

Naval Base Ventura County San Nicolas Island Biosecurity Plan



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Cover photo: Coastal prickly-pear cactus (Opuntia littoralis) overlooking the south side of San Nicolas Island

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Acronyms and Abbreviations

°C	degrees centigrade
AIS	aquatic invasive species
BASH	bird airstrike hazard
BMP	best management practices
Cal-IPC	California Invasive Plant Council
CDFA	California Department of Food and Agriculture
CDFW	California Department of Fish and Wildlife
ECATTS	Environmental Compliance Assessment, Training, and Tracking System
EO	Executive Order
ft	feet
FOD	foreign object damage
GE	Government Estimates
HACCP	Hazard Analysis Critical Control Point
HT	heat-treated
INRMP	Integrated Natural Resource Plan
IPM	Integrated Pest Management
ISPM 15	International Standards for Phytosanitary Measures No. 15
KD-HT	kiln-dried heat-treated
m	meter
MOD	marine-origin debris
NAVFAC	Naval Facilities Engineering Command, Southwest Division
NAWCWD	Naval Air Warfare Center Weapons Division
NBVC	Naval Base Ventura County
SCB	Southern California Bight
SNI	San Nicolas Island
WPM	wood packaging materials

1.0 Introduction

1.1 Background

Executive Order (EO) 13112 (1999) defines an invasive species as “an alien species whose introduction does or is likely to cause economic or environmental harm or harm to human health.” Invasive species pose a perpetual and particularly costly threat to islands. They may have significant impacts on native fauna and flora, ecosystem functions, biodiversity, and watersheds, as well as military missions, economies, public health, and the quality of life for island users. Islands throughout the world boast a unique assemblage of life and are notoriously vulnerable to biological invasions. Because of isolation from mainland species, island species can evolve without mainland pressures. The combination of isolation and time tends to result in the development of distinct genotypes and the emergence of highly specialized species or subspecies with new characteristics and unusual adaptations, such as gigantism, dwarfism, and loss of dispersal and defense mechanisms. Population sizes and genetic diversity tend to be limited and species often become concentrated in small confined areas. These factors in combination with human impacts make island species more susceptible to extirpation, extinction, and displacement by invasive species than their mainland counterparts (Loope and Mueller-Dombois 1989). For these reasons, many island species are endemic—found nowhere else on Earth. Islands harbor higher concentrations of endemic species than do continents and the number and proportion of endemics rises with increasing isolation, island size, and topographic variety (Kier et al. 2009).

Invasive species can not only degrade islands’ ecological systems and compromise islands’ native biodiversity, but they can impact the ability to train the nation’s armed forces and potentially cause harm to human health. This presents a unique challenge in balancing a primary goal of maintaining the quality of military lands, while also meeting the responsibility to protect natural resources and biodiversity on Department of Defense (DoD) lands.

Strategies to prevent and manage invasive species have been formulated throughout the world, including approaches specific to various archipelagos and islands throughout the world to protect against biological invasion. The term biosecurity has been commonly employed to encompass this concept of protecting lands from invasion and spread of invasive species. According to the Food and Agriculture Organization of the United Nations, a definition for biosecurity would be a “strategic and integrated approach that encompasses policy and regulatory framework for analyzing and managing invasive species’ relevant risks to human, animal and plant life and health, and associated risks to the environment” (2010).

Invasive species cause approximately \$138 billion in economic damage to the United States economy every year; however, some researchers estimate this figure is low (Pimental et al. 2005). The DoD manages approximately 25 million acres of land across 525 installations, and invasive species also pose significant costs to DoD-managed lands—both economic and environmental—though it is much more difficult to track exact figures. For example, Camp Pendleton in southern California spent approximately \$1.2 million over a five-year period trying to control giant reed (*Arundo donax*) and tamarisk (*Tamarix ramosissima*) for the improvement of various federally

listed species' riparian habitat. The sharp spikes of yellow star-thistle (*Centaurea solstitialis*) shredded many parachutes valued at \$4,000 each at Fort Hunter Liggett, also in California, affecting troops' training conditions (Westbrook and Ramos 2005). Impacts to military missions and environmental impacts cost the DoD millions of dollars each year, and perhaps more.

Because it can be expensive to prevent invasive species on military lands, outlining comprehensive biosecurity strategies is a critical step to guide DoD policies for managing economic and environmental costs, and ultimately mission sustainment. Though invasive species are pervasive, island systems are unusual in that strategies to prevent the arrival of invasive species can be extremely effective because of islands' inherent self-contained nature. Invasive species reach islands through either accidental or deliberate release by island visitors, transportation pathways, cargo, or they are self-introduced from the mainland (floating debris) or nearby islands (wind-distributed). Prevention strategies can focus on managing these pathways in which invasive species arrive.

Strategies to prevent the transport or effective establishment of invasive species are imperative as the first-line of defense. Once established, managing invaders often require many years and potentially millions of dollars of investment. Effective efforts to prevent the arrival or transport of potentially harmful species are directed at specific vectors¹. They also aim to reduce the magnitude and frequency of species transfers to particular areas. Preventative measures can be directed at specific species; however, vectors are a more comprehensive and explicit focal point for management actions in most cases. Thus, vector management is a central aspect of most efforts to prevent invasions.

Biosecurity's emphasis is usually focused on preventative measures, but also includes post-incursion responses and management of established invasive species (e.g. eradication, containment, and control). Minimizing the probability and the number of new invasions is usually viewed as the most cost-effective and desirable strategy to pursue, because it can be extremely difficult to eradicate or control species once they have become established (Wittenberg and Cock 2001). Even though prevention may be the best approach to minimizing impacts from potential invasive species, other strategies such as early detection, monitoring and rapid response to incursions should be incorporated in a comprehensive biosecurity plan.

1.2 Purpose and Scope

The purpose of this Biosecurity Plan is to detail measures for the prevention, early detection, rapid response, and outreach information of invasive species to and from Naval Base Ventura County (NBVC) San Nicolas Island (SNI) and identify gaps and efficiencies in the current program as directed by EOs, DoD instruction, and Department of the Navy policy. This document is one of many management documents that ensures NBVC SNI remains available and in good condition to support the installation's military mission.

SNI is located within the Sea Range of the Naval Air Warfare Center Weapons Division (NAWCWD) and is the primary use area for NAWCWD test and evaluation activities involving internal and external missile data systems using radar, telemetry, and photography. NBVC is responsible for

¹ Vector defined as any agent that acts as a carrier or transporter

supporting the NAWCWD mission on SNI, maintaining environmental compliance, and exercising responsible stewardship of federal lands.

Numerous federal laws, policies, and directives require federal agencies to implement programs that prevent or manage the arrival of invasive species, identify and reduce threats to listed species, and promote the early detection of incipient invasive species such as: the Endangered Species Act, Federal Noxious Weeds Act, Alien Species Prevention and Enforcement Act, National Invasive Species Act, and the Sikes Act to name a few. Under the *Sikes Act Improvement Amendments of 1997* (16 United State Code 670a-670o) and DoD Instruction 4715.03, DoD lands, including NBVC SNI, are specifically directed to manage natural resources under the guidance of an Integrated Natural Resource Management Plan (INRMP).

NBVC's INRMP supports the preparation and implementation of a Biosecurity Plan with the objective that SNI "minimize, to the greatest practical extent, the introduction of pest species to SNI" (Naval Facilities Engineering Command, Southwest Division [NAVFAC] 2015).

Additionally, EO 13112 directs federal agencies whose actions may affect the status of invasive species to "identify such actions and use programs to prevent the introduction of invasive species, detect and respond rapidly to and control populations of such species, monitor, conduct research, and develop technologies to prevent the introduction of invasive species." EO 13751 (2016) supports and amends EO 13112 and directs federal agencies to continue coordinated prevention and control efforts related to invasive species.

Non-native species can and do result in physical encumbrances to military ranges. Invasive species can directly affect SNI's military mission by increasing the risk of fire, creating human health risks from the introduction of zoonotic diseases (e.g. Hanta virus or rabies), increasing government costs from damage (e.g. chewed cables, wires, etc.) from nuisance rodents, or indirectly affect by outcompeting native species thereby limiting suitable habitat. This can result in additional Endangered Species Act listings of various SNI taxa. The establishment of a Plan supports both EOs' requirement to identify actions and programs that prevent the introduction of invasive species as well as supports SNI INRMP's recommendation to reduce threats to listed species by providing actions that reduce the arrival of non-native species. The Biosecurity Plan thereby supports continued military operations on SNI by presenting incremental guidelines that either partially or comprehensively work to limit the introduction and spread of invasive species. For the purposes of this Plan, all non-native species introductions will be treated as the potential to become invasive until proven otherwise.

The focus of this plan is on implementable prevention and response measures for the unique bio-invasion vectors for SNI. While the transport of cargo from the mainland to the island is a primary vector of concern, other vectors that may transport established invasive species to other areas of the island are also thoroughly considered. These include on-island sourcing of materials, construction and habitat restoration activities, food and waste operations, personnel, and natural processes. While the bio-invasion vectors and activities associated with these vectors are specific to SNI, the principles outlined herein can be used to make sound biosecurity decisions addressing any potential introduction pathway, both current and future. And though this Biosecurity Plan is meant to be comprehensive, there are limitations to its scope discussed in Section 2.1.

1.3 San Nicolas Island

The most distant island from shore of California’s eight Channel Islands, SNI is located in the Southern California Bight (SCB) approximately 65 miles (105 kilometers) south of NBVC Point Mugu. The SCB is a recessed curve in the southwestern California coastline from Point Conception in Santa Barbara County to just south of the Mexican border and is a transitional area between many different water masses creating an area rich in biodiversity (Figure 1-1).



Figure 1-1. San Nicolas Island's location relative to other Channel Islands within the Southern California Bight.

SNI’s isolated location from the mainland and at the southern-most intersection between the California Current and California Countercurrent has resulted in distinctive natural communities relative to the northern islands—approximately 11 percent of SNI’s native vascular plants are

endemic to the Channel Islands. San Nicolas Island buckwheat (*Eriogonum grande* var. *timorum*) and the San Nicolas Island malacothrix (*Malacothrix foliosa* ssp. *polycephala*) are endemic to SNI only. The vascular flora of SNI includes approximately 137 native species and 141 non-native species (Junak and Vorobik 2008). SNI has no federally listed endangered or threatened plant species. Endemic land vertebrates are limited to the previously federally-listed island night lizard (*Xantusia riversiana*), SNI deer mouse (*Peromyscus maniculatus exterus*), and San Nicolas island fox (*Urocyon littoralis dickeyi*).

SNI is also home to several introduced species. Chukar (*Alectoris chukar*) were introduced in 1968 by the California Department of Fish and Wildlife for island hunting purposes and also as a source population to restock mainland populations (NAVFAC 2015). Argentine ants (*Linepithema humile*), decollate snails (*Rumina decollata*), European garden snails (*Cornu aspersum*), and various invasive plant species are also present and may threaten native habitats on the island. Feral cats (*Felis catus*), were established from 1952 until 2010, when the Navy successfully trapped and removed them to aid in the recovery of the San Nicolas Island fox and island night lizard (NAVFAC 2015).

Several animals have arrived on SNI but were quickly and successfully removed. There are records of introductions of Virginia opossum (*Didelphis virginiana*), coastal desert wood rat (*Neotoma lepida intermedia*), Belding's ground squirrel (*Uroditellus beldingi*), and domestic dog (*Canis lupus familiaris*), as well as anecdotal reports of raccoon (*Procyon lotor*; Island Conservation 2010). Although these particular introductions did not result in established populations, non-native and potentially invasive species may also threaten island users' public health and native species health through the potential for disease transmission.

Invasive plant and non-native arthropod introductions are harder to pinpoint, but many likely arrived via equipment and materials shipped from the mainland, misguided horticultural attempts that likely introduced garden and decollate snails and other non-native plants, personal effects, and/or wind dispersal. While many accidental animal introductions (e.g. Virginia opossum) did not result in established populations, introduction of non-native and potentially invasive species present threats to SNI's ecosystem as well as military mission through the potential for disease introduction, increased fire risk, ecological damage, and regulatory restrictions on military operations. Because military operational use has the potential to result in many pathways for the introduction of invasive species and eradication/control programs come at a tremendous cost, prevention in the form of an effective plan for biosecurity is imperative.

2.0 Implementation Strategy

Invasive species pose significant management challenges. Land managers must choose what strategies to employ and how much to invest to prevent new introductions, monitor for new invasions, and control established invaders. Though biosecurity strategies can be thoroughly detailed and documented, plans cannot be effectively implemented unless challenges inherent to invasive species management are well understood.

2.1 Challenges and Needs

Though far from comprehensive in nature, this Plan outlines invasive species challenges intrinsic to an island and specifically, SNI. For example, biosecurity challenges exist for both marine and terrestrial habitats, however, aquatic invaders present their own significant risks and difficulties—especially in prevention. Another challenging aspect of managing invasive species is confounded by the mere type of introduction and the ecology of invader. Removing non-native species is also economically challenging in and of itself. These challenges point to the need for strategies that manage the pathways an invader takes—rather than the species itself—and the guidance with which to implement recommendations within a comprehensive SNI Biosecurity Plan.

Aquatic

In the marine environment, the interface of public and military interests in waters surrounding SNI specifically confound aquatic invasive species (AIS) management options since aquatic or marine species tend to have high dispersal rates and the ability to rapidly colonize and outcompete other marine taxa. Many pathways exist for invasive species to transit through the aquatic environment, such as by barge, boat, or equipment contained therein. Some non-AIS species such as the freshwater invaders giant reed (*Arundo donax*), salt cedar species (*Tamarix* spp.) can occasionally transit through the marine environment and enter into SNI's management footprint where various invasives can eventually end up in terrestrial habitat.

Freshwater habitats may be less affected mainly due to their limited extent and ephemeral nature on the island (NAVFAC 2015). On the other hand, the limited existence of freshwater habitats also makes them extremely vulnerable and easily impacted if incursions occur. While the likelihood of freshwater introductions is relatively low when compared to marine and terrestrial systems, basic biosecurity strategies applicable to all SNI ecosystems will outline comprehensive preventative measures. Additionally, the federally listed San Diego fairy shrimp (*Branchinecta sandiegoensis*), native to Southern California, (or other federally listed branchiopods) could potentially be naturally introduced by birds flying from the mainland to the island (Muñoz 2013). For the purposes of this Plan, mainland species of *Branchinecta* will be considered as a biosecurity risk to freshwater ecosystems for SNI's management purposes because of the added regulatory constraint that may impact the military mission if it were introduced.

Types of Introductions

There are various types of introductions that result in drastically different outcomes. For example, there are clear instances of introductions from species that range from an entirely different continent for which rapid and effective management decisions can occur. However, there are also instances of mainland species introductions that where it has yet to be determined if an introduction occurred or it was simply a lack of a previous detection. This scenario is especially true when attempting to determine “nativity” of various arthropod fauna that also occur in California or other Channel Islands. Lastly, the potential for mainland California and other Channel Island native genotypes to mix with SNI-specific genotypes can result in a “cryptic” introduction—one that again can go undetected because of the limited understanding of SNI's

genetic subunit or can never be detected unless genetic studies are conducted. This scenario happens frequently with Channel Islands- and California-native species, such as various plants that have the potential to hybridize with regionally-close but genetically-distinct species or subspecies. For example, the perennial dunedelion (*Malacothrix incana*) is considered to be non-native and has only occurred on SNI for roughly 50 years; however, it has since been documented hybridizing with the San Nicolas Island leafy malacothrix (*Malacothrix foliosa* ssp. *polycephala*), which is endemic only to SNI (Davis and Junak 1993). This type of introduction is the easiest of all, yet the most difficult to detect without specialized testing.

Without broad, methodological, spatiotemporal sampling, it is impossible to know if an introduction has occurred, much less what type of introduction occurred and how management should respond. Because this is such a broad category, it is important to have an on-going program that inventories SNI's flora and fauna, across vast areas and time. Attempting to prevent introductions by a species-by-species basis is impossible to manage. It is therefore important to follow best management strategies that broadly apply to groups of animals or plants to detect introductions. Once it is established that an introduction has occurred, management can respond appropriately.

The effects of introduced, non-native species are largely dependent on the characteristics of the organism and are challenging to predict. However, all systems are at risk and any introduced non-native organisms have the potential to become established, create viable populations, and cause impacts. This is evident globally and locally on SNI. New introductions of invasive species that may cause harm in the form of ecological damage, restrictions to the military mission, and/or disease introduction include but are not limited to black rat (*Rattus rattus*), Norwegian rat (*Rattus norvegicus*), house mouse (*Mus musculus*), feral cat (*Felis catus*), lagomorphs (hares and rabbits), reptiles, invertebrates (e.g. arthropods), and mesopredators (e.g. raccoons, opossums). Animal introductions additionally pose secondary threats by creating new disease vectors for the island. Because certain zoonotic infections (leptospirosis, West Nile virus, hantavirus, etc.) occur naturally within the environment, prevention of incursion and monitoring of invasive species are critical to preventing and/or containing zoonotic diseases.

Only a small percentage of introduced species will ever become invasive. However, it is nearly impossible to predict which species will become invasive and some species may exist for many years before they exhibit invasive characteristics. Introduced species may expand slowly until they reach a size large enough for the population to explode and become invasive. The biggest challenge for management is how to plan and make decisions for species not yet known to exhibit invasive qualities. This is true for introduced arthropods and can be especially detrimental because of their role in native plant ecosystems. For example, polyphagous shot hole borer (*Euwallacea* sp.) penetrates tree and shrub species and inoculates the wood with fusarium, a filamentous fungus, that prevents the tree from successful transport of nutrients causing stress and dieback. Generally, SNI has very limited woody tree and shrub species, but the island would be devastated by a shot hole borer outbreak. Regularly investing time into understanding what is present on SNI in the form of ecological inventories can serve as a comparative baseline to determine if a non-native species introduction truly has an impact.

Removal Costs

Another challenge posed by a new, non-native species is the removal cost associated with invasive species arrivals. An exponential curve can model the relationship between the time since arrival versus the area infested and the cost associated with more entrenched and larger infestations—this is called the Invasion Curve (Figure 2-1). Each of the four stages then elicits a different and increasingly expensive management response further reinforcing that prevention strategies are most cost effective. However, early detection and rapid response programs can help managers work to remove species likely to cause the most economic or ecological damage before they become entrenched and/or too costly to effectively control. Prevention is the most cost-effective solution, followed by eradication if conducted in a timely manner. If a species is not detected and removed early, intense and long-term control efforts become unavoidable (Figure 2-1).

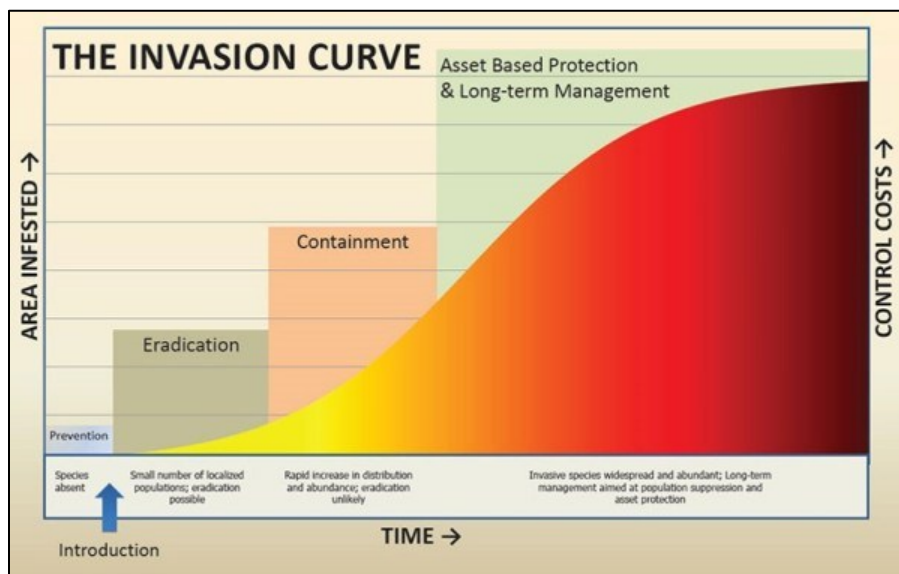


Figure 2-1. The Invasion Curve illustrates the costs associated with the arrival of invasive species over time and area infested.

Biosecurity Plan Purpose and Successful Implementation Needs

Biosecurity plans are designed to provide the framework for future action and their execution must consider DoD instructions, installation range plans, training plans, INRMPs, Integrated Cultural Resource Management Plans, Integrated Pest Management Plans, Installation Restoration Plans, and other appropriate plans. However, Biosecurity Plans do not always contain intricate protocols; rather, these Plans make recommendations on which protocols need development. Biosecurity Plans recommend various rapid response protocols, for example, in the event of a detected black rat—a protocol should be developed stemming from the recommendations of a Biosecurity Plan. This protocol would be more explicitly laid out and cross referenced with other installation plans, such as the installation's Integrated Pest Management Plan.

The largest vectors for the introduction of invasive species to SNI are barges, aircraft, and the materials carried therein. Currently, a Biosecurity Science Specialist or a contractor conducts

periodic cargo inspections at embarkation points before transport to SNI. Inspections are the first line of defense against the transport of invasive species and the Biosecurity Science Specialist should continue to have the installation command's express authority and support to stop shipments should the Specialist observe any egregious biosecurity violations. However, prohibiting shipments may result in an extremely challenging economic burden on the shipper and this particular challenge points to the need for the Specialist to coordinate with NBVC Installation Command to continue to codify their authority.

2.2 Biosecurity Oversight

Enforcement of biosecurity policies outlined in plans may present additional challenges. Many archipelagos throughout the world create entire departments within their government structure to enforce biosecurity policies. For example, New Zealand has designated biosecurity managers governed by the Ministry of Primary Industries, a governmental organization of six different branches with missions to protect New Zealand against the incursion of invasive species. At the very least, positions dedicated to biosecurity with roles in enforcement, inspection, and coordination ensure that biosecurity plans are implemented. While the Navy may not need a specific biosecurity department to regulate policies and ensure their enforcement, NBVC benefits from a Biosecurity Science Specialist position, shared by two other Channel Islands land management agencies/organizations. The Biosecurity Science Specialist is managed by the Environmental Division when on NBVC property and conducts inspections at embarkation points and coordinates responses to incursions.

Currently, six out of the eight California Channel Islands have some level of oversight by this position that coordinates biosecurity for the Navy, The Nature Conservancy, and the Channel Islands National Park: San Miguel, Santa Rosa, Santa Cruz, Anacapa, San Nicolas, and Santa Barbara islands. Santa Catalina and San Clemente islands do not currently have a position dedicated to biosecurity. The Biosecurity Science Specialist, through coordination with the NBVC Environmental Division, upholds the recommendations contained within this Plan and should continually strive to coordinate implementation of various recommendations to minimize invasive species incursions in a cost-effective manner.

In addition, under the directive of the NBVC Commanding Officer, actions minimizing the transport of invasive species to SNI have been given express authorization within DoD Naval Instruction 5090.14. This document codifies previously recommended guidelines into rules for NBVC. The Biosecurity Science Specialist, in coordination with the Environmental Division, should regularly make recommendations to update these Instructions to promote NBVC-wide awareness of new policies, strategies, or invasive species threats, as well as to consider new recommendations made in this Plan.

Effective biosecurity requires the oversight and efforts of all personnel, not just the Environmental Division or the Biosecurity Science Specialist. In addition to a permanently funded biosecurity position, secondary points of contact need to be identified and trained in identification and animal handling and capture to assist the biosecurity manager. A new position does not necessarily need to be created, but these invasive species trained positions should be present in the event an invasive species is detected on SNI, during barge and aircraft unloading,

or on the mainland during barge and aircraft loading. Efforts should be made to encourage a culture of biosecurity throughout NBVC, from the installation command down to all tenant commands, to civilian workers and contractors.

Biosecurity involves vigilant oversight, implementation, enforcement, and most importantly—authorization. The biosecurity manager must also have authority to stop shipments to SNI; otherwise a biosecurity manager would merely be making suggestions that could be overridden. Any lapses in inspections or coordination efforts can allow incursions that affect the military mission and compromise long-term program operations. Mission critical shipments that may violate biosecurity principles would be allowed onto island, but an appropriate, rapid response must be enacted following shipment.

2.3 Recommendations' Organization Scheme

The NBVC SNI Biosecurity Plan's recommendations are the core of the implementation strategy and are organized in a vector-based approach. The biggest challenge communicating these recommendations and the subsequent distribution to staff is that the structure and organization of a successful Plan needs to be of value to a diverse group of stakeholders; including land managers, facilities managers, military personnel, and contractors. Therefore, the vector-based recommendations are organized into three sections and are delineated to draw attention to the differences between biosecurity threats that originate off-island, originate on-island, and natural processes in which management has little control or prevention strategies. The organization scheme is intended to eliminate redundancy and cross-referencing throughout the document. Additionally, the document can be deconstructed into relevant parts that can then be disseminated to targeted or interested audiences. For example, aircraft operations can be selectively removed from the larger plan and handed to contractors and air terminal staff without having to reference the larger document. Each subsection has instructions of how to use and select the recommended biosecurity strategies.

Each section is organized based off vectors' point of origin. Section 3.0 discusses the preparation and transport of cargo originating from off-island sources. Section 4.0 discusses on-island source materials, infrastructure operations and maintenance, and natural resource management once cargo is already on SNI. Cargo is defined herein as any materials or equipment arriving on the island such as vehicles, heavy machinery, personal gear, personnel, construction equipment, aggregate and road base, soil, food, refuse, water, fuel, natural resource management supplies, etc. Finally, Section 5.0 discusses natural processes that pose biosecurity risks to NBVC SNI, but that may be difficult to manage from a preventative objective.

Different vectors are discussed thoroughly within their respective subsection, providing scenarios and examples observed on NBVC SNI and associated biosecurity risks. Each vector has multiple biosecurity objectives that are categorized as: the prevention of incursions, early detection and monitoring, post detection response, and educational opportunities. Each of these objectives has one or more strategies associated with the topic. For example, prevention strategies may include the sourcing of packaging materials or trapping efforts on barges.

While many other invasion biology topics overlap with biosecurity, issues such as the containment and control of existing invasive plant populations or the eradication of current

rodent populations are better suited to existing or future management plans or protocols and should be cross-referenced with the NBVC SNI Biosecurity Plan. This Biosecurity Plan focuses on prevention and detection strategies designed to limit invasive species from reaching SNI in the first place.

Some recommendations could easily fit into more than one objective and where this is the case, an attempt has been made to place the recommendation under the most appropriate objective. Many of the recommendations are vector specific; however, one theme common to all recommendations is the need for inspections and enforcement.

2.3.1. Biosecurity Effort Score Priority Index and Action Value Tables

The quantity of recommended actions is intended to be exhaustive, but also adaptable and justifiable to the needs of NBVC SNI's command structure. Therefore, not all recommendations may be implemented for reasons beyond the current command structure's control or some recommendations may be modified based on current circumstances. In order to organize all recommendations succinctly and based off a quantifiable value of that recommendation, each vector subsection contains a table precedes and organizes all succeeding recommendations (herein referred to as "actions") by how easy or difficult that action is to implement, as well as the strategic value of that action. For example, an easy Action A1 will be the cheaper recommendation to implement whereas a succeeding Action will be incrementally more difficult and/or more expensive to implement. It should be stressed that not every Action will be implemented.

These tables are intended to prioritize biosecurity strategies on a scale from easily implementable to a more intensive effort. NBVC can easily select the best strategies based on the current command structure and available resources while adapting this plan and its recommended strategies to remain relevant in the future.

Biosecurity Action Table Scoring Methods

A total "biosecurity effort" score is made up of three ranked categories; Implementation, Personnel, and Cost and the action value ranks the strategic level of each action.

The Implementation category within the effort score is ranked one to three; an index of one indicates that implementation of the associated action will result in a minor alteration to an existing action or program, an index of two indicates that the action can be implemented within existing programs but will moderately expand the program, and an index of three indicates that an additional program may be necessary or it will significantly alter and add substantial tasks to existing programs.

The Personnel category within the effort score is ranked one to three with personnel defined as any NBVC staff, military personnel, contractor, etc. An index of one indicates that the action can be executed easily under existing positions; however, the job description may need to expand slightly to incorporate the implementation or execution of the biosecurity action. An index of two indicates that a job description must expand moderately to incorporate the implementation or execution of the associated action, and an index of three indicates that the effort required to

incorporate the recommended action is so substantial it may require more oversight than currently existing positions dedicated to biosecurity.

Finally, the Cost category within the effort score is ranked one to three; an index of one indicates that the action is essentially cost-neutral. An index of two indicates that a moderate increase to cost will result while a score of three would require a significant program-wide cost increase.

The total biosecurity effort is achieved by adding the Implementation, Personnel, and Cost indices for the final score. This score allows management to discern what level of effort must be undertaken to effectively implement each recommended action. This also allows management to make informed decisions and strategically prioritize the best actions for their programs.

However, an additional component that must be considered when deciding what biosecurity recommendations to implement is the inherent value of the action. Because resources are usually limited, the paired element of including a value score allows managers to evaluate the strategic worth of each action. A rank of LOW indicates that the action is a standard biosecurity strategy, a rank of MEDIUM indicates that the action increases in strategic value, and a rank of HIGH indicates that the strategy is an advanced and highly valuable action. The recommended actions are not meant to be selected solely based on their value score; some actions are only applicable to specific resources or are made to prevent specific incursions.

When paired together, the biosecurity effort score and the action value score are comprehensive and are provided in tables tailored for each vector subsection. The biosecurity effort index and action value tables include all biosecurity actions recommended in the prevention of incursions, early detection and monitoring, post detection response, and biosecurity education sections.

3.0 Cargo and Personnel

The development of a remote island, in this case SNI, presents an inherent biosecurity risk because of the necessity to introduce commodities, supplies, and services to support mission operations. For example, maintenance of island facilities may require importing construction supplies such as wood, metal, gravel, prefabricated structures, earth-moving equipment, and vehicles. Cargo originates from “abroad,” whether internationally or nationally, to be dispersed around the island. While there are biosecurity risks with the transport mechanism (barge, aircraft), there are also significant and inherent biosecurity risks with the cargo itself. These differences between the transport mechanism and the cargo contained within the transport mechanism will be handled separately for the purposes of this Biosecurity Plan.

Certain preventative strategies can be employed to reduce and, in some cases, eliminate biosecurity risks in the preparation of vehicles, personnel, equipment and supplies to be shipped. Following established protocols and enforcing the policies described will be key to preventing invasive species introductions through imported cargo.

3.1 Preparation for Transport of Cargo and Personnel

There are many potential cargo items; however, there are three general groups that most cargo can be attributed to. Recommendations for the preparation of cargo for transport to NBVC SNI will fall under the following three subcategories: Vehicles and Heavy Equipment, Equipment and Materials, and Personnel. Preparation for transport of vehicles, cargo, and personnel for military operations is addressed separately in Section 4.1.4.

