lumber
- Any item that cannot be lifted by hand, or must be lifted by mechanical means.

Dumpsters should be inspected, emptied, and cleaned before departing the mainland for the islands.

- Under no circumstances should dumpsters go to the islands with any garbage. The inside and outside, including the wheels, of the dumpsters should be pressure washed and treated with a disinfectant solution before leaving the mainland.
- Under no circumstances should dumpsters move between islands.

2.3 People

Employees and visitors alike should clean and inspect their footwear, clothing and gear (especially Velcro) for seeds and soil before boarding the boats and moving between islands.

In addition, the NPS and concession boats should:

- Install boot brushes and disinfectant shoe baths on NPS and concessionaires' docks.
- Inspect and clean clothing prior to getting onboard aircraft. Socks and cuffs of pants should be given particular attention. Ideally, only clean clothes should be worn to the islands.
- Sleeping bags, sleeping pads, and tents should be cleaned and inspected for soil, invertebrates, and seeds before leaving the mainland.

Seeds can survive passage through the human digestive track and be inadvertently deposited via human waste onto islands. On developed islands, all staff and visitors should use the facilities provided. In the undeveloped backcountry, staff and visitors should bring portable facilities (eg. kitty litter, paper and plastic bags, portable waste bucket) and refrain from consuming seed bearing fruits and vegetables that can survive and sprout on the islands (see Table 4).

2.4 Animals and Plants

Animals and plants transported to the islands perhaps represent the greatest risk of introducing non-native species to the islands. The animals and plants themselves may establish on the islands, but in addition, they can carry pathogens, invertebrates and seeds. For example, many of the of non-native grasses on the islands were introduced and distributed by introduced cattle and sheep. Potted plants in soil can carry invertebrates, weed seeds and potential pathogens that may have a significant detrimental impact on the local plant community. The Park should prohibit all domestic and wild plants and animals from being transported to the islands. Under certain circumstances plants and animals are transported to the island for use in restoration projects. For example, endemic island plants are cultivated on the mainland and transported to the islands for planting; live animals are used as live bait to trap other non-native mammals, and dead birds are used as feed for captive foxes.

We recommend the NPS:

- Prohibit the transportation of plants and animals (live and dead) to and between the Park islands.
- Prohibit pets on islands.
- Develop strict quarantine and treatment protocols for any animals that must be transported to the Park islands for restoration projects.
- Assure that feed for any animals be appropriately treated for pathogens and certified weed free.
- Consider cultivating native plants for restoration on the individual islands and not on the mainland. Under certain circumstances, it may be necessary to cultivate the plants on the mainland, however, strict protocols should be in place to inspect and treat plants and soils for invertebrates, weeds and pathogens.

2.5 Boats and Aircraft

There are 8 NPS vessels, 9 concession boats, and an unknown number of private boaters, as well as a number of helicopters and fixed wing aircraft that regularly visit the islands (Table 2). NPS vessels and concession boats regularly transport people and equipment ranging from camping gear to large earth moving equipment. Boats and aircraft pose a high risk of transporting invasive species because of the lack of specific methods and procedures preventing non-native species from being accidentally or deliberately loaded onto boats and aircraft. Specific measures should be implemented to prevent or reduce the risk of invasive species from being transported to the islands. In particular, the Surf Ranger is considered a very high risk because of its routine use to transport large and bulky equipment, supplies and vehicles.

Table 2. Risk index for boats and aircraft that regularly land on the islands of Channel Islands National Park.

