

The US Army War College Quarterly: Parameters

Volume 34
Number 1 *Parameters Spring 2004*

Article 9

3-1-2004

Invasive Threats to the American Homeland

Robert J. Pratt

Follow this and additional works at: <https://press.armywarcollege.edu/parameters>

Recommended Citation

Robert J. Pratt, "Invasive Threats to the American Homeland," *Parameters* 34, no. 1 (2004), doi:10.5554/0031-1723.2191.

This Article is brought to you for free and open access by USAWC Press. It has been accepted for inclusion in The US Army War College Quarterly: Parameters by an authorized editor of USAWC Press.

Invasive Threats to the American Homeland

ROBERT J. PRATT

“Defending our nation against its enemies is the first and fundamental commitment of the federal government. Today, that task has changed dramatically. Enemies in the past needed great armies and great industrial capabilities to endanger America. Now, shadowy networks of individuals can bring great chaos and suffering to our shores for less than it costs to purchase a single tank.”

— President George W. Bush,
*National Security Strategy of the
United States*, September 2002

Before 11 September 2001, when American leaders prepared for war they envisioned enemies using bombs, tanks, guns, military force, and other traditional armaments. The attacks on that fateful day forever changed the way the United States and the world would view the nature of war. Using four hijacked commercial jetliners, terrorists attacked the United States, killing some 3,000 men and women. This surprise attack was not a symmetric attack, but an asymmetric one. Furthermore, a non-state entity conducted this attack at a relatively low cost of under \$500,000.¹ However, that may have been just the beginning. The success of the attack, and the devastation inflicted on the nation at a relatively low cost, will doubtless inspire our adversaries to continue to employ asymmetric methods to threaten and weaken the United States. Among those methods may be the introduction of an invasive species, a disease pathogen, or some other biological threat.

Introducing Invasive Species

Presidential Executive Order 13112 defines invasive species as “a species that is (1) non-native (or alien) to the ecosystem under consideration

and (2) whose introduction causes or is likely to cause economic or environmental harm or harm to human health.”² An invasive species can be a microbe, plant, animal, or other organism. These invaders may be moved from their natural habitat and introduced to a new environment either purposefully or by accident. The simple act of moving a nonindigenous species to a new habitat does not make it invasive. For centuries people have moved species around the world for agricultural and other purposes. Examples of noninvasive species are numerous—from livestock to grain crops to ornamental plants. Most of these species are nonthreatening and benign, but some species can be threatening because of their adverse impact on their new environment. Their introduction may threaten the natural balance in the ecosystem because of their competitive nature, may threaten human and agricultural plant and animal health, and may cause economic damage through the cost of controlling or managing the species. These threatening species are “invasive species.”

Historically, the introduction of an invasive species has not been intentional, nor has it been the purposeful act of an adversary to weaken or attack the United States. Typically, invasive species have been accidentally introduced when they were imported for ornamental purposes, escaped from captivity, or were carelessly released into the environment. Often invasive species arrived by means of ocean vessels’ ballasts, or in pallets, produce, or plant nursery stock. Additionally, animals and other agricultural products have transported them to the United States.³

The new species may flourish and rapidly expand, as they typically have few or no natural enemies in their new environment. Parasites, pathogens, or predators that would inhibit or limit their spread may be few or nonexistent. In addition, the new environment often provides a better medium for growth and reproduction than the species’ original surroundings.⁴ With these advantages, native species may find it difficult to compete and survive against a new, more energetic and prolific neighbor.

A 1999 study by Cornell University estimated that approximately 50,000 foreign species have invaded the United States since the 1700s, and the number in the last 30 years has increased at an alarming rate.⁵ Ten to 15 percent of these foreign species are considered threatening or invasive. Their

Colonel Robert J. Pratt (Illinois Army National Guard) commands the 66th Infantry Brigade. He previously commanded an infantry company, a combat support company, two infantry battalions, and a general studies battalion in the regional training institute. He is an honors graduate of the University of Illinois in agronomy. He also is a graduate of the US Army Command and General Staff College and the US Army War College, where he received the Master of Strategic Studies degree. In addition to his military service, he manages a 550-acre farm in central Illinois.

effects range from being a nuisance to causing economic damage, health problems, and endangerment of native species; 42 percent of “endangered” or “threatened” species are at risk because of invasive species.⁶ One hundred million acres of the United States are covered by invasive plants, and the rate of spread is 14 percent per year—an area twice the size of Delaware.⁷ Since 1985, the US Department of Agriculture’s Animal and Plant Health Inspection Service (APHIS) has intercepted 7,400 species of plant pests at our country’s borders.⁸ The US Department of Transportation estimates that every day 4,600 acres of land are colonized by invasive species in the United States.⁹ Every 60 seconds, oceangoing vessels release 40,000 gallons of foreign ballast water in American waters, often releasing invasive species.¹⁰

Historical Examples

History offers many examples of invasive species damaging their new parent environment. Four revealing examples include the invasion of multiple species in San Francisco Bay, the glassy-winged sharpshooter, “foot-and-mouth” disease (aphthovirus), and the brown tree snake.