Naval Base Ventura County San Nicolas Island Biosecurity Plan

Contact: NAVFAC Environmental Division

General Instructions: *The following subsection is a component of the overarching NBVC SNI Biosecurity Plan designed to reduce and/or prevent the arrival of invasive species to SNI that impact military readiness and mission. Please contact NAVFAC Environmental Division for questions or for the complete Plan. Each subsection represents a potential pathway for an invasive species to arrive on the island and in order to detail strategies that prevent that risk, all recommendations are summarized into one table the precedes the subsection. Each recommendation is referred to as an “Action” and has an associated number. Not all Actions will be implemented due to costs or other constraints; however, all Actions are provided and are organized by their inherent value—starting from the easier and less costly to more strategic and complicated of Actions. Detailed descriptions follow the table and provide context.*

This subsection requires the following enclosure(s):

1. Appendix A

3.1.1. Vehicles and Heavy Equipment

Vehicles of all types are loaded onto the barge at NBVC Port Hueneme and transported to SNI for many purposes, including construction, maintenance, and general transportation. Heavy equipment is defined as any earth-working, heavy-duty vehicles that are usually used for construction tasks. It is widely recognized that vehicles and heavy equipment easily harbor invasive species because vehicles are mobile and originate from across a large region. An island-wide infestation can be caused by a single piece of equipment transported from an area with a highly aggressive weed or insect species and that has not been cleaned.

Table 3-1. Vehicles and heavy equipment biosecurity effort priority index and action value table.

Action Number	Potentially Prevented Invasives	Action	Implementation Index ^a	Personnel Index ^b	Cost Index ^c	Additive Effort Score ^d	Action Value Score ^e
Prevention of Incursions							
A1.	invertebrates, invasive plants, small mammals, reptiles	Implement the vehicle cleaning standards included as a checklist in Appendix A.	1	1	1	3	LOW
A2.	invertebrates, invasive plants, small mammals, reptiles	Require signed agreements that vehicles will be in compliance with Action A1 prior to shipping.	1	1	1	3	LOW
A3.	invasive plants	Require all vehicles (including heavy equipment) to drive over "shaker plates" before loading and when off-loading.	1	1	2	4	MED
A4.	invertebrates, invasive plants, small mammals, reptiles	Ensure that vehicles are completely clean upon arrival at NBVC SNI and continue to clean vehicles when moving from various work locations.	1	2	1	4	MED
A5.	invertebrates, invasive plants, small mammals, reptiles	Inspect all vehicles and heavy equipment before transport to NBVC SNI and upon return to the mainland.	2	2	2	6	HIGH
A6.	all species	Maintain NBVC SNI's Red Tag Program to flag vehicles if they do not meet inspection standards and codify language to allow the inspection officer to have express authorization of the shipment.	3	3	2	8	HIGH
A7.	invertebrates, invasive plants	Install pressure washers, vacuums, and air compressors at barge loading facilities.	3	2	3	8	HIGH
A8.	invertebrates, invasive plants	Contain and dispose of wastewater appropriately.	3	3	3	9	HIGH
Early Detection and Monitoring							
B1.	all species	Personnel conducting biosecurity inspections (such as NBVC Environmental Staff or the Biosecurity Science Specialist) will wear appropriate uniforms or present valid identification while conducting inspections of vehicles/heavy equipment to convey the sanctioned authority of the position and secondarily carry information cards to be passed on to any personnel, contractor, or military personnel that challenges their authority.	2	1	1	4	HIGH
B2.	invertebrates, invasive plant	Monitor shaker plates at barge loading facilities for the presence of dirt or seeds. Initiate cleaning protocols if not cleaned.	1	1	2	4	LOW
B3.	invasive plants	Monitor roadsides for new species.	1	2	2	5	MED
B4.	invertebrates, invasive plants, small mammals, reptiles	Examine all vehicles and heavy equipment prior to transport.	2	3	2	7	LOW
Post Detection Response							
C1.		Hold the shipping party responsible for cleaning tagged vehicles.	1	2	1	4	MED
C2.	invertebrates,	Identify and notify the appropriate point of contact.	2	2	1	5	LOW
C3.	invasive plants, small mammals, reptiles	Deliver a formal warning.	2	2	1	5	LOW
C4.		Red tag vehicles when they do not meet cleaning protocols and/or invasive species have been detected to prevent transport on the barge.	2	3	1	6	HIGH
C5.		Contain the detected organism.	2	2	2	6	LOW
Biosecurity Education							
D1.		Update and re-distribute NBVC SNI Commander's Naval Instructions on Biosecurity.	1	1	1	3	LOW
D2.		Include reference to NBVC SNI Commander's Naval Instruction in all interpretive paneling on biosecurity.	1	1	1	3	LOW
D3.	invertebrates, invasive plants, small mammals, reptiles	Develop and distribute a SNI "Most Wanted" poster of watch-list species and worst invaders to anyone shipping vehicles or driving on-island.	1	1	1	3	LOW
D4.		Distribute information on how to report suspected incursions.	2	2	1	5	LOW
D5.		Create and post instructional signage for vehicle cleanliness standards at on-island car washes and if implemented, cleaning stations at barge loading facilities.	2	2	2	6	LOW
D6.		Conduct regular training on invasive species prevention and distribute Command Instructions to all personnel.	2	3	2	7	MED

^aImplementation Index - 1 Minor alteration to existing action or program 2 Action can be implemented within existing programs but moderately expanding program's actions 3 Requires an additional program, significantly alters programs, adds significant tasks to existing program

^bPersonnel Index - 1 Action can be done under existing position, job description may expand slightly to incorporate implementation of biosecurity action 2 Job description must expand moderately to incorporate implementation of biosecurity action 3 The effort required to incorporate the recommended action is so substantial it may require more oversight than currently existing positions dedicated to biosecurity

^cCost Index - 1 Little to no appreciable increase to existing budget 2 Moderate increase 3 Extensive increase

^dAdditive Effort Score - additive of the three above indices. Scores of 3 represent biosecurity actions that should be prioritized first because of low cost, no significant changes to existing program, and easy implementability. Scores of 4 - 7 are second level priority biosecurity actions that may have higher cost and require greater output at the Navy's expense to implement. Scores of 7+ represent third level priority biosecurity actions that require the most output and the design of significant programs.

^eAction Value Score - LOW Basic or standard biosecurity strategy MED Moderate or increasing in strategic value HIGH Advanced and highly valuable action

Prevention of Incursions – Vehicles and Heavy Equipment

Strategy A: Vehicle Shipping Standards and Accountability

Adhere to the standards set by NBVC SNI for the transport of clean vehicles and ensure shipping parties' accountability.

ACTIONS

- A1. **Implement the vehicle cleaning standards included as a checklist in Appendix A.**
Vehicles should be free of dirt and debris. Paint should be clean and free of dust. Tires should be free of dirt and debris in treads. Undercarriages should be pressure washed to ensure dirt and debris is completely dislodged. Vehicle appendages should be free of cobwebs. Hoods of vehicles and truck beds should be confirmed as free of invasive species. Toolboxes, front loader buckets should all be thoroughly cleaned. Cabs should be opened and floorboards should be swept. When parked and stored, front loaders should have blades resting on the blade edge in full contact with the ground to prevent non-native animals from hiding underneath.
- A2. **Require signed agreements that vehicles will follow Action A1 prior to shipping.**
Shipping parties should certify that they have read and understood the vehicle and heavy equipment cleaning protocols well in advance of attempting to ship. It should be made clear that vehicles not in compliance with cleaning protocols (i.e. are unclean or are harboring invasive species) will be given a first warning to remedy the vehicle cleanliness. Shipping parties will be liable for the costs incurred with having to transport vehicles a second time. If shipping parties are repeat offenders, loss of access should be considered if shipping parties do not abide by protocols.
- A3. **Require all vehicles (including heavy equipment) to drive over “shaker plates” before loading and when off-loading.**
Shaker plates are metal plates fabricated to dislodge seeds and other invasive species (Figure 3-1). These should be utilized at NBVC Port Hueneme and at NBVC SNI and could potentially reduce weed seeds and other invasive species transported in mud, dirt, and dust contaminating the loading area and conveyed to the island (Figure 3-2). Regular maintenance will be required to clean the plates and prevent re-contamination.
- A4. **Ensure that vehicles are completely clean upon arrival at NBVC SNI and continue to clean vehicles when moving from various work locations.**
In the event that vehicles arrive on island unclean, then vehicles will immediately be cleaned to prevent transport of invasives throughout the island. If vehicles and heavy equipment are to be moved from various project sites or work locations, then vehicles/heavy equipment will be cleaned prior to transport to prevent the spread of invasive species between project sites.
- A5 **Inspect all vehicles and heavy equipment before transport to NBVC SNI and upon return to the mainland.**

Ensure that the minimum standards are met for vehicle and heavy equipment (Appendix A). No animals (especially rodents) should be harbored in vehicles/heavy equipment upon arrival to the island or upon transport back to the mainland.

A6. **Maintain NBVC SNI's Red Tag Program to flag vehicles if they do not meet inspection standards and codify language to allow the inspection officer to have express authorization of the shipment.**

NBVC SNI developed a program in which the Environmental Division is responsible for inspecting vehicles, cargo and shipping containers and initiating warnings if these do not pass inspection. Inspectors work with the shipping party to remedy the situation but if it is not, the SNI Environmental Division places a red tag to distinguish items that are not eligible for transport. This program should be maintained to eliminate confusion on vehicles and other cargo that should not be transported to the island because of invasive species incursion risks.

NBVC SNI should continue to work with shipping parties well in advance of transportation to notify of cleaning inspection protocols. Most importantly for SNI, if the Biosecurity Specialist or the inspection officer tags a vehicle, they should have express authorization to stop the shipment if it does not meet cleaning standards.

A7. **Install pressure washers, vacuums, and air compressors at barge loading facilities.**

If vehicles are not in compliance with cleaning protocols, shipping parties can quickly meet minimum standards at the dock prior to loading by using available tools such as pressure washers, vacuums, and air compressors to clean vehicles and heavy equipment. The biosecurity inspector should instruct shipping parties on the location of the available tools and proper cleaning protocols.

A8. **Contain and dispose of wastewater appropriately.**

Shipping parties may be transporting vehicles from all over the region and equipment could potentially be harboring many noxious weeds or other invasive species. All water produced during cleaning activities should be properly contained and disposed of to reduce the risk of recontamination or contamination of other vehicles.



Figure 3-1. Two examples of shaker plates, designed to "shake" mud and dirt from tires and undercarriages and could prove to be effective at dislodging invasive species.



Figure 3-2. The barge loading and off-loading facilities at NBVC Port Hueneme and SNI would greatly benefit from a shaker plate installed at two points where vehicles would dislodge seeds and dirt prior to arrival on the island. The NBVC SNI barge facilities would serve as a last resort, second point-of-contact to dislodge seeds/dirt from vehicles.

Early Detection and Monitoring – Vehicles and Heavy Equipment

Strategy B: Early Detection and Monitoring

Develop a standardized monitoring system focused on early detection for high priority invasive species on vehicles and heavy equipment.

ACTIONS

- B1. Personnel conducting biosecurity inspections (such as NBVC Environmental Staff or the Biosecurity Science Specialist) will wear appropriate uniforms or present valid identification while conducting inspections of vehicles/heavy equipment to convey the sanctioned authority of the position and secondarily carry information cards to be passed on to any personnel, contractor, or military personnel that challenges their authority.**

Staff conducting inspections of vehicles and heavy equipment should be dressed to convey to authority and legitimacy of the position or alternately, the staff member should clearly display their identification. Should the person conducting inspections of equipment be questioned, an information card will contain contact information to the appropriate command so that questions regarding the validity of the Biosecurity

Inspector can be addressed. Additionally, NBVC SNI's Naval Instruction 5090.14 on biosecurity will be referenced.

- B2. **Monitor shaker plates at barge loading facilities for the presence of dirt or seeds. Initiate cleaning protocols if not cleaned.**
Determine if shaker plates are being maintained (cleaned) so that dislodged dirt/materials do not accumulate to a level that will be easily spread, ideally before and after every loading event.
- B3. **Monitor roadsides for new species.**
Coordinate with existing weed management plans to survey ruderal and disturbed roadsides nearby to cargo collection and departure sites to detect new invasive weed species brought by vehicles.
- B4. **Examine all vehicles and heavy equipment prior to transport.**
Thoroughly inspect all vehicles following the checklist in Appendix A. Retain the vehicle if invasive species are detected.

Post Detection Response – Vehicles and Heavy Equipment

Strategy C: Rapid Response

Implement a coordinated system for rapid response efforts to contain newly detected invasive species from vehicles.

ACTIONS

- C1. **Hold the shipping party responsible for cleaning tagged vehicles.**
If vehicles are found in violation of established cleanliness standards, are unable to be used on island or cannot be cleaned to be shipped in time, the shipping party is responsible for any incurred costs for reshipments. This may incentivize compliance with biosecurity standards.
- C2. **Identify and notify the appropriate point of contact.**
Depending on the organism detected, potential points of contact may include NBVC Natural Resources Managers, Natural Resources Specialists and Integrated Pest Management (IPM). The appropriate entity should be notified that an invasive species was detected upon inspection.
- C3. **Deliver a formal warning.**
The Navy should issue formal warnings and maintain an official record. If shipping parties are repeatedly in non-compliance by not cleaning vehicles or heavy equipment prior to delivery to the barge, shipping parties should be warned, and as a last measure, prohibited from sending vehicles and equipment to NBVC SNI.
- C4. **Red tag vehicles when they do not meet cleaning protocols and/or invasive species have been detected to prevent transport on the barge.**
If vehicles do not meet the shipping standards for cleanliness, they should be treated as if they harbor invasive species.

C5. **Contain the detected organism.**

Develop procedures to contain various organisms. For example, nets, traps, or cages should be used for invasive vertebrates. Sealed plastic bags should be used for invasive plant species. Smaller containers, glass or plastic vials, can be used to hold small invertebrates.

Biosecurity Education - Vehicles and Heavy Equipment

Strategy D: Outreach

Increase education of, and outreach to, those who may be potential sources for invasive species introductions through the transport of vehicles and heavy equipment.

ACTIONS

D1. **Update and re-distribute NBVC SNI Commander's Naval Instructions on Biosecurity.**

The Naval Instructions should have a section on the preparation and cleanliness expectations of vehicles prior to transport. Additionally, the Naval Instruction should contain an organization schematic that directs specific activities to certain sections within this Plan.

D2. **Include reference to NBVC SNI Commander's Naval Instruction in all interpretive paneling on biosecurity.**

It should be reinforced that NBVC SNI's expectation is that vehicles and heavy equipment should be carefully and frequently cleaned to prevent introductions and to limit the spread of invasive species.

D3. **Develop and distribute a SNI "Most Wanted" poster of watch-list species and worst invaders to anyone shipping vehicles or driving on-island.**

Colorful and photo-heavy pamphlets should be distributed to all personnel driving vehicles and heavy equipment.

D4. **Distribute information on how to report suspected incursions.**

Shipping parties should have the proper contacts if it is suspected that an invasive species was transported to the island through a vehicle.

D5. **Create and post instructional signage for vehicle cleanliness standards at on-island car washes and if implemented, cleaning stations at barge loading facilities.**

Instructional materials should detail the importance of keeping vehicles clean, how to prevent spread of invasive species to the island, and the expectations on what should be thoroughly cleaned (Appendix A).

D6. **Conduct regular training on invasive species prevention and distribute NBVC Naval Instructions to all NBVC personnel.**

Currently, the SNI Natural Resources Manager conducts regular in-briefings once new island personnel arrive on-island that discusses pertinent issues to natural resources, including biosecurity. This in-briefing should be maintained but should also be conducted on the mainland prior to departure.

A Biosecurity Specialist should also conduct these trainings and determine the proper materials that should be distributed to personnel prior to departure. For example, if personnel are transporting a vehicle to SNI, vehicle cleaning expectations, hand-outs, and written protocols relevant to prevent invasive species incursions via heavy equipment and vehicles should be disseminated and explained prior to transport.

Naval Base Ventura County San Nicolas Island Biosecurity Plan

Contact: NAVFAC Environmental Division

General Instructions: *The following subsection is a component of the overarching NBVC SNI Biosecurity Plan designed to reduce and/or prevent the arrival of invasive species to SNI that impact military readiness and mission. Please contact NAVFAC Environmental Division for questions or for the complete Plan. Each subsection represents a potential pathway for an invasive species to arrive on the island and in order to detail strategies that prevent that risk, all recommendations are summarized into one table the precedes the subsection. Each recommendation is referred to as an “Action” and has an associated number. Not all Actions will be implemented due to costs or other constraints; however, all Actions are provided and are organized by their inherent value—starting from the easier and less costly to more strategic and complicated of Actions. Detailed descriptions follow the table and provide context.*

This subsection requires the following enclosures:

1. Appendix E
2. Appendix G
3. Appendix H

3.1.2. Equipment and Materials

In order to service an inhabited island, equipment and materials are imported to SNI to sustain a functioning military. However, equipment and materials are imported with inherent risks such as arthropod pests embedded in wood packaging materials (WPM) and cardboard, invasive plant species from aggregates, invasive species on hand and power tools, and organisms on or contained within shipping containers.

Infrastructure such as roads require mainland sources and are shipped to NBVC SNI. Imported materials, such as gravel and road base, are often responsible for the introduction of various pests such as Argentine ants. Very few materials are produced on SNI, but fill dirt is excavated for maintenance projects. A significant amount is sourced from the mainland and brought to NBVC SNI.

Cargo such as soil and erosion control material (straw wattles or straw bales) may also contain invasive species unless certified weed and pest-free (Figure 3-7). Tools used for construction or restoration projects, road maintenance, or transportation may introduce invasive species, especially weed seeds.

Habitat restoration activities on the island typically involve importing potting soil and soil amendments for use in the native plant nursery. Coarse sand may also occasionally be imported or collected in small quantities from the island. Materials originating from the mainland may introduce soil pathogens, including but not limited to fungus, bacteria, invertebrates, etc. These may harm native plants and disrupt natural soil cycles. Improperly composted materials may also contain viable weed seeds. Composted soils and peat moss present the greatest threat, while perlite and vermiculite are generally sterile. Invertebrates, such as earthworms, slugs, and ants, may occur within or on packing materials, and large shipments may conceal small mammals, such

as rats or mice. Contaminated media used in restoration poses the greatest threat to native habitats.

Additionally, restoration or erosion control materials, such as straw bales and wattles, can harbor noxious plant species and transport other non-native taxa. To prevent the spread of invasive plants, County Agricultural Commissioners and the California Department of Food and Agriculture (CDFA) offer inspection services to certify materials as weed-free. Weed-free forage is defined as hay, feed, straw or straw mulch that has been inspected and certified not to contain seeds from plants found on the California noxious weed list. The term “weed-free” is a misnomer in that the CDFA inspection process cannot reduce the risk to zero nor are these materials inspected for other invasive weeds not found on the CDFA noxious weed list.

Ideally, in the process of construction or restoration, 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, impractical or not allowed, thereby, requiring the import of mainland soils and amendments.

Lastly, containers such as roll-offs, dumpsters, conex boxes, or prefabricated construction materials are attractive to various invasive species such as raccoons and have the potential to easily transport organisms to the island, especially if containers are not inspected.

Table 3-2. Equipment and materials biosecurity effort priority index and action value table.

Action Number	Potentially Prevented Invasives	Action	Implementation Index ^a	Personnel Index ^b	Cost Index ^c	Additive Effort Score ^d	Action Value Score ^e
Prevention of Incursions							
A1.	invertebrates, invasive plants, small mammals	Dispose of cardboard brought to the island properly.	1	1	1	3	MED
A2.	invertebrates, invasive plant	Require lumber that is heat treated, kiln dried and/or chemically impregnated.	2	2	2	6	MED
A3.	invertebrates, invasive plant	Require all shipping parties to be in compliance with DoD Naval Instruction 4140.01-M-1 – Compliance for Defense Packaging: Phytosanitary Requirements for Wood Packaging Material (Appendix G).	2	2	2	6	MED
A4.	invertebrates, invasive plant	If obtaining wood from the Western United States, require wood be certified with a KD-HT stamp.	2	2	2	6	MED
A5.	invertebrates, invasive plants, small mammals	Reduce and discourage the use of cardboard boxes in the shipment of materials to NBVC SNI.	3	1	3	7	HIGH
A6.	invertebrates	Require that wood pallets arriving on island be certified as treated and/or fumigated with methyl bromide.	3	2	2	7	MED
A7.	invertebrates, invasive plants, small mammals	Require shipments arrive on plastic pallets.	2	2	3	7	MED
A8.	invertebrates, invasive plants, small mammals	Use plastic crates for food shipment.	3	1	3	7	MED
A9.	invertebrates, invasive plants, small mammals	Ensure shipments made on/in WPM prevent the transport of invasive species.	3	2	3	8	HIGH
A10.	small mammals, reptiles	Maintain island-only plastic pallets that are cleaned and reused as needed.	3	2	3	8	MED
A11.	small mammals	If shipments are made on wooden pallets, require the transfer from wooden to plastic pallets.	3	3	3	9	MED
B1.	invertebrates, invasive plants	Require that any NBVC Port Hueneme re-purposed pallets be stored in a "pest-free" zone prior to shipment to SNI.	3	2	3	8	HIGH
C1.	invasive plants	Require that personnel sourcing aggregates source materials from approved mainland quarries that meet standards.	1	1	1	3	HIGH
C2.	invasive plants	Require that aggregates are sourced from pit quarries; forbid river-bottom sourced aggregates.	3	1	2	6	HIGH
C3.	invasive plants	Request weed-free aggregate.	2	2	2	6	HIGH
C4.	invasive plants	Request weed-free aggregate sourced from mainland U.S.	2	2	2	6	HIGH
D1.	invertebrates, invasive plants	Do not stock pile soil prior to transport to NBVC SNI.	1	1	1	3	LOW
D2.		Request contractors source certified weed free erosion control and restoration materials (straw bales, wattles).	1	1	1	3	HIGH
D3.		If soil must be imported, shipping parties should visually inspect the outside of the package.	1	2	1	4	LOW
D4.		Alternatively, forbid transport of foreign soil and develop a "make-your-own" soil program.	3	3	2	8	HIGH
D5.		Consider sterilization measures such as solarization.	3	3	2	8	MED
D6.		Consider sterilization measures such as chemical treatment.	2	3	3	8	MED
E1.	invertebrates, invasive plants, small mammals	Require that food and perishable items be stored in pest-proof containers.	1	2	1	4	HIGH
E2.	all species	Require that shipping parties bear the burden of unshipped containers if they are red-tagged or not shipped due to biosecurity concerns.	1	2	1	4	LOW
E3.		Red tag shipping containers that harbor invasive species or are unclean.	1	3	1	5	HIGH
E4.		Thoroughly inspect all shipping containers destined for SNI.	3	2	2	7	HIGH
E5.		Investigate the feasibility of island-designated barge shipping containers that are not used anywhere else in the region.	3	3	3	9	HIGH
E6.		Require that the integrity of all storage containers, Conex boxes, air cargo containers, roll-offs, dumpsters, etc. be intact, sealed (so as to prevent the entry of animals), and pressure-washed.	3	3	3	9	LOW
E7.		If storage becomes necessary at NBVC Port Hueneme or at NBVC SNI for barge shipments, create a quarantined and pest-free storage facility near barge operations to store shipping containers destined for the mainland and island.	3	3	3	9	HIGH
F1.		all species	Thoroughly inspect all cargo destined for NBVC SNI, check for the presence of invasive species and ensure cleanliness of equipment.	3	3	2	8
F2.	all species	Implement inspections by trained scent dogs.	3	3	3	9	HIGH
G1.	Cargo specific	Forbid the transport of specific cargo items.	1	1	1	3	LOW
G2.	all species	Do not allow stockpiling or storage of equipment and materials prior to transport.	1	1	1	3	LOW
G3.		Provide contracting language.	1	1	1	3	LOW
G4.		Red tag cargo not in compliance or harboring invasive species.	1	3	2	6	HIGH

Table 3-2 continued. Equipment and materials biosecurity effort priority index and action value table.

Early Detection and Monitoring							
H1.	not applicable	Biosecurity Inspectors will wear appropriate uniforms while conducting inspections of equipment and materials to convey the sanctioned authority of the position and secondarily carry information cards to be passed on to any personnel, contractor, or military personnel that challenges their authority.	1	1	1	3	HIGH
H2.	all species	Set up regular monitoring schedules anywhere equipment and materials are stored or unpackaged on island.	2	2	2	6	LOW
Post Detection Response							
I1.	equipment specific	Hold the shipping party responsible for meeting cleanliness expectations.	1	1	1	3	LOW
I2.	all species	Identify and notify the appropriate point of contact.	2	2	1	5	LOW
I3.		Deliver a formal warning.	2	2	1	5	LOW
I4.		Contain the detected organism.	2	2	2	6	LOW
I5.		Red tag equipment and materials when invasive species have been detected or when equipment does not meet cleanliness standards to prevent accidental inclusion on the barge/aircraft.	3	3	2	8	HIGH
I6.		When detections are confirmed, set up regular monitoring schedules anywhere equipment and materials are stored or unpackaged on island.	3	3	2	8	HIGH
Biosecurity Education							
J1.	all species	Update and re-distribute NBVC SNI Commander's Naval Instructions on Biosecurity.	1	1	1	3	LOW
J2.		Include reference to NBVC SNI Commander's Naval Instruction in all interpretive paneling on biosecurity.	1	1	1	3	LOW
J3.		Develop and widely distribute a concise and regularly updated list of most wanted species likely to be attached to equipment and materials.	1	1	1	3	LOW
J4.		Ensure that contracting language includes cleaning expectations for equipment and the expectation that certain sourced materials will have to be approved.	1	1	1	3	LOW
J5.		Ensure that the NBVC SNI Biosecurity Plan and the NBVC SNI Commander's Naval Instructions on Biosecurity are in Request for Proposals issued by NBVC and Naval Facilities Engineering Command contracting teams.	1	1	1	3	LOW
J6.		Distribute information on how to report suspected incursions.	2	2	1	5	LOW
J7.		Implement regular training on invasive species and DoD Naval Instruction 5090.14 to all personnel.	2	2	2	6	LOW
J8.		Develop interpretive signage at all shipping locations (barge and airport) emphasizing importance of source materials and equipment cleanliness.	2	2	2	6	LOW

¹Implementation Index - 1 Minor alteration to existing action or program 2 Action can be implemented within existing programs but moderately expanding program's actions 3 Requires an additional program, significantly alters programs, adds significant tasks to existing program

²Personnel Index - 1 Action can be done under existing position, job description may expand slightly to incorporate implementation of biosecurity action 2 Job description must expand moderately to incorporate implementation of biosecurity action 3 The effort required to incorporate the recommended action is so substantial it may require more oversight than currently existing positions dedicated to biosecurity

³Cost Index - 1 Little to no appreciable increase to existing budget 2 Moderate increase 3 Extensive increase

⁴Additive Effort Score - additive of the three above indices. Scores of 3 represent biosecurity actions that should be prioritized first because of low cost, no significant changes to existing program, and easy implementability. Scores of 4 - 7 are second level priority biosecurity actions that may have higher cost and require greater output at the Navy's expense to implement. Scores of 7+ represent third level priority biosecurity actions that require the most output and the design of significant programs.

⁵Action Value Score - LOW Basic or standard biosecurity strategy MED Moderate or increasing in strategic value HIGH Advanced and highly valuable action

Prevention of Incursions – Equipment and Materials

Strategy A: Examine Protocols On Wood Packaging Materials

Require shipping parties to examine the media involved in the transport of supplies to NBVC SNI.

ACTIONS

- A1. **Dispose of cardboard brought to the island properly.**
Cardboard should be stockpiled in a designated dumpster near barge operations and transported off island regularly.
- A2. **Require lumber that is heat treated, kiln dried and/or chemically impregnated.**
For the purposes of WPM and the requirement to eradicate pest infestations, heat-treated (HT) lumber is heated to reach a core temperature of 56 degrees centigrade (°C) for 30 minutes. Strength or durability is not compromised in any way by the HT process.
- A3. **Require all shipping parties to be in compliance with DoD Naval Instruction 4140.01-M-1 – Compliance for Defense Packaging: Phytosanitary Requirements for Wood Packaging Material (Appendix G).**
This document provides guidance on the implementation of procedures for uniform DoD compliance with international agreements on cross-border flows of “Pest-Free”

WPM. This document requires that military installations shall “actively promote, implement, monitor, and measure procedures to ensure the elimination of ‘pests’ [invasive species] using WPM as a host. As such, the intent is to treat, test, or phase-out all non-compliant WPM inventory over time.”

This manual also incorporates the International Standards for Phytosanitary Measures No. 15 (ISPM 15). ISPM 15 affects all wood packaging material (pallets, crates, dunnage, etc.) and requires that they be debarked and then heat treated or fumigated with methyl bromide and stamped with a mark of compliance (Figure 3-3). This is mostly available for wood that is sourced internationally and imported into the United States. In international shipping, fumigation certificates can also be requested when importing cargo and WPM from abroad but are not mandated. Locally sourced lumber will not have an ISPM 15 stamp but a kiln-dried heat-treated stamp (KD-HT). Having an easily viewable stamp allows ease in biosecurity inspections to ensure no invasive species such as invertebrate pests are utilizing WPM.

A4. If obtaining wood from the Western United States, require wood be certified with a KD-HT stamp.

Western Wood Products Association and West Coast Lumber Inspection Bureau, both grading agencies for lumber, list mills offering KD-HT grade marked lumber; Sierra Forrest Products, Sierra Pacific Industries, and Collins Pine Company are some examples of mills that produce KD-HT treated products. Require that shipping parties source KD-HT timber in framing projects. Non-framing projects that use wood laminates do not need or have KD-HT stamps. Having an easily viewable stamp allows ease in biosecurity inspections to ensure no invasive species such as invertebrate pests are utilizing WPM.

A5. Reduce and discourage the use of cardboard boxes in the shipment of materials to NBVC SNI.

Cardboard boxes can harbor various pests and should be banned from use on NBVC SNI. Larvae of pest species such as the polyphagous shot hole borer If not feasible, limit the use of cardboard on NBVC SNI to only allow shipments in cardboard if materials were directly packed into a clean and inspected cardboard box. Do not allow cardboard to be repurposed. Repurposed cardboard, especially used in the galley, can attract invasives such as Argentine ants to new locations on the island (Figure 3-5).

A6. Require that wood pallets arriving on island be certified as treated and/or fumigated with methyl bromide.

WPM (boxes, pallets, crates, dunnage, ammo containers, etc.) are typically made from the lowest grade of lumber and have not been debarked—an important standard in sourcing wood materials. Therefore, the instances of pests and risk of introduction are often higher in WPM, including pallets, due to the presence of bark. Therefore, require that if wood pallets are used that they are in compliance with ISPM 15 and DoD Naval Instruction 4140.01-M-1.

A7. Require shipments arrive on plastic pallets.

Alternatively, if wooden pallets are not in compliance with ISPM 15/DoD Naval Instruction 4140.01-M-1, mandate that all shipments utilize plastic pallets; many types and affordable options exist (Figure 3-4).

A8. Use plastic crates for food shipment.

Food should be shipped in plastic agricultural boxes to limit the spread of pests and promote cleanliness.

A9. Ensure shipments made on/in WPM prevent the transport of invasive species.

WPM (boxes, pallets, crates, dunnage, ammo containers, etc.) are typically made from the lowest grade of lumber and have not been debarked—an important standard in sourcing wood materials. Therefore, the instances of pests and risk of introduction are often higher in WPM due to the presence of bark. Untreated lumber poses a risk of carrying harmful pests, including wood-boring beetles that could negatively affect wooden infrastructure and coastal woody shrublands on SNI. Every region that lumber is sourced from likely has some pest(s) which could be extremely harmful to local flora and fauna on NBVC SNI.

A10. Maintain island-only plastic pallets that are cleaned and reused as needed.

Using plastic pallets will prevent the spread of pests and other invasive species harbored in WPM. However, they must be regularly cleaned and stored in pest-free environments.

A11. If shipments are made on wooden pallets, require the transfer from wooden to plastic pallets.