| Organization | Boat | Harbor | Size | Recommended Prevention | Willing to participate ¹ | Risk ² |
|--------------------|-----------------|-----------------------------|--------|-------------------------------------|-------------------------------------|------------------------|
| Channel Islands NP | Ocean Ranger | Ventura HQ | 100' | Stations/Traps | The NPS is willing to cooperate | High |
| | Sea Ranger II | Ventura HQ | 58' | Stations/Traps | | High |
| | Pacific Ranger | Ventura HQ | 56' | Stations/Traps | | High |
| | Surf Ranger | Ventura HQ | 74' | Stations/Traps | | Very High |
| | Patrol Boat 1-4 | Ventura HQ | 14-20' | Visual Inspection | | Low |
| Island Packers | Sunfish | Ventura Harbor | 48' | Stations/Traps | Willing to cooperate | Low |
| | Islander | | 64' | Stations/Traps | | Medium |
| | Jeffery Arvid | | 65' | Stations/Traps | | Medium |
| | Vanguard | Oxnard Harbor | 68' | Stations/Traps | | Medium |
| Truth Aquatics | Truth | Santa Barbara Harbor | 75' | Stations/Traps | Willing to cooperate | Medium |
| | Conception | Barbara Harbor | 85' | Stations/Traps | | Medium |
| | Vision | | 85' | Stations/Traps | | Medium |
| | Condor Express | | 75' | Stations/Traps | | Medium |
| | Stardust | | 65 | Stations/Traps | | Low |
| NOAA | Xantu | Santa Barbara Harbor | N/A | Stations/Traps | Willing to cooperate | Low |
| | New Boat | | N/A | Stations/Traps | | Not enough information |
| CAF&G | Swordfish | Ventura Harbor | N/A | Stations/Traps | Willing to cooperate | Medium |
| Coastguard | Multiple Boats | Oxnard Harbor/Other Harbors | N/A | Inspections/Stations if needed | | |
| Commercial Boats | Many Boats | Multiple Harbors | N/A | Educational Pamphlet/Stations/Traps | Not able to obtain any information | N/A |
| Private Boaters | Many Boats | Multiple Harbors | N/A | Educational Pamphlet | Not able to obtain any information | N/A |

¹ IC has been working with the stakeholders concerning the prevention plan and generally everyone is cooperative and willing to make changes.

² Risk is determined by looking at the size of the boat (the larger the boat the harder it is to detect weed seeds, vertebrates or invertebrates), the presence of rodents in the harbor where the boats dock, and the type of gear that is transported by the boat

Table 2. Risk index for boats and aircraft that regularly land on the islands of Channel Islands National Park.

| Organization | Boat | Harbor | Size | Recommended Prevention | Willing to participate ¹ | Risk ² |
|-------------------------|---------------------|---|----------------|--|-------------------------------------|-------------------|
| Aspen Helicopters | 5-6 helicopters | Oxnard Airport | Four passenger | Station/Traps in hanger area. Inspection of aircraft. Wash landing gear before departure. | Willing to cooperate | Medium |
| Channel Island Aviation | At least two planes | Camarillo Airport and they occasionally use other airports. | Nine passenger | Station/Traps in hanger area. Inspections of aircraft. Wash landing gear before departure. | Willing to cooperate | Medium |

To protect the islands of the Channel Islands National Park, we recommend implementation of the following guidelines on NPS vessels, aircraft and concession/contract boats:

- Install rodent and ant/insect bait stations on the docks and onboard all vessels. Stations should be checked and re-armed as necessary.
- Install fly/wasp traps onboard vessels. If feasible, install sticky fly tape onboard aircraft to intercept flying insects prior to flights.
- Ensure that the decks of all vessels are cleaned and inspected for soil and other debris where gear and equipment is stored, before and after each trip. The decks should be washed down after hauling equipment especially tractors, vehicles, construction material, and other high-risk equipment. This includes gear coming off the islands as well as going to the islands from the mainland.
- Install “rat guards” on all ropes used to secure the vessels, to prevent rodents from accessing the ships while tied up to the docks.
- Inspect the dock areas, vessels and gear regularly for any sign of weed seeds, invertebrates, vertebrates or material that could carry pathogens (such as soil).
- Require contract planes and helicopter to inspect and clean their landing gear and passenger compartment of their aircraft prior to leaving the mainland.
- Implement an education program that targets the many private boaters. The program should encourage voluntary participation in ensuring their boats are clean and no species are inadvertently transported to the island. In particular, dogs should be prohibited from landing on the islands.

3.0 Prohibited and Restricted Items

Many items and actions should be prohibited from the islands because of the high risk associated with transporting weed seeds, invertebrates, vertebrates and pathogens (Table 3). Many fruits, vegetables and disposal of foodstuffs on or around islands could lead to the introduction of non-native species to the islands.