The San Francisco Bay plays an important role in American commerce. Many ocean-going vessels bring in foreign goods through the Bay’s ports to trade with the United States. In addition to bringing in foreign goods, these transports also inadvertently bring in foreign invasive species; the Bay is invaded by a new species an average of once every 12 weeks.¹¹ From 1940 to 1969 the Bay saw a doubling of the number of entering invasive species. From 1970 to 1995 the rate jumped to almost a fivefold increase.¹² The San Francisco Bay is now home to over 240 nonindigenous species.¹³ In some areas of the Bay it is difficult to find a native organism.¹⁴ In October 1986, three small clams were collected from the Bay by a college biology class and later identified as a foreign species from Asia, the Asian species *Potamocorbula amurinsis*. In 1996, this species reached densities of 50,000 clams per square meter, a density that filters the entire water in the Bay at least once and up to two times a day. These prolific clams virtually eliminated phytoplankton, the base of the food chain in the Bay. Although the final effects have yet to be determined, this disruption in the food chain can only be detrimental.¹⁵

The second example is the glassy-winged sharpshooter, an invasive insect that hosts the bacterium *Xylella Fastidiosa*. The insect was first detected in California in 1990. Although it is uncertain how it arrived in California, it is believed to have arrived on imported plants. The bacterium *Xylella Fastidiosa* causes Pierce’s Disease in grapes, which infects and kills the grapevine. The glassy-winged sharpshooter transmits and spreads the disease when it feeds on the plant. Severe outbreaks of the disease necessitated destruction of diseased plants and a major replanting of grapevines, resulting in

“Terrorist adversaries will not overlook the overwhelming impact that invasive species could have on the United States.”

a reduction in grape production.¹⁶ Tourism and grape-related industries are collectively worth \$35 billion in California. The bacteria-carrying insect has cost a \$40 million overall loss in California’s grape, wine, and raisin industry and an undisclosed amount in the tourism industry.¹⁷

A third example is foot-and-mouth disease (aphthovirus), a highly infectious disease that infects cloven-hoofed animals. The disease struck Britain in 2001 with a vengeance, killing over a thousand livestock,¹⁸ with millions more voluntarily killed or destroyed to prevent the spread of the disease.¹⁹ Furthermore, to prevent the disease from spreading from Great Britain, the European Union placed an embargo on British meat. In turn, the United States placed a temporary ban on meat imports from the entire European Union and Chile. To control the spread of the disease in Britain, limits were placed on movement of people and equipment throughout the area. Overall, foot-and-mouth disease cost British companies the equivalent of \$30 billion, with a \$300,000 average loss to large businesses and a \$75,000 average loss to small businesses.²⁰

A fourth and powerful example of the effect of invasive species is the accidental introduction of the brown tree snake into Guam. The brown tree snake was probably brought into Guam during World War II by military ships arriving from the South Pacific. Its introduction eventually resulted in 1,200 incidents of power outages and the extinction of several native species, including 10 of the 13 native bird species, two of the three native bat species, and six of the 12 native lizard species.²¹ The snake is indeed a public nuisance; it has spread across the island at a rapid rate and achieved densities of 12,000 snakes per square mile.²² The snakes are very aggressive and have been reported to attack small children while they sleep. One in every thousand visits to the emergency room is the result of snakebite from the slightly venomous snake. As a result, Guam, which was once a popular tourist site, has lost most of its tourism business. Before the brown tree snake’s invasion, tourism ranked third as a revenue source, surpassed only by federal government and military expenditures. Transportation and shipping have slowed to ensure no further spread of the snake. Healthcare costs on the island have risen due to snakebites. The snake has gravely affected agriculture, where production and

revenues have steadily declined since the snake was introduced in 1945. The snake's predation pressure on both live animals and eggs makes it almost impossible to raise poultry. Insect species that were formerly controlled by species eliminated by the brown tree snake are now damaging fruits and vegetables. Increased insect populations demand more pesticides, which increases the cost of agricultural production. Direct damages in losses of overall productivity in the country are estimated at between \$1 million and \$4 million per year, with estimated research and control costs of the brown tree snake at an additional \$4 million.²³ In all, the introduction of the brown tree snake has had a more negative ecological impact on the island of Guam than all of the heavy fighting and naval bombardment that leveled the island's forests in World War II. The island's ecology recovered from World War II with time, but time offers no chance for recovery of the extinct species lost to the brown tree snake.²⁴

Prospects for an Attack

Terrorist adversaries will not overlook the overwhelming impact that invasive species could have on the United States. An adversary could use invasive species as an asymmetric method of attack to weaken the country by inflicting tremendous economic and psychological damage. Such an attack could ultimately weaken the will of the people and affect national policy by straining the economy, tainting America's food supply, or endangering the health of the populace. In addition, adversaries could strike a strong blow while avoiding any symmetric retaliation.

Adversaries may seek to weaken the United States as a way to achieve a more equitable political, economic, and military balance of power. Today, the United States is the world's only true superpower, so dominating that it is sometimes referred to as a "hyper-power."²⁵ To attack the United States directly in a symmetric manner would defy logic and result in the rapid destruction of a weaker adversary.

Additionally, the United States is increasing its dominance through constant incorporation of state-of-the-art technology and advanced information systems. Few adversaries will be able and willing to commit the resources necessary to build a force that is a symmetric peer competitor of the United States. An asymmetric attack, however, could delay the United States' transformation of military forces and continued buildup of military and national power. This could allow an adversary the opportunity for a buildup of its own, to permit a direct, symmetric confrontation at a later time when the correlation of forces and the balance of military strength might be more favorable. A successful asymmetric attack also would provide a more favorable position for an adversary to use in negotiating for desired goals.