Once palletized shipments arrive on NBVC SNI, shipments should be transferred to plastic pallets in a quarantine facility near barge operations or areas of highest use. These plastic palletized shipments can then be distributed throughout the island.



Figure 3-3. Examples of pallets and crates with the ISPM 15 logo certifying these containers are in compliance with international standards. Source: en.wikipedia.org/wiki/ISPM_15



Figure 3-4. Many types of plastic pallets exist including crates and storage options. Source: www.packagewarehouse.com



Figure 3-5. An example of how cardboard should never be repurposed on the island. In this instance, cardboard could make an attractive food source for Argentine ants and lead to the expansion of their population on SNI. Additionally, cardboard could transport various invasive species such as ants and cockroaches and efforts should be made to reduce shipments to SNI in cardboard.

Strategy B: Ensure Proper Protocols on Pallets and Their Movement

Follow standardized protocols focused on pallets and their movement.

ACTIONS

B1. Require that any NBVC Port Hueneme re-purposed pallets be stored in a “pest-free” zone prior to shipment to SNI.

Re-purposing pallets should be highly discouraged as per DoD Naval Instruction 4140.01-M-1 and recommendations outlined within this Plan. However, if pallets are in fact re-purposed and stored on the mainland, they should be kept in facilities that are regularly inspected and/or treated to prevent contamination from invasive species such as arthropod pests (Figure 3-6). Re-purposed pallets should always:

- be stored on concrete or asphalt, never directly on dirt, and
- be pressure washed prior to loading for transport to SNI.



Figure 3-6. Termites embedded in pallets transported to NBVC SNI and subsequently burned once discovered.

Strategy C: Require Weed-Free Aggregates

Require contractors and military personnel to source certified weed-free aggregates before transport to NBVC SNI.

ACTIONS

C1. Require that personnel sourcing aggregates source materials from approved mainland quarries that meet standards.

Management should develop a list of approved aggregates sourced from the mainland incorporating the California Invasive Plant Council’s (Cal-IPC) best management practices ([BMP]; Preventing the Spread of Invasive Plants: Best Management Practices for Land Managers, N.D.; Appendix E). Contractors should notify biosecurity managers within two weeks after the contract award date the source company, location, and type of aggregate material they plan to use for the project.

C2. Require that aggregates are sourced from pit quarries; forbid river-bottom sourced aggregates.

Highly disturbed sites such as river-bottom quarries have the potential to include a higher diversity of invasive weed species because of alluvial sediment movement. Pit quarries source aggregates deeper from surface soil layers and have less of a potential for cross-contamination and seed movement as compared to river-sourced aggregates.

C3. **Request weed-free aggregate.**

Aggregates sourced from quarries and gravel pits are from perennially disturbed areas. Because of this disturbance regime, quarries become high quality habitat for many invasive species and the materials sourced from them become a mechanism to transport invasive species elsewhere. Invasive plant seeds land on and contaminate recently mined sand and gravel. When the contaminated aggregate is transferred to a project site, these seeds are distributed and can easily establish. When NBVC SNI (or its contractors) sources aggregate, spray pre-emergent herbicides to prevent germination of any plant species.

C4. **Request weed-free aggregate sourced from the mainland U.S.**

As described above, aggregates are a likely vector for invasive plant seeds. Therefore, as an additional precaution to prevent the incursion of invasive plants from abroad, all aggregates should be sourced from the mainland U.S. Other countries, such as Australia, have invasive species assemblages that are similarly devastating to SNI's ecoregion. Sourcing aggregates from a country with a similar climate and a suite of invasive species is a high risk.

Strategy D: Examine Restoration and Erosion Control Materials

Require contractors and military personnel to source certified weed-free erosion control materials and pest-free soil.

ACTIONS



D1. **Do not stock pile soil prior to transport to NBVC SNI.**

Store mixed soils and ingredients in a manner that will not encourage growth of pathogens or invasive species. Keep the mainland area where soil is stored clean and dry to not attract pests.

D2. **Request that personnel source certified weed-free erosion control and restoration materials (straw bales, wattles).**

Shipping parties should provide a proof of certification that erosion control materials are weed-free before transport to SNI. CDFA Form 66-079 "Certificate of Quarantine Compliance (Origin or Treatment)" is the legal document verifying that the materials have been inspected and certified (Appendix H). This is associated with the inspection of forage/straw materials. This document should be required as part of the paperwork process for shipping materials to NBVC SNI if weed-free restoration materials are required. Invasive plant species are capable of transport in restoration materials and could result in costly expenditures to treat (Figure 3-7).

Figure 3-7. Yellow star-thistle growing out of a straw bale. Source: Cal-IPC.

- D3. **If soil must be imported, shipping parties should visually inspect the outside of the package.**
Packages should be free of dirt, dust, and invertebrates and be imported in a pest-proof, clean container as an extra precautionary measure.
- D4. **Alternatively, forbid transport of foreign soil and develop a “make-your-own” soil program.**
Soil could be mixed on the island from materials of known origin. Sources of material could include properly composted food waste from the NBVC SNI’s kitchen in pest-free containers, inorganic material and sand. Santa Barbara Island, one of the California Channel Islands, is successfully making soil on-site for its restoration efforts (D. Mazurkiewicz, pers. comm.). Making soil on island would successfully eliminate any transport of invertebrates by soil.
- D5. **Consider sterilization measures such as solarization.**
Large quantities of soil can be reliably solarized using plastic tarps, and pathogens should be killed after 30 minutes at 82°C. Soil sterilization should occur as soon as possible after arrival to prevent escape of any potential invasive species (Callaway et al. 2004).
- D6. **Consider sterilization measures such as chemical treatment.**
This would require considerably more infrastructure, permitting and storage of chemicals but would be effective at preventing the introduction of new weed species. This is not effective for invertebrate pests. A broad spectrum, non-selective herbicide such as imazapyr is active in soils for up to six months and can be used as a pre-emergent in addition to a post-emergent herbicide. However, this will likely have a negative effect on restoration output because of the amount of time that imazapyr remains active in the soil and therefore the soil would require a resting period to allow the herbicide to deactivate.

Strategy E: Examine Storage Containers

Ensure that storage containers, roll-offs, dumpsters, etc. prevent refuge for invasive species and that all perishables are stored in pest-proof containers.

ACTIONS

- E1. **Require that food and perishable items be stored in pest-proof containers.**
Food should not only be transported in ISPM 15 certified crates or plastic agricultural boxes but in sealed containers that do not allow pests such as invertebrates and rodents.
- E2. **Require that shipping parties bear the burden of unshipped containers if they are red-tagged or not shipped due to biosecurity concerns.**
Provide the shipping party with reasons why cargo did not pass inspection and require that cleanliness standards are met before shipment to SNI.
- E3. **Red tag shipping containers that harbor invasive species or are unclean.**

Prevent the transport of shipping containers that do not pass inspection prior to barge loading.

E4. Thoroughly inspect all shipping containers destined for SNI.

Open doors of Conex boxes, open lids to dumpsters, and thoroughly examine all potential animal harborage points and presence of mesopredators, reptiles, and rodents. Prior to departure, a flashlight should be used to inspect fork lift holes which may serve as rodent refuge in shipping containers (Figure 3-11).

E5. Investigate the feasibility of island-designated barge shipping containers that are not used anywhere else in the region.

If feasible, barge-specific shipping containers that are designated for use only to NBVC SNI could reduce the risk of invasive species. Cleanliness standards would be easier to ensure, and pest-free storage conditions could be achievable. Currently, air cargo containers are dedicated to SNI.

E6. Require that the integrity of all storage containers, Conex boxes, air cargo containers, roll-offs, dumpsters, etc. be intact, sealed (so as to prevent the entry of animals), and pressure-washed.

Air cargo containers must be sealed to disallow animals (e.g. rodents or mesopredators) from entering. If air cargo containers do not have rubber stoppings, they must be replaced (Figure 3-8).

Developing rust spots should be painted to prevent further corrosion and development of holes (Figures 3-9 and, 3-10). No holes should be permitted to prevent re-infestation after the inspection. Additionally, fork lift holes should be closely inspected with a flashlight to ensure they are not harboring animals. Whenever possible, roll-offs should use covers to prevent entry from undesirable animals; however, inspections should occur immediately prior to transport to ensure no unwanted animals if storage containers and roll-offs cannot be completely sealed (Figures 3-8 and 3-9).

Air cargo containers, storage containers, and dumpsters must be free of dust, cobwebs, dirt clods, mud, attached organisms, and contraband such as firewood (Figure 3-9). They must be cleaned and swept prior to loading any materials inside. Inspections must confirm that shipping containers do not harbor any organisms.

E7. If storage becomes necessary at NBVC Port Hueneme or at NBVC SNI for barge shipments, create a quarantined and pest-free storage facility near barge operations to store shipping containers destined for the mainland and island.

Currently, barge shipments are loaded the day of and storage is not required at NBVC Port Hueneme. However, some shipments are stored on island prior to departure for the mainland. If storage becomes a necessity, shipping parties should access all island designated shipping containers from a pest-proof facility in which to load equipment. A concerted trapping effort with IPM is recommended.

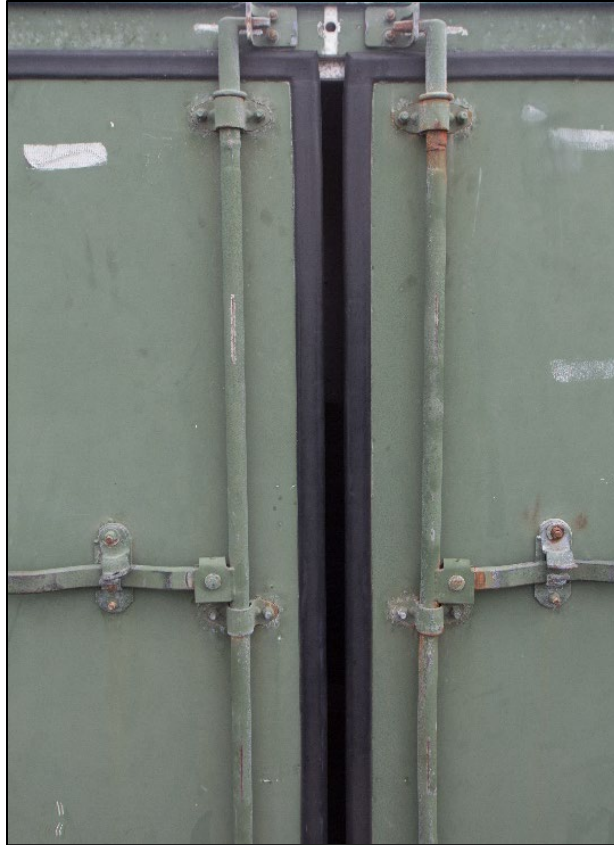


Figure 3-8. Air cargo containers with no rubber backing allow animals such as rodents to seek refuge and possible transport to NBVC SNI.



Figure 3-9. Dumpsters and roll-offs should be inspected immediately before transport to NBVC SNI to ensure no harborage stowaways. Additionally, containers should be pressure washed and free from dirt to ensure no transport of invasive plant or arthropod species.



Figure 3-10. Inspections should ensure that the integrity of shipping containers is intact to prevent entry by unwanted pests. In this case, air cargo containers should be sealed. Holes in dumpsters or shipping containers offer attractive points of entry for invasive species.



Figure 3-11. Fork lift holes should be inspected with flashlights to ensure no animal harborage prior to departure.

Strategy F: Ensure Cleanliness of Equipment And Materials

Require that personnel ensure the cleanliness of their equipment and materials before transport to NBVC SNI.

ACTIONS

F1. Thoroughly inspect all cargo destined for NBVC SNI, check for the presence of invasive species and ensure cleanliness of equipment.

Ensure that equipment and materials free of dust, cobwebs, dirt clods, mud, and trash, and that cargo does not harbor any organisms whatsoever. Items such as chainsaw chains, hand saw blades, mower decks and blades, weed-eater blades, and crevices on other tools should be carefully inspected to prevent the introduction of invasive species, including invasive species harbored in dirt or mud. General inspections should include visual survey of the outside of packages, palletted shipments, or equipment for the presence of dirt (Figure 3-12).

F2. Implement inspections by trained scent dogs.

Detection dogs or military working dogs should conduct weekly cargo inspections for items transported by the barge. Trained dogs are effective detection tools for tracking animals and their sign, contraband, and forbidden materials (Smith et al. 2001).



Figure 3-12. Collections of dirt and trash on equipment loaded on the barge. Equipment with piles of dirt should be treated as if harboring an invasive species and properly cleaned or removed from the barge shipment.

Strategy G: Accountability

Ensure shipping parties are held accountable for the preparation of equipment and materials being transported to NBVC SNI.

ACTIONS

- G1. **Forbid the transport of specific cargo items.**
Managers on NBVC SNI should prioritize high risk items that should be forbidden from importation to the island, suggested items include: firewood, wood packaging materials, personal pets, landscaping and house plants.
- G2. **Do not allow stockpiling or storage of equipment and materials prior to transport.**
Equipment and materials should not be stored in unsecured facilities, or facilities with no IPM. Cargo should not be staged at the barge loading facilities or at the airport overnight. Cargo should be directly transported from points of origination to the barge and aircraft loading facilities.
- G3. **Provide contracting language.**
An abbreviated example of contracting language that could be adapted for use by NBVC SNI follows:

“All imported material from contractor-located sources must be certified to be free from noxious weeds or invasive plant materials and other deleterious material before entering the project site at the start of any contract with ground disturbing activities and/or construction season. The site and/or quarry must be available for review between the months of May and August, as that is the primary time when invasive plants are presentable and recognizable.” (Cal-IPC, N.D.).
- G4. **Red tag cargo not in compliance or harboring invasive species.**
If any shipping containers, equipment, tools, etc. are not up to cleanliness protocols or harbor invasive species, they must be tagged and forbidden transport to NBVC SNI.

Early Detection and Monitoring – Equipment and Materials

Strategy H: Early Detection

Develop a standardized monitoring system focused on early detection for invasive species on equipment and materials or at un-packaging locations.

ACTIONS

- H1. **Biosecurity Inspectors will wear appropriate uniforms while conducting inspections of equipment and materials to convey the sanctioned authority of the position and secondarily carry information cards to be passed on to any personnel, contractor, or military personnel that challenges their authority.**
Anyone conducting inspections of equipment and materials should be dressed to convey to authority and legitimacy of the position. Should the person conducting inspections of equipment be questioned, an information card will contain contact information to the appropriate command so that questions regarding the validity of the Biosecurity Inspector can be addressed. Additionally, NBVC SNI's Naval Instruction 5090.14 on biosecurity will be referenced.

H2. **Set up regular monitoring schedules where equipment and materials are stored or unpackaged on island.**

This should be accomplished using track plates, camera traps, and active traps to determine if regular animal use is occurring. Though most expensive, camera traps can identify a larger swath of species occurring within a site; from small mammals, to snakes, and mesopredators. Camera traps can be set passively without using an attractant bait—this is beneficial when facilities do not want to attract pests to their equipment.

Regular monitoring with camera traps or track plates should be conducted on the mainland at barge facilities and at the airfield. On island, locations such as contractor laydown yards and the airfield should also have regular monitoring programs to conduct early detection monitoring.

Post Detection Response – Equipment and Materials

Strategy I: Rapid Response

Implement a coordinated system for rapid response efforts to contain newly detected invasive species from equipment and materials.

ACTIONS

11. **Hold the shipping party responsible for meeting cleanliness expectations.**
If equipment is found in violation of established cleanliness standards and is unable to be included for shipment on the barge, the shipping party is responsible for any incurred costs for resh Shipments. This may incentivize compliance with biosecurity standards.
12. **Identify and notify the appropriate point of contact.**
Biosecurity managers should develop a flow chart for appropriate contacts. Depending on the organism, potential points of contact may include NBVC pest management, natural resources, animal services, and/or weed managers that an invasive species was detected upon inspection.
13. **Deliver a formal warning.**
The NBVC should issue formal warnings and maintain an official record. If shipping parties become repeat offenders by not cleaning equipment or materials, or harboring invasives prior to inclusion on the barge or aircraft, they should be prohibited from shipping equipment and materials to NBVC SNI.
14. **Contain the detected organism.**
Develop procedures to contain various organisms. For example, nets, traps, or cages should be used for invasive vertebrates. Sealed plastic bags should be used for invasive plant species. Smaller containers, glass or plastic vials, can be used to hold small invertebrates.
15. **Red tag equipment and materials when invasive species have been detected or when equipment does not meet cleanliness standards to prevent accidental inclusion on the barge/aircraft.**

If equipment and materials do not meet the shipping standards for cleanliness, they should be treated as if they harbor invasive species.

16. **When detections are confirmed, set up regular monitoring schedules anywhere equipment and materials are stored or unpackaged on island.**

Develop set transects, grids, or routes in concentric rings outward from storage areas, facilities, yards, nursery, restoration and erosion control sites or anywhere equipment and materials arrive targeting invasive plants species. Buffer zones and fence edges should also be surveyed with set transects, grids. Ensure that the IPM plan has a robust trapping program in these locations to prevent rodents or other invasive species. See Section 4.1.1 for more information on buffer zones.

Biosecurity Education - Equipment and Materials

Strategy J: Outreach

Increase education of, and outreach to, those who may be potential sources for invasive species introductions through the transport of equipment and materials.

ACTIONS

- J1. **Update and re-distribute NBVC SNI Commander's Naval Instructions on Biosecurity.**
The Naval Instructions should be updated to detail a list of equipment and materials that are expressly forbidden (e.g. firewood, potentially pallets in the future) and on cleanliness expectations of equipment and materials prior to transport. Additionally, the Naval Instruction should contain an organization schematic that directs specific activities to certain sections within this Plan.
- J2. **Include reference to NBVC SNI Commander's Naval Instruction in all interpretive paneling on biosecurity.**
Formalizing biosecurity requirements and protocols may persuade personnel to actively engage in biosecurity topics.
- J3. **Develop and widely distribute a concise and regularly updated list of most wanted species likely to be attached to equipment and materials.**
Photographs can help personnel positively identify and report invasive species.
- J4. **Ensure that contracting language includes cleaning expectations for equipment and the expectation that certain sourced materials will have to be approved.**
Section 3.1 Vehicles and Section 3.1 Equipment and Materials can both be included as appendices to contracts or other materials given to contractors.
- J5. **Ensure that the NBVC SNI Biosecurity Plan and the NBVC SNI Commander's Naval Instructions on Biosecurity are in Request for Proposals issued by NBVC and Naval Facilities Engineering Command contracting teams.**
When federal contracts are in the request for proposal stage, potential bidders should be provided with pertinent sections of the NBVC SNI Biosecurity Plan and the Commander's naval instructions as they pertain to the scope of work.

- J6. **Distribute information on how to report suspected incursions.**
After a point of contact is identified, all reports should coordinate and collaborate with other departments.
- J7. **Implement regular training on invasive species and DoD Naval Instruction 5090.14 to all personnel.**
All in-briefs should include a thorough biosecurity section.
- J8. **Develop interpretive signage at all shipping locations (barge and airport) emphasizing importance of source materials and equipment cleanliness.**
Educate personnel and all shipping parties that the first strategy for prevention is how cargo is prepared for transport.

Naval Base Ventura County San Nicolas Island Biosecurity Plan

Contact: NAVFAC Environmental Division

General Instructions: *The following subsection is a component of the overarching NBVC SNI Biosecurity Plan designed to reduce and/or prevent the arrival of invasive species to SNI that impact military readiness and mission. Please contact NAVFAC Environmental Division for questions or for the complete Plan. Each subsection represents a potential pathway for an invasive species to arrive on the island and in order to detail strategies that prevent that risk, all recommendations are summarized into one table the precedes the subsection. Each recommendation is referred to as an “Action” and has an associated number. Not all Actions will be implemented due to costs or other constraints; however, all Actions are provided and are organized by their inherent value—starting from the easier and less costly to more strategic and complicated of Actions. Detailed descriptions follow the table and provide context.*

This subsection requires the following enclosure(s):

1. Appendix B
2. Appendix I

3.1.3. Personnel

Personnel have the potential to be an inadvertent vector of invasive species dispersal through clothing, footwear, and personal effects (e.g. luggage) carried onto the island. Personnel bringing authorized and unauthorized gear may become problematic if invasive species disperse from their personal effects. Generally, few occupants bring houseplants or decorative landscaping, but introductions have occurred in the past even though NBVC SNI policy does prohibit these items as per DoD Naval Instruction 5090.14.

Additionally, unsanctioned personnel activities, such as hobby gardening or landscaping, may introduce garden species that have the potential to become pest species. Even commonly cultivated plants such as cherry tomatoes have proven invasive on Anacapa, one of the Northern Channel Islands, or celery and rosemary on SNI that have escaped into nearby habitats.

The preparation of personnel and personal effects before arrival on NBVC SNI involves adherence to cleaning protocols in addition to understanding about unsanctioned items.

Table 3-3. Personnel biosecurity effort priority index and action value table.

Action Number	Potentially Prevented Invasives	Action	Implementation Index ^a	Personnel Index ^b	Cost Index ^c	Additive Effort Score ^d	Action Value Score ^e
Prevention of Incursions							
A1.	invertebrates, invasive plants	Prior to departure and part of the on-boarding requirements, require personnel to complete the biosecurity ECATTs (see Action E5).	1	1	1	3	LOW
A2.	invertebrates, invasive plants	Update contracting language and refer contractors to DoD Naval Instruction 5090.14.	1	1	1	3	LOW
A3.	invertebrates, invasive plants	Continue to prohibit island resident's personal gardens.	1	1	1	3	LOW
A4.	all species	Require a Hazard Analysis Critical Control Point (HACCP) Plan as part of any project conducted by NBVC staff and reviewed by the Project Review Board form deemed to potentially spread invasive species. Additionally, require a HACCP Plan as part of Navy Work Plans and/or Environmental Compliance Plans as part of federal contracts.	3	1	1	5	HIGH
A5.	invasive plants	Create official "Landscape Atlases" in which all ornamental landscaping is mapped and inventoried.	1	2	2	5	HIGH
B1.	invertebrates, invasive plants	Remove any deleterious material from clothing, shoes or boots and personal effects (including backpacks, gaiters) before leaving the mainland and travelling to NBVC SNI.	1	1	1	3	LOW
B2.	invertebrates, invasive plants	Clean clothing, boots and gear at designated cleaning areas or locations on the mainland limited in exposure to invasive plant seeds or material.	1	1	1	3	LOW
B3.	invertebrates, invasive plants	Maintain the cleanliness of boot scrubbers and other cleaning implements such as wall vacuums	1	1	1	3	LOW
B4.	all taxa	Disseminate the personnel biosecurity protocol checklist (Appendix B).	1	1	1	3	LOW
B5.	invertebrates, invasive plants	Require designated officials to perform quick visual inspections of personnel departing on aircraft and barges destined for NBVC SNI.	2	1	1	4	LOW
B6.	invertebrates, invasive plants	Require field personnel to carry appropriate equipment on both the mainland and SNI to help remove soil, seed, and plant parts.	2	1	1	4	MED
B7.	invertebrates, invasive plants	Examine camping gear.	1	2	1	4	LOW
B8.	invertebrates, invasive plants	Camping gear should be produced upon request for thorough inspections by trained officials.	1	2	1	4	LOW
B9.	invertebrates, invasive plants	Mandate on-island designated shoes/hiking boots, gaiters and field backpacks.	1	1	2	4	MED
B10.	all species	Ensure pest-proof trash cans distributed island-wide and encourage the proper disposal of trash.	2	1	3	6	MED
B11.	all species	Implement inspections by trained scent dogs.	3	3	3	9	HIGH
Early Detection and Monitoring							
C1.	invertebrates, invasive plants	Encourage personnel to self-report organisms they have removed from clothing.	1	1	1	3	LOW
C2.	invertebrates, invasive plants	Monitor for sign of invasive species in SNI's personal gardens.	1	1	1	3	MED
C3.	invertebrates, invasive plants	Schedule monitoring for entry points and common areas.	1	2	1	4	MED
Post Detection Response							
D1.	all species	Notify the appropriate point of contact.	2	2	1	5	LOW
D2.		Deliver a formal warning and repercussions if protocols are not followed.	2	2	1	5	LOW
D3.		Contain any detected organism found on personnel's clothing, shoes, or personal luggage.	2	2	2	6	LOW
D4.	invertebrates, invasive plants	If personnel do not meet cleanliness standards, do not allow transport to NBVC SNI until they have remedied the issue(s).	3	2	2	7	MED
Biosecurity Education							
E1.	all species	Routinely distribute NBVC SNI Commander's Naval Instructions on Biosecurity and regularly include in briefings.	1	1	1	3	LOW
E2.		Include reference to NBVC SNI Commander's Naval Instruction in all interpretive paneling on biosecurity.	1	1	1	3	LOW
E3.		Develop and widely distribute a concise and regularly updated list of most wanted species likely to be attached to personnel.	1	1	1	3	LOW
E4.		Implement regular training on invasive species and Naval Instruction to all personnel.	2	2	1	5	LOW
E5.		Update the ECATTs and include the following topics in the mandatory in brief of all NBVC SNI visitors.	2	2	2	6	LOW

^aImplementation Index - 1 Minor alteration to existing action or program 2 Action can be implemented within existing programs but moderately expanding program's actions 3 Requires an additional program, significantly alters programs, adds significant tasks to existing program

^bPersonnel Index - 1 Action can be done under existing position, job description may expand slightly to incorporate implementation of biosecurity action 2 Job description must expand moderately to incorporate implementation of biosecurity action 3 The effort required to incorporate the recommended action is so substantial it may require more oversight than currently existing positions dedicated to biosecurity

^cCost Index - 1 Little to no appreciable increase to existing budget 2 Moderate increase 3 Extensive increase

^dAdditive Effort Score - additive of the three above indices. Scores of 3 represent biosecurity actions that should be prioritized first because of low cost, no significant changes to existing program, and easy implementability. Scores of 4 - 7 are second level priority biosecurity actions that may have higher cost and require greater output at the Navy's expense to implement. Scores of 7+ represent third level priority biosecurity actions that require the most output and the design of significant programs.

^eAction Value Score - LOW Basic or standard biosecurity strategy MED Moderate or increasing in strategic value HIGH Advanced and highly valuable action

Prevention of Incursions – Personnel

Strategy A: Accountability

Ensure personnel are held accountable for the preparation of cargo (themselves and their personal gear) being transported to NBVC SNI as well as items considered contraband.

ACTIONS

- A1. **Prior to departure and part of the on-boarding requirements, require personnel to complete the biosecurity ECATs (see Action E5).**
Following the development of an updated ECATs that includes curriculum on biosecurity, all military personnel and contractors should be required to complete this online training prior to arrival on SNI.
- A2. **Update contracting language and refer contractors to DoD Naval Instruction 5090.14.**
Ensure that contracting language details items expressly forbidden and the cleaning standards they should adhere to prior to arrival on NBVC SNI.
- A3. **Continue to prohibit island resident’s personal gardens.**
The risks in hobby gardens include the spread of escapee plants as well as hybridization between native and non-native plants. In order to increase personnel awareness of endemic species, encourage residents to plant native gardens, especially around resident housing and the hotels. Federal properties also have the responsibility to the 1994 Presidential Memorandum *Environmentally and Economically Beneficial Practices on Federal Landscaped Grounds* which outlines using native plants that don’t harm ecological functions. All native plants should be sourced from the SNI nursery with approval of the NBVC SNI natural resources manager.
- A4. **Require a Hazard Analysis Critical Control Point (HACCP) Plan as part of any project conducted by NBVC staff and reviewed by the Project Review Board Form deemed to potentially spread invasive species. Additionally, require a HACCP Plan as part of Navy Work Plans and/or Environmental Compliance Plans as part of federal contracts.**
The Navy (or NBVC SNI in the least) should require staff and contractors to prepare a HACCP Plan as part of project reviews and contract deliverables. HACCP planning is a management tool that provides a structured method to identify risks and focus procedures that is being successfully used in natural resource pathway activities. Currently, the U.S. Fish and Wildlife Service performs HACCP planning to prevent non-native species from being dispersed, especially during biological surveys. Understanding pathways and developing plans to prevent and/or reduce non-target species and prevent biological contamination is necessary to avoid unintended spread of species.

A structured form is included in Appendix I but the process is as follows:

Step 1: Describe the activity

Step 2: Outline sequential tasks of the activity

Step 3: Identify potential non-target species that may be introduced as a result of the activity

Step 4: Conduct a risk assessment of the potential introduced non-target species
Step 5: Develop a risk action plan

A5. **Create official “Landscape Atlases” in which all ornamental landscaping is mapped and inventoried.**

This would entail that all flora are documented within landscaped areas and if that plant is found to infest native habitat, outside of its existing footprint in a developed area, then that particular species would be targeted for eradication. The Environmental Division should maintain this as a geospatial dataset and regularly monitor and inventory the developed areas where hobby gardens exist and the rest of the island to ensure that no ornamental plants have escaped.

Strategy B: Ensure Personnel Cleanliness and Proper Disposal

Require that personnel ensure the cleanliness of themselves and their personal effects before transport to NBVC SNI and the proper disposal of invasive species found within their own effects.

ACTIONS

B1. **Remove any deleterious material from clothing, shoes or boots and personal effects (including backpacks, gaiters) before leaving the mainland and travelling to NBVC SNI.**

Soil, mud, seeds, any plant parts should be carefully removed and placed in the trash prior to departure from the mainland. If any plant parts are discovered while en route, the soil shall be placed in sealed plastic bags for disposal. Cleaning stations should be established at the airport with wall vacuums and outside boot brushes (Section 3.2.2) where personnel can safely clean footwear. Boots can harbor invasive plant seeds, the effects of which can be seen in Figure 3-13.



B2. **Clean clothing, boots and gear at designated cleaning areas or locations on the mainland limited in exposure to invasive plant seeds or material.**

It is important that gear is cleaned prior to arrival on NBVC SNI, not post arrival. Locations where wall and hose vacuums have been installed as part of the biosecurity educational kiosk are appropriate boot cleaning facilities.

B3. **Maintain the cleanliness of boot scrubbers and other cleaning implements such as wall vacuums.**

Boot brushes that are routinely dirty can re-contaminate footwear and defeat the purpose of cleaning (Figure 3-13). Cleaning stations with boot brushes and/or wall vacuums should be regularly maintained to ensure cleanliness and lack of deleterious debris.

Figure 3-13. Photo of the NBVC SNI greenhouse manager with a pallet of grown-out grasses and other non-native plants that were collected as seeds from personnel's shoes.

B4. Disseminate the personnel biosecurity protocol checklist (Appendix B).

All personnel destined for NBVC SNI should follow the checklist to ensure all personal clothing and gear has been thoroughly cleaned and inspected.

B5. Require designated officials to perform quick visual inspections of personnel departing on aircraft and barges destined for NBVC SNI.

Identify a point of contact that can provide visual inspections to ensure that footwear is clean.

B6. Require field personnel to carry appropriate equipment on both the mainland and SNI to help remove soil, seed, and plant parts.

In particular, restoration, military, and fire field personnel will benefit by carrying wire brushes, horse-pick type brushes, small screwdrivers, and boot brushes to help clean gear in between sensitive areas on SNI and before departure from the mainland to SNI.

B7. Examine camping gear.

Tents should be shaken out and thoroughly dried before transport to NBVC SNI. Velcro should not harbor any seeds or debris. No dirt, mud, or other debris should be found inside, on, or clinging to any gear used for camping.

B8. Camping gear should be produced upon request for thorough inspections by trained officials.