Table 3. Recommended material that should not be transported to the Channel Islands (adapted from MARPOL food disposal regulations and Galapagos National Park’s invasive species prevention plan).

| Materials and Actions Prohibited to Transport to the Islands³ | | |
|---|---|--|
| Fruits | Vegetables | Others |
| Berries (black berries, strawberries, etc.) Watermelon | Avocado Tomato Cucumber Green Peppers Sprouts | Garbage Firewood or any wood with bark Soil Plants Organic erosion control material Animals ⁴ Cardboard Rocks Gravel Disposing of food on the islands or in the marine environment (see MARPOL food disposal regulations). |

4.0 Education

A critical component to the introduction prevention plan is an ongoing education plan that highlights the impact of invasive species on biodiversity, the costs of removing invasive species from the islands, and the importance of keeping them off the islands. The interpretive division at the Park should be part of integral role in developing and implementing an effective education program targeting diverse user groups.

An education and awareness program should be instated to ensure everyone that visits the park understands the dangers of introduced species. This education program will greatly increase the cooperation and make the recommendations a success. Also, by encouraging people to participate through monitoring and reporting sightings of non-native species, the park will help close the pathways to introductions of non-native species.

5.0 Implementation

The implementation of the above recommendations will require a concerted effort by NPS staff and there will be a shift in the way the Park carries out its day to day business. For the prevention plan to be effective, it will require someone to implement the recommendations, conduct inspections of shipments destined for the islands, maintain prevention equipment, and respond to any questions or issues that arise. We recommend that the NPS consider contracting out the implementation and monitoring of the prevention plan to a conservation based NGO that shares the mandate of the NPS to protect and conserve the resources of the islands. Once the recommendations are adopted and implemented, the amount of work will be limited to maintenance of equipment and inspections/treatment of shipments destined to the islands that will not likely support someone full time. We

³ Prohibiting fruits and vegetable is more critical in primitive camping areas than well-developed park sites. If limiting these foods to all visitors is not feasible the NPS should consider limiting the food of employees and visitors going to primitive camping areas.

⁴ Special circumstances may make it necessary for animals to travel to the islands such as dogs and horses. If it is crucial that these animals go to the islands certain quarantine and treatment measures need to be taken. Dogs should be required to have documented and up to date vaccinations. Horses should be up to date with worming and hooves need to be cleaned of all soil before leaving the mainland.

recommend that the NPS work with other agencies and NGO's responsible for other Southern California Islands (eg. US Navy, Catalina Conservancy) to jointly fund a position that will be responsible for the implementation of the prevention plan for all the California Islands. The staff member can ultimately rotate around to the various islands as necessary.

6.0 Conclusion

Current Channel Islands NP policies and procedures leave the islands vulnerable to invasions by non-native species. The recommendations made in this plan are feasible and the benefits outweigh the costs or effort of implementing them. A general prevention plan including safe storage and inspections are the first steps for the Park to close the pathways of introductions. These two action items are only the beginning of an overall non-native species management plan for Channel Islands NP. Education, monitoring, policy, safe storage, and inspection/cleaning are the five action items for a complete management plan. The recommendations will only be successful if all park employees, contractors, sub-contractors, and visitors make a cooperative effort.

An effective management strategy for non-native species should be developed in conjunction with this plan, and should include a commitment for:

- 1) Preventing introductions,
- 2) Early detection, responding, and eradicating non-natives if feasible,
- 3) Controlling if it is not feasible to eradicate,
- 4) Continuous, ongoing monitoring to evaluate progress towards goals or to make necessary adjustments, and
- 5) Education for all stakeholders.

Because of the significant conservation, time and financial investment into removing rats from Anacapa Island between 1999-2002, we strongly recommend the NPS adopt the Shipwreck and Emergency Response Plan outlined in Appendix C.

The successful implementation of this prevention plan, and overall management strategy, will be dependent on a strong policy and compliance by all stakeholders including NPS staff, cooperators, concessionaires, and the visiting public.

Appendix A. Safe Storage, Treatment and Transportation of Materials

Conditions of “safe” storage:

- Cleaned and fumigated regularly,
- Inaccessible or highly unattractive to highly mobile species such as insects, mice and rats.
- Storage only for designated equipment and supplies.