Terrorists have other reasons for using invasive species. Traditionally, terrorists have used violence and fear as a means of political coercion to “undermine the legitimacy of the targeted government and garner support among a disaffected populace.” Other nonpolitical objectives include using “indiscriminate violence to create a general environment of fear and chaos prior to a general overthrow of Western political order or . . . even simply [to] seek anarchy as a goal.” An example of this is the subway sarin attack in Tokyo by the Aum Shinrikyo group, which took no credit for the attack.²⁶ Yet another reason for terrorists’ use of an invasive species is the new “war paradigm.”²⁷ Paradigmatic theorists assert that since terrorist groups typically lack the ability to confront their adversary directly, they will take a more indirect, less confrontational approach to conducting terrorist acts. This long-term approach does not advance specific demands but intends to inflict damage to wear down an adversary over time. Consider the strategy of Osama bin Laden and the al Qaeda organization. The bombings in the 1990s of the World Trade Center, of the embassies in Nairobi and Dar-es-Salaam, and of US military forces at the Khobar Towers exemplify this protracted war paradigm.²⁸ They are not isolated events. Rather, they are a loosely coordinated series of attacks designed to confuse, disrupt, and demoralize the US government and its citizens over time.

Invasive species could be used to support all three of these terrorist motives. The introduction of fast-spreading invasive species and pathogens such as smallpox and other microbes that threaten human health or food safety would directly support the terrorist tactics of causing violence and instilling fear to undermine the legitimacy of government or to support anarchical objectives. However, the use of most other invasive species would support the latter, “protracted war” paradigm. Most of these are slower in their effects and would require some time to cause damage. Such a slower, covert attack might go undetected for years until the species are well implanted and impossible to counter. The long-term economic, health, and psychological effects of using invasive species could strike a tremendous blow at the United States by exhausting resources and national will over time.

Potential Effects

One of the primary effects of a terrorist introduction of an invasive species would be economic damage. The 1999 Cornell University study estimated the cost of invasive species to be \$138 billion annually in their effects and control measures in the United States.²⁹ This equates to more than one-third of the funding allocated to the total military budget in the 2003 National Defense Authorization Act. According to the Congressional Budget Office, discretionary spending for defense as a percentage of the total GDP has been

decreasing from 1962 to 2001. Domestic needs compete heavily for tax dollars. Given the drastic increases forecast in spending for Social Security, Medicare, and Medicaid in the years ahead, expenditures for national defense will undoubtedly be constrained.

If an adversary chooses the right invasive species, the additional cost to counter its effects could be dramatic. Coupled with a strained economy and a tight budget, it could become difficult to sustain the funds to fully man and equip US military forces at current levels. It might become extremely difficult to fund costly transformation forces. Therefore, the second- or third-order effects of an invasive species attack could mean less money for discretionary spending and ultimately a weakened military.

Second, military resources could also be diverted to meet an emerging crisis. Military forces could be needed to cordon off infested areas or to assist in caring for the sick from an invasive bacteria or virus. Consider an outbreak of Ebola or smallpox. National Guard forces would be diverted for homeland security missions and thus not be available for contingencies elsewhere or to support major regional wars. Military forces also would suffer direct casualties from such an attack, as the same invasive microbes or pathogens that attack the civilian population would attack military personnel. Whole Army divisions and specialized units could be rendered physically ineffective from an invasive disease. The ensuing psychological impact would be immense.

Third, invasive species could diminish the industrial capability and productivity of the United States to support a war. Resources used to mobilize the nation's industrial base conceivably would be diverted to control the effects of the invasive species. Personnel needed to support industry and augment military forces could be incapacitated or be unwilling to work in areas where they would be exposed to infectious bacteria. Invasive species might directly attack timber or other natural resources used as raw material for industry, thereby forcing the United States to rely on imports or other expensive alternatives for raw materials.

Fourth, illness could be spread rampantly by an invasive disease. A biological attack could begin with one infected person or the release of toxins in a highly populated area, such as a subway or a sports stadium. Victims probably would not initially know they were infected. The first victims might report to their doctors with common flu-like complaints, and their symptoms could easily be misdiagnosed. Even after suspicion of a deliberate attack, it would take time for the Centers for Disease Control to identify the agent. Meanwhile, the contagious disease would spread, leading to widespread illness and public panic. Critical community services, where available, would be strained. Officials might consider quarantining affected communities. But quarantines are very difficult if not impossible to enforce on a large scale. In

***“Invasive species management is a
homeland security issue.”***

the end the disease could spread in epidemic proportions.³⁰ Health care costs for an invasive contagious disease in this scenario would be phenomenal. The health care system would be greatly stressed in terms of its capacity to handle patients and the money, facilities, and professionals available to support the population’s health care needs. The cost of providing such massive care would eventually be placed on the consumer, further straining the economy.