Enforcement of protocols will prevent incursions from overlooked items. The Biosecurity Science Specialist or other NBVC personnel may examine camping gear prior to departure to SNI. In the event camping gear is not thoroughly examined, personnel shall alert the the NBVC SNI natural resource manager during the on-island indoctrination.

B9. Mandate on-island designated shoes/hiking boots, gaiters and field backpacks.

Personnel not entering field-type settings, or occupying office-type situations, may not need abide by this action. This is at the discretion of the biosecurity program and this may be most effective for military performing training exercises, natural resource, fire, utilities, and restoration personnel.

B10. Ensure pest-proof trash cans distributed island-wide and encourage the proper disposal of trash.

Personnel will dispose of trash that poses biosecurity risks if pest-proof trash cans are widely available. NBVC SNI should discourage personnel and residents from littering or stashing refuse in inappropriate places such as unsecured trash cans. All trash cans should be impenetrable to animals such as rodents. Ask personnel to dispose of weed seeds in sealed plastic bags.

B11. Implement inspections by trained scent dogs.

Detection dogs can be trained to detect invasive species and contraband. Dogs can quickly and discreetly walk through a waiting room of personnel waiting to depart to perform inspections of personnel and their personal effects.



Figure 3-14. Boot brushes should be regularly cleaned and debris should be disposed of in sealed plastic bags. The trafficked area around the boot cleaning station should also be swept and maintained.

Early Detection and Monitoring - Personnel

Strategy C: Early Detection

Develop a standardized monitoring system focused on early detection for high priority invasive species around areas heavily trafficked by personnel.

ACTIONS

- C1. **Encourage personnel to self-report organisms they have removed from clothing.**
Activities such as growing out weed seeds collected from personnel's clothing may encourage people to continue to inspect their clothing and others' clothing (Figure 3-13).
- C2. **Monitor for sign of invasive species in SNI's personal gardens.**
Although hobby gardens should be discouraged, any existing gardens should be monitored for known noxious, invasive weeds and any rodent activity. See Action A5 for creating, mapping, and inventorying personal gardens.
- C3. **Schedule monitoring for entry points and common areas.**
The airfield and barge landing areas should be prioritized for regular monitoring by camera trapping. Additionally, other areas such as the galley, resident housing, personal gardens, hotels, and training areas should be on a regular monitoring schedule and coordinated with Pest Management entities.

Post Detection Response - Personnel

Strategy D: Rapid Response

Post-detection responses should be tailored to whether a biosecurity risk was likely or not likely introduced to NBVC SNI from personnel.

ACTIONS

- D1. **Notify the appropriate point of contact.**
Biosecurity managers should develop a flow chart for appropriate contacts. Depending on the organism, potential points of contact may include NBVC pest management, natural resources, animal services, and/or weed managers that an invasive species was detected upon inspection.
- D2. **Deliver a formal warning and repercussions if protocols are not followed.**
If authority is granted, personnel with repeat offenses should be denied transport to NBVC SNI and do not follow protocols outlined in Appendix B for cleanliness standards.
- D3. **Contain any detected organism found on personnel's clothing, shoes, or personal luggage.**
Dispose of dirt and seeds in sealed plastic bag. If personnel are bringing expressly forbidden personal pets or other animals, contain the animal.
- D4. **If personnel do not meet cleanliness standards, do not allow transport to NBVC SNI until they have remedied the issue(s).**
Sites of embarkation should have boot cleaning materials and brushes so that personnel can quickly clean footwear to meet protocols and pass inspections.

Biosecurity Education - Personnel

Strategy E: Ensure Personnel Cleanliness

Increase education of, and outreach to, those who may be potential sources for invasive species introductions through the transport of vehicles and heavy equipment.

ACTIONS

- E1. **Routinely distribute NBVC SNI Commander's Naval Instructions on Biosecurity and regularly include in briefings.**
The Naval Instructions should be regularly distributed to civilian, military, and contractor personnel that details the cleanliness expectations of personnel's boots, clothing, and personal effect prior to transport. Additionally, the Naval Instruction should contain an organization schematic that directs specific activities to certain sections within this Plan.
- E2. **Include reference to NBVC SNI Commander's Naval Instruction in all interpretive paneling on biosecurity.**

It should be reinforced that this is a NBVC SNI expectation that personnel are responsible to prevention their own introductions and to limit the spread of invasive species, including landscaping and gardening supplies.

E3. Develop and widely distribute a concise and regularly updated list of most wanted species likely to be attached to personnel.

Colorful and photo-heavy pamphlets should be distributed to all personnel. These should also be in areas such as resident housing.

E4. Implement regular training on invasive species and Naval Instruction to all personnel.

All in-briefs should include a significant component on biosecurity and incorporate the cleaning standards checklist (Appendix B).

E5. Update the ECATTS and include the following topics in the mandatory in brief of all NBVC SNI visitors:

Primarily cover SNI topics that affect personnel and the specific vectors that will affect the military mission. Topics should instruct personnel how to:

- Prepare cargo for transport to NBVC SNI
- Prepare vehicles and heavy equipment for transport
- Source on-island materials to reduce spread of invasives
- Properly store food items
- Properly clean clothing, shoes and personal effects
- Identify invasive species of concern
- Report sightings and identify points of contact
- and most importantly, demonstrate the impacts invasive species have on the NBVC SNI military mission and ecosystem

3.2 Modes of Transport

Globally, international and national shipping is the primary pathway for the introduction of invasive species through the transport of foreign cargo and materials. Locally, for SNI this is no different; however, the conveyance itself (whether by barge, aircraft, commercial or recreational boats) is a significant vector. Barges discharge ballast water, suffer from biofouling complications, and also provide a platform for the transport of larger invasive species, especially rodents. Aircraft are capable of rapid transit resulting in higher species survival during short travel times and the risk of repeated introductions because of the regularity of flight schedules.

Although cargo is a substantial biosecurity risk and detailed in Section 3.1, thorough plans must also incorporate the risks incurred by the mode of transport (in this case, ocean-going vessels and commercial aircraft) itself. Military aircraft will be discussed separately in Section 4.1.4.

Ocean-going traffic in waters around SNI include NBVC SNI's weekly barge operations, commercial and recreational fishing operations, and recreational boats. Round-trip civilian flights service NBVC SNI multiple times daily.

Well defined protocols need to be implemented for the transportation agent itself—the barge and various airplanes that arrive on NBVC SNI, in addition to the preparation of cargo for transport.

Naval Base Ventura County San Nicolas Island Biosecurity Plan

Contact: NAVFAC Environmental Division

General Instructions: *The following subsection is a component of the overarching NBVC SNI Biosecurity Plan designed to reduce and/or prevent the arrival of invasive species to SNI that impact military readiness and mission. Please contact NAVFAC Environmental Division for questions or for the complete Plan. Each subsection represents a potential pathway for an invasive species to arrive on the island and in order to detail strategies that prevent that risk, all recommendations are summarized into one table the precedes the subsection. Each recommendation is referred to as an “Action” and has an associated number. Not all Actions will be implemented due to costs or other constraints; however, all Actions are provided and are organized by their inherent value—starting from the easier and less costly to more strategic and complicated of Actions. Detailed descriptions follow the table and provide context.*

This subsection requires the following enclosure(s):

1. Appendix C

3.2.1. Barge

A Foss 185-C4 barge services SNI and is towed by Foss Maritime tugboats. The barge is modified to match the barge docking facilities on SNI and therefore, the island is exclusively serviced by this barge only. Tugboats are not exclusive for SNI operations. The barge and tugboats are owned and operated by Foss Maritime and stored at their facilities at the Port of Long Beach. The barge is available to transport cargo for other customers but is rarely used for tasks unrelated to SNI operations. When not servicing SNI, the barge is stored at the Port of Long Beach where AIS including but not limited to wakame (*Undaria pinnatifida*) and devil weed (*Sargassum horneri*) have invaded harbor waters (Silva et al. 2002). Though as of 2018, devil weed has been documented in SNI’s intertidal. As of the date of this report, no rat barriers are used along mooring cables at the Port of Long Beach.



Figure 3-15. NBVC Port Hueneme barge loading area.

Materials, vehicles, roll-off dumpsters, equipment, and general supplies arrive at a staging area at NBVC Port Hueneme for direct transport to SNI (Figure 3-15). The concrete staging area is immediately adjacent to the dock used to load the barge. Cargo are unloaded at this staging area and are generally not stored here before transport. No facilities exist to store cargo.

Prevention is the most cost effective and environmentally sensitive method of managing invasive species and involves the

interception of invasives at the point of entry or release. The movement of AIS is usually the primary focus with ocean-going vessels, but terrestrial invasive species are of high concern as well. Regulating and enforcing ocean-going vessels is notoriously challenging and limited reasonable options exist to prevent the introduction of organisms (excluding organisms contained in cargo) such as rodents, reptiles, and mesopredators that hide onboard, and invasive algae, fish, and fouling organisms attached on hulls, rudders, propellers, anchors, etc.

Additionally, the barge's storage location and sheer proximity to such an urbanized environment with persistent pests invites many opportunities for organisms to seek refuge and eventual transport to SNI.

Table 3-4. Barge biosecurity effort priority index and action value table.

Action Number	Potentially Prevented Invasives	Action	Implementation Index ^a	Personnel Index ^b	Cost Index ^c	Additive Effort Score ^d	Action Value Score ^e
Prevention of Incursions							
A1.	all species	Modify and/or enforce existing contract language.	1	1	1	3	LOW
A2.	invertebrates, invasive plants, small mammals	Eliminate any debris piles, including coiled line piles, dirt collection, or gravel piles on barge deck.	1	1	1	3	LOW
A3.	small mammals	Maintain riprap concrete maintenance for the prevention of rodents.	1	1	1	3	HIGH
A4.	all species	Inspect barge to ensure that it is free of dirt, plant or animal species prior to loading.	1	1	1	3	LOW
A5.	small mammals	Dispose of trash and refuse appropriately.	1	1	1	3	LOW
A6.	all species	Require that marine tugs are "pest-free".	1	1	1	3	HIGH
A7.	invasive fish, algae, biofouling organisms	Require tug and barge contractors produce documentation that they are adhering to biofouling management and reporting requirements.	1	1	1	3	HIGH
A8.	invasive fish, algae, biofouling organisms	Require tug and barge contractors produce documentation that they are adhering to ballast water discharge requirements (if applicable).	1	1	1	3	HIGH
A9.	invasive plants, small mammals, invertebrates	Require that barges are pressure washed with water before any loading occurs.	1	2	1	4	LOW
A10.	invertebrates, invasive plants	Install shaker plates at both NBVC Port Hueneme loading areas and the barge loading area at NBVC SNI.	1	1	2	4	MED
A11.	small mammals, reptiles	Continually maintain traps to capture rodent, snake, and mesopredators on and around the barge.	2	1	2	5	MED
A12.	small mammals	Install rat guards on mooring lines for both the barge and tugs.	2	1	2	5	MED
A13.	small mammals	Require that marine tugs maintain rodent traps.	2	1	2	5	MED
A14.	small mammals	Do not moor the barge tied to the dock or the mainland for extended periods of time (i.e. overnight or longer than loading periods). This will prevent invasive species from seeking refuge.	3	1	3	7	HIGH
A15.	invasive plants, small mammals, reptiles	Develop a robust IPM plan around barge areas.	3	2	3	8	MED
A16.	invasive fish, algae, biofouling organisms	Coordinate with the contractor and determine an interval for in-water and dry dock hull cleaning of the marine tug and barge. Maintain the hull cleaning schedule.	3	2	3	8	HIGH
A17.	all species	Implement detection dog surveys at barge landings.	3	3	3	9	HIGH
Early Detection and Monitoring							
B1.	all species	Require a pre-departure survey of traps, visual inspections of the barge and its cargo, and ensure cleanliness.	2	2	2	6	LOW
B2.	all species	Require animal traps onboard the barge and tugboat during any shipping activities to and from NBVC SNI.	2	2	2	6	MED
B3.	invasive plants	Perform regular invasive plant surveys around the immediate loading facilities.	2	2	2	6	MED
B4.	small mammals	Require camera traps at barge facilities on island and at NBVC Port Hueneme.	2	2	3	7	MED
B5.	invasive fish, algae, biofouling organisms	Negotiate with the contractor to conduct regular underwater surveys of both the barge and the tugs' hulls to detect the presence of invasive marine algae, fish or egg masses, mollusks, or other biofouling organisms.	3	3	3	9	HIGH
Post Detection Response							
C1.	all species	Identify the party responsible for invasive species containment and animal capture.	1	1	1	3	LOW
C2.	all species	Identify lapses in biosecurity protocols that allowed introduction to occur.	1	2	1	4	LOW
C3.	small mammals, reptiles	Barge operators must not make contact with NBVC SNI in the event an animal is detected during the channel crossing.	1	1	2	4	HIGH
C4.	small mammals, reptiles	Stage an Invasive Species Monitoring and Detection Kit in an easily accessible location near barge docking activities.	1	2	2	5	MED
C5.	small mammals, reptiles	If discovered at the on-island barge dock or if an invasive species is discovered escaping from the barge, implement grid trapping around detection sites no more than 150 ft (45.8 m) apart (Roberts 2003) across five acres (two hectares) or the complete area where the animal was detected, whichever is greater.	3	2	3	8	HIGH
C6.	small mammals, reptiles	If an invasive animal is found and contained on the barge: determine sex, quarantine, euthanize and perform necropsy.	3	3	3	9	LOW
C7.	invasive fish, algae, biofouling organisms	If <i>Undaria pinnatifida</i> is discovered on the hull, pull the barge or tug immediately.	3	3	3	9	LOW
C8.	all species	Post removal of an invasive species, perform local sampling to confirm that all individuals have been removed and a population has not been established.	3	3	3	9	MED
Biosecurity Education							
D1.	all species	Develop a separate Naval Instruction specifically on barge biosecurity prevention procedures detailed in Actions A1 – A18). This should be distributed to all military personnel on the mainland as well as contractors.	1	1	1	3	LOW
D2.	all species	Require barge contractor and all personnel associated with barge operations to participate in biosecurity course.	2	2	2	6	LOW

^aImplementation Index - 1 Minor alteration to existing action or program 2 Action can be implemented within existing programs but moderately expanding program's actions 3 Requires an additional program, significantly alters programs, adds significant tasks to existing program

^bPersonnel Index - 1 Action can be done under existing position, job description may expand slightly to incorporate implementation of biosecurity action 2 Job description must expand moderately to incorporate implementation of biosecurity action 3 The effort required to incorporate the recommended action is so substantial it may require more oversight than currently existing positions dedicated to biosecurity

^cCost Index - 1 Little to no appreciable increase to existing budget 2 Moderate increase 3 Extensive increase

^dAdditive Effort Score - additive of the three above indices. Scores of 3 represent biosecurity actions that should be prioritized first because of low cost, no significant changes to existing program, and easy implementability. Scores of 4 - 7 are second level priority biosecurity actions that may have higher cost and require greater output at the Navy's expense to implement. Scores of 7+ represent third level priority biosecurity actions that require the most output and the design of significant programs.

^eAction Value Score - LOW Basic or standard biosecurity strategy MED Moderate or increasing in strategic value HIGH Advanced and highly valuable action

ACTIONS

- A1. **Modify and/or enforce existing contract language.**
Contracts should ensure that barge operators maintain cleanliness standards and all additional requirements that follow.
- A2. **Eliminate any debris piles, including coiled line piles, dirt collection, or gravel piles on barge deck.**
Barge operators must reduce the potential of attracting invasive species by eliminating all harborage. Trash, debris, or line should not be comingled on deck. Line must be coiled on hooks that do not come into contact with the deck (Figure 3-18).
- A3. **Maintain riprap concrete maintenance for the prevention of rodents.**
Currently, NBVC Port Hueneme fills concrete into the riprap at the barge loading area to dissuade (Figure 3-16). This practice should be maintained on a regular basis to ensure no harborage develops for invasive rodents.
- A4. **Inspect barge to ensure that it is free of dirt and plant or animal species prior to loading.**
At the minimum inspect: rodent traps, presence of mesopredators in areas of likely harborage, animal spoor, and cleanliness of barge platform. Barges should not be permitted to cross the channel with collections of dirt on the deck or the presence of any animal sign (Figure 3-17). Consider the use of detection dogs in inspection surveys (see Action A18).
- A5. **Dispose of trash and refuse appropriately.**
Any trash on the vessel should be disposed of properly on the mainland prior to departure. No trash should be stored on the barge while at dock.
- A6. **Require that marine tugs are “pest-free”.**
Develop contracting language that requires the use of pest control by the marine tug company to ensure pest-free tugs. Contracting language should also indicate that the contractor will assume liability should it be discovered that a pest from a tug was subsequently introduced to the barge or NBVC SNI.
- A7. **Require tug and barge contractors produce documentation that they are adhering to biofouling management and reporting requirements.**
Refer to California’s Marine Invasive Species Program reporting standards (California State Lands Commission 2015) to discourage the spread of AIS species.
- A8. **Require tug and barge contractors produce documentation that they are adhering to ballast water discharge requirements (if applicable).**
Not all barges may be ballasted by seawater. Refer to California’s Marine Invasive Species Program reporting standards (California State Lands Commission 2015) to discourage spread of AIS species.

- A9. **Require that barges are pressure washed with water before any loading occurs.** Pressure washing reduces the potential for invasive species refuge to ensure no collection of dirt that may be harboring invasive species (Figure 3-17).



Figure 3-16. NBVC Port Hueneme currently manages potential rodent harborage by pouring concrete into holes to dissuade animal usage.



Figure 3-17. An example of a location where dirt can collect on barge decks. Barge decks must be pressure washed prior to loading.



Figure 3-18. An example of dock line piles that may encourage animal refuge. Ropes should be hung from hooks on the barge.



Figure 3-19. Example of a rat guard that should be installed on all vessels at dock travelling to NBVC SNI. Source: US Navy.

- A10. **Install shaker plates at both NBVC Port Hueneme loading areas and the barge loading area at NBVC SNI.**
These should be utilized at NBVC Port Hueneme and at NBVC SNI and could potentially reduce weed seeds and other invasive species transported in mud, dirt, and dust contaminating the loading area and conveyed to the island. Regular maintenance will be required to clean the plates and prevent re-contamination. See Section 3.1.1.
- A11. **Continually maintain traps to capture rodent, snake, and mesopredators on and around the barge.**
Traps should be durable and not quickly degrade in the maritime environment. These traps should be maintained on the barge in addition to a robust integrated pest management program trapping effort at barge loading facilities. Check occupancy before departure from NBVC Port Hueneme. See Appendix C for trap recommendations.
- A12. **Install rat guards on mooring lines for both the barge and tugs.**
Although not always 100-percent preventative, rat guards are a good barrier to prevent the introduction of mesopredators in addition to rodents depending on the size of the cone (Figure 3-19). Also require the tug contractor to install rat guards if not already in place.
- A13. **Require that marine tugs maintain rodent traps.**
Because marine tugs tie up to barges in order to direct barge movement, lines between tug and barge can become a route for rodents (Figure 3-20). An example of a small and inconspicuous trap (TOMCAT) that is recommended for tugboats is shown in Appendix C.
- A14. **Do not moor the barge tied to the dock or the mainland for extended periods of time (i.e. overnight or longer than loading periods). This will prevent invasive species from seeking refuge.**

If the barge is left tied up to the dock, the proximity and height of the dock in addition to the available sources of animal harborage in the area (warehouses, storage facilities) may make it impossible to fully prevent rodents and other pests from attempting to seek refuge on the barge.

A15. Develop a robust IPM plan around barge areas.

IPM plans should also coordinate with weed management plans to develop trapping and treatment schedules for barge loading facilities. Aggressively trapping for pests at the barge loading facilities will reduce the number of invasive species in the area and therefore reduce the risk of pests seeking refuge on the barge itself. Additionally, it is highly recommended to keep a plant-free margin around the immediate barge loading facilities and all structures. Cover all dirt and non-asphalt services with pea-gravel to further reduce the growth of invasive plants.

A16. Coordinate with the contractor and determine an interval for in-water and dry dock hull cleaning of the marine tug and barge. Maintain the hull cleaning schedule.

Marine tugs should have complete hull cleanings at agreed upon and scheduled intervals. The decks of tugs should be pressure washed prior to crossing the channel.

A17. Implement detection dog surveys at barge landings.

Detection dogs quickly and thoroughly inspect barges and/or associated marine tugs that may be otherwise difficult for visual inspection prior to departure or on arrival.



Figure 3-20. A possibility exists for rodents to move between tug and barge. This possibility can be reduced by maintaining rodent traps on both the tug and barge.

Early Detection and Monitoring – Barge

Strategy B: Early Detection

Develop a standardized monitoring system focused on early detection for high priority invasive species on the barge.

ACTIONS

- B1. Require a pre-departure survey of traps, visual inspections of the barge and its cargo, and ensure cleanliness.**
Forbid the barge from crossing the channel if an invasive species is detected and not removed during pre-departure surveys of traps or if the barge is not adhering to cleanliness standards.
- B2. Require animal traps onboard the barge and tugboat during any shipping activities to and from NBVC SNI.**
The contractor should maintain passive, un-baited animal traps so as not to attract any pests to the barge. If an animal is captured, further inspection protocols must be enacted to ensure no invasive species aboard the tugboat or the barge during transportation activities to and from NBVC SNI.
- B3. Perform regular invasive plant surveys around the immediate loading facilities.**
Develop set transects for invasive plant species at barge loading facilities and NBVC SNI barge dock. Coordinate with weed management to treat any invasive plant species to limit seed dispersal through wind and equipment travelling through the area to the barge.
- B4. Require camera traps at barge facilities on island and at NBVC Port Hueneme.**
A program utilizing un-baited camera traps can establish animal usage of the barge loading areas and should be reviewed regularly to determine if the potential for invasive species transport exists. Using low profile and wireless enabled game cameras can also ease the effort required to download and sort photographs (Figure 3-21). Newer WiFi-enabled cameras, such as the Reconyx Microfire, can be easily downloaded when connected to a device within 100 feet (ft) (30.5 meters [m]) for quick scrolling through photographs to determine if an invasive species is utilizing barge facilities.
- B5. Negotiate with the contractor to conduct regular underwater surveys of both the barge and the tug's hulls to detect the presence of invasive marine algae, fish or egg masses, mollusks, or other biofouling organisms.**
If invasive species are detected in the underwater survey, the tug or barge must be immediately cleaned. The California Coastal Commission recommends cleaning hulls as frequently as every six weeks (California Coastal Commission 2012). Hulls may need to be more frequently cleaned because of concerns with invasive algae contamination.



Figure 3-21. Equipment like Reconyx Microfire cameras are motion and infrared sensitive and should be used as part of a robust early detection and monitoring program to detect invasive species around barge facilities. Source: Reconyx.

Post Detection Response – Barge

Strategy C: Rapid Response

Post-detection responses should be tailored to detected biosecurity risks involving the barge.

ACTIONS

- C1. Identify the party responsible for invasive species containment and animal capture.**
The responsible person should be a natural resource position experienced in animal capture, e.g. Animals Services positions within the United States Department of Agriculture. This person should be required to be “on-call” when inspections occur at NBVC Port Hueneme in the event an invasive animal is detected that cannot be easily contained by the inspector, e.g. snakes, cats, etc. This position would also be required to understand animal capture techniques and be on-call to set transects on NBVC SNI in the event of a suspected incursion.
- C2. Identify lapses in biosecurity protocols that allowed introduction to occur.**
Adapt the NBVC SNI Biosecurity Plan as needed to incorporate any lapses in strategies that allowed the barge to transport an invasive species.
- C3. Barge operators must not make contact with NBVC SNI in the event an animal is detected during the channel crossing.**
If an animal is discovered prior to departure, attempt containment and removal. If an animal is discovered during docking procedures, the barge should not make contact with the island or safely detach from the NBVC SNI dock until the animal is contained. If they cannot be contained, the barge should return to port for assistance from animal services. However, under no circumstances should the barge make landfall. Once captured, invasive species should be disposed of properly.
- C4. Stage an *Invasive Species Monitoring and Detection Kit* in an easily accessible location near barge docking activities.**

Multi-target kits should not possess any toxic baits due to regulatory constraints and the potential for off-target consumption (island fox). The following serves as an example of contents in a multi-target *Invasive Species Monitoring and Detection Kit*:

- Gnaw sticks or other indicator baits such as peanut butter, molasses, oat loaves, cat food
- Rapid response camera traps
- Snake, mesopredator, rat, and small mammal traps (Sherman traps)
- Rat tunnels, papers, and paint (Black Trakka; Appendix C)
- Nets

- C5. **If discovered at the on-island barge dock or if an invasive species is discovered escaping from the barge, implement grid trapping around detection sites no more than 150 ft (45.8 m) apart (Roberts 2003) across five acres (two hectares) or the complete area where the animal was detected, whichever is greater.**

Usually grid searches and accompanying traps are an effective survey method for the initial introduction of rodents in particular (Figure 3-22). The trapping method would be determined based off the taxa of the species identified and the *Invasive Species Monitoring and Detection Kit* available.

- C6. **If an invasive animal is found and contained on the barge: determine sex, quarantine, euthanize and perform necropsy.**

Time is of the utmost importance when containing newly introduced invasive species. Performing necropsies will be important to delineate stomach contents and to identify if the animal has reproduced recently.

- C7. **If wakame is discovered on the hull, pull the barge or tug immediately.**

Wakame is documented at the Port of Long Beach and at Port Hueneme but has not yet been documented at NBVC SNI, whereas devil weed has (Kenner and Tomoleoni 2018). Clean the hull using BMPs (California Coastal Commission 2012) to eliminate the algae infestation.

- C8. **Post removal of an invasive species, perform local sampling to confirm that all individuals have been removed and a population has not been established.**

Determine appropriate lengths of time to monitor post-extirpation. The interval and location would be defined based off that particular invasive species fall event.

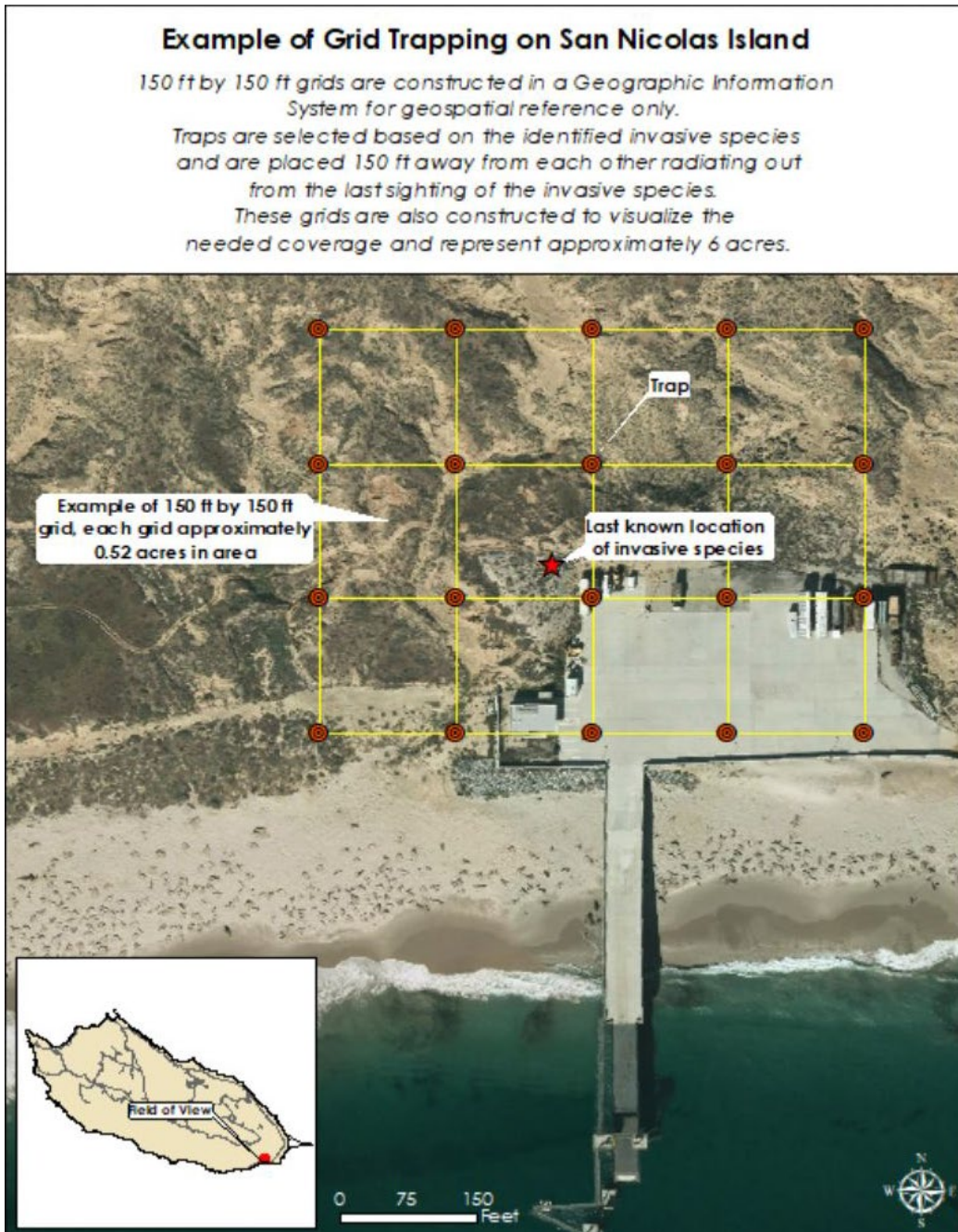


Figure 3-22. Example of a geospatially devised grid trapping scheme.

Biosecurity Education – Barge

Strategy D: Outreach

Improve the awareness of invasive species and topics in biosecurity concerning supply barges to barge operators, contractors, and associated personnel through targeted outreach efforts.

ACTIONS

- D1. **Develop a separate Naval Instruction specifically on barge biosecurity prevention procedures detailed in Actions A1 – A18). This should be distributed to all military personnel on the mainland as well as contractors.**

The separate Naval Instruction should be detailed to promote hull cleaning and expectations for prevention strategies within NBVC Port Hueneme’s harbor, even if ships/barges/tugboats will not be transiting to NBVC SNI. Responsible hull management and prevention of the establishment of biofouling organisms will ultimately prevent these organisms from transiting to NBVC SNI.

- D2. **Require barge contractor and all personnel associated with barge operations to participate in biosecurity course.**

An in-brief and either a PowerPoint presentation or a special section in the ECATTS on the topic of biosecurity should be developed specifically for all barge contractors and NBVC Port Hueneme personnel. The PowerPoint presentation should be updated to include prevention strategies outlined in Actions A1– A18 and include AIS topics.

Naval Base Ventura County San Nicolas Island Biosecurity Plan

Contact: NAVFAC Environmental Division

General Instructions: *The following subsection is a component of the overarching NBVC SNI Biosecurity Plan designed to reduce and/or prevent the arrival of invasive species to SNI that impact military readiness and mission. Please contact NAVFAC Environmental Division for questions or for the complete Plan. Each subsection represents a potential pathway for an invasive species to arrive on the island and in order to detail strategies that prevent that risk, all recommendations are summarized into one table the precedes the subsection. Each recommendation is referred to as an “Action” and has an associated number. Not all Actions will be implemented due to costs or other constraints; however, all Actions are provided and are organized by their inherent value—starting from the easier and less costly to more strategic and complicated of Actions. Detailed descriptions follow the table and provide context.*

This subsection requires the following enclosure(s):

1. Appendix C

3.2.2. Aircraft

Regularly scheduled commuter flights to NBVC SNI are operated by Phoenix Air. Between eight and 12 roundtrip flights from Point Mugu Air Station arrive Monday through Friday on NBVC SNI. The aircraft used as of this writing is a Gulf Stream G-1 with a capacity of 20 passengers. One C-130 cargo flight is scheduled each week, but the schedule varies depending on need and weather. Aircraft are usually stored outside but may be parked in a hangar if they are being serviced. In addition, private aircraft are also occasionally chartered for transportation to NBVC SNI.

