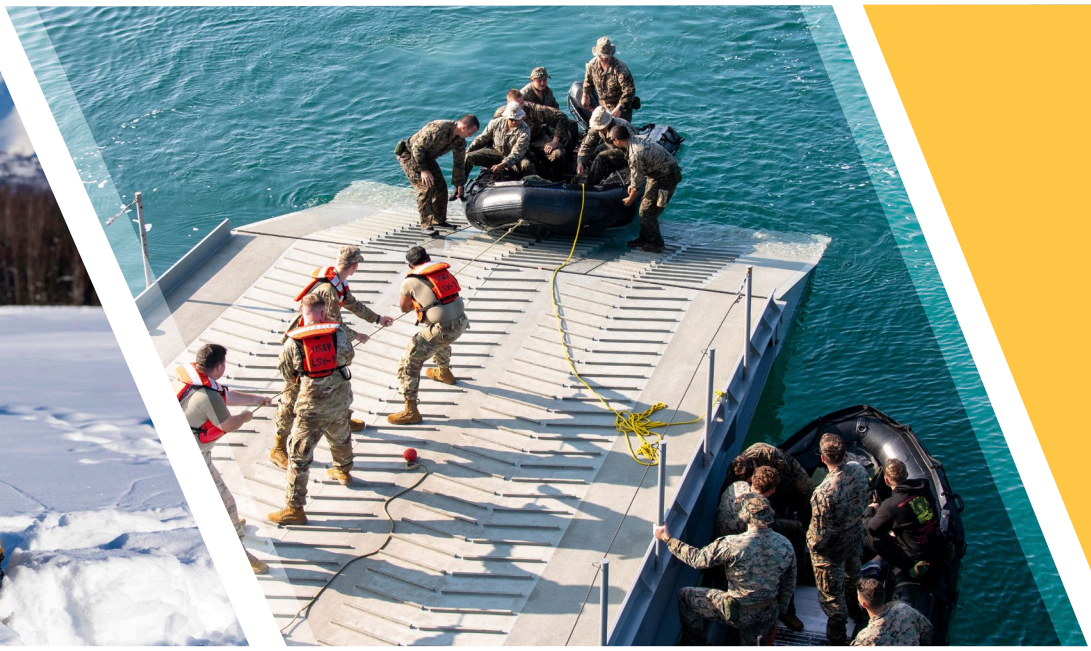


FY 2022 Metrics Report on REPI Program Outcomes and Benefits to Military Mission Capabilities

U.S. Department of Defense
Office of the Assistant Secretary of Defense for Energy, Installations, and Environment
Readiness and Environmental Protection Integration (REPI) Program

Cover photo credits: (left to right)
(top row) *U.S. Air Force photo by Alejandro Pena; U.S. Marine Corps photo by Lance Cpl. Cody Purcell*
(bottom row) *U.S. Air Force photo by Senior Airman Zachary Willis; U.S. Air Force photo by Airman 1st Class Spencer Kanar*

Inside photo credits:
(Executive Summary) *U.S. Marine Corps photo by Lance Cpl. David Getz*
(Chapter 1) *U.S. Marine Corps photo by Cpl. Angel Alvarado*
(Chapter 2) *U.S. Marine Corps photo by Cpl. Vincent Pham*
(Chapter 3) *U.S. Army photo by Joseph Kumzak*
(Chapter 4) *Uncredited U.S. Navy photo*
(Chapter 5) *U.S. Marine Corps photo by Sgt. Christian Garcia*
(Chapter 6) *U.S. Army photo by Spc. Javier Arencibia*

TABLE OF CONTENTS

EXECUTIVE SUMMARY

The Department of Defense (DOD) installations and missions across the nation face increasing risks from the conversion of natural and agricultural lands that are compatible with the military mission, as well as impacts from climate change and extreme weather events. Development outside of installation boundaries leads to habitat fragmentation that can displace at-risk species onto military installations and exacerbate existing or anticipated climate hazards. The Department leverages the Readiness and Environmental Protection Integration (REPI) Program as a key tool to address these risks in support of military training, testing, and operations.