Fifth, the agricultural sector and a reliable food supply could be deeply affected. A recent US government report asserted that the “US agricultural sector is especially vulnerable to agro terrorism . . . and a successful attack could result in local or regional economic destabilization,” ultimately affecting international commerce.³¹ Citizens have come to expect a safe and cheap food supply. Although American agriculture is diverse and spread over many states, large portions of it are concentrated in local areas. The top five agricultural states account for 34 percent of the nation’s total agricultural production. Some crops are far more concentrated in specific regions than others. For example, California produces 100 percent of the nation’s almonds, 92 percent of its grapes, 78 percent of its lettuce, 75 percent of its strawberries, 47 percent of its tomatoes, and 34 percent of its oranges. Such concentrations can be further localized. Forty-one percent of California’s strawberry production is concentrated in two contiguous counties. Seventy percent of its cattle production is concentrated in a 200-mile radius. Such concentration makes our agricultural assets especially vulnerable to a terrorist attack using an invasive species.³²

The cost to agriculture from the introduction of one or several invasive species is difficult to predict, but it could be extraordinary. The attack would not only affect the producer, but the entire producer-consumer chain, from the grower and those employed in agriculture-related fields, through packagers and distributors, and ultimately the consumer. In 1999, farming and its related industries accounted for 16 percent of the US gross national product. In the same year agriculture employed 17 percent of the US work force, some 24 million people.³³ In 1997, US farmers sold \$208 billion in agricultural products.³⁴ The amount of economic damage from an invasive species attack would vary considerably depending on the extent of infestation, the crops or livestock affected, the response, and the ability to counter, con-

tain, or destroy the species. Effects also would be dependent on the availability of substitute products and the elasticity of supply, and on the ability to ramp up production elsewhere.³⁵

Last but certainly not least, as *Joint Vision 2020* notes, there would be psychological or political costs to the introduction of an invasive species: “The psychological impact of an attack might far outweigh the actual physical damage inflicted.”³⁶ The apparent inability of the government of the United States to protect its people and resources would have severe detrimental effects on the social contract between the government and the people. The government would lose credibility, with a resulting loss of confidence and productivity from its citizens.³⁷ Historically, consumer confidence has been the objective of attacks on agriculture.³⁸ For example, in 1989, a previously unknown group called the Breeders threatened to spread the Medfly to damage crops in California if the state did not stop aerial spraying of pesticides. Although no one was caught or prosecuted, that season’s dense Medfly population confirmed that a deliberate infestation was being conducted. Although their attack may not have been successful, the Breeders attracted much publicity by destroying crops and reducing consumer confidence.³⁹

Another example is the West Nile Virus. First detected in 1999 in the state of New York, in 2000 it spread up and down the East Coast. In 2001, it spread north and further into the central part of the United States. In 2002, it was reported in 32 states, in Canada, and was suspected to be in Mexico. As of September 2002 there had been 1,965 West Nile cases resulting in 94 deaths.⁴⁰ West Nile Virus is non-native, and it is not known how it was introduced into the United States. As the number of cases and deaths continue to increase and further affect public health and possibly our blood supply, it is uncertain what psychological effects will result and what effects it will have on everyday life. If it continues to spread, will the elderly or people who are not in good health avoid outdoor activity? If it is determined that the introduction of West Nile virus was intentional, would it be wise to inform the public? Such an announcement of an intentional infestation could spread panic, fear, lack of trust in the government and its services, and in turn support the goals of the perpetrator.⁴¹

An invasive species coupled with other forms of asymmetric warfare also would have a synergistic effect. If an enemy focused on creating maximum economic impact and attacked along multiple, low-profile paths, he would be more likely to generate overwhelming effects. Such an attack could include an invasive species coupled with a cyber attack, the use of weapons of mass destruction such as a “dirty bomb,” or the use of more standard terrorist bombing techniques. Likewise, invasive species could be coupled with more symmetric methods of conventional force-on-force warfare. Such multifaceted attacks would have a greater chance of destroying or se-

verely damaging American national power. If two or more methods proved successful, the combined synergistic effect could be much greater, producing more physical and psychological damage.

Production and Introduction

Invasive species are relatively cheap and easy to produce or acquire and introduce into the environment. Large numbers need not be introduced, only enough to start a population base. Introduction at multiple locations in numbers large enough to begin colonization would reduce the risk of both detection and the failure of one or two clusters to colonize and establish a population base for the species' spread. Introduction in multiple locations also would decrease the amount of time needed to establish and spread the invasive species to dangerous levels.

Most microbes can be easily produced. Kathleen Bailey, who interviewed pharmaceutical manufacturers, professors, and graduate students, concluded, "Several biologists with only \$10,000 worth of equipment could produce a significant quantity of biological agents. The required site equipment would fit in a small room, and the glassware, centrifuges, growth media, etc., can all be manufactured by virtually any country."⁴²

Detection at American borders would be extremely difficult. The mere fact that billions of dollars of illegal drugs are smuggled into our country annually speaks for itself. Border inspectors have difficulty finding unintentional smuggling violations, let alone detecting the purposefully concealed smuggling of invasive species. Insects, plant seeds, or a vial of microbes could be easily hidden. Most likely, inspectors would not even know what to look for.