Example of Safe Storage Facilities:

1. **Refrigerators** for foodstuffs destined to the islands.
2. **Freezers** for foodstuffs and treatment of high risk material. Cold storage should be used for high-risk equipment like construction materials, and any equipment that cannot be easily inspected. Cold storage can be rented at a cold storage warehouse in Oxnard or the NPS can purchase a freezer to have on the premises. A walk in freezer on premises to store larger equipment prior to shipping to islands will reduce the handling time (Table 4). All equipment in cold storage needs to be left for at least 72 hours. This does not protect against weeds and pathogens, and the equipment should still be washed and inspected, and fumigated further if necessary.
3. **Conex box** – sealed to protect against invertebrates and vertebrates. Potential food sources should not be stored in Conex boxes. The conex should be inspected, fumigated, and cleaned on a regularly scheduled basis.
4. **Sealed plastic or metal containers** with tight fitting lids.
5. **Warehouse** or a room that is cleaned, fumigated and protected from access by non-native species.

Note on Mega Bags:

- We recommend all bags be replaced. The bags are inexpensive and the benefits of eliminating the risk that the current bags may pose to the islands greatly outweigh replacement costs (Table 3).
- Bags should be cleaned and inspected upon return to the mainland from the islands. Cleaning requires a visual inspection to look for seeds, vertebrates, and invertebrates especially in the cracks and folds of the bags. Bags should be treated using a disinfectant spray to kill pathogens that may be on bags.
- Cleaned and disinfected bags should be stored in a closed container, located near the dock area for easy access.
- The bags should NOT be used for overnight storage of materials and supplies destined for the islands. The bags should be loaded as close as to departure as reasonably possible.

Table 4. Recommended prevention equipment and purchasing costs.

| Prevention Product | Estimated Cost | Size | Contact | Benefit |
|----------------------|----------------|--|---|---|
| Walk-in Freezer | \$3,429.00 | 61 cu. ft. | Cuttingedgekitchens.com | Ensure equipment does not contain vertebrates or invertebrates. |
| Walk-in Freezer | \$3,157.00 | 5'10"x11'7" 7'4" High | Zesco.com | Ensure equipment does not contain vertebrates or invertebrates. |
| Walk-in Refrigerator | \$1,949.00 | 40 cu. ft. | Cuttingedgekitchens.com | Safe way to store food prior to departure. |
| Walk-in Refrigerator | \$3,584.00 | 73.4 cu. ft. | Zesco.com | Safe way to store food prior to departure. |
| Cold Storage Rental | Cost unknown | 17 million cu. ft. total storage space | Terminal Freezers, Oxnard 805-483-2265 | Ensure equipment does not contain vertebrates or invertebrates. |
| New Mega Bags | \$2,600.00 | 100 bags | 36 | Protect against pathogens. |

Rodent Emergency Response Kit

Proper Information for Primary Evaluation

- Emergency Response Plan
- Trapping Manual
- Species Identification Manual
- Phone numbers of NPS and ICEG staff

Equipment for Accessing Distribution and Controlling Hotspots

- Gloves 2 boxes each of med., large, and x-large
- Rat snap traps (100)
- Bait (1 box kept dry)
- Bait stations 50-100
- Large Ziplock Bags for Collections 10 boxes
- Indicator Blocks 100 pre-made
- Tracking Boards 50-100
- Storage Container (water proof)

| Response Kit Equipment for Hotspotting and Detection | Estimated Price |
|---|------------------------|
| Gloves | \$30 |
| Tracking Boards | \$450-\$900 |
| Bait | \$80 |
| Bait Stations | \$380-\$760 |
| Collection Bags | \$40 |
| Indicator Blocks | \$50 |
| Storage Container | \$35 |
| Rat Snap Traps | \$150 |
| Total | \$1215-\$2045 |

If hotspotting cannot control introduced species the Vertebrate Emergency Response Kit for Widespread Distribution will be needed.

Vertebrate Emergency Response Kit for Widespread Distribution

- OAS certified helicopter with hopper and experienced pilot.
- Bait pellets to distribute by aerial broadcast.
- Experienced crew to validate broadcast density.
- Traps to validate efficacy post-broadcast.
- Indicator Blocks and other miscellaneous monitoring equipment post-broadcast.

| Response Kit Equipment for Widespread Distribution⁵ | Estimated Price |
|---|------------------------|
| Helicopter Time | \$6,000 |
| Bait pellets | \$3,500 |
| Traps | \$2,000 |
| Misc. Monitoring Equipment ⁶ | \$1,215 |
| Total | \$12,715 |

References

MARPOL. 1973. International Convention for Prevention of Pollution from Ships.

⁵ The estimated price does not include personnel costs.

⁶ This equipment is similar to the hotspot response equipment. The cost is less because fewer bait stations are needed.