Biosecurity 

The purpose of this group project is to inform the development of a proactive approach to invasive species management through the development of an island biosecurity plan. Biosecurity is the application of protocols and policies to prevent an area or a population from biological harm. Within the field is the concept that an ounce of prevention is equal to a pound of cure, or that preventative policies will be a more cost effective than reactive ones. For this project, we focused on developing a framework for determining risk, prioritizing action, and evaluating prevention protocols.

The Problem

Santa Cruz Island (OCI) is a unique island ecosystem managed jointly by the National Park Service (NPS) and The Nature Conservancy (TNC) with a common mission to protect native ecosystems and biodiversity. This relies in part on the management of invasive species, a biological threat to which island species tend to be particularly sensitive. To date, managing this threat has been done in a largely reactive manner, through the eradication of invasive species and restoration of native populations at a cost of $11.4 million over ten years from TNC alone. Island managers are in need of a more cost effective way of managing invasive species risks.

Biosecurity Decision Framework

1. Species & Vector Characterization

The first step in biosecurity decision making is to identify potential threats based on the latest research on invasive species and threats present on nearby and similar locations. Background information on these species is gathered in order to identify what life history traits might make each species a threat to the island ecosystem. This includes the ability for the species to reach the island. The means by which a potential threat arrives on the island is referred to as a vector. Vectors were identified based on which vessel(s) arriving on the island may have played a role in historical introductions for each threat.

2. Risk Evaluation & Prioritization

Next, species and vectors which potentially threaten the island are ranked with respect to which should be priority management targets. The risk posed by each species is based on the ability of the species to be introduced and established on the island and the impact it would have on the island ecosystem. Risk is vector-dependent, because the characteristics of a vector determine the frequency and magnitude at which the invader may arrive. We developed a risk evaluation process based on the steps of the invasion process in order to score the relative risk each species-vector combination would pose to the island.

3. Protocol Evaluation

Prevention protocols are management actions that reduce the risk of introduction of an invasive species. Prevention protocols were gathered from existing biosecurity plans and evaluated on three criteria: the degree of risk from the species being prevented, the effectiveness, and the associated cost. It was determined through consultation with island resource managers who currently implement these strategies. As a result, protocols were categorized as: recommended, ineffective, infeasible, or no information. Cost estimates are based on labor requirements and market value of the necessary equipment.

4. Decision Making

Risk can be reduced either by reducing the probability of invasion through prevention protocols or by reducing the consequences of eradication or control actions. Generally, prevention is considered to be more effective and less costly. However, managers can choose to wait to control when the vectors for introduction cannot be fully addressed through protocols or when the cost of effective control or eradication is lower than the cost of prevention.

Framework Outcomes

The decision framework was used to create a draft biosecurity plan based on the evaluation of a trial list of potentially invasive species, supplied by TNC. This included the risk associated with all relevant species-vector combinations, selected a set of recommended protocols to effectively reduce high risks at the lowest cost, and identified species for which reducing consequences of invasion is more appropriate than reducing the probability of introduction.

This process is applicable for use with any set of priority species, budgetary requirements, or risk preferences and should be repeated when managers are presented with new information or new risks. A biennial review process is recommended including an internal audit of stakeholder compliance and a proactive management process that reduces uncertainty through monitoring and the incorporation of new information.

Project Deliverables

• A framework for the evaluation of risk
• A database with prevention protocols, and their costs and effectiveness
• Protocol recommendations based on current priority species
• Rapid response plans for key species
• A review of educational techniques

Conclusions

• Management decisions will be based on individual risk tolerance of managers and financial feasibility. This decision process will allow managers to prioritize biosecurity risk and determine the appropriate management action.
• Risk assessment provides a logical framework for analyzing potential species threats to Santa Cruz Island and is a method for prioritizing management action.
• Data regarding the effectiveness of individual prevention protocols, biosecurity plans, and the costs associated with eradication and control are rare and would greatly improve the ability for managers to make informed biosecurity management decisions.
• New information about invasive species, biosecurity technologies, techniques, and calculating risk will become available in the future. It is important to maintain and incorporate changes into the existing plan according to these new innovations.

Sacramento Island Biosecurity

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High Risk
Cape Ivye: Aircraft, animals, bulk soil, miscellaneous equipment and supplies, personal gear, vehicles, and water
Domestic cat: Dumpster
West Nile Virus: Animals
Rabbits (other wild animals): Dumpster
Rabies (raccoons): IPC7, NPS, and private boat
Canine Distemper (raccoons): IPC1, IPC2, NPS, and private boat
Parvovirus (domestic animals): Private boat
Parvovirus (raccoons): IPC5, NPS, and private boat
New Zealand Mud Snail: Staff and Contractor Footwear, miscellaneous equipment and supplies, and vehicles
Raccoon: Dumpster

Risk Evaluation Results: high-risk species-vector combinations to Santa Cruz Island

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