Once an invasive species is established it would be extremely difficult to discern who had implanted it unless the perpetrator or group claimed credit for the attack. In turn, it would be virtually impossible to track it to its source. If the United States could not identify who introduced the species, it would be difficult to counter or apply national power in retribution for such an attack. With all the accidental introduction of so many invasive species, how could we legitimately and credibly blame a suspected adversary? A current example is the West Nile Virus. As previously noted, no one knows how it was introduced to this country. Some, including at least one analyst at the Center for Defense Information, suspect it was brought to the United States as a terrorist act.⁴³

Once an invasive species becomes established, it is difficult if not impossible to exterminate it without a huge expenditure. Our history is replete with failures to control invasive species once they are established. The gypsy moth, zebra mussel, purple loosestrife, and Kudzu are just a few examples. The foot-and-mouth disease outbreak in England is an example of an invasive disease being controlled, but at a high cost (\$30 billion).⁴⁴ The Asian

long-horned beetle is another example. Thought to have been carried into this country in wooden pallets from China, it was detected in New York City and Chicago in 1996. The United States has been battling the beetle ever since. In 1996, the cost to control it was \$4 million in New York alone. Total annual revenue from all New York related industries affected is \$11 billion, and the total for the affected US industries is \$138 billion. In response, Secretary of Agriculture Dan Glickman declared a state of emergency, authorizing \$5.5 million to aid in the prevention, detection, control, and eradication of the pest in 2001. Even with all this expenditure of effort and resources, however, the Asian long-horned beetle has yet to be exterminated.⁴⁵

Genetic Engineering

Webster's Ninth New Collegiate Dictionary defines genetic engineering as "the directed alteration of genetic material by intervention in genetic processes." Adversaries of the United States may modify the genetics of an invasive species to increase its competitiveness, virulence, lethality, or resistance to control measures. Subtle changes in gene and DNA sequencings can have drastic effects on the characteristics of an organism.

Genetic engineering is a common practice in agriculture. Plants are engineered to be hardier, more chemical-tolerant, and more resistant to insects. For example, *Bacillus thuringiensis*, a bacterium commonly known as "Bt," is used as a natural insecticide. The toxin gene which makes it an effective insecticide was identified by scientists and inserted into agricultural crops such as field corn to make them resistant to corn borers. When the corn borer ingests plant material, it dies from the toxic gene.⁴⁶ Another example is glyphosate, the active ingredient in Roundup herbicide. Glyphosate is a broad-spectrum herbicide used to kill most herbaceous plants. Microbiologists inserted a glyphosate-resistant gene into corn, soybeans, and other agricultural crops, enabling farmers to liberally spray glyphosate and kill all other plants except the resistant variety. Inserting these same genes into an aggressive invasive plant would nullify many of the chemicals used to control unwanted plants and even make them resistant to some natural biological insect controls, thereby making the invasive species a more lethal, faster-spreading asymmetric weapon. Another example is the laboratory mouse on display in the Smithsonian Institution which scientists genetically modified to be susceptible to cancer. Scientists identified and inserted the gene to aid in cancer research. If scientists can modify the mouse's genetic makeup, they can modify an invasive species to make it more competitive, resilient, or tailored for a particular need.

Adversaries with technological and scientific support could genetically modify all types of organisms. If the technology or the scientific support is not available, they could purchase or acquire it through the black market.

Alastair Hay, an expert on biological warfare from the University of Leeds in the United Kingdom, debriefed defecting scientists from Biopreparat (a clandestine group of facilities spread across Russia and Kazakhstan). From these interviews, he believes genetically modified organisms currently exist. One of them is a form of the plague that is resistant to 16 different antibiotics.⁴⁷ Stephen Block, a biophysicist at Stanford University and the leader of JASON (a study of a group of scientists hired by the US government for technical advice), commenting on the possibilities of genetic engineering, observed, "If you put a bunch of biologists in a room and asked them to brainstorm, you'd come up with countless possibilities."⁴⁸

In the wrong hands, genetic engineering technology applied to an already competitive or virulent invasive species would make control methods difficult, if not impossible. New methods of control would have to be developed, tested, and fielded to defeat the genetically modified organism. Serums would be less effective, and diagnosis of human pathogens could change and become harder to recognize. It would take a considerable amount of time to isolate, test, and determine what control or treatment methods would be necessary to battle the organism.⁴⁹ Additionally, production and distribution of counter-mechanisms in large numbers would take significant time and resources.

Hypothetical Attack

What would an attack with an invasive species or a group of invasive species look like? What effects might it have? There are many possibilities, but let's consider one hypothetical nightmare:

The year is 2025. America remains a strong military power, but her national power is waning. Adversaries of the United States have subversively smuggled invasive species and pathogens into the country and attacked her in the first decades of the 21st century. The attacks were designed to weaken the US economy and diminish America's influence around the world. Asian long-horned beetles have decimated the American forests and severely weakened the related \$138 billion timber industry.⁵⁰ The brown tree snake was introduced in Hawaii and the population is rapidly growing, nearing densities of 12,000 per square mile, as was seen in Guam in 2002.⁵¹ Hawaii's tourist industry and economy are faltering. American agriculture and its food supply are also in jeopardy. Foot-and-mouth disease has killed many livestock, and hundreds of thousands of livestock were destroyed before the disease could be contained. Most countries have banned American exports of meat due to concerns about the spread of disease. Similar problems have occurred in the grain industry after a contagious rust was identified on summer and winter wheat. West Nile Virus deaths continue to rise. A "small" outbreak of smallpox left five million Americans dead, requiring vaccination for the remainder

of the population and further stressing the health care system. No country or organization takes credit for the attacks, nor has the United States been able to determine who or what organization is responsible. The American economy is in a full depression. America has shifted what little discretionary funds remain in the federal budget away from defense spending. The military has abandoned its technological transformation to maintain current military strength and programs. Adversaries are rapidly approaching parity in military strength and should surpass America's military prowess in the near future. America's national security is threatened.