Through the REPI Program, the Military Services enter into cost-sharing agreements with state governments, local governments, other federal agencies, and conservation organizations to build installation resilience to climate change, promote compatible land use near military installations, and address environmental regulatory restraints that restrict military activities. These mutually beneficial arrangements preserve and enhance military readiness by providing installation and range commanders with the necessary flexibility to optimally conduct essential missions, as authorized by Congress in 10 United States Code (U.S.C.) § 2684a as well as other authorities such as the Sikes Act (16 U.S.C. § 670c-1) and Intergovernmental Support Agreements (10 U.S.C. § 2679). This report examines data through Fiscal Year (FY) 2022 submitted by the Military Services to quantitatively demonstrate the outcomes of REPI projects that benefit military training, testing, and operations. The detailed analysis of the program's operations and effectiveness contained herein is supported by data submitted through the annual proposal request for REPI funding and annual Military Service execution reporting requirements.

REPI PROJECTS SAFEGUARD MILITARY MISSIONS IN THE UNITED STATES AND ITS TERRITORIES

REPI projects are an innovative way to support compatible land uses around DOD lands to benefit the military, community, and wildlife alike. The REPI Program defines compatible land uses around military installations as lands that support full access or operational use of the live training and testing domain. Based on available REPI project data through the FY 2022 proposal submissions, the five most common restrictors of military activity are noise complaints, danger or safety zone regulations, tall structures, radar or spectrum, and species encroachment risks. As discussed in Section 2 of this report, 90 percent of the 70 proposals submitted in FY 2022 report at least one of these five restrictions. To ensure full access to the live training and testing domain, the majority of the REPI Program's annual budget is dedicated to promoting compatible land use to prevent those current or anticipated restrictions.

ENCROACHMENT IMPACTS ARE GROWING RAPIDLY IN SCOPE AND SCALE EACH YEAR

Conversion of natural and agricultural lands adjacent to installations into residential and commercial property directly impacts military operations and readiness. Family farms and large timber companies' holdings are declining while transportation, utility, and other infrastructure networks are expanding across lands that were previously viewed as undesirable to developers. Just under half of the properties targeted for action by the Military Services as part of their most recent REPI project funding requests are at risk of development pressures within 12 to 24 months, while an additional 19 percent of properties are at risk of development

within a year. Protection of these parcels is time sensitive; once the lands are subdivided and developed, the impact to nearby military operations is often irreversible.

Further illustrating the growing scope of encroachment risks, installations are increasingly identifying restrictions to live training and testing capabilities from climate-related impacts. These impacts include hazards such as wildfires, flooding, and sea level rise, which could lead to costly workarounds, lost training days, and an inability to conduct operations. In FY 2022 proposals, 19 projects identified climate hazards that pose a risk to the military mission—more than double the number of proposals that indicated the same impacts in FY 2021.

REPI PROJECTS PROMOTE COMPATIBLE LAND USE TO SUPPORT ESSENTIAL MISSION CAPABILITIES

Compatible land use supports a wide variety of mission-critical activities across air, land, sea, and frequency spectrum domains, including fixed-wing and rotary-wing flight training, live-fire operations, and ground maneuver activities. From its inception through FY 2022, the REPI Program has protected 1,182,928 acres to prevent or relieve restrictions on military activities or build installation resilience. As outlined in Section 3, the top four mission capabilities the REPI Program preserved in FY 2022 were flight operations (fixed-wing and rotary-wing flight training), unmanned aircraft systems, radar and navigation, and testing.

Through the REPI Program, installations are preserving and enhancing their largest assets, including range complexes and total airspace footprint, in addition to protecting smaller assets such as 2 million acres of test ranges and nearly 60 miles of runways. The White Sands Missile Range case study highlights how the range and partners leveraged the REPI Program to protect nearly 316,000 acres of natural lands adjacent to the range in FY 2022 to preserve its critical long-range flight programs, including High Speed and Hypersonic Weapons capabilities.