Aircraft originating from locations other than NBVC Point Mugu, but within the continental U.S., occasionally land on SNI. All aircraft typically undergo inspections before departure that target safety hazards such as birds or rodents. On rare occasions, aircraft originating from areas outside the U.S. land on SNI. In this case, the plane will usually stop at an airport in the U.S. that is equipped to handle customs and inspections involved with any border crossing. These processes typically include inspection for live animals.

It may be challenging to prevent invasive species introductions from aircraft originating from across the region, such as chartered private aircraft. However, recommendations herein emphasize early detection and outreach at the point of origin for introductions; the airport at NBVC Point Mugu, and secondarily for NBVC SNI’s airfield as well.

Table 3-5. Aircraft biosecurity effort priority index and action value table.

Action Number	Potentially Prevented Invasives	Action	Implementation Index ^a	Personnel Index ^b	Cost Index ^c	Additive Effort Score ^d	Action Value Score ^e
Prevention of Incursions							
A1.	small mammals	Coordinate with installation pest management service providers to conduct rodent prevention and control at all mainland airport storage facilities and hangars.	1	1	1	3	MED
A2.	invertebrates, invasive plants	Regularly clean luggage carts.	1	1	1	3	LOW
A3.	invasive plants, small mammals, reptiles	Conduct routine inspections targeting landing gear.	1	1	1	3	LOW
A4.	small mammals	Paint 12 inch white "rat runs" at the bottom of walls in airport storage facilities and hangars.	1	1	1	3	LOW
A5.	all species	Assemble, inspect and approve a list of charter aircrafts for contractors.	1	1	1	3	MED
A6.	all species	Utilize X-Ray machines to scan luggage and/or physically check baggage.	3	3	3	9	HIGH
A7.	all species	Implement detection dog surveys at NBVC Point Mugu airfield.	3	3	3	9	HIGH
Early Detection and Monitoring							
B1.	all species	Include invasive species and cleanliness inspections as part of routine aircraft maintenance.	1	1	1	3	LOW
B2.	invertebrates, invasive plants	Regularly inspect flight line equipment such as baggage carts.	1	1	1	3	LOW
B3.	all species	Regularly clean and monitor cargo spaces for invasive species.	1	1	1	3	LOW
B4.	invasive plant	Check aircraft moorings/hangars for invasive plant seeds and flowerheads.	1	1	1	3	LOW
B5.	all species	Conduct airfield monitoring for presence of invasive species as part of "foreign object damage (FOD) walk-downs".	1	1	1	3	LOW
B6.	invasive plants	Conduct airfield mapping and monitoring in support of biosecurity and BASH.	1	2	2	5	HIGH
B7.	small mammals	Investigate feasibility of baited rodent traps onboard aircraft.	1	2	2	5	HIGH
B8.	all species	Implement detection dog surveys at NBVC Point Mugu airfield to monitor for invasive species.	3	3	3	9	HIGH
Post Detection Response							
C1.	all species	Identify the party responsible for invasive species containment and animal capture.	1	1	1	3	LOW
C2.	all species	Identify lapses in biosecurity protocols that allowed introduction to occur.	1	2	1	4	LOW
C3.	invertebrates, small mammals, reptiles	Stage an <i>Invasive Species Monitoring and Detection Kit</i> in an easily accessible location near airport facilities.	1	2	2	5	MED
C4.	small mammals, reptiles	Maintain an animal capture and containment kit in airport facilities at all times to assist in animal capture.	2	2	2	6	MED
C5.	small mammals, reptiles	If an invasive animal is found and contained on the aircraft: determine sex, quarantine, dispatch and perform necropsy.	3	3	3	9	LOW
C6.	small mammals, reptiles	If discovered at the NBVC SNI airfield or if an invasive species is discovered escaping from the aircraft, implement grid trapping around detection sites no more than 150 ft (45.8 m) apart (Roberts 2003) across five acres (two hectares) or the complete area where the animal was detected, whichever is greater.	3	3	3	9	HIGH
C7.	all species	Post removal, perform local sampling to confirm that all individuals have been removed and a population has not been established.	3	3	3	9	HIGH
Biosecurity Education							
D1.	all species	Develop an educational interpretative paneling at the Point Mugu airport waiting room.	2	2	2	6	LOW
D2.		Develop a cleaning station in combination with the interpretative paneling.	2	2	2	6	MED
D3.		Develop a biosecurity educational video designed to be viewed on repeat with closed captioning.	1	3	2	6	MED

^a**Implementation Index** - 1 Minor alteration to existing action or program 2 Action can be implemented within existing programs but moderately expanding program's actions 3 Requires an additional program, significantly alters programs, adds significant tasks to existing program

^b**Personnel Index** - 1 Action can be done under existing position, job description may expand slightly to incorporate implementation of biosecurity action 2 Job description must expand moderately to incorporate implementation of biosecurity action 3 The effort required to incorporate the recommended action is so substantial it may require more oversight than currently existing positions dedicated to biosecurity

^c**Cost Index** - 1 Little to no appreciable increase to existing budget 2 Moderate increase 3 Extensive increase

^d**Additive Effort Score** - additive of the three above indices. Scores of 3 represent biosecurity actions that should be prioritized first because of low cost, no significant changes to existing program, and easy implementability. Scores of 4 - 7 are second level priority biosecurity actions that may have higher cost and require greater output at the Navy's expense to implement. Scores of 7+ represent third level priority biosecurity actions that require the most output and the design of significant programs.

^e**Action Value Score** - LOW Basic or standard biosecurity strategy MED Moderate or increasing in strategic value HIGH Advanced and highly valuable action

Strategy A: Minimize Risk Of Introduction

Identify all standards for aircraft cleanliness and operations.

ACTIONS

- A1. **Coordinate with installation pest management service providers to conduct rodent prevention and control at all mainland airport storage facilities and hangars.**
Rodents are well established on the mainland and can easily access aircraft through wheel wells.
- A2. **Regularly clean luggage carts.**
If not maintained, luggage carts may inadvertently transfer invasive plant seeds or arthropod to luggage. They should be regularly wiped down every day and regularly washed and vacuumed.
- A3. **Conduct routine inspections targeting landing gear.**
Aircrafts' landing gear can be a potential source of entry for invasive species (Figure 3-24). Inspection emphasis should focus on materials caught in wheels and tire treads as well as any organism that may have breached the aircraft through the wheel well. Landing gear breaches do occur as in the case of an Australian scrub python (*Morelia amethistina*) in 2013 that was discovered nestled in the wing of the plane (Daily Mail 2013). On May 29, 2018 at NBVC Point Mugu, a European starling (*Sturnus vulgaris*) nest was discovered on the aircraft that travels to NBVC SNI and Naval Air Weapons Station China Lake (USDA APHIS 2018). The nest was found approximately 20 feet (6 meters) off the ground where the vertical and horizontal stabilizers meet demonstrating the importance of routinely inspecting aircraft to prevent introductions (Figure 3-25).
- A4. **Paint 12 inch white "rat runs" at the bottom of walls in airport storage facilities and hangars.**
Painted white rat runs can enable management to determine if integrated pest management efforts need to be implemented or expanded (Figure 3-23). If rub marks (dark, greasy stains) appear on the white run, then trapping efforts and other IPM strategies should be employed. Rats like linear spaces, particularly if they offer some concealment, therefore additional white rat runs could be painted along the floor at the bottom of walls, in gutters, on ledges, between walls and units of equipment like coolers and stoves, or on pipes and wires.
- A5. **Assemble, inspect and approve a list of charter aircrafts for contractors.**
The Environmental Division, biosecurity personnel, and pest management personnel should work closely with various chartered aircraft companies in the region to ensure that the company's pest management activities will prevent the introduction of invasive species from aircraft. First, a list of chartered aircrafts that have been approved by a biosecurity manager should be assembled, awareness information should then be disseminated to the pilots prior to arrival at SNI.
- A6. **Utilize X-Ray machines to scan luggage and/or physically check baggage.**

X-ray machines are not the most effective preventative action and require extensive training to detect a myriad of invasive species. However, if compliance with personnel becomes a problem, then this could be an added recommendation. X-ray machines can be used to detect contraband and restricted items. If X-ray machines are not functional, random physical checking of baggage should occur.

A7. **Implement detection dog surveys at NBVC Point Mugu airfield.**

Detection dogs can quickly and thoroughly inspect aircraft prior to departure that may be otherwise difficult for visual inspection prior to departure or on arrival.



Figure 3-23. Rats leave rubbings (dark greasy stains) along linear locations, usually between a nest and food source. Painted white rat runs will enable management to determine if integrated pest management trapping efforts are successful.



Figure 3-24. Landing gear is easily accessible and may provide refuge for rodents and mesopredators. They should be regularly inspected.



Figure 3-25. Left: location of European starling nest that traveled from NBVC Point Mugu to NBVC SNI multiple times. Right: Nestlings actively brooded by parents and found in NBVC aircraft. Source: USDA APHIS 2018.

Early Detection and Monitoring – Aircraft

Strategy B: Early Detection

Develop a standardized monitoring system focused on early detection for high priority invasive species around aircraft and associated facilities.

ACTIONS

- B1. Include invasive species and cleanliness inspections as part of routine aircraft maintenance.**
Work with airport personnel to incorporate looking for invasive species while conducting routine maintenance and inspections on aircraft. Biosecurity managers should provide a list of “watch species” (see Biosecurity Education and Outreach recommendation actions) as well as provide this section to airfield managers (Section 3.2.2).
- B2. Regularly inspect flight line equipment such as baggage carts.**
Baggage carts should be thoroughly cleaned at the minimum once a day, five days a week to limit the spread of invasive species through dirt, seeds, and debris.
- B3. Regularly clean and monitor cargo spaces for invasive species.**
Cargo spaces should be monitored and cleaned as part of routine aircraft maintenance.
- B4. Check aircraft moorings/hangars for invasive plant seeds and flower heads.**
Any areas on the tarmac or in hangars that harbor debris should be regularly pressure washed and debris disposed of properly. For plant flower heads and seeds, place into plastic bags before tossing into trash receptacle.
- B5. Conduct airfield monitoring for presence of invasive species as part of “foreign object damage (FOD) walk-downs”.**
Aircraft personnel and pilots should be briefed on biosecurity risks. As part of the FOD walk-downs, inspections should specifically include the landing gear and any foreign items on the tarmac. Any signs of rodent chewing or abrasions should not only be reported as part of safety FOD inspections, but also to the Environmental Division.
- B6. Conduct airfield mapping and monitoring in support of biosecurity and Bird Airstrike Hazard (BASH) programs.**
Geospatial invasive species data should be regularly mapped and maintained to document if there are instances where various invasive plant species established at the NBVC Point Mugu airfield are transferred to SNI. These baseline data can also duly support the BASH program to determine if various invasive species such as non-native grasses are posing not only biosecurity hazards, but aircraft hazards as well.
- B7. Investigate feasibility of baited rodent traps onboard aircraft.**
Cargo holds and other stowaway locations may be feasible to use small, plastic traps for rodents and should be discussed with the contractor (TOMCAT, Appendix C).
- B8. Implement detection dog surveys at NBVC Point Mugu airfield to monitor for invasive species.**
Detection dogs can quickly and effectively survey for invasive species.

Post Detection Response - Aircraft

Strategy C: Rapid Response

Post-detection responses should be tailored to detected biosecurity risks involving the aircraft.

ACTIONS

- C1. Identify the party responsible for invasive species containment and animal capture.**
The responsible person should be a natural resource position experienced in animal capture, e.g. Animals Services positions within the United States Department of Agriculture. This person should be required to be “on-call” when aircraft inspections occur at NBVC Point Mugu in the event an invasive animal is detected that cannot be easily contained by the inspector, e.g. snakes, cats, etc. This position would also be required to understand modern animal capture techniques and be on-call to set transects on NBVC SNI in the event of a suspected incursion.
- C2. Identify lapses in biosecurity protocols that allowed introduction to occur.**
Adapt the NBVC SNI Biosecurity Plan as needed to incorporate any lapses in strategies that allowed the aircraft to transport an invasive species.
- C3. Stage an *Invasive Species Monitoring and Detection Kit* in an easily accessible location near airport facilities.**
Multi-target kits should not possess any anti-coagulants or toxic baits due to regulatory constraints and the potential for off-target consumption (island fox). The following serves as an example of contents in a multi-target *Invasive Species Monitoring and Detection Kit*:
- Gnaw sticks or other indicator baits such as peanut butter, molasses, oat loaves, cat food
 - Rapid response camera traps
 - Snake, mesopredator, rat, and small mammal traps (Sherman traps)
 - Rat tunnels, papers, and paint (Black Trakka; Appendix C)
 - Nets
- C4. Maintain an animal capture and containment kit in airport facilities at all times to assist in animal capture.**
If an animal is discovered prior to departure, attempt containment and removal. If an animal is discovered while en route, the aircraft should not open any holds or begin offloading procedures until the animal is contained. If the animal cannot be contained, the plane should return to the mainland for assistance from pest management. Once captured, invasive species should be disposed of properly.
- C5. If an invasive animal is found and contained on the aircraft: determine sex, quarantine, dispatch and/or perform necropsy.**
Time is of the utmost importance when containing newly introduced invasive species. Performing necropsies as needed will be important to delineate stomach contents and to identify if the animal has reproduced recently.
- C6. If discovered at the NBVC SNI airfield or if an invasive species is discovered escaping from the aircraft, implement grid trapping around detection sites no more than 150 ft**

(45.8 m) apart (Roberts 2003) across five acres (two hectares) or the complete area where the animal was detected, whichever is greater.

Usually grid searches and accompanying traps are an effective survey method for the initial introduction of rodents in particular. The trapping method would be determined based off the taxa of the species identified and the *Invasive Species Monitoring and Detection Kit* available.

- C7. **Post removal, perform local sampling to confirm that all individuals have been removed and a population has not been established.**

Determine appropriate lengths of time to monitor post-extirpation. The interval and location would be defined based off the particular invasive species fall event.

Biosecurity Education - Aircraft

Strategy D: Outreach

Increase education of, and outreach to, personnel travelling by aircraft who may be potential sources for invasive species introductions.

ACTIONS

- D1. **Develop educational interpretative paneling at the Point Mugu airport waiting room.**

Educational signage should be included for personnel at embarkation areas such as the NBVC Point Mugu Airport and the NBVC SNI airfield. Currently, there is an educational panel entitled “Natural Resources” detailing the sensitive resources of NBVC SNI at the island airport waiting area (Figure 3-26).

A similar “Natural Resources” panel should be installed at the Point Mugu waiting room to enhance personnel’s biosecurity awareness before transport to SNI. Currently, a wall in the back of the Point Mugu waiting room could accommodate a large interpretative panel (Figure 3-27). This location should also direct personnel to a nearby cleaning station—wall vacuum, hose attachment, and boot brush as well as proper and thorough protocols for cleaning shoes. The panel should include biosecurity topics such as: NBVC SNI Commander’s Naval Instruction and biosecurity importance to the military mission, ecosystem preservation, endemic species, personnel awareness, cleaning and clothing checks, and watch-list species.

- D2. **Develop a cleaning station in combination with the interpretative paneling.**

Various seed capture supplies should be installed as a component of the cleaning station. Wall vacuums with hose attachments are relatively easy and inexpensive to install in addition to boot brushes, horse picks, and other brush-type implements (Figures 3-28 and 3-29). Wall vacuums are dual-purpose and can clean personnel’s footwear as well as maintain passive boot cleaning brushes. All seed-capture devices can be installed outside and have almost no noise impact. A 5-gallon tank that captures all debris can be installed inside storage facilities and emptied as part of a maintenance schedule.

D3. **Develop a biosecurity educational video designed to be viewed on repeat with closed captioning.**

NBVC has two waiting rooms (NBVC SNI and NBVC Point Mugu) in which a captive audience can view an informational video on the importance of biosecurity and strategies that they can implement before travelling to the island. This video should be designed with sound or the option to be muted with closed captioning. Topics should also include the economic and ecological impacts of invasive species.



Figure 3-26. Current educational signage at NBVC SNI airfield. This sign could be expanded to include topics on biosecurity, marine invasive species, and current prevention efforts on the island and how island visitors can reduce the transport of invasive species.



Figure 3-27. Potential location of educational signage and a cleaning station for personnel's shoes, boots, and personal effects.



Figure 3-28. Example of a port wall vacuum where dirt, debris, and any other materials that may harbor invasive species such as plant seeds can be disposed.



Figure 3-29. Example of a wall vacuum with a hose attachment that can be used to maintain cleanliness at the biosecurity station as well as to vacuum footwear and personal effects.

Naval Base Ventura County San Nicolas Island Biosecurity Plan

Contact: NAVFAC Environmental Division

General Instructions: *The following subsection is a component of the overarching NBVC SNI Biosecurity Plan designed to reduce and/or prevent the arrival of invasive species to SNI that impact military readiness and mission. Please contact NAVFAC Environmental Division for questions or for the complete Plan. Each subsection represents a potential pathway for an invasive species to arrive on the island and in order to detail strategies that prevent that risk, all recommendations are summarized into one table the precedes the subsection. Each recommendation is referred to as an “Action” and has an associated number. Not all Actions will be implemented due to costs or other constraints; however, all Actions are provided and are organized by their inherent value—starting from the easier and less costly to more strategic and complicated of Actions. Detailed descriptions follow the table and provide context.*

This subsection requires the following enclosure(s):

1. Appendix C
2. Appendix D

3.2.3. Commercial Fishing and Recreational Boats

Many ocean areas around SNI are accessible to the public for recreational and commercial purposes, which are important social and economic activities. These industries support large numbers of fishermen, boat operators and recreational boaters.

The commercial fishing industry around SNI can be productive for fish, squid, crab, lobster and sea urchins, though the remoteness and weather may discourage high visitation. Salt-water sport fishing and charter boats also target waters around SNI to pursue fish species such as yellowfin and bluefin tuna, yellowtail, rockfish, kelp bass, California sheephead, whitefish, dorado, marlin, barracuda, and lingcod.

The greatest biosecurity concern with the interface of commercial fisheries and the public boating community in NBVC SNI’s management footprint is the introduction of AIS through the transference of fishing gear from waters elsewhere and terrestrial vertebrate species (e.g. rodents) through swim-to-shore vessel and scupper escapes or vessel groundings. Unfortunately for the Navy’s biosecurity concerns, this is a pervasive problem and the State of California is responsible for regulating the spread of AIS by developing policies that ensure the cleanliness of fishing gear and boats in general.

Currently, vessels are free to navigate or fish within restricted areas or sections Alpha, Bravo, and unless these sections are closed for specific operational needs (excluding the State Marine Preserve at Begg Rock). NBVC SNI also has a 300-yard (274-m) stand-off from the shoreline of the island which prohibits any non-military vessels from approaching or anchoring. This standoff is necessary to maintain the security of the NBVC SNI mission and its facilities. The Alpha, Bravo, and Charlie restricted areas, excluding the 300-yard stand-off, remain open to fishing unless one or more sections are specifically closed for naval operations (Figure 3-30). While the public is generally allowed in the areas surrounding SNI, enforcement may be difficult when vessels are in violation of temporarily restricted areas, and some may attempt to make landfall. Biosecurity

prevention strategies targeted at the public are limited, thus biosecurity efforts should be directed at outreach and the development of rapid response plans for vessel groundings on shores.

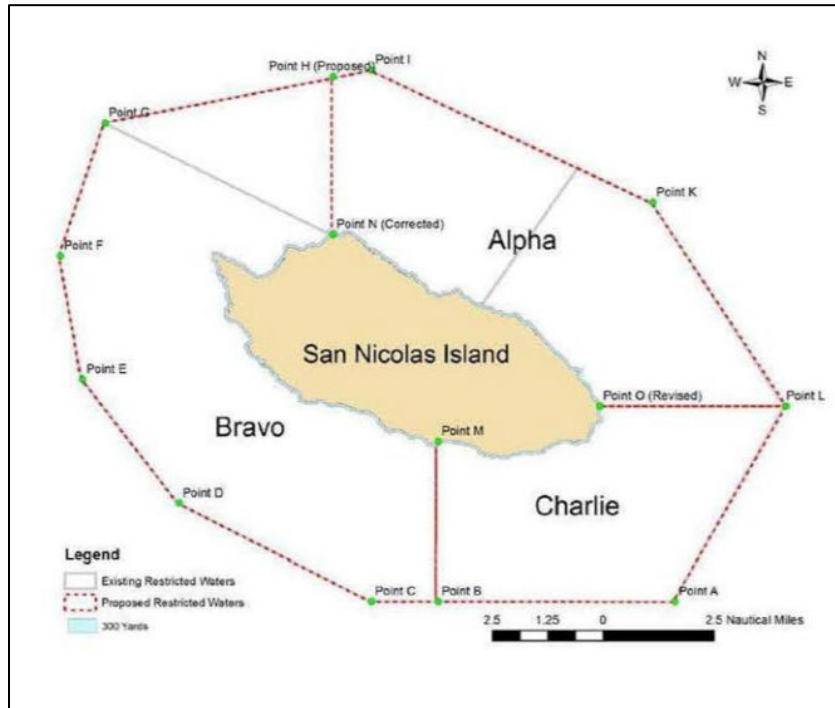


Figure 3-30. Restricted sections surrounding SNI. Source: U.S. Army Corps of Engineers, Los Angeles District.

Table 3-6. Commercial fishing and recreational boat biosecurity effort priority index and action value table.

Action Number	Potentially Prevented Invasives	Action	Implementation Index ^a	Personnel Index ^b	Cost Index ^c	Additive Effort Score ^d	Action Value Score ^e
Prevention of Incursions							
A1.	invasive fish, algae, biofouling organisms	Work with CDFW to implement fishing gear policies to limit the spread of MIS.	2	2	2	6	HIGH
A2.	invasive fish, algae, biofouling organisms	Develop species specific rapid response protocols.	2	2	2	6	MED
Early Detection and Monitoring							
B1.	small mammals	Install a robust camera trapping program across island to be rotated at the minimum biannually.	2	2	3	7	MED
B2.	small mammals	Develop and implement monitoring plans if vessels run aground.	2	2	3	7	MED
B3.	invasive fish, algae, biofouling organisms, small mammals	Establish an AIS monitoring plan in coordination with relevant marine monitoring activities.	2	2	3	7	HIGH
Post Detection Response							
C1.	invasive fish, algae, biofouling organisms, small mammals	Stage an Invasive Species Detection and Monitoring Kit in an easily accessible location on the island.	1	2	2	5	MED
C2.	all taxa	Determine the taxon of potential threat and identify professionals experienced in detection and extirpation of vertebrates.	2	2	2	6	MED
C3.	all taxa	In the event of a grounded vessel, implement rapid response protocols.	3	3	3	9	MED
C4.	all taxa	If an invasive animal is contained on NBVC SNI: determine sex, quarantine, euthanize and perform necropsy.	3	3	3	9	LOW
Biosecurity Education							
D1.	all species	Create interpretative signage at military barge embarkation points, public access points, marinas, commercial fishing ports, etc. across the Southern California region.	2	2	2	6	LOW
D2.		Provide biosecurity language targeted to commercial and recreational marine users to update commercial charter websites and fishing forums and that educates the public on biosecurity risks associated with the marine environment.	2	2	2	6	LOW
D3.		Request charter companies fishing near SNI to provide biosecurity pamphlets regarding MIS on board.	2	2	2	6	LOW

^aImplementation Index - 1 Minor alteration to existing action or program 2 Action can be implemented within existing programs but moderately expanding program's actions 3 Requires an additional program, significantly alters programs, adds significant tasks to existing program

^bPersonnel Index - 1 Action can be done under existing position, job description may expand slightly to incorporate implementation of biosecurity action 2 Job description must expand moderately to incorporate implementation of biosecurity action 3 The effort required to incorporate the recommended action is so substantial it may require more oversight than currently existing positions dedicated to biosecurity

^cCost Index - 1 Little to no appreciable increase to existing budget 2 Moderate increase 3 Extensive increase

^dAdditive Effort Score - additive of the three above indices. Scores of 3 represent biosecurity actions that should be prioritized first because of low cost, no significant changes to existing program, and easy implementability. Scores of 4 - 7 are second level priority biosecurity actions that may have higher cost and require greater output at the Navy's expense to implement. Scores of 7+ represent third level priority biosecurity actions that require the most output and the design of significant programs.

^eAction Value Score - LOW Basic or standard biosecurity strategy MED Moderate or increasing in strategic value HIGH Advanced and highly valuable action

Prevention of Incursion – Commercial Fishing and Recreational Boats

Strategy A: Prevention

Work with California Department of Fish and Wildlife (CDFW), and any other enforcement agencies to ensure fishing gear is kept clean.

ACTIONS

A1. Work with CDFW to implement fishing gear policies to limit the spread of AIS.

The need for policy at the state level is apparent and is largely unregulated at the marine commercial fishing level. The threat of non-native organisms is high because of the widespread movement across the region, and the pervasive distribution of invasives such as wakame and devil weed algae infestations across Southern California harbors. The State is responsible for developing strong policies regarding hull fouling, biofouling, fishing gear, fishing traps, live wells, sea chests, rodent infestation prevention, etc. Commercial fishing activities are poised to spread AIS and threaten the diverse underwater, nearshore and terrestrial ecosystems of not only NBVC SNI, but of all the Channel Islands. Navy Region Southwest is encouraged to make suggestions to the State to encourage the implementation of a statewide policy to limit the spread of AIS by commercial and charter fishing operations. These occur at the policy level and may be appropriate for multi-agency funding positions such as the Biosecurity Science Specialist currently funded by the Navy, the Park Service, and the Nature Conservancy.

- A2. **Develop species specific rapid response protocols.**
Rapid response protocols should be separate management plans of their own, with specific actions based off of the location and total area of the incursion, the species involved. Plans are encouraged to be developed for rats, dogs, cats, raccoons and possums. These plans should also consider zoonotic diseases that may be introduced.

Early Detection and Monitoring – Commercial Fishing and Recreational Boats

Strategy B: Early Detection

Develop a standardized monitoring system focused on early detection for high priority invasive species around shoreline, beach and dune areas.

ACTIONS

- B1. **Install a robust camera trapping program across island to be rotated at the minimum biannually.**
Camera trap monitoring programs can be very successful for monitoring all invasive vertebrates, especially introduced by vectors with few prevention strategies such as commercial fishing and recreations boats (Boser et. al. 2014; Figure 3-31).
Cameras should be placed near all embarkation/debarkation points on the island (e.g. barge areas, air terminals and runways, storage areas, etc.). Additionally, the program should include remote camera stations in a variety of habitats and targeted to invasive species of most concern. For example, if the target taxon is a rodent, camera traps should be set in such a way the maximizes the detectability of that animal by being placed in non-grassland settings and at dispersal pathways, such as coastlines and canyons. Traps should be set between three and five feet from the bait source with a combination of musk rat scent attractant and a peanut butter and oat bait mixture (Wildlands Conservation Science, 2015). Photos should be downloaded at least twice a year to monitor for the presence of invasive vertebrates. Secure digital cards should be at least 32 gigabytes to ensure that high visitation does not exhaust the storage capacity.
- B2. **Develop and implement monitoring plans if vessels run aground.**
Rapid response and monitoring plans should take into consideration the risk of rodent incursion from vessels, especially commercial fishing vessels. NBVC SNI should develop a generalized monitoring plan and separate specific target species rapid response plans. The Nature Conservancy has developed a specific rapid response protocol for rodent incursion (Appendix D).
- B3. **Establish an AIS monitoring plan in coordination with relevant marine monitoring activities.**
Sampling should occur concurrently with marine-related sampling activities, such as kelp forest and/or abalone monitoring.



Figure 3-31. Examples of species detected on camera traps on San Nicolas Island. Source: U.S. Navy.

Post Detection Response – Commercial Fishing and Recreational Boats

Strategy C: Develop Response Initiatives for Shipborne Taxa

Post-detection responses should be tailored to whether a biosecurity risk was introduced from a vessel—grounded or a swim-to-shore scenario.

ACTIONS

- C1. **Stage an *Invasive Species Detection and Monitoring Kit* in an easily accessible location on the island.**

Multi-target kits should not possess any toxic baits due to regulatory constraints and the potential for off-target consumption (island fox). The following serves as an example of contents in a multi-target *Invasive Species Monitoring and Detection Kit*:

- Gnaw sticks or other indicator baits such as peanut butter, molasses, oat loaves, cat food
 - Rapid response camera traps
 - Snake, mesopredator, rat, and small mammal traps (Sherman traps)
 - Rat tunnels, papers, and paint (Black Trakka; Appendix C)
 - Nets
- C2. **Determine the taxon of potential threat and identify professionals experienced in detection and extirpation of vertebrates.**
 Confirm the species detected and identify the appropriate response plan. NBVC SNI should develop relationships with various professionals that are experienced in detecting incursions at low densities, especially in island contexts. NBVC SNI will need to determine if the threat is high enough to quickly contract eradication professionals to prevent a non-native shipborne vertebrate population from establishing.
- C3. **In the event of a grounded vessel, implement rapid response protocols.**
 Response plans are most effective if established well in advance of any shipborne incursion, especially to prevent the introduction of rodents. Refer to Appendix D for The Nature Conservancy’s Rodent Rapid Response Protocol, currently in development.
- C4. **If an invasive animal is contained on NBVC SNI: determine sex, quarantine, euthanize and perform necropsy.**
 Time is of the utmost importance when containing newly introduced invasive species. Performing necropsies will be important to delineate stomach contents and to identify if the animal has reproduced recently.

Biosecurity Education – Commercial Fishing and Recreational Boats

Strategy D: Outreach

Increase education and outreach to the public boating community.

ACTIONS

- D1. **Create interpretative signage at military barge embarkation points, public access points, marinas, commercial fishing ports, etc. across the Southern California region.**
 Signage should detail risks of AIS (particularly wakame and devil weed) to the environment, biofouling organisms, rodent infestations, and the risks incurred by transporting fishing gear from areas infesting with invasive algae and how the public can help prevent invasion.
- D2. **Provide biosecurity language targeted to commercial and recreational marine users to update commercial charter websites and fishing forums and that educates the public on biosecurity risks associated with the marine environment.**
 Providing language to various charter companies that could make available on their websites would serve to educate marine visitors of biosecurity concerns pertinent to SNI. Research all charter vessels visiting the waters surrounding SNI and develop a collaborative relationship to increase the knowledge of biosecurity concerns.

D3. **Request charter companies fishing near SNI to provide biosecurity pamphlets regarding AIS on board.**

Biosecurity managers should coordinate with local charter fishing companies to have biosecurity pamphlets on board if they are to fish in NBVC SNI waters. This can increase general public awareness on a diverse array of marine-environment related topics, including rodent and rat infestations on board and biofouling concerns, as well as benefit the California Channel Islands archipelago.