Executive Order 13112

That distressing scenario indicates that the detrimental effects of invasive species and pathogens are potentially insurmountable. Local governments, state governments, environmental groups, farmers, ranchers, and scientists collectively have urged the federal government to coordinate the defensive effort and to make invasive species control a higher-priority issue. In 1999, in response to this pressure, President Clinton issued Executive Order 13112 on invasive species.⁵² It was designed to coordinate and enhance federal activities "to prevent the introduction of invasive species and provide for their control and to minimize the economic, ecological, and human health impacts that invasive species cause."⁵³

Executive Order 13112 established the National Invasive Species Council, whose members include the Secretary of State, the Secretary of the Treasury, the Secretary of Defense, the Secretary of the Interior, the Secretary of Agriculture, the Secretary of Commerce, the Secretary of Transportation, and the Administrator of the Environmental Protection Agency.⁵⁴ The purpose of the Invasive Species Council is to prepare and oversee a "National Invasive Species Management Plan," which would detail the requirements, goals, objectives, and efforts of involved federal agencies.⁵⁵ Additionally, the council was established to "provide national leadership on invasive species; see that their federal efforts are coordinated and effective; promote action at local, state, tribal, and ecosystem levels; identify recommendations for international cooperation; [and] facilitate a coordinated network to document and monitor invasive species for federal agencies to use in implementing the National Environmental Policy Act."⁵⁶

The Invasive Species Council developed a national management plan within the 18-month period set by the executive order. The plan identified nine interrelated and equally important areas of concern for addressing invasive species issues and countering their potentially devastating spread (leadership, coordination, prevention, research, early detection and rapid response, international cooperation, information management, education, and

public awareness); the coordinated activities emanating from these areas thus comprise the defense of the United States against invasive species.

Evaluation and Recommendations

Executive Order 13112 makes an excellent start toward development of a much-needed national plan for invasive species control. The establishment of the Invasive Species Council's National Management Plan continues the movement in the right direction. Despite this good start, however, there remains much to do. Al Qaeda terrorists continue to threaten the United States and could be introducing invasive species to weaken the United States even at this moment.

First, we must prepare for the purposeful introduction of invasive species. The National Invasive Species Management Plan and the General Accounting Office's report to Congress on the matter do not currently consider the intentional introduction of an invasive species as a security threat. Identification of all asymmetric threats and pathways should be anticipated in order to defend the US homeland, to include an adversary's use of invasive species. Potential pathways should be identified and analyzed in the council's prioritizing of invasive species problems. Adversaries may choose methods of introduction that are considerably different from those that happen by accident.

Second, the plan conveys no sense of urgency. The management plan is not being implemented fast enough, particularly to counter a known hostile threat. The plan's timeline should be accelerated to quickly mobilize the resources and efforts of all agencies involved. As with any new plan, deficiencies surface and problems arise during implementation. The plan was issued in 2001, and many of the proposed programs have yet to be implemented. The sooner the plan is fully implemented, the sooner its deficiencies and problems can be identified and fixed. Rapid identification and response is critical to success in controlling invasive species. If the plan is not fully implemented, invasive species may become established and spread before proposals to control them are fully implemented.

A third deficiency of the plan is the development and implementation of a comprehensive national system for detecting all types of invasive species infestations and responding to them. All levels of government, national through local, will need to work together under one national system to adequately detect and combat invasive species and protect the homeland. Both the GAO report and the National Invasive Species Management Plan identify this weakness. According to the GAO report this "system could provide (1) integrated planning to encourage partnerships, coordinate funding, and develop response priorities; (2) technical assistance and other resources; and (3) guidance on effective response measures."⁵⁷ The Invasive Species

“An adversary’s purposeful introduction of invasive species or disease pathogens into the United States presents a potentially devastating threat.”

Council’s Management Plan adequately identified this need, recommending by July 2003 the development of a program of coordinated rapid response and support. Again, this is a slow process, with nothing yet produced. The Centers for Disease Control’s reaction plan to an invasive disease dangerous to human health offers a good model for responding to invasive species. The council’s plan indicates that insufficient resources, lack of funding, jurisdictional issues, limited technology, and other factors are the prominent reasons for lack of a national system.⁵⁸

The fourth deficiency is rapid response. Officials from the Departments of Agriculture, Interior, Commerce, and Defense have reported that “rapid response needs have not been and are not being adequately met.”⁵⁹ Reasons for this include lack of resources, lack of attention to the problem, not detecting infestations in their early stages of spread, insufficient understanding about the potential risk, and lack of technology to thwart the colonization of the invasive species. In addition, the nation needs a systematic national approach with criteria to determine when a rapid, crisis response is needed. Many agencies stated they did not know when or what criteria to use when requesting a rapid response. Rapid response criteria should be based on a fair risk analysis. Currently, responses to invasive species on agricultural land receive a higher priority than on non-agricultural land or native areas. This may not be the right priority for a terrorist attack. Rapid response decisions should be based on common risk criteria, and these risks should include intentional introductions of invasive species.⁶⁰