REPI INVESTS IN DOD PRIORITIES

As outlined in the National Defense Strategy released in October 2022, DOD has identified building installation resilience to climate change and strengthening the United States' position in the Pacific region as key priorities. The REPI Program has the network, capabilities, and funding to contribute toward these priorities in collaboration with other partnership efforts. Since Congress expanded the 10 U.S.C. § 2684a authority to address climate change and resilience in FY 2019, funding and focus on these projects have steadily grown. In FY 2022, the number of proposed REPI projects with installation resilience as a primary justification tripled, growing from three projects in FY 2021 to nine.

In addition to the annual REPI Program funding allocation, the Military Services and partners have significantly leveraged REPI Challenge funding to build installation resilience to climate change. The REPI Challenge is an annual competitive opportunity where partners submit proposals to receive funding for innovative projects that support mission readiness. Since FY 2020, REPI Challenge projects have received over $54 million in REPI funds to support installation resilience, comprising more than 40 percent of all REPI Challenge funding to date. Total contributions toward REPI Challenge projects that seek to bolster installation resilience have totaled nearly $200 million since FY 2020, with a partner cost share of 64 percent and Service cost share of nearly 8 percent.

Adding to the growing portfolio of REPI proposals focused on climate change and resilience, the REPI Program is increasing funding across projects that host critical missions in the Pacific region. Eight REPI projects across Alaska, Guam, and Hawai‘i face several encroachment risks, from noise and light pollution to water quantity and climate impacts. To date, these installations have used $136 million in annual REPI and partner funding to preserve or enhance over 16,363 acres. REPI projects are preserving tangible assets in the region, including the planned construction of a known-distance range at Joint Base Elmendorf-Richardson valued at $5 million; a collection of ammunition storage locations, ranges, runways, and wharves valued at $138 million in Guam; and the Advanced Radar Detection Laboratory at Pacific Missile Range Facility Barking Sands in Hawai‘i with an estimated value of $22 million. Partners have contributed much of the funding, providing a 76-percent partner cost share. In addition to annual REPI Program funding, 15 percent of REPI Challenge funding—nearly $21 million—has been committed to projects in Hawai‘i through FY 2022.

REPI'S RETURN ON INVESTMENT HELPS TO PROTECT DOD'S HIGH-VALUE ASSETS FROM COSTLY WORKAROUNDS

The REPI Program is preserving and enhancing valuable DOD assets for a small fraction of what it costs to build, modernize, replace, or repair them. The Department spends billions of dollars on military construction (MILCON), capital improvement, repair projects, and maintenance of its facilities and equipment. To modernize and maintain unfettered access to key capabilities into the future, DOD must promote compatible land use around high-value assets and leverage tools to reduce the risks from known or potential climate change impacts.

As outlined in Section 5, the REPI Program serves as an effective and cost-efficient way for DOD to preserve and enhance the military's capabilities. The Joint Base Pearl Harbor-Hickam case study highlights the nearly $15 million in REPI funding matched by approximately $8 million in external partner contributions that have helped preserve just over $1 billion in recent MILCON investments. The installation and partners are using available funding to implement erosion control and habitat preservation measures to improve water quality and quantity within the Pearl Harbor aquifer. This project improves the harbor's water supply vital to the preservation of both the surrounding natural habitat and the mission capabilities at Joint Base Pearl Harbor-Hickam that rely on it. This project protects multiple military assets and capabilities valued between $1 million and $100 million, totaling almost $7 billion in capabilities. These investments preserve the installation's recent $845 million investment in capital improvements for new construction and roadway infrastructure, and facility modernization at Wahiawā Annex to support mission capabilities and sustain military operations well into the future.

REPI HAS SAVED DOD $1.13 BILLION BY LEVERAGING PARTNER CONTRIBUTIONS TO COMPLETE TRANSACTIONS

The REPI Program is an innovative tool for sustaining military readiness, as the program leverages DOD funding alongside other organizations interested in preserving land and natural resources. DOD funds are intended to help prevent suboptimal military operating environments, costly development of new facilities to replace encroached assets, and relocation of critical missions. Since Congress enacted 10 U.S.C. § 2684a in FY 2003 REPI cooperative agreements have attracted contributions from federal agencies, state and local governments, conservation organizations, and other private organizations that nearly match DOD investments. Through partnerships, the REPI Program has achieved a total cost savings of over $1.13 billion for DOD through FY 2022.