Naval Base Ventura County San Nicolas Island Biosecurity Plan

Contact: NAVFAC Environmental Division

General Instructions: *The following subsection is a component of the overarching NBVC SNI Biosecurity Plan designed to reduce and/or prevent the arrival of invasive species to SNI that impact military readiness and mission. Please contact NAVFAC Environmental Division for questions or for the complete Plan. Each subsection represents a potential pathway for an invasive species to arrive on the island and in order to detail strategies that prevent that risk, all recommendations are summarized into one table the precedes the subsection. Each recommendation is referred to as an “Action” and has an associated number. Not all Actions will be implemented due to costs or other constraints; however, all Actions are provided and are organized by their inherent value—starting from the easier and less costly to more strategic and complicated of Actions. Detailed descriptions follow the table and provide context.*

This subsection requires the following enclosure(s):

1. Appendix A
2. Appendix C

4.0 On-Island Operations and Infrastructure Management

4.1.1. Facilities Management

The construction and maintenance of facilities, as well as facilities in and of themselves, presents a biosecurity risk with the movement of construction supplies, equipment, and personnel—not just from the mainland to SNI, but movements throughout SNI itself. For example, construction of facilities in areas infested with a particular weed may transport that weed from one part of the island to a new area not known to be infested. NBVC SNI facilities may include Nic town’s buildings, construction and equipment yards, the nursery, hotels, the quarry, landfill, temporary training targets, radar/antenna stations, bivouac/camping areas, utility lines (power, water, sewer, and gas pipelines), and training areas used for demolition.

Although biosecurity efforts are focused at preventing incursions, significant efforts should also be directed at protocols designed to reduce the spread of invasive species in the event an organism is already established on the island, so it does not infest new areas.

Table 4-1. Facilities management biosecurity effort priority index and action value table.

Action Number	Potentially Prevented Invasives	Action	Implementation Index ^a	Personnel Index ^b	Cost Index ^c	Additive Effort Score ^d	Action Value Score ^e
Prevention of Incursions							
A1.	invertebrates, invasive plants	Maintain a 12-ft (3.7 m) distance between aggregate piles and any vegetation. Do not allow "stockpiling creep".	1	1	1	3	LOW
A2.	invertebrates, invasive plants	Treat aggregate piles and all invasive plants growing on or near aggregate piles and on the perimeter of facilities and thoroughfares.	1	1	1	3	LOW
A3.	invertebrates, invasive plants	Install shaker plates at the entrance to all contractor laydown yards and facilities with a high probability of transferring invasive species.	1	1	2	4	LOW
A4.	invertebrates, invasive plants, small mammals	Implement vehicle cleaning protocols before travelling to other facilities or infested habitats.	2	1	1	4	HIGH
A5.	invasive plants	Perform routine weed treatment activities at high-use yards (including contractor laydown yards), hotels, and military areas at identified facilities.	2	1	3	6	MED
A6.	invertebrates, invasive plant	Identify additional high-use facilities and military areas that would benefit from invasive plant management and implement the suggested weed containment scheme.	2	1	3	6	MED
A7.	invasive plants, small mammals	Ensure construction and utility yard cleanliness by defining boundaries with a chain link fence.	2	2	3	7	MED
A8.	invertebrates, invasive plant	Create a 12-foot buffer zone of pea-gravel surrounding fenced facilities.	2	2	3	7	HIGH
A9.	invertebrates, invasive plants	Install gravel inside the perimeter of fencing, or the yard itself, when feasible.	2	2	3	7	HIGH
A10.	small mammals, reptiles	Demolish derelict or unused buildings to prevent attractive refuges for mesopredators or other invasive species.	3	3	3	9	LOW
B1.	small mammals	Maintain a geodatabase of trapping efforts and locations. Update frequently.	2	1	1	4	LOW
B2.	small mammals	Maintain facilities' and buildings integrity to exclude potential rodents and other small mammals from buildings.	2	1	3	6	HIGH
C1.	invertebrates, invasive plants	Promote the use of the car wash in biosecurity efforts and vehicle cleanliness protocols.	1	1	1	3	LOW
C2.	invasive plants	Ensure functionality of car wash drain.	1	1	1	3	LOW
C3.	invasive plants	Identify drains that collect propagule containing water and ensure proper disposal.	2	2	1	5	MED
C4.	invasive plants	Ensure functionality of all NBVC SNI drains.	2	2	1	5	HIGH
D1.	invertebrates, zoonoses	Re-grade yards and quarries to ensure consistent surface topography.	2	2	3	7	HIGH
E1.	invertebrates, invasive plants, small mammals, zoonoses	Investigate the feasibility of an island food waste program.	1	1	1	3	HIGH
E2.	invertebrates	Treat the water in the nursery table legs to prevent mosquito breeding.	1	1	1	3	HIGH
E3.	invertebrates	Native outplantings should only be placed on nursery tables, never on the ground.	1	1	1	3	HIGH
E4.	invasive plants, genetic dilution	Ensure that only native plants grown in the island nursery are from seeds collected on SNI for outplanting.	1	1	2	4	MED
E5.	invasive plant	Install gravel in non-concreted areas around the greenhouse and maintain a weed buffer around the perimeter.	1	1	2	4	LOW
E6.	invertebrates, invasive plant, small mammals, zoonoses	Never install any in-ground compost piles; use sealed containers for compost and soil.	1	2	2	5	MED
Early Detection and Monitoring							
F1.	all species	Coordinate with IPM, restoration, and weed managers to assess opportunities to include monitoring for invasive species.	1	1	1	3	MED
F2.	all species	Identify optimal budgets for monitoring around facilities in cooperation with the invasive weed manager and determine the interval of monitoring.	1	1	1	3	MED
F3.	all species	Determine regular monitoring schedules for invasive species at NBVC SNI points-of-first-entry.	1	1	1	3	MED
F4.	small mammals	Install rodent chew cards at all points of entry.	1	1	1	3	MED
F5.	rodents	Paint 12-inch white rat runs at the bottom of walls in facilities across the island.	1	1	1	3	LOW
F6.	small mammals, reptiles	Develop a facilities-based camera trap monitoring plan.	1	2	1	4	LOW
F7.	all species	Monitor landfill for possible escapees or unauthorized material that may harbor invasive species.	2	1	2	5	LOW
F8.	all species	Require contractors and personnel to set up monitoring schedules for an agreed upon time period after initiation and post-completion of construction or ground disturbing activities.	3	3	3	9	HIGH
F9.	invasive plants	Collaborate with the biosecurity manager and invasive weed manager to schedule and ensure these sites receive an annual weed survey.	3	3	3	9	HIGH
Post Detection Response							
G1.	all species	Stage an Invasive Species Monitoring and Detection kit in an easily accessible location in facilities around the island.	1	2	2	5	MED
G2.	species specific	Implement rapid response protocols.	2	2	2	6	LOW
G3.	species specific	Determine the taxon of potential threat and identify professionals experienced in detection and extirpation.	2	2	3	7	LOW
G4.	species specific	If an invasive animal is contained on NBVC SNI: determine species and sex, quarantine, dispatch and perform necropsy.	3	3	3	9	LOW
Biosecurity Education							
H1.	all species	Incorporate biosecurity topics into the "Natural Resources" signage at the NBVC SNI Airfield (Figure 3-25).	1	1	1	3	LOW
H2.		Develop a "weed box" and install an accompanying educational panel and additional footwear cleaning brushes.	2	2	2	6	LOW

^aImplementation Index - 1 Minor alteration to existing action or program 2 Action can be implemented within existing programs but moderately expanding program's actions 3 Requires an additional program, significantly alters programs, adds significant tasks to existing program

^bPersonnel Index - 1 Action can be done under existing position, job description may expand slightly to incorporate implementation of biosecurity action 2 Job description must expand moderately to incorporate implementation of biosecurity action 3 The effort required to incorporate the recommended action is so substantial it may require more oversight than currently existing positions dedicated to biosecurity

^cCost Index - 1 Little to no appreciable increase to existing budget 2 Moderate increase 3 Extensive increase

^dAdditive Effort Score - additive of the three above indices. Scores of 3 represent biosecurity actions that should be prioritized first because of low cost, no significant changes to existing program, and easy implementability. Scores of 4 - 7 are second level priority biosecurity actions that may have higher cost and require greater output at the Navy's expense to implement. Scores of 7+ represent third level priority biosecurity actions that require the most output and the design of significant programs.

^eAction Value Score - LOW Basic or standard biosecurity strategy MED Moderate or increasing in strategic value HIGH Advanced and highly valuable action

Prevention of Incursions – Facilities Management

Strategy A: Create Weed Entrapment and Containment Areas

Creating buffer zones and routine weed treatment activities around facilities with high potential to disperse invasive species can work to control easily dispersed weed species. Control stockpiling.

ACTIONS

- A1. **Maintain a 12-ft (3.7 m) distance between aggregate piles and any vegetation. Do not allow “stockpiling creep”.**
Aggregate piles can spread seed directly by infesting nearby native habitat or indirectly by infesting the pile itself with non-native seed that is then dispersed throughout project sites (Figures 4-1, 4-4, and 4-5).
- A2. **Treat aggregate piles and all invasive plants growing on or near aggregate piles and on the perimeter of facilities and thoroughfares.**
Invasive weeds growing within or near facilities should be prioritized and aggressive treatments should occur, especially on the perimeters of facilities to discourage seed dispersal into surrounding habitats. Aggregate piles should be preemptively treated and if invasive plants are growing near or on the piles (Figures 4-1, 4-4, and 4-5).
- A3. **Install shaker plates at the entrance to all contractor laydown yards and facilities with a high probability of transferring invasive species.**
These must be maintained on a regular basis to not allow dirt or seed collection. Materials caught in the shaker plates should be properly disposed of to prevent germination of any seeds captured.
- A4. **Implement vehicle cleaning protocols before travelling to other facilities or infested habitats.**
Vehicles should reduce the risk of infesting other sites. Thoroughly clean vehicles before leaving work yards or maintain a regular cleaning schedule. Reference Appendix A for a vehicle cleanliness checklist.
- A5. **Perform routine weed treatment activities at high-use yards (including contractor laydown yards), hotels, and military areas at identified facilities.**
After a cursory review of different yards and military use areas, ManTech identified three specific weed containment schemes to reduce the spread of weeds and invasive arthropods throughout the island: 1) Fence perimeters of facilities and cover yard and outer margin with gravel that has been pretreated with a preemergent herbicide (Actions A7, A8); 2) Maintain gravel areas and perform weed treatments (Action A8); 3) perform routine weed treatments only. Preventative pre-emergent herbicide treatments, such as imazapyr, will help prevent the growth and subsequent spread of wind-dispersed weed seeds, especially in facilities with high use and therefore high potential to spread across the island. First point-of-entry locations, such as the airfield, such be prioritized with installation of pea gravel and pre-emergent weed treatments (Figure 4-2).

See Figures 4-7 through 4-10 for recommended facilities containment schemes for weed treatment, gravel buffer zones and fencing.

A6. **Identify additional high-use facilities and military areas that would benefit from invasive plant management and implement the suggested weed containment scheme.**

The identified weed manager and biosecurity manager should work collaboratively with the military to identify additional facilities of high potential for weed dispersal. Implement these weed containment BMPs described above (Figures 4-7 through 4-10).

A7. **Ensure construction and utility yard cleanliness by defining boundaries with a chain link fence.**

Installing fencing around the perimeter of work yards with a high porosity shade cloth can reduce wind-dispersed seeds presently onsite from being further spread across NBVC SNI. Fencing will also eliminate stockpiling “creep” or the slow spreading of materials closer to native and non-native vegetation which presents infestation risks (Figures 4-4 and 4-5).

A8. **Create a 12-foot buffer zone of pea-gravel surrounding fenced facilities.**

Pea-gravel buffer zones should encircle the fencing described in Action A7. Pea gravel should attempted to be sourced from “weed-free” sources. Border edging should be buried a minimum of six inches (15 centimeters) deep. No landscape cloth should be used to prevent the spread of Argentine ants. Preventatively treating buffered gravel with a non-selective, pre-emergent herbicide, such as imazapyr, will help prevent the growth and subsequent spread of wind-dispersed weed seeds and acts as a catchment system. Figures 4-7 through 4-10 show recommended facilities containment schemes for weed treatments, gravel buffer zones and fencing.

A9. **Install gravel inside the perimeter of fencing, or the yard itself, when feasible.**

Activities that will not be affected by wholly-graveled yards should additionally install gravel within the perimeter of the fencing. See Figures 4-7 through 4-10 for recommended facilities containment schemes for weed treatment, gravel buffer zones and shade fencing.

A10. **Demolish derelict or unused buildings to prevent attractive refuges for mesopredators or other invasive species.**

Mesopredators, such as cats or possums, may seek refuge in unused buildings. Buildings slated for demolition should be quickly deconstructed to eliminate harborage for invasive species (Figure 4-6).



Figure 4-1. Stockpiles of sand, aggregates, or other materials should be treated with pre-emergent herbicides to prevent the transport of invasive plant species.



Figure 4-2. First point of entry for personnel arriving at NBVC SNI by aircraft. The gravel buffer surrounding the SNI airfield is an effective catchment of invasive weed seeds and should be on a regular weed maintenance regime.



Figure 4-3. Example of a yard that would benefit from a 12-ft (3.7 m) gravel buffer and pre-emergent herbicide treatment.



Figure 4-4. Example of stockpiling creep. Piles should maintain a 12-foot distance from all vegetation.



Figure 4-5. Stockpiling creep resulting in iceplant infestation into aggregate piles.



Figure 4-6. Buildings laid up for demolition should be prioritized for quick demolition to eliminate refuge for mesopredators and other invasive species.

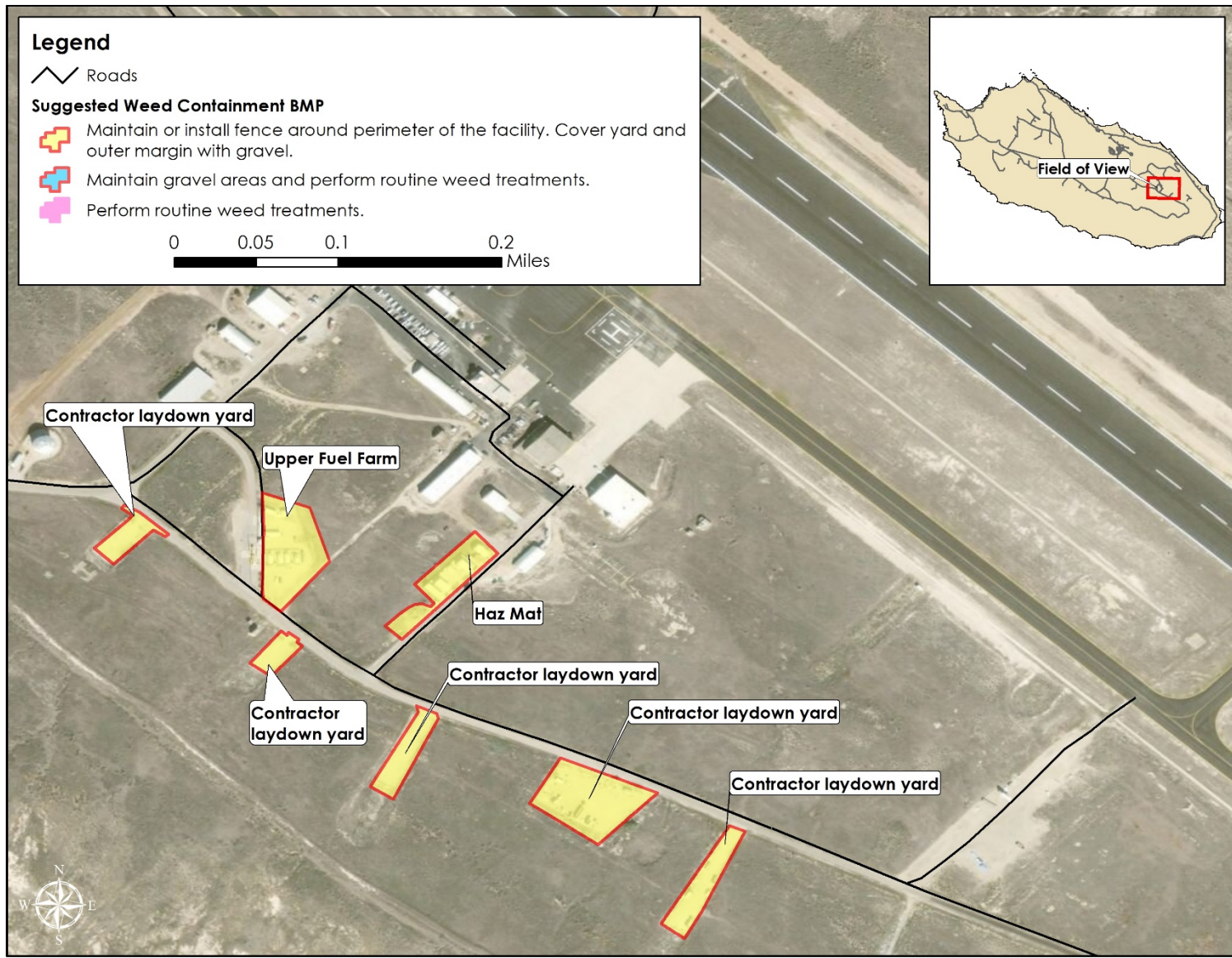


Figure 4-7. Suggested weed containment scheme for contractor laydown yards near the airfield and the upper fuel farm.

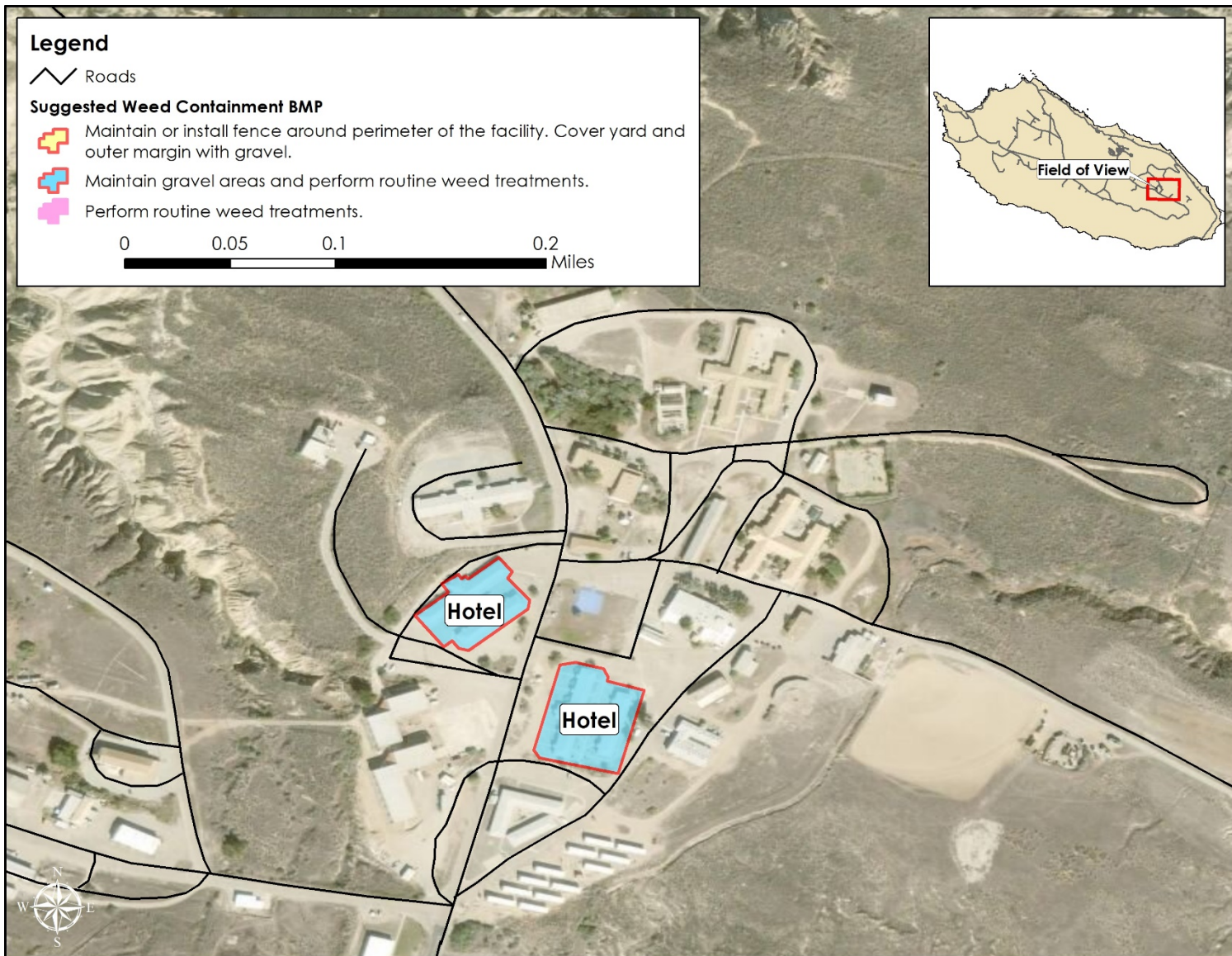


Figure 4-8. Suggested weed containment scheme for the hotels.

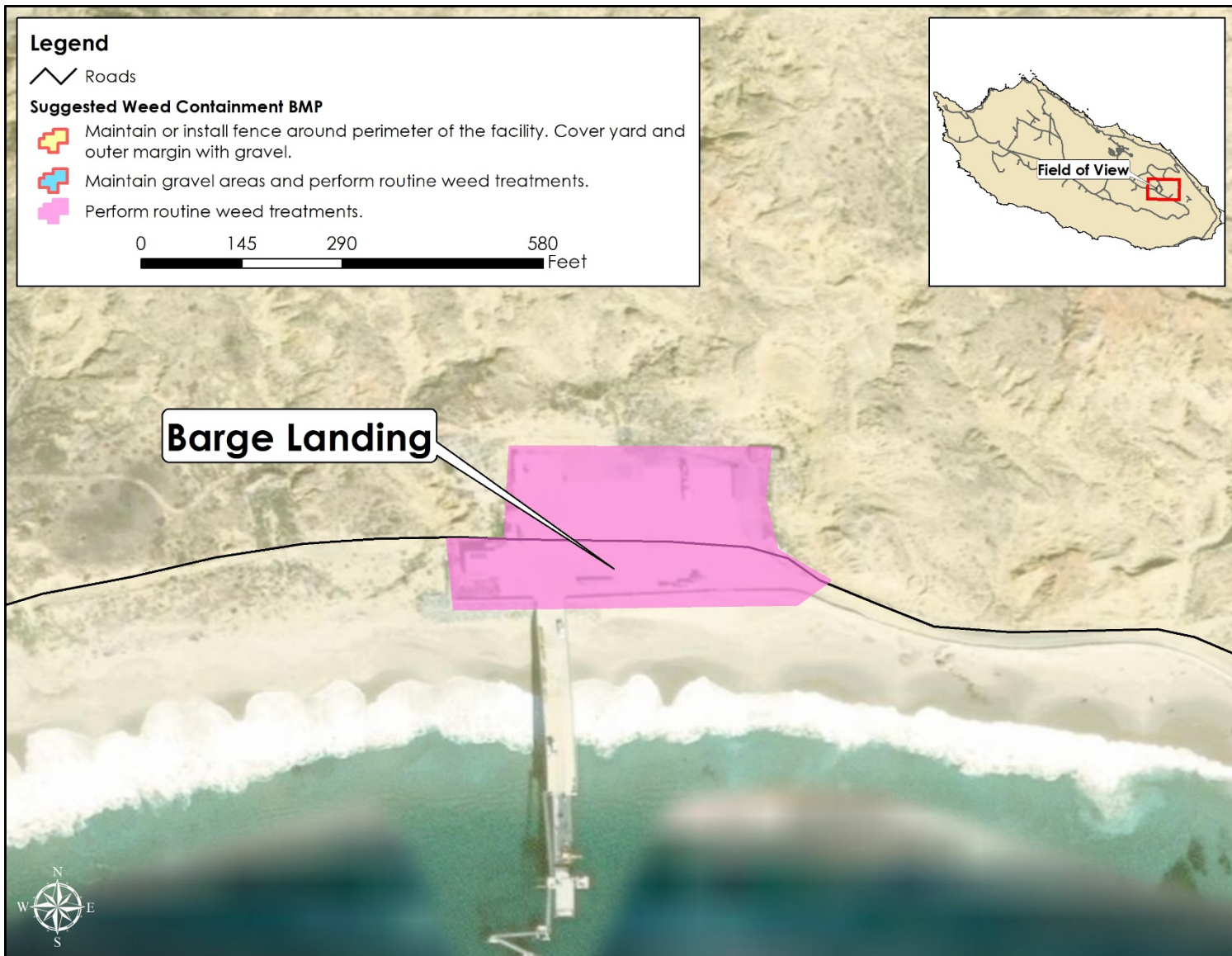


Figure 4-9. Suggested weed containment scheme for the barge landing area.

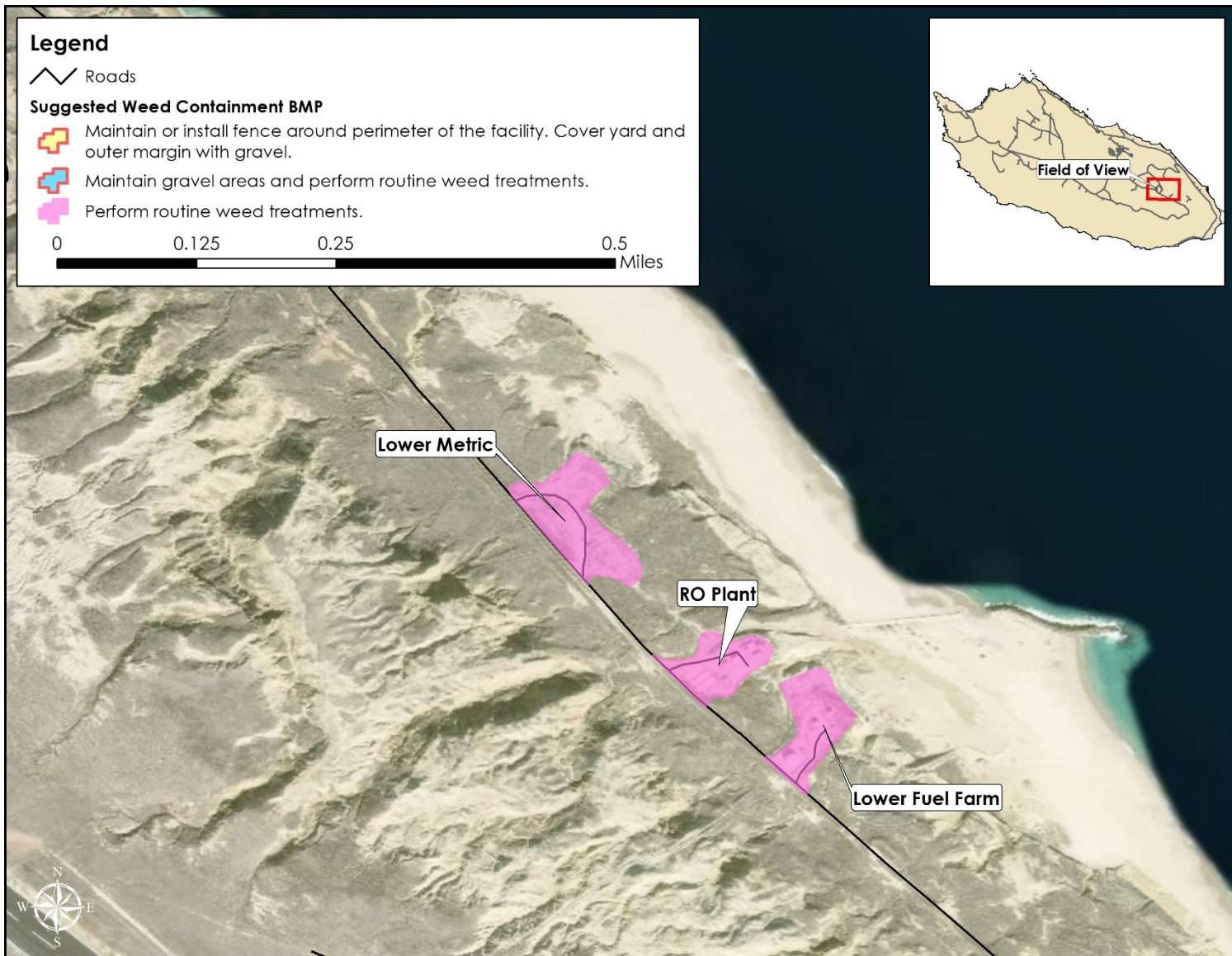


Figure 4-10. Suggested weed containment scheme for the lower metric (batch plant) staging area and lower fuel farm..

Strategy B: IPM and Weed Management Efforts

Collaboration between integrated pest management, restoration, and weed management will be imperative to effectively enacting biosecurity recommendations.

ACTIONS

- B1. Maintain a geodatabase of trapping efforts and locations. Update frequently.**
Developing a geodatabase of pest management activities within a Geographic Information System (GIS) can allow management to quickly visualize data in order to identify gaps, track effort and trends, and identify target areas.
- B2. Maintain facilities' and buildings integrity to exclude potential rodents and other small mammals from buildings.**
Holes or degrading wood allow entry points into facilities with no previously known infestations. Biosecurity managers should coordinate with the pest management service provider to ensure that points of entry are eliminated, and buildings are maintained (Figure 4-11).



Figure 4-11. Maintain facilities infrastructure, eliminate rodent entry-points (such as holes), and make building repairs quickly to discourage rodent harborage.

Strategy C: Promote the Use of the SNI Car Wash

Public Works and the Environmental Division should promote the use of the car wash prior to allowing vehicles to drive throughout the island. Regular maintenance of the facilities should be conducted to ensure functionality.

ACTIONS

- C1. **Promote the use of the car wash in biosecurity efforts and vehicle cleanliness protocols.**
The car wash on NBVC SNI should be encouraged for use by contractors, vehicle renters, and the military. However, car washes pose inherent biosecurity risks due to the facilities being a collection point of invasive species and pooling water which may provide mosquito habitat. If not already installed, vacuums should be readily accessible, and vehicles should be thoroughly vacuumed. No seed heads should be left in vehicles (Figure 4-12).
- C2. **Ensure functionality of car wash drain.**
The drain should be regularly maintained to ensure clearing and functionality. No water should be allowed to collect over a 12-hour period (most mosquito larvae hatch after exposure to water for 48 hours). Water collection areas also pose risk for re-contaminating tire treads. Debris-clogged drains prevent proper flow and can trap invasive seeds.
- C3. **Identify drains that collect propagule containing water and ensure proper disposal.**
The biosecurity manager should identify all facilities' drains and their outfall locations. They should ensure in areas of vehicle washings and work yards where vehicles are being pressure-washed that propagule containing water is routed to a waste management facility.
- C4. **Ensure functionality of all NBVC SNI drains.**
Other drains should be cleared of dirt and debris to not allow invasive plants to grow through the drain. Drains should be regularly inspected and cleared of debris to ensure proper drainage to prevent propagule accumulation and mosquito breeding.

Strategy D: Standing Pools Of Water

Reduce pooling water near infrastructure. Pools pose a biosecurity risk because of mosquito breeding and the potential to provide habitat for listed branchiopods.

ACTIONS

- D1. **Re-grade yards and quarries to ensure consistent surface topography.**
Pools of water collect in ditches and culverts and should be discouraged to reduce the risk of waterfowl attraction (Figure 4-13). Surfaces should be level but allow proper water drainage. This will reduce the risk of introduced federally-listed branchiopods transported by waterfowl to NBVC SNI and breeding of mosquitoes that transmit diseases (e.g. West Nile virus).



Figure 4-12. Two seeds heads left in a SNI vehicle, one from a non-native grass (left) and one from a non-native mustard species (right). Vacuum protocols for vehicles should be enforced.



Figure 4-13. Pools of waters around infrastructure should be discouraged and surfaces should be regraded. This pool could encourage waterfowl to frequent the pond and subsequently introduce San Diego fairy shrimp (*Branchinecta sandiegoensis*) or other federally listed branchiopods (Muñoz 2013).

Strategy E: Examine Nursery Activities

Require that the restoration program examines its practices regarding nursery operations.

ACTIONS

- E1. Investigate the feasibility of an island food waste program.**

Utilizing galley food waste into a compost program decreases food waste at the landfill and aids progress towards making soil on-island for restoration projects thereby reducing import of foreign-sourced material. All food waste should use tumbler type compost barrels (Figure 4-16). In areas of Argentine ant infestations, Figure 4-20 should be adapted to the legs of tumblers. Tumblers should be strategically located in areas of food collection.

- E2. **Treat the water in the nursery table legs to prevent mosquito breeding.**
SNI implemented a Channel Islands Restoration design for nursery table legs that exclude pests from crawling into native plant starts (Figures 4-14 and 4-15). A PVC tube is filled with a non-toxic mixture to exclude any crawling arthropods, such as Argentine ants, from infesting nursery tables (Figures 4-14 and 4-15). Because mosquito larvae have been discovered in the nursery table legs, water should be treated with either Bti (*Bacillus thuringiensis* ssp. *israelensis*), which is a naturally occurring bacterium found in soils, or dish washing soap (such as Dawn®) and bleach if Argentine ants are found using Bti as a bridge across water.
- E3. **Native outplantings should only be placed on nursery tables, never on the ground.**
Outplantings should only be placed on tables that exclude pests, if placed on the ground they risk infestation from Argentine ants and other crawling arthropods.
- E4. **Ensure that only native plants grown in the island nursery are from seeds collected on SNI for outplanting.**
Continue growing native plants from seed collected on NBVC SNI to ensure the native genotype of species.
- E5. **Install gravel in non-concreted areas around the greenhouse and maintain a weed buffer around the perimeter.**
Maintain a weed-free perimeter around the greenhouse. In areas not concreted and excluding existing landscaping, install pea gravel to function as a weed seed sequestration area. Ensure that any non-native weed seeds potentially embedded in gravel are preventatively treated with a non-selective, pre-emergent herbicide, such as imazapyr. The buffer is at the discretion of the SNI Natural Resources Manager.
- E6. **Never install any in-ground compost piles; use sealed containers for compost and soil.**
Unsecure compost piles can attract various pests and have the potential to spread disease to native populations. It is recommended to use pest-proof, sealed containers such as tumbler-style compost bins (Figure 4-16). It is important that sealed containers used for compost possess legs that could be adapted to the nursery table legs design to prevent Argentine ant infestations (Figure 4-14).



Figure 4-14. San Nicolas Island nursery table legs are adapted to prevent the infestation of Argentine ants in native plants starts, mosquito larvae, and the transfer of decollate snails. Designed by Channel Islands Restoration.

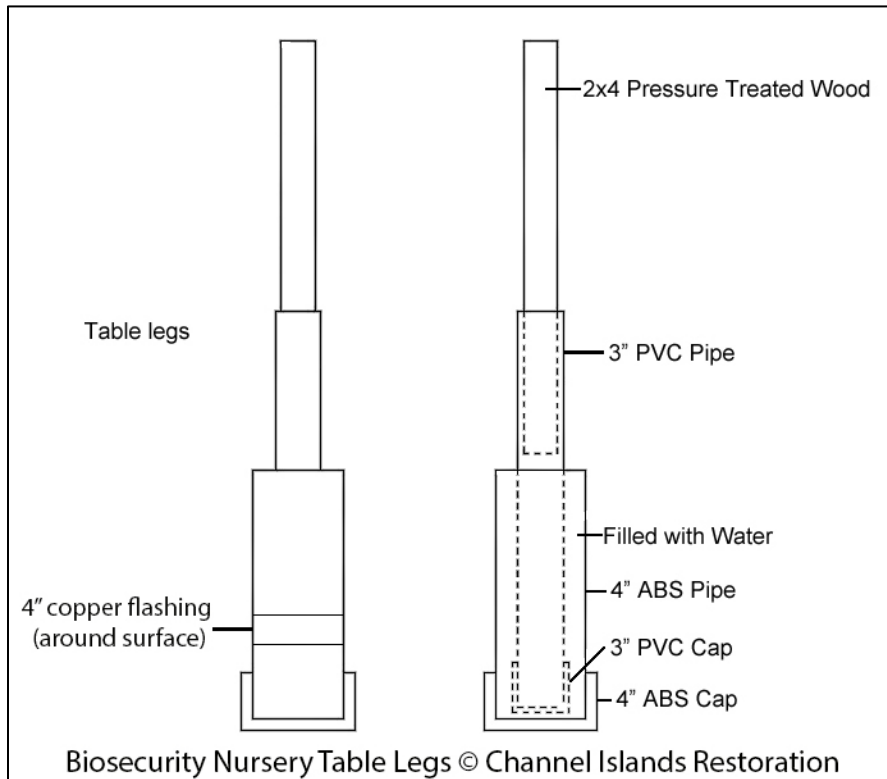


Figure 4-15. Nursery table legs designed to prevent specific pests, such as Argentine ants, from infesting native plants grown for restoration projects. Source: Ken Owen, Channel Islands Restoration.



Figure 4-16. Mostly pest-proof and high capacity tumblers aerate and compost food waste. Source: www.flipboard.com

Early Detection and Monitoring – Facilities Management

Strategy F: Early Detection

Develop a standardized monitoring system focused on early detection for high priority invasive species around facilities and all points of entry.

ACTIONS

- F1. Coordinate with IPM, restoration, and weed managers to assess opportunities to include monitoring for invasive species.**
The biosecurity manager should work collaboratively with other managers to assess options for incorporating early detection surveys into existing management activities.
- F2. Identify optimal budgets for monitoring around facilities in cooperation with the invasive weed manager and determine the interval of monitoring.**
In order to determine the monitoring schedule, staff should first identify available resources. Develop generic Government Estimates (GE) for monitoring various weed species around different sized facilities.
- F3. Determine regular monitoring schedules for invasive species at NBVC SNI points-of-first-entry.**

Develop set transects, grids, or routes in concentric rings outward from points-of-first-entry surrounding infrastructure, such as barge loading facilities and the NBVC SNI barge dock, NBVC SNI airfield, roadways, facilities with high personnel usage, military training areas, and the nursery. The important aspect of monitoring points-of-first-entry is to have an adequate time to respond. If the frequency is too low, invasives (especially invasive plants) may become established in the interim period and will defeat the goal of monitoring. Suggested schedules include:

Mainland & SNI Barge Loading Area and Dock – Bimonthly

NBVC SNI Airfield – Monthly

SNI Roadways – Semi-monthly January through July

Facilities – Semi-monthly year round

Military training areas – Semi-monthly January through July

Nursery – Semi-monthly January through July

F4. Install rodent chew cards at all points of entry.

Chew cards, or chew sticks, may assist in early detection in the event that a rodent is introduced. Wooden chew sticks soaked in oil or other attractants can remain attractive for up to two years. Additionally, chew cards can be examined to determine the species of rodents based on differences in incisor markings (McFadden 1991).

F5. Paint 12-inch white rat runs at the bottom of walls in facilities across the island.

Painted white rat runs can enable management to determine if a rodent infestation has occurred (Figure 3-23). If rub marks (dark, greasy stains) appear on the white run, then trapping efforts and other IPM strategies should be employed. Rats like linear spaces, particularly if they offer some concealment, therefore additional white rat runs could be painted along the floor at the bottom of walls, in gutters, on ledges, between walls and units of equipment like coolers and stoves, or on pipes and wires.

F6. Develop a facilities-based camera trap monitoring plan.

Facilities and infrastructure should incorporate camera trapping near buildings and yards to detect the presence of non-native vertebrates. Personnel monitoring captured photos should be well-versed in the identification of mammals, especially non-native rodents. Quantitative measurements will need to be conducted based on the nose, eyes, ears, and tails of rodents to determine species-level identification. These measurements can be made in GIS or other systems.

F7. Monitor landfill for possible escapees or unauthorized material that may harbor invasive species.

Heavy equipment and vehicles that drive to the landfill may transport weed species. The landfill should be included on a regular survey of roadsides and facilities.

F8. Require contractors and personnel to set up monitoring schedules for an agreed upon time period after initiation and post-completion of construction or ground disturbing activities.

For any ground disturbing projects on NBVC SNI, institute best management actions that personnel and/or contractors can take to reduce the introduction of new invasive

species. This should include on-going selective herbicide treatments of target weed species to reduce the spread of invasive plants across the project site and follow-up biological surveys to identify any new species introduced.

F9. Collaborate with the biosecurity manager and invasive weed manager to schedule and ensure these sites receive an annual weed survey.

For any ground disturbing projects on NBVC SNI, institute mitigation actions that personnel and/or contractors can take to reduce the introduction of new invasive species. This should include on-going selective herbicide treatments of target weed species to reduce the spread of invasive plants across the project site and follow-up biological surveys to identify any new species introduced.

Post Detection Response – Facilities Management

Strategy G: Develop Response Initiatives for Island-Wide Incursions

Post-detection responses should be developed for prioritized invasive species of risk.

ACTIONS

G1. Stage an *Invasive Species Monitoring and Detection* kit in an easily accessible location in facilities around the island.

Multi-target kits should not possess any anti-coagulants or toxic baits due to regulatory constraints and the potential for off-target consumption (island fox). The following serves as an example of contents in a multi-target *Invasive Species Monitoring and Detection Kit*:

- Gnaw sticks or other indicator baits such as peanut butter, molasses, oat loaves, cat food
- Rapid response camera traps
- Snake, mesopredator, rat, and small mammal traps (Sherman traps)
- Rat tunnels, papers, and paint (Black Trakka; Appendix C)
- Nets

G2. Implement rapid response protocols.

Response plans are most effective if established well in advance of any incursion, especially to prevent the introduction of a rodent or cat.

G3. Determine the taxon of potential threat and identify professionals experienced in detection and extirpation.

Confirm the species detected and adapt the appropriate vessel grounding response plans (Section 3.2.3 Action A3) for facilities-based use. NBVC SNI should develop relationships with various professionals that are experienced in detecting incursions at low densities, especially in island contexts. NBVC SNI will need to determine if the threat is high enough to quickly contract eradication professionals to prevent a non-native vertebrate population from establishing.

G4. If an invasive animal is contained on NBVC SNI: determine species and sex, quarantine, dispatch and perform necropsy.

Time is of the utmost importance when containing newly introduced invasive species. Performing necropsies will be important to delineate stomach contents and to determine if the animal has reproduced recently.

Biosecurity Education – Facilities Management

Strategy H: Outreach

Increase education of invasive species to island visitors and personnel by developing an educational station at the NBVC SNI Airfield.

ACTIONS

- H1. **Incorporate biosecurity topics into the “Natural Resources” signage at the NBVC SNI Airfield (Figure 3-27).**
An engaging multi-media station educates all visitors on the SNI ecosystem, SNI military mission, SNI biosecurity concerns, and the damages inflicted on habitat and the military mission by invasive species.
- H2. **Develop a “weed box” and install an accompanying educational panel and additional footwear cleaning brushes.**
A transparent vinyl-type box should contain weed seeds and other debris captured on personnel’s clothing, footwear, Velcro, and luggage. Photos should also accompany the weed seeds of the plants and the damages they inflict (Figure 3-13). This educational opportunity informs visitors about the risks of unclean footwear and allows the “last chance” opportunity to clean boots off on foot brushes at the educational station.

Naval Base Ventura County San Nicolas Island Biosecurity Plan

Contact: NAVFAC Environmental Division

General Instructions: *The following subsection is a component of the overarching NBVC SNI Biosecurity Plan designed to reduce and/or prevent the arrival of invasive species to SNI that impact military readiness and mission. Please contact NAVFAC Environmental Division for questions or for the complete Plan. Each subsection represents a potential pathway for an invasive species to arrive on the island and in order to detail strategies that prevent that risk, all recommendations are summarized into one table the precedes the subsection. Each recommendation is referred to as an “Action” and has an associated number. Not all Actions will be implemented due to costs or other constraints; however, all Actions are provided and are organized by their inherent value—starting from the easier and less costly to more strategic and complicated of Actions. Detailed descriptions follow the table and provide context.*

This subsection requires the following enclosure(s):

1. Appendix A
2. Appendix E

4.1.2. On-Island Source Material

Few materials are produced on SNI, such as gravel for fill and topsoil from borrow pits. Personnel participating in construction and maintenance activities may be island personnel, temporary contractors or military groups. Materials sourced from on-island have the potential to significantly reduce invasive species risks in the long term; however, measures will have to ensure that invasive species already present on the island are contained.

Quarries, borrow pits, and areas of excavation are significantly disturbed and therefore easily colonized by many invading plant species. Equipment used at these sites and solely on the island presents less of a risk than imported equipment but may still spread invasive species locally.

Table 4-2. On-island source material biosecurity effort priority index and action value table.

Action Number	Potentially Prevented Invasives	Action	Implementation Index ^a	Personnel Index ^b	Cost Index ^c	Additive Effort Score ^d	Action Value Score ^e
Prevention of Incursions							
A1.	invertebrates, invasive plant	Require that on island quarries, borrow pits, facilities that collect aggregates, or excavation sites follow protocols on stockpiles.	1	1	1	3	MED
A2.	invertebrates, invasive plant	Preferentially utilize old stockpiles to minimize length of time materials are sitting.	1	1	1	3	LOW
A3.	invertebrates, invasive plant, small mammals	Implement vehicle cleaning standards (Appendix A).	1	1	1	3	LOW
A4.	invertebrates, invasive plant	Pressure wash and vacuum vehicles before movement to new yards or sourcing sites on island.	2	2	2	6	HIGH
A5.	invertebrates, invasive plant	Collect and crush on-island concrete (e.g. from demolished building foundations) as a source of on-island aggregate. Incorporate the BMPs in Cal-IPC's <i>Preventing the Spread of Invasive Plants: Best Management Practices for Land Managers</i> (Appendix E).	2	2	3	7	HIGH
A6.	invertebrates	Grade surfaces at borrow pits or excavation sites to ensure consistent surface topography.	2	2	3	7	HIGH
Early Detection and Monitoring							
B1.	all species	Coordinate with pest, restoration and weed managers to assess opportunities to include monitoring for invasive species. Monitor NBVC SNI facilities where on-island source materials are being utilized.	1	1	1	3	MED
B2.		Maintain geospatial data of disturbed areas and the materials associated with or sourced from them.	2	1	1	4	LOW
Post Detection Response							
Invasive species already established on NBVC SNI							
Biosecurity Education							
C1.	all species	Routinely distribute NBVC SNI Commander's Naval Instructions on Biosecurity and regularly include in briefings.	1	1	1	3	LOW
C2.		Deliver the general PowerPoint included in the mandatory in brief of all NBVC SNI visitors.	2	2	2	6	LOW

^aImplementation Index - 1 Minor alteration to existing action or program 2 Action can be implemented within existing programs but moderately expanding program's actions 3 Requires an additional program, significantly alters programs, adds significant tasks to existing program

^bPersonnel Index - 1 Action can be done under existing position, job description may expand slightly to incorporate implementation of biosecurity action 2 Job description must expand moderately to incorporate implementation of biosecurity action 3 The effort required to incorporate the recommended action is so substantial it may require more oversight than currently existing positions dedicated to biosecurity

^cCost Index - 1 Little to no appreciable increase to existing budget 2 Moderate increase 3 Extensive increase

^dAdditive Effort Score - additive of the three above indices. Scores of 3 represent biosecurity actions that should be prioritized first because of low cost, no significant changes to existing program, and easy implementability. Scores of 4 - 7 are second level priority biosecurity actions that may have higher cost and require greater output at the Navy's expense to implement. Scores of 7+ represent third level priority biosecurity actions that require the most output and the design of significant programs.

^eAction Value Score - LOW Basic or standard biosecurity strategy MED Moderate or increasing in strategic value HIGH Advanced and highly valuable action

Prevention of Incursion – On-Island Source Material

Strategy A: On-Island Source Materials

Require that quarries and other sourcing facilities implement BMPs to reduce the spread of invasive species aggregate sourcing on-island.

ACTIONS

- A1. **Require that on island quarries, borrow pits, facilities that collect aggregates, or excavation sites follow protocols on stockpiles.**
Do not allow material stockpiles (dirt, sand, topsoil, aggregate, gravel) to sit or collect for lengthy periods of time. The longer a stockpile sits, the higher the chances that invasive plants can contaminate the stocked aggregate. Preventatively treat stockpiles with a non-selective, pre-emergent herbicide biannually (e.g., imazapyr). This can eliminate growth of invasive plants growing out of aggregate piles (Figure 4-17).
- A2. **Preferentially utilize old stockpiles to minimize length of time materials are sitting.**
Older stockpiles have more time for weed seeds to infest. Institute a standard rotation of materials that are older are to be used first.
- A3. **Implement vehicle cleaning standards (Appendix A).**

Personnel using vehicles at sites for source materials should be especially vigilant about washing protocols and also ensure that propagule containing water is collected and disposed of at proper waste treatment facilities.

A4. **Pressure wash and vacuum vehicles before movement to new yards or sourcing sites on island.**

Vehicles should be pressure washed in their respective yards prior to departing for another site or working at a quarry to limit the transfer to invasive seed propagules to the sourcing site. Ensure that paint is clean and free of dust, dirt, and debris. Tires should be free of dirt, dust, mud, and visible sign of invasive species in tire treads. Vehicle appendages should be free of seed-grabbing materials such as cobwebs. The undercarriage should be high pressure washed and free of mud, dirt, and debris.

A5. **Collect and crush on-island concrete (e.g. from demolished building foundations) as a source of on-island aggregate. Incorporate the BMPs in Cal-IPC's *Preventing the Spread of Invasive Plants: Best Management Practices for Land Managers* (Appendix E).**

Require that personnel sourcing materials for use on island (e.g. aggregates and concrete) read and incorporate the BMPs for NBVC SNI sourcing materials operations.

A6. **Grade surfaces at borrow pits or excavation sites to ensure consistent surface topography.**

Pools of water collect in ditches and culverts and should be discouraged to reduce the risk of waterfowl attraction, especially at excavation sites, borrow pits, and quarries. Surfaces should have a uniform grade and allow proper water drainage. This will reduce the risk of introduced federally-listed branchiopods transported by waterfowl to NBVC SNI or mosquitos (e.g. *Aedes aegypti*, *Aedes albopictus*) and mosquito-borne diseases (e.g. West Nile).



Figure 4-17. Tree tobacco, (*Nicotiana glauca*), growing out of an aggregate pile on Naval Auxiliary Landing Field San Clemente Island. Collections of aggregate are vectors for the transport of weed species not only from the mainland, but throughout the island. Recommendations emphasize the need for herbicide treatment of gravel piles. Source: Emma Havstad, Soil Ecology and Restoration Group (SERG).

Early Detection and Monitoring – On-Island Source Material

Strategy B: Early Detection

Develop standardized monitoring where on-island source materials are being utilized.

ACTIONS

- B1. Coordinate with pest, restoration and weed managers to assess opportunities to include monitoring for invasive species. Monitor NBVC SNI facilities where on-island source materials are being utilized.**

The biosecurity manager should work collaboratively with other managers to assess options for incorporating early detection surveys into existing management activities. However, managers from across the California Islands archipelago are currently developing protocols for island-wide invasive plant surveys in order to monitor and detect new populations of invasive species before establishment. Ground monitoring accomplishes surveys in smaller, targeted locations and are difficult to implement over large land areas. Aerial surveys for invasive plants are conducted to establish a baseline of species identified and their distribution/extent on the island. These can be repeated every five years to monitor changes in baseline conditions and detect spread and introduction of invasive species. For example, Santa Cruz Island’s invasive plant monitoring program is currently conducting island-wide aerial invasive plant surveys

every five years in order to track eradication progress as well as to detect new biosecurity threats (J. Knapp, pers. comm.). SNI is slated to receive an island-wide survey in June 2018.

B2. Maintain geospatial data of disturbed areas and the materials associated with or sourced from them.

This will aid in tracking the sources and locations of materials. Geospatial data can help identify quarries or other sites that need additional management.

Post Detection Response – On-Island Source Material

Because on-island source material is already present on SNI, any invasive species that show up elsewhere is already known to occur on the island. Therefore, IPM and invasive weed management plans will have to address the control of already established species.

Biosecurity Education – On-Island Source Material

Strategy C: Outreach

Increase education of, and outreach to, those who may be potential sources for invasive species introductions through the transport of vehicles and heavy equipment.

ACTIONS

C1. Routinely distribute NBVC SNI Commander’s Naval Instructions on Biosecurity and regularly include in briefings.

The Naval Instructions should be regularly distributed to civilian, military, and contractor personnel that details the cleanliness expectations of personnel’s boots, clothing, and personal effect prior to transport. Additionally, the Naval Instruction should contain an organization schematic that directs specific activities to certain sections within this Plan. Naval Instruction should have a section on responsibly sourcing materials and storage of aggregates.

C2. Deliver the general PowerPoint included in the mandatory in brief of all NBVC SNI visitors.

Alert personnel to the risks of transporting source materials across the island and aggregate stockpiling.

Naval Base Ventura County San Nicolas Island Biosecurity Plan

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This subsection requires the following enclosure(s):

1. Appendix F

4.1.3. Roadway and Airfield Mowing

Mowing increases light availability, changes biomass (by decreasing living biomass and temporarily increasing litter) and introduces moderate disturbance. The added disturbance makes new niche spaces available, which may be appropriated by either native or non-native seeds. Depending on timing and the phenology of the species present, mowing interrupts seeding or flowering, or disperses seeds if they are mature. Carefully timed mowing may be beneficial depending on the species composition of the stand and the desired end goal. If timed properly and repeated yearly, mowing can exhaust seed banks and prevent flowering of unwanted species. In general, mowing benefits low-growing species with high specific leaf area.

Regular mowing currently occurs around the airfield on SNI in areas not covered by blacktop. However, mowing also has the potential to expand and disperse invasive plant populations, especially if conducted along road corridors that pose the risk of transport across the island. The physical disturbance of the mower contributes to seed spread by projecting seeds into the air where they could be carried further off site. This presents a significant biosecurity risk and may result in long-distance introductions. Even mowing equipment that is designated for only on-island use can be problematic because it can further spread invasive plant populations already present on SNI to new areas.

Mowing programs should be implemented carefully and consider the phenology of various desired controlled species when determining timing and location of mowing activities. Recommendations are directed at prevention strategies and collaboration with weed management plans, fox management plans, and any objectives for Bird Airstrike Hazards (BASH).

Table 4-3. Roadway and airfield mowing biosecurity effort priority index and action value table.

Action Number	Potentially Prevented Invasives	Action	Implementation Index ^a	Personnel Index ^b	Cost Index ^c	Additive Effort Score ^d	Action Value Score ^e
Prevention of Incursions							
A1.	invertebrates, invasive plants, small mammals	Mowers and all associated equipment must be pressure washed and cleaned at a pre-determined interval.	2	2	1	5	MED
A2.	invertebrates, invasive plants, small mammals, reptiles	Forbid the transfer of mowers from the mainland to the island without a stringent protocol.	2	2	2	6	HIGH
A3.	invasive plants	Thoroughly map all areas that are mowed and determine species composition in order to determine if a mowing program should be implemented or maintained.	2	2	2	6	MED
A4.	invasive plants	Implement a properly timed mowing program.	3	2	2	7	HIGH
A5.	invasive plants	Evaluate chemical mowing of roadside edges.	3	2	2	7	HIGH
B1.	invasive plants	Investigate the restoration of roadsides in place of mowing.	1	1	1	3	HIGH
Early Detection and Monitoring							
C1.	invasive plants	Map all roadside edges.	2	2	2	6	LOW
Post Detection Response							
D1.	invertebrates, invasive plants	Implement a rapid response treatment protocol.	2	2	2	6	LOW
Biosecurity Education							
E1.	invasive plants	Increase outreach to public utilities departments about the biological consequences of mowing.	1	1	1	3	LOW
E2.	invasive plants	Train personnel in public works departments proper cleaning procedures of mowing equipment, plant identification, and proper mowing schedules.	1	2	1	4	MED

^aImplementation Index - 1 Minor alteration to existing action or program 2 Action can be implemented within existing programs but moderately expanding program's actions 3 Requires an additional program, significantly alters programs, adds significant tasks to existing program

^bPersonnel Index - 1 Action can be done under existing position, job description may expand slightly to incorporate implementation of biosecurity action 2 Job description must expand moderately to incorporate implementation of biosecurity action 3 The effort required to incorporate the recommended action is so substantial it may require more oversight than currently existing positions dedicated to biosecurity

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^eAction Value Score - LOW Basic or standard biosecurity strategy MED Moderate or increasing in strategic value HIGH Advanced and highly valuable action

Prevention of Incursion – Mowing

Strategy A: Limit the Spread of Invasive Species Infestations by Mowing

Determine species composition along roads and utilize mowing to exhaust seed banks and prevent flowering of targeted invasive species.

ACTIONS

- A1. **Mowers and all associated equipment must be pressure washed and cleaned at a pre-determined interval.**
The biosecurity manager and restoration managers should work collaboratively to determine the interval that equipment should be washed. The goal is to limit the spreading of invasive plant species to new habitats from invasive species-contaminated mowers travelling around the island.
- A2. **Forbid the transfer of mowers from the mainland to the island without a stringent protocol.**
Limit the potential for infestation and maintain on-island designated mowers. Additional cleaning measures should be developed if mowers are to be transferred between the mainland and NBVC SNI.
- A3. **Thoroughly map all areas that are mowed and determine species composition in order to determine if a mowing program should be implemented or maintained.**

The data collected should inform managers on mow timing based off the composition and weed species of concern phenology. If it is not feasible to responsibly mow road edges without introducing or further dispersing seeds, or if mowing encourages aggressive re-growth of various weed species, other alternatives should be investigated.

A4. Implement a properly timed mowing program.

If species phenology and the timing of mowing can coincide to responsibly mow road-edges, conduct roadside mowing to prevent the infestation of non-infested habitat and to increase fox visibility and limit vehicle-caused mortalities. Mowing on an interval that allows weeds to re-grow between mowing will eventually kill or reduce the number of some weeds. Depending on the species palette present, mowing would most likely take place prior to seeding.

A5. Evaluate chemical mowing of roadside edges.

If mechanical mowing occurs along roadside edges, investigate the feasibility of chemical mowing, especially if island fox vehicle strikes are an issue. Chemical mowing can be an inexpensive, effective, and long-lasting way to eliminate or substantially reduce the need for mechanical mowing. Additionally, by treating weeds along road edges, roads do not become a vector for the transportation of weed species throughout the island.

Strategy B: Encourage Roadside Establishment of Native Perennial Grasses

Prevent the spread of invasive species by restoring roadsides, reducing roadside maintenance and preventing the spread of invasive weeds by developing a native grass road margin establishment program.

ACTIONS

B1. Continue restoration of roadsides in place of mowing.

Invasive weeds require a regular mowing program in conjunction with herbicide treatments, but repeatedly re-infest the same roadsides and have the potential to spread to other un-infested areas of the island. SNI has successfully installed native plantings to outcompete non-native species, for example the Pipeline Planting, along road edges (Figure 4-19).

Another resource for the restoration of roadside edges includes Yolo County Regional Conservation District's report on the process of establishing roadside natives. The process takes approximately three years and involves intensive herbicide treatments and hydroseeding of low-growing native bunchgrasses (Wrysinski, N.D; Appendix F.) Other considerations include the development of a seed crop produced from island stock and once successfully outplanted, grasses would have to be maintained at a short enough stature so that foxes are visible to drivers.



Figure 4-18. Road edges are subject to disturbance and occasional mowing but serve as vectors for the transport of invasive plant species to far-flung locations throughout the island. Additionally, shrubs and grasses can limit the visibility of island foxes and cause vehicle mortalities. Chemical mowing along road edges may prevent weeds from being dispersed throughout the island and also reduce any potential for island fox collisions.



Figure 4-19. The Pipeline Planting is an example of restoring road edges to prevent the transfer of non-native plants to other parts of the island.

Early Detection and Monitoring – Mowing

Strategy C: Early Detection

Develop a standardized monitoring system focused on early detection for high priority invasive species around areas heavily trafficked by vehicles and all roadways.

ACTIONS

C1. Map and survey all roadside edges.

An invasive plant program manager should determine the timing of surveys but periodically, all roadside edges to 10-m should be surveyed for high priority invasive plants. Early detection is the second highest tenet behind prevention strategies, therefore road edges should be surveyed annually in early summer as part of an invasive plant management program.

Post Detection Response – Mowing

Strategy D: Develop Response Initiatives

Post detection responses should work cooperatively with biosecurity managers and invasive plant program managers.

ACTIONS

D1. Implement a rapid response treatment protocol.

It should be up to the discretion of the invasive plant program manager to determine proper treatment protocols depending on the species detected, but efforts should be coordinated with the biosecurity manager to limit the spread of the infestation.

Biosecurity Education – Mowing

Strategy E: Outreach

Educational efforts should be targeted to all personnel involved in mowing on NBVC SNI to inform on the biological implications of mowing.

ACTIONS

E1. Increase outreach to public works departments about the biological consequences of mowing.

Encourage collaborative roadside maintenance between different entities on island. An invasive plant program in concert with the Natural Resources Manager and Biosecurity Science Specialist should detail the biological benefits and damages incurred by mowing.

E2. Train personnel in public works departments proper cleaning procedures of mowing equipment, plant identification, and proper mowing schedules.

The Biosecurity Science Specialist in coordination with the SNI Natural Resource Managers should identify the complete species list of road edges and associated mowing timing and frequency. This information should then be regularly communicated to the public works department.

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This subsection requires the following enclosure(s):

1. Appendix C

4.1.4. Military Operations

San Nicolas Island’s primary mission is to support the research, development, acquisition, test, and evaluation of air weapons and associated aircraft systems into strike, anti-surface, and anti-air warfare aircraft within the Point Mugu Sea Range (PMSR)—one of the primary locations for the Naval Air Warfare Center Weapons Division. In support of the mission, SNI serves two primary functions: as a launch platform for short and medium missile testing, and as an observation facility for missile testing. The majority of operations involve the electronic evaluation of missile systems utilizing various radars and global positioning systems (NAVFAC 2015).

The PMSR is used by the U.S. and allied military services to test and evaluate weapon systems associated with air warfare, missiles and missile subsystems, aircraft weapons integration, and airborne electronic warfare systems, to provide realistic training opportunities and to maintain the operational readiness of these forces (NAVFAC 2015).

Military training, testing, and evaluation operations directed by the NAWCWD PMSR utilize an array of locations and areas including developed facilities, remote launch pads, beaches, air space, and nearshore waters on and around SNI (NAVFAC 2015).

The complexity of different training missions and the equipment necessary to support these training missions has inherent biosecurity risks. Military equipment is used in locations all over the world and may transport invasive species that otherwise would not encounter vectors capable of transportation to the U.S. and subsequently SNI. Equipment that should receive extra scrutiny includes aircraft and tracked vehicles that may travel off road either abroad or on the island.

A Biosecurity Science Specialist will be imperative to coordinate and collaborate with the intricacies of military operations on SNI.

Table 4-4. Military operations biosecurity effort priority index and action value table.