Adequate funding is currently unavailable for an aggressive invasive species program. Implementing the strategies identified in the Invasive Species National Management Plan will be costly. In fiscal year 2000 the total expenditure of the federal government on invasive species-related activities was over \$611 million. The Department of Agriculture spent over \$556 million—90 percent of the total federal outlay to fight invasive species. The Department of Interior spent over \$30 million, and the Department of Defense spent over \$12 million.⁶¹ Of the \$611 million budgeted, rapid response costs were less than one-quarter, resourced at \$148.7 million. This is not adequate.⁶² More funding is necessary to support the plan. If the federal government cannot han-

dle the monetary burden, then the tasks should be shifted to the state and local levels. An official from the Bureau of Land Management aptly observed, "You can pay now or later, but you will eventually pay sometime."⁶³

The Invasive Species Management Plan does not address invasive pathogens that affect human health. However, such pathogens fall under the Presidential Executive Order 13112 definition of an invasive species and should be included in the Management Plan. If not, then the definition should be changed to exclude human disease pathogens. This must be made clear to determine who responds and who manages an outbreak of such pathogens. The Centers for Disease Control currently responds to the introduction of invasive human pathogens, but its efforts are not integrated into the Invasive Species Management Plan. Nor is the Department of Health and Human Services or the Centers for Disease Control represented on the council. The plan simply does not include all of the needed agencies.

Last, the Department of Homeland Security ought to be integrated into the council and, indeed, assume the lead agency role. Although the Department of Homeland Security is new, the Executive Order should be amended to add the department as a full, leading member. Invasive species management is a homeland security issue. The new department should lead the council's efforts to integrate inspection, detection, prevention, and crisis response capabilities across government agencies. Invasive species management should be embedded into the homeland security strategy.

Conclusion

An adversary's purposeful introduction of invasive species or disease pathogens into the United States presents a potentially devastating threat. Currently, the United States is not adequately prepared for such an attack. The Invasive Species Management Plan is designed more to protect US agriculture from accidental introductions of invasive species than to counter intentional, hostile introductions. To better protect the United States from an attack, we need to prepare now.

Recommendations to improve protection from an adversary's use of invasive species should include timely national identification of the employment of an invasive species as a potential weapon and appropriate planning and preparation to counter its use as a weapon. Additionally, the federal government must speed up the process for full implementation of the Invasive Species Council's plan to fully implement a comprehensive national system for management and control of this potential threat. The council should develop and implement criteria for rapid response based on risk correlation. The plan should be fully resourced and actively supported at an accelerated pace. Mitigation measures should include invasive human disease pathogens as

part of the Management Plan or else the definition should be changed to exclude such pathogens. The Department of Health and Human Services and the Department of Homeland Defense should participate on the National Invasive Species Council. Finally, invasive species protection and management should be made a key part of the homeland security strategy.

Despite America's status and strength as a superpower, the United States was tragically vulnerable to attack on 11 September 2001. That attack came not from cruise missiles, ballistic missiles, bombing, or other conventional weapons, but by unconventional asymmetric means. Today, the homeland is vulnerable to a different type of asymmetric attack, a biological attack from invasive species. We should act now to strengthen our defenses to protect ourselves from such attacks. Our future and our children's future might depend on it.

NOTES

1. Daniel Rubin and Michael Dorgan, "Terrorists' Sept. 11 Plot a Many-Tentacled Creature," *Knight Rider Newspapers*, 9 September 2002, http://www.tallahassee.com/mld/tallahassee/news/special_packages/attack_on_america/4020169.
2. National Invasive Species Council (NISC), "National Management Plan: Executive Summary," <http://www.invasivespecies.gov/council/execsumm.shtml>, p. 1.
3. Ibid.
4. Tim Abbey, "University of Connecticut; Integrated Peat Management – Check Those Plants for Unwanted Pests," Connecticut Agricultural Experiment Station, Windsor, Conn., 2001, <http://www.hort.uconn.edu/ipm/nursery/htms/invasives.htm>.
5. Lori Lach et al., "Environmental and Economic Costs Associated with Non-Indigenous Species in the United States," College of Agriculture and Life Sciences, Cornell University, Ithaca, N.Y., 12 June 1999, http://www.news.cornell.edu/releases/Jan99/species_costs.html.
6. Ibid.
7. US Department of Agriculture (USDA), Animal and Plant Health Inspection Service, "Invasive Species," April 2003, http://www.aphis.usda.gov/lpa/pubs/fsheet_faqs_notice/fs_aphisinvasive.html.
8. Abbey.
9. US Department of Transportation, Federal Highway Administration, "Guidance: Implementing Executive Order on Invasive Species," 20 June 2001, http://www.fhwa.dot.gov/environment/em_inv.htm.
10. National Oceanic & Atmospheric Administration (NOAA), "America's Ocean Future," http://www.publicaffairs.noaa.gov/pdf/ocean_rpt.pdf.
11. USDA, "Invasive Species."
12. NISC, "National Management Plan: Meeting the Invasive Species Challenge," 18 January 2001, <http://www.invasivespecies.gov/council/nmptoc.shtml>, p. 17.
13. NOAA, "America's Ocean Future."
14. NISC, "National Management Plan: Introduction," <http://www.invasivespecies.gov/council/intro.shtml>.
15. NISC, "National Management Plan: Meeting the Invasive Species Challenge," p. 17.
16. Mark Souder, "Small Carriers Deliver Big Worries to Local Agriculture," *Farm Bureau Bulletin*, April 2000, <http://www.slofarmbureau.org/OldNews/april00.html>.
17. NISC, "Invasive Species: Impacts of Invasive Species," <http://www.invasivespecies.gov/impacts.shtml>.
18. Gavon Cameron and Jason Pate, "Covert Biological Weapons Attacks Against Agriculture Targets, Assessing the Impact Against U.S. Agriculture," in *Terrorism and Counterterrorism, Understanding the New Security Environment*, ed. Russel D. Howard, Reid L. Sawyer, and Barry R. McCaffrey (Guilford, Conn.: McGraw Hill, 2003), p. 254.
19. John Leatherbury, "Living Through the FMD Outbreak," *Country Spirit*, Summer 2002, p. 13.
20. NISC, "Invasive Species: Impacts of Invasive Species."
21. Ibid.
22. US Geologic Service, "Safety and Health of Pacific Island Residents and Tourists," <http://www.mesc.usgs.gov/resources/education/bts/impacts/safety.asp>.