FY 2022
REPI PROGRAM HIGHLIGHTS

1.2 million

acres protected through FY 2022 to preserve key DOD operational assets, infrastructure, and capabilities, across **120 REPI partnership locations**

$800 million

expended by DOD on projects supporting critical missions through FY 2022; leveraged by more than **$1.13 billion in partner expenditures**

$272 million

total REPI funding requested by the Military Services in FY 2022—a **36 percent increase from FY 2021**

$150 million

REPI appropriations in FY 2022, up from $105 million in FY 2021

$54 million

REPI Challenge contributions toward installation resilience projects since FY 2019

$21 million

REPI Challenge contributions toward projects in Hawai‘i through FY 2022

1 OVERVIEW AND PURPOSE OF THE ANALYSIS

The U.S. Department of Defense (DOD) Readiness and Environmental Protection Integration (REPI) Program is an innovative tool for curbing encroachment that can limit or restrict military training, testing, and operations. The development of a REPI project is typically in response to one of the following encroachment risks: land use conflicts with mission capabilities, commercial and residential development that fragments at-risk species habitat leading to regulatory restrictions on testing and training operations, or installation infrastructure vulnerabilities from climate change impacts. The REPI Program preserves and enhances mission capabilities by relieving or avoiding land use conflicts and restrictions near installations and by developing proactive regulatory solutions. The program relies on partnerships with other federal agencies, state and local governments, and conservation organizations to fund REPI projects nationwide.

The FY 2022 REPI Metrics Report uses a quantitative assessment of proposal and annual reporting data; therefore, it does not focus on the numerous qualitative benefits inherent in the REPI Program's core emphasis on partnerships. For example, the REPI Program fosters innovative and diverse partnerships between DOD and external organizations that align each organization's priorities to prevent future restrictions on the military mission.

The report outlines and analyzes over 20 years of the Military Services' data submitted to the REPI Program to quantify the program's value to the DOD mission. The data analysis demonstrates the extent of current and future land use conflicts, how REPI projects overcome those conflicts, and the overall investments in and benefits to military capabilities. The information in this report reflects installation goals submitted and verified by the Military Services through the FY 2022 funding proposal process. Additionally, this report utilizes data on completed actions reported by the Military Services through FY 2022.

2 REPI PROJECTS SAFEGUARD MILITARY MISSIONS IN THE UNITED STATES AND ITS TERRITORIES

Military installations, ranges, and other training and testing spaces nationwide host Service members to maintain military readiness in support of vital DOD missions. Natural lands provide the training infrastructure necessary to conduct daily operations, realistic live-fire training, and effective weapon system testing that prepare Service members and their equipment for real-world combat. Realistic training at home and success on the battlefield go hand in hand; therefore, preservation of optimal test and training conditions can lead to lives saved in combat.

The development and degradation of natural lands near and adjacent to installations, ranges, and operating areas increasingly limit the military's ability to conduct training and testing operations. DOD has identified three of its most critical encroachment risks: nearby land use that conflicts with missions, commercial and residential development that fragments at-risk species habitat leading to regulatory restrictions on testing and training operations, and climate change impact and extreme weather events that can exacerbate existing encroachment challenges. Within these broad categories, many distinct types of threats have emerged. Below are examples of the different threats facing military installations and how each can impact training, testing, and operations.

Land Use Changes

- Light pollution near installations and ranges reduces the effectiveness of night-vision training;
- Residents near installations and ranges experience noise, dust, and smoke generated by military activities, and submit complaints that result in restrictions on the timing, frequency, and types of training activities;
- Competition for electromagnetic spectrum limits critical communication activities and the number of unmanned aircraft systems able to operate at a given time; and
- Communication towers, wind turbines, energy transmission lines, and other tall structures near restricted air spaces or through large air ranges interfere with DOD flight operations, radars, and sensitive testing equipment.