Action Number	Potentially Prevented Invasives	Action	Implementation Index ^a	Personnel Index ^b	Cost Index ^c	Additive Effort Score ^d	Action Value Score ^e
Prevention of Incursions							
A1.	species specific	Identify related activities for military operations recommendations.	1	1	1	3	LOW
A2.	invasive plants	Coordinate with other military installations in the region for invasive plant species inventories.	2	2	1	5	MED
A3.	all species	The Biosecurity Science Specialist should coordinate preventive measures with military units using SNI for training.	3	3	1	7	MED
A4.	invasive plants	Establish weed containment buffer areas at military operations sites where feasible.	3	2	3	8	HIGH
Early Detection and Monitoring							
B1.	all species	Coordinate with pest, restoration and weed managers to assess opportunities to include monitoring for invasive species.	1	1	1	3	MED
B2.	all species	Identify optimal budgets for monitoring around facilities in cooperation with the invasive weed manager and determine the interval of monitoring.	1	1	1	3	MED
B3.	rodents	Paint 12-inch white rat runs at the bottom of walls in facilities across the island.	1	1	1	3	LOW
B4.	species specific	Develop a facilities-based camera trap monitoring plan.	1	1	1	3	MED
Post Detection Response							
C1.	species specific	Stage an Invasive Species Monitoring and Detection kit in an easily accessible location in facilities around the island.	1	2	2	5	MED
C2.		Determine the taxon of potential threat and identify professionals experienced in detection and extirpation.	2	2	2	6	LOW
C3.		Implement rapid response protocols.	2	2	2	6	LOW
C4.		If an invasive animal is contained on NBVC SNI: determine species and sex, quarantine, euthanize and perform necropsy.	3	3	3	9	LOW
Biosecurity Education							
D1.	all species	Routinely distribute NBVC SNI Commander's Naval Instructions on Biosecurity and regularly include in briefings.	1	1	1	3	LOW
D2.		Deliver the general PowerPoint and include in the mandatory in brief of all NBVC SNI military personnel.	2	2	2	6	LOW

^aImplementation Index - 1 Minor alteration to existing action or program 2 Action can be implemented within existing programs but moderately expanding program's actions 3 Requires an additional program, significantly alters programs, adds significant tasks to existing program

^bPersonnel Index - 1 Action can be done under existing position, job description may expand slightly to incorporate implementation of biosecurity action 2 Job description must expand moderately to incorporate implementation of biosecurity action 3 The effort required to incorporate the recommended action is so substantial it may require more oversight than currently existing positions dedicated to biosecurity

^cCost Index - 1 Little to no appreciable increase to existing budget 2 Moderate increase 3 Extensive increase

^dAdditive Effort Score - additive of the three above indices. Scores of 3 represent biosecurity actions that should be prioritized first because of low cost, no significant changes to existing program, and easy implementability. Scores of 4 - 7 are second level priority biosecurity actions that may have higher cost and require greater output at the Navy's expense to implement. Scores of 7+ represent third level priority biosecurity actions that require the most output and the design of significant programs.

^eAction Value Score - LOW Basic or standard biosecurity strategy MED Moderate or increasing in strategic value HIGH Advanced and highly valuable action

Prevention of Incursion – Military

Strategy A: Prevention

Coordinate with all NBVC SNI military personnel to implement biosecurity protocols for road vehicles, aircraft, etc.

ACTIONS

- A1. Identify related activities for military operations recommendations and ensure that military operations are reviewed for biosecurity hazards within the NBVC Project Review Board form.**

All airborne operations should refer to Section 3.2.2. All amphibious vehicles and ocean-going operations should refer to Section 3.2.1. All military personnel should refer to Section 3.1.4. All military training is also reviewed by various NBVC departments for conflicts with various regulations and federal statutes. Military operations should continue to be reviewed by the NBVC Project Review Board form.

- A2. Coordinate with other military installations in the region for invasive plant species inventories.**

Due to the transfer of troops and equipment between NBVC Point Mugu and Port Hueneme and other bases within the immediate region, maintaining other bases'

current geodatabases will assist NBVC SNI management with planning for likely incursions and inform targeted biosecurity efforts.

A3. The Biosecurity Science Specialist should coordinate preventive measures with military units using SNI for training.

Due to the varied nature of the military mission and activities and the multiple points of embarkation, biosecurity measures will have to evolve with the military mission. For this reason, the Biosecurity Science Specialist should work with military commands to develop prevention measures on a per project scenario. Many of the prevention strategies have been detailed in this document. However, the specific biosecurity measures of military actions should be the responsibility of the Biosecurity Science Specialist working with NBVC SNI Commander, Environmental Division, and other pertinent entities.

A4. Establish weed containment buffer areas at military operations sites where feasible.

Training areas and other general operations should identify which weed containment buffer scheme would best fit the facilities. Any military areas with high usage by personnel, vehicles, or ground disturbance should all have a treatment plan or pea-gravel buffer encircling the perimeter of facilities. See Section 4.1.1 Strategy A for a full description of weed containment strategies (Figures 4-7 through 4-10).

Early Detection and Monitoring – Military

Strategy B: Early Detection

Develop a standardized monitoring system focused on early detection for high priority invasive species around areas heavily trafficked by military equipment.

ACTIONS

B1. Coordinate with pest, restoration and weed managers to assess opportunities to include monitoring for invasive species.

The biosecurity manager should work collaboratively with the military to assess options for incorporating early detection surveys into existing management activities.

B2. Identify optimal budgets for monitoring around facilities in cooperation with the invasive weed manager and determine the interval of monitoring.

In order to determine the monitoring schedule, staff should first identify available resources.

B3. Paint 12-inch white rat runs at the bottom of walls in facilities across the island.

Painted white rat runs can enable management to determine if IPM efforts need to be expanded and can monitor infestations.

B4. Develop a facilities-based camera trap monitoring plan.

Military facilities should incorporate camera trapping near buildings and yards to detect the presence of non-native vertebrates.

Post Detection Response – Military

Strategy C: Develop Response Initiatives for Incursions

Post-detection responses should be developed for prioritized invasive species of risk in areas of military operations.

ACTIONS

- C1. **Stage an *Invasive Species Monitoring and Detection* kit in an easily accessible location in facilities around the island.**
Multi-target kits should not possess any anti-coagulants or toxic baits due to regulatory constraints and the potential for off-target consumption (island fox). The following serves as an example of contents in a multi-target *Invasive Species Monitoring and Detection Kit*:
- Gnaw sticks or other indicator baits such as peanut butter, molasses, oat loaves, cat food
 - Rapid response camera traps
 - Snake, mesopredator, rat, and small mammal traps (Sherman traps)
 - Rat tunnels, papers, and paint (Black Trakka; Appendix C)
 - Nets
- C2. **Determine the taxon of potential threat and identify professionals experienced in detection and extirpation.**
Confirm the species detected and adapt the appropriate vessel grounding response plans (Section 3.2.3 Action A3) for facilities-based use. NBVC SNI should develop relationships with various professionals that are experienced in detecting incursions at low densities, especially in island contexts. NBVC SNI will need to determine if the threat is high enough to quickly contract eradication professionals to prevent a non-native vertebrate population from establishing.
- C3. **Implement rapid response protocols.**
Response plans are most effective if established well in advance of any incursion, especially to prevent the introduction of Norway rat.
- C4. **If an invasive animal is contained on NBVC SNI: determine species and sex, quarantine, euthanize and perform necropsy.**
Time is of the utmost importance when containing newly introduced invasive species. Performing necropsies will be important to delineate stomach contents and to identify if the animal has reproduced recently.

Biosecurity Education – Military

Strategy D: Outreach

Increase education of, and outreach to, military personnel who may be potential sources for invasive species introductions through the transport of vehicles, military training, and military infrastructure.

ACTIONS

D1. Routinely distribute NBVC SNI Commander's Naval Instructions on Biosecurity and regularly include in briefings.

The Naval Instructions should be regularly distributed to civilian, military, and contractor personnel that details the cleanliness expectations of personnel's boots, clothing, and personal effect prior to transport. Additionally, the Naval Instruction should contain an organization schematic that directs specific activities to certain sections within this Plan.

D2. Deliver the general PowerPoint and include in the mandatory in brief of all NBVC SNI military personnel.

Primarily cover SNI topics that affect military personnel and the specific vectors that will affect the military mission. Topics should instruct personnel how to:

- Prepare cargo for transport to NBVC SNI
- Prepare vehicles and heavy equipment for transport
- Source on-island materials to reduce spread of invasives
- Properly store food items
- Properly clean clothing, shoes and personal effects
- Identify particular invasive species of concern
- Report sightings and identify points of contact
- And most importantly, demonstrate the impacts invasive species have on the NBVC SNI military mission and ecosystem

Naval Base Ventura County San Nicolas Island Biosecurity Plan

Contact: NAVFAC Environmental Division

General Instructions: *The following subsection is a component of the overarching NBVC SNI Biosecurity Plan designed to reduce and/or prevent the arrival of invasive species to SNI that impact military readiness and mission. Please contact NAVFAC Environmental Division for questions or for the complete Plan. Each subsection represents a potential pathway for an invasive species to arrive on the island and in order to detail strategies that prevent that risk, all recommendations are summarized into one table the precedes the subsection. Each recommendation is referred to as an “Action” and has an associated number. Not all Actions will be implemented due to costs or other constraints; however, all Actions are provided and are organized by their inherent value—starting from the easier and less costly to more strategic and complicated of Actions. Detailed descriptions follow the table and provide context.*

This subsection requires the following enclosure(s):

none

5.0 Natural Processes

Natural processes are a real and potentially high threat for the introduction of non-native species to NBVC SNI. However, the distance from the mainland as well as tidal currents and rough seas in the California Bight 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.

Although natural processes are responsible for the current composition of island species, new non-native introductions can negatively affect the ecosystem as well as introduce zoonotic disease. Recent arrivals, such as Eurasian collared doves (*Streptopelia decaocto*), are poised to introduce zoonotic infections such as Avian pox. House sparrows (*Passer domesticus*) may also introduce disease to native bird populations. In addition, insects may also arrive on the island under their own power and cause ecological damage as invasive species.

Because of the forces at play, effective biosecurity actions incorporate detailed early detection and rapid response protocols in order to quickly determine if an invasion is imminent.

5.1.1. Zoonoses

The complexity and natural occurrence of zoonotic infections presents a significant biosecurity challenge. Recommendations are focused on monitoring the species of concern that can introduce disease into the population. Then if detected, attempt to isolate the source. Table 5-1 details various diseases, vectors, species of concern, and any viable strategies to prevent or monitor the introduction. This table is designed to provide the framework to investigate more monitoring and control options, although significant resource investment will be mandatory to work with zoonoses.

Table 5-1. Comprehensive zoonotic disease table listing possibilities for prevention and control strategies.

Zoonotic Infections							
Disease	Aetiological Agent	Vector/Host	Species of Concern	Transmissibility Concerns	Vector Prevention	Vector Monitoring	Vector Control
Leptospirosis	<i>Leptospira interrogans</i> (bacteria)	Rodents (native and non-native), canids, pinnipeds (<i>Zalophus californianus</i> and <i>Callorhinus ursinus</i>), bats	Island fox, San Nicolas island deer mouse	Mode of transmission is unknown, however there is a strong association between occurrence of leptospirosis in pinniped and canid populations. May involve direct spread of urine or contact with stagnant sources of fresh water.	<ul style="list-style-type: none"> Prevent introduction of infected rodents/introduced mammals - possible Prevent introduction of infected pinnipeds/bats - not possible Pinniped vaccination - not feasible Can jump taxa groups, but canid vaccines available for various serovars 	Blood sampling for multiple serovars	No known control available
West Nile	West Nile virus (Flavivirus)	Mosquitoes/birds*	all birds occurring on SNI	*Transmitted among birds by ornithophilic mosquitoes to species of concern. Therefore, occurrences on the mainland could be transmitted to island species from avian trans-oceanic flights.	<ul style="list-style-type: none"> Experimental preventative vaccination; not commercially available (University of British Columbia 2013) Infected bird prevention - not possible Water use policy (no pooling/open water) <p>NATURALLY OCCURRING</p>	Special status species testing/mosquito surveillance and testing	<ul style="list-style-type: none"> Water use policy/mosquito abatement
Hantavirus	<i>Sin nombre virus</i>	Deer mouse	San Nicolas island deer mouse, invasive rodents. Poses highest concern for public health on island.	Transmission among rodents and from rodents to humans generally occurs through inhalation of aerosolized excreta. In their natural host, hantaviruses establish a persistent infection, which causes no apparent harm. In humans, however, hantaviruses causes cardiopulmonary syndrome in North America.	<ul style="list-style-type: none"> Prevent introduction of infected rodents - possible <p>NATURALLY OCCURRING</p>	Monitor general population	Mouse control
Distemper	Paramyxovirus	Domestic dogs, wildlife	San Nicolas Island fox, pinnipeds	Domestic dogs on island, e.g. work dogs.	<ul style="list-style-type: none"> Prevent introduction of infected non-native carnivores - possible Prevent introduction of infected pinnipeds/bats - not possible <p>NATURALLY OCCURRING</p> <ul style="list-style-type: none"> Can jump taxa groups, but canid vaccines available 	Monitor sensitive populations	No known control available
Avian pox	Avipoxvirus, a subgroup of poxviruses	Mosquitoes, (surfaces or airborne particles can also result in infection in captive birds)	all birds occurring on SNI	Multiple songbirds can become carriers and spread avian pox among local populations. Aviaries and any captive birds would be a concern as well. Poxvirus is resistant to drying, can pose problems for captive species.	<ul style="list-style-type: none"> Vector control in areas around sensitive populations, i.e. aviaries or small home ranges with limited distributions <p>NATURALLY OCCURRING</p>	Monitor sensitive populations,	No control available
Lyme disease	<i>Borrelia burgdorferi</i> (bacteria)	<i>Ixodes pacificus</i> ; Western black-legged tick, infected rodents & foxes, non-native vertebrates that could host	San Nicolas Island fox	Lyme disease is a bacterial disease spread by ticks that affects dogs, horses, humans. Foxes can also serve as a host for lyme disease, but don't transmit efficiently to ticks. Disease presentation in canids may take 2-5 months and symptoms include: lameness, joint pain, fever.	<ul style="list-style-type: none"> Prevention of introduction of terrestrial vertebrates - possible <p>NATURALLY OCCURRING</p>	Listed species testing, post-attachment tick monitoring on foxes	Tick control

5.1.2. Currents

Anything human-made, including litter and fishing gear, can become marine debris once lost or thrown into the marine environment and subsequently transported by currents. The most common materials that make up marine debris are plastics, general land-based and ocean-based refuse, derelict fishing gear, and marine-origin debris (MOD). Derelict fishing gear refers to nets, lines, crab/shrimp pots, and other recreational or commercial fishing equipment that has been lost, abandoned, or discarded in the marine environment and can pose a potential biosecurity threat by translocating species attached to gear.

MOD such as docks, piers, buoys, vessels, aquaculture floats, and other buoyant materials are a large concern because of the high potential for colonizing biofouling organisms. Some of these assemblages of marine organisms have the high potential to become invasive species within the local environment should any MOD be discovered on-island. Currently, devil weed is already established in the waters surrounding SNI. High profile and high-risk species such as wakame and the Asian shore crab (*Hemigrapsus sanguineus*) were two of over 90 non-native species discovered on a 188-ton fisheries dock that washed ashore on the Oregon Coast on 5 June 2012 (NOAA 2012). This event indicated the striking potential for MODs' ability to transport potentially serious aquatic invasive species to North America (Figure 5-1).

Prevention is not a realistic objective in the control of invasive species transported by MOD, therefore emphasis is placed on monitoring, response, and increasing awareness.

Table 5-2. Natural processes biosecurity effort priority index and action value table.

Action Number	Potentially Prevented Invasives	Action	Implementation Index ^a	Personnel Index ^b	Cost Index ^c	Additive Effort Score ^d	Action Value Score ^e
Prevention of Incursions							
<i>Not applicable</i>							
Early Detection and Monitoring							
A1.	all species	Develop monitoring strategies for MOD that work closely with existing weed management plans.	2	2	2	6	HIGH
Post Detection Response							
B1.	all species	Contact the NOAA Marine Debris Program.	1	1	1	3	LOW
Biosecurity Education							
C1.	all species	Improve the outreach and awareness of AIS and topics in biosecurity to military personnel and personnel likely to encounter MOD.	1	1	1	3	LOW
C2.	invasive algae	Increase the knowledge of already established AIS such as devil weed and warn of its dangers to the marine environment.	2	2	1	5	MED

^aImplementation Index - 1 Minor alteration to existing action or program 2 Action can be implemented within existing programs but moderately expanding program's actions 3 Requires an additional program, significantly alters programs, adds significant tasks to existing program

^bPersonnel Index - 1 Action can be done under existing position, job description may expand slightly to incorporate implementation of biosecurity action 2 Job description must expand moderately to incorporate implementation of biosecurity action 3 The effort required to incorporate the recommended action is so substantial it may require more oversight than currently existing positions dedicated to biosecurity

^cCost Index - 1 Little to no appreciable increase to existing budget 2 Moderate increase 3 Extensive increase

^dAdditive Effort Score - additive of the three above indices. Scores of 3 represent biosecurity actions that should be prioritized first because of low cost, no significant changes to existing program, and easy implementability. Scores of 4 - 7 are second level priority biosecurity actions that may have higher cost and require greater output at the Navy's expense to implement. Scores of 7+ represent third level priority biosecurity actions that require the most output and the design of significant programs.

^eAction Value Score - LOW Basic or standard biosecurity strategy MED Moderate or increasing in strategic value HIGH Advanced and highly valuable action

Early Detection and Monitoring – Currents

Strategy A: Early Detection

Develop a standardized monitoring system focused on early detection for high priority AIS around areas heavily trafficked by vehicles and heavy equipment and all points of entry.

ACTIONS

A1. **Develop monitoring strategies for MOD that work closely with existing weed management plans.**

Accessible beaches and shorelines should be surveyed at regular intervals, ideally once a quarter to identify new MOD and work to contain any transported species. Non-accessible beaches and shorelines should be surveyed by boat at intervals that utilize current resources.

Post Detection Response – Currents

Strategy B: Contact Federal Officials

Coordinate with established agencies for marine debris coordination and reporting.

ACTIONS

B1. Contact the NOAA Marine Debris Program.

For sightings of MOD, contact the NOAA Marine Debris Program which is the United States Federal government's lead for addressing marine debris. The California Regional MOD Coordinator is: Sherry Lippiatt, California Regional Coordinator sherry.lippiatt@noaa.gov as of this writing.

Biosecurity Education – Currents

Strategy C: Develop MOD Section Within Biosecurity Media

Develop the floating marine debris section with all media produced and distributed to various management operators, military, and personnel occupying beach areas.

ACTIONS

C1. Improve the outreach and awareness of AIS and topics in biosecurity to military personnel and personnel likely to encounter MOD.

Develop pamphlets of the dangers of AIS and incorporate into Naval Instructions that personnel should report sightings.

C2. Increase the knowledge of already established AIS such as devil weed and warn of its dangers to the marine environment.

Incorporate devil weed into discussions about impacts to natural resources.



Figure 5-1. An example of marine-origin debris that translocated an assemblage of organisms, including highly invasive wakame. Source: NOAA.

6.0 Conclusion

The focus of the NBVC SNI Biosecurity Plan is to provide an organizational framework on a vector by vector basis that target audiences use to inform their management decisions. This fully encompassing framework provides recommendations that apply to species of concern. Specific threats may change through time, but vector-based approaches will remain relevant. A successful plan must be able to evolve but will also require the regular review of NBVC SNI activities and potential invasive species occurring within the region. This requires a point person that can work between infrastructure, transport, and military to ensure that biosecurity objectives have been met, i.e. a biosecurity manager.

The Biosecurity Science Specialist must have the ability to communicate effectively with different stakeholders—military, infrastructure and natural resource managers—regarding minimally invasive ways to monitor and must have the authority to stop projects or shipments because of an imminent incursion to NBVC SNI.

NBVC SNI must also determine what defines a biosecurity breach worthy of response. For example, does a shipment get held up for one invasive plant seed? This is the purpose of a Biosecurity Science Specialist, to work closely with military mission to ensure effective and logical solutions to practical situations.

In addition to the work of keeping invasive species off NBVC SNI, vigilance on the island is the only way to determine if a biosecurity breach has occurred. For this reason, a portion of the Biosecurity Science Specialist or the Environmental Division's time should allocate to island inventory for vertebrate, invertebrate, plants and pathogens. Without a baseline of occurrence, it is impossible to determine whether there is in fact a biosecurity concern at all.

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APPENDICES

Appendix A. Checklist protocol for vehicles and heavy machinery.

Check for invasive species (weeds, mesopredators, rodents, etc.)	Inspected by: (initial)	Cleaned by: (initial)
1. Truck bed		
2. Exhaust systems		
3. Vent openings		
4. Grills: front and back		
5. Tray under radiator		
6. Top of transmission		
7. Stabilizer bar		
8. Shock absorber joint with axles		
9. Front and rear axles		
10. Top of front suspension units		
11. Wheel well/quarter panels		
12. Ledges under bumper (front and rear)		
13. Tire rims and treads		
14. Between rear wheel brake drums and the rim of the wheel		
15. At the bend in the fuel inlet tube		
16. Spare tire and mounting area		
17. Under the floor mat (inside cab)		
18. Under the seat (inside cab)		
19. Upholstery (inside cab)		
20. Beneath foot pedals (inside cab)		
21. Gear shift cover folds (inside cab)		
22. Buckets on front-loaders		

Inspection conducted by: _____

Organization/Command: _____

Date: _____

Phone Number: _____

Cleaning performed by: _____

Organization/Command: _____

Date: _____

Phone Number: _____

Adapted from Cal-IPC's Preventing the Spread of Invasive Plants: Best Management Practices for Land Managers.

Appendix B. Checklist protocol for personnel clothing and shoes.

Check for soil, seeds, and plant material	Inspected by: (initial)	Cleaned by: (initial)
1. Hat		
2. Hoods		
3. Collars and cuffs		
4. Clothing folds or flaps		
5. Ventilation openings		
6. Pockets		
7. Zippers		
8. Straps or Velcro grips		
9. Belts or buckles		
10. Buttons, fasteners, and rivets		
11. Laces or ties		
12. Gloves		
13. Pant cuffs		
14. Socks		
15. Shoelaces or ties		
16. Shoe tongues		
17. Shoe inserts		
18. Treads		

Inspection conducted by: _____

Organization/Command: _____

Date: _____

Phone Number: _____

Cleaning performed by: _____

Organization/Command: _____

Date: _____

Phone Number: _____

Appendix C. Examples of TOMCAT snap trap, AEGIS Rodent Bait Station, BlackTrakka animal tracking station, and SnakeTrap.



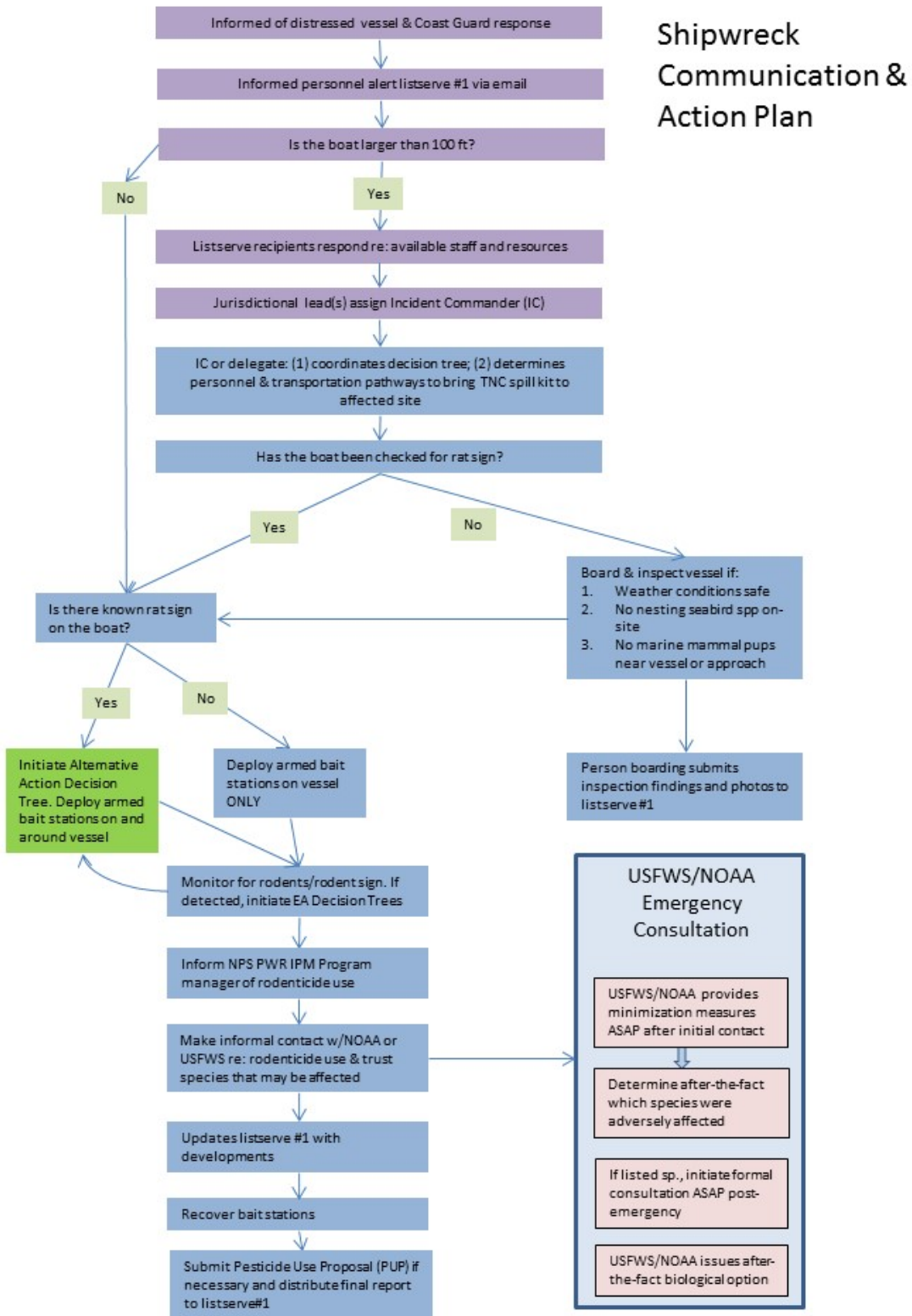
TOMCAT Snap Trap

AEGIS Rodent Bait Station

Black Trakka

Snake Trap

Appendix D. Example of a rodent rapid response protocol proposed for use in the Northern Channel Islands. Source: Christina Boser, The Nature Conservancy.



Appendix E: Preventing the Spread of Invasive Plants: Best Management Practices for Land Managers

Preventing the Spread of Invasive Plants:



Best Management Practices for Land Managers

3rd Edition

California Invasive Plant Council

Appendix F: Roadside Establishment of Native Perennial Grasses

Roadside Establishment of Native Perennial Grasses

Jeanette Wrynski, Yolo County RCD

Perennial bunchgrasses that are native to California can go a long way toward helping solve a series of problems associated with roadside maintenance. At the same time, they can improve the appearance of a part of rural landscapes that are typically weedy in one season or scraped bare in another.

Most road rights-of-way, whether county roads, state highways or interstate freeways, are covered with vegetation that consists primarily of poisonous, invasive weeds. These weeds are considered to be a problem source of weed seeds that move into agricultural fields—resulting in herbicide treatments—and continue to reinfest the same roadsides. Efforts to clean up the roadsides usually involve multiple herbicide sprays and/or scraping. These measures either contribute to pesticide runoff into waterways or leave soil stripped bare and subject to erosion during winter storms or heavy winds.

Bunchgrasses can be very effective competitors with these noxious weeds through shading and competition for nutrients. Their extensive root systems anchor soils during erosive rainstorms, keeping road shoulders more stable and firm, and provide pathways for surface water to percolate into the soil.

In addition to these benefits, native bunchgrasses also provide excellent wildlife habitat, encouraging greater biodiversity. Mature stands of these grasses can harbor a large variety of small mammals, reptiles, game birds, songbirds and insects—including important food crop pollinators.

Establishment

Establishing native grasses requires using some standard farming practices for the first few years. Because of their slow germination, low seedling vigor and slower growth rates, they must be managed as many agricultural crops are with efforts made to reduce competition by more vigorous, non-native, annual weeds. Reduction of weed competition is so important that the process could be started up to a year in advance of the actual planting.

One way to begin site preparation is with a controlled burn in the summer or fall to destroy surface weed seeds and trash. Weeds that germinate later through the winter and spring can be disked under in March or April, before they set seed. The area should be left fallow throughout the growing season, but any additional weeds that germinate should be controlled either with herbicide sprays, flage, or burning before seeds are mature. Final seedbed preparation in the fall, done by disking or other tillage equipment, may also serve to remove persistent weeds. If clods are large, a scraper or roller may be needed to provide seedbed uniformity and to close up air spaces so as to help preserve soil moisture.



Illustration by Paul Robins

The type of seed selected or the mixture of species will depend on location, soil type and moisture conditions expected throughout the season. Suppliers of native grass seed can provide good information on species to select for different situations. A mixture of varieties, with differing moisture adaptations, is often recommended for roadsides where a ditch or swale is present. Grasses suited to drier conditions will predominate on the higher ground, whereas those that tolerate occasional flowing water will thrive in the lower areas.

Seeding is usually done in the fall, to allow rains to provide the moisture needed for germination. Seed can be drilled directly into the seedbed, as prepared, or into soils managed under no-till situations. Where no-till management has been used, weed control before and shortly after planting can and should be accomplished with herbicides or burning.

Broadcasting is another means of planting native grass seed. After seeding by this method, a light

**Appendix G: DoD Naval Instruction 4140.01-M-1 – Compliance for Defense Packaging:
Phytosanitary Requirements for Wood Packaging Material**

DoD 4140.01-M-1



**COMPLIANCE
FOR DEFENSE PACKAGING:
Phytosanitary Requirements for
Wood Packaging Material (WPM)**

September 7, 2007

**Office of the Deputy Under Secretary of Defense
(Logistics and Materiel Readiness)**

Appendix H: State of California Department of Food and Agriculture Certificate of Quarantine



STATE OF CALIFORNIA
 DEPARTMENT OF FOOD AND AGRICULTURE
 PLANT HEALTH AND PEST PREVENTION SERVICES
 PEST EXCLUSION BRANCH
**CERTIFICATE OF QUARANTINE COMPLIANCE
 (ORIGIN OR TREATMENT)**
 66-079 (7/98)

ORIGINAL - WITH SHIPMENT
 DUPLICATE - DESTINATION AG. DEPT.
 TRIPPLICATE - ORIGIN COMM.

THE FOLLOWING COMMODITY MEETS THE REQUIREMENTS OF:		NO.
COMMODITY (IES)		SHIPMENT QUANTITY
SHIPPER	ADDRESS	
CONSIGNEE	ADDRESS	
ORIGIN OR RESHIPMENT		
<input type="checkbox"/> COMMODITY ORIGINATED IN A PORTION OF _____ COUNTY NOT KNOWN TO BE INFESTED WITH _____		
<input type="checkbox"/> COMMODITY IDENTITY HAS BEEN MAINTAINED AND COMMODITY HAS NOT BEEN EXPOSED TO INFESTATION.		
TREATMENT		
DATE	CONCENTRATION	DURATION AND TEMPERATURE
CHEMICAL (ACTIVE INGREDIENT)	TREATMENT	ADDITIONAL INFORMATION
ADDITIONAL DECLARATION		
PLANT QUARANTINE OFFICER	COUNTY	DATE

Appendix I: HACCP Planning Forms