23. US Geologic Service, "Economic Damages from the Brown Tree Snake," http://www.mesc.usgs.gov/resources/education/bts/invasion/intro_pred.asp.
24. US Geologic Service, "Introduced Predators on Formerly Snake Free Oceanic Islands," <http://www.mesc.usgs.gov/resources/education/bts/impacts/economic.asp>.
25. G. John Ikenberry, "Getting Hegemony Right," *National Interest*, No. 63 (Spring 2001), p. 17.
26. Gregory J. Rattray, "The Cyberterrorism Threat," in Howard, Sawyer, and McCaffrey, p. 224.
27. Caleb Carr, "Terrorism as Warfare," *World Policy Journal*, 13 (Winter 1996-1997), 1-12.
28. Rattray, pp. 224-25.
29. Lach et al.
30. Frank Cilluffo, Sharon Cardash, and Gordon N. Lederman, *Combating Chemical, Biological, Radiological, and Nuclear Terrorism: A Comprehensive Strategy: A Report of the CSIS Homeland Defense Project* (Washington: CSIS Press, 2001), p. 5.
31. Gilmore Commission, "First Annual Report to the President and the Congress of the Advisory Panel to Assess Domestic Response Capabilities for Terrorism Involving Weapons of Mass Destruction, I: Assessing the Threat," 15 December 1999, <http://www.rand.org/nsrd/terrpanel/terror.pdf>, p. 12.
32. Cameron and Pate, pp. 258-59.
33. US Congress, Senate, Committee on Appropriations, Subcommittee on Agriculture, Rural Development, and Related Agencies, "Statement of Keith Collins, Chief Economist, U.S. Department of Agriculture," 17 May 2001, <http://www.usda.gov/oce/speeches/051701co.html>.
34. Cameron and Pate, p. 258.
35. *Ibid.*, p. 250.
36. Director for Strategic Plans and Policy, J5, Strategy Division, *Joint Vision 2020* (Washington: GPO, June 2000), p. 5.
37. *Ibid.*
38. *Ibid.*, p. 260.
39. *Ibid.*, p. 253.
40. US Congress, Senate, Committee on Restructuring and the District of Columbia Subcommittee, Senate Government Affairs Committee, and Subcommittee Oversight of Government Management, "US Senator Richard Durbin (D-IL) Holds Joint Hearing With Senate Health, Education, Labor and Pensions Committee on West Nile Virus," 24 September 2002, <http://environmentalrisk.cornell.edu/WNV/WNVEducDocs/SenateHearing9-24-02.html>.
41. Cameron and Pate, p. 257.
42. Jessica Stern, "Getting and Using the Weapons," in Howard, Sawyer, and McCaffrey, p. 159.
43. Seva Gunitskiy, "Iraq and the West Nile Virus: A Possible Connection?" Center for Defense Information, Terrorism Project, 28 October 2002, <http://www.cdi.org/terrorism/west-nile.cfm>.
44. NISC, "Invasive Species: Impacts of Invasive Species."
45. USDA, Agricultural Research Service, "From East to West: The Asian Longhorned Beetle Has Landed," <http://www.ars.usda.gov/is/np/mba/apr00/asian.htm>.
46. Jim Deacon, "The Microbial World: Bacillus thuringiensis," University of Edinburgh, Institute of Cell and Molecular Biology, <http://helios.bto.ed.ac.uk/bto/microbes/bt.htm>.
47. Carina Dennis, "The Bugs of War," *Nature*, 17 May 2001, p. 232, http://www.nature.com/cgi-taf/DynaPage.taf?file=/nature/journal/v411/n6835/full/411232a0_fs.html.
48. *Ibid.*
49. *Ibid.*, pp. 232-35.
50. USDA, "From East to West: The Asian Longhorned Beetle Has Landed."
51. NISC, "Invasive Species: Impacts of Invasive Species."
52. NISC, "National Management Plan: Executive Summary."
53. The White House, Executive Order 13112, "Invasive Species," 3 February 1999, <http://ceq.eh.doe.gov/nepa/regs/eos/eo13112.html>.
54. *Ibid.*
55. USDA, "Invasive Species."
56. NISC, "National Management Plan: Executive Summary."
57. General Accounting Office, *Invasive Species: Obstacles Hinder Federal Rapid Response to Growing Threat* (Washington: GPO, 2001), p. 20.
58. NISC, "National Management Plan: Meeting the Invasive Species Challenge," p. 5.
59. General Accounting Office, *Invasive Species*, p. 17.
60. *Ibid.*, pp. 27-34.
61. *Ibid.*, p. 4.
62. *Ibid.*, p. 12.
63. *Ibid.*, p. 20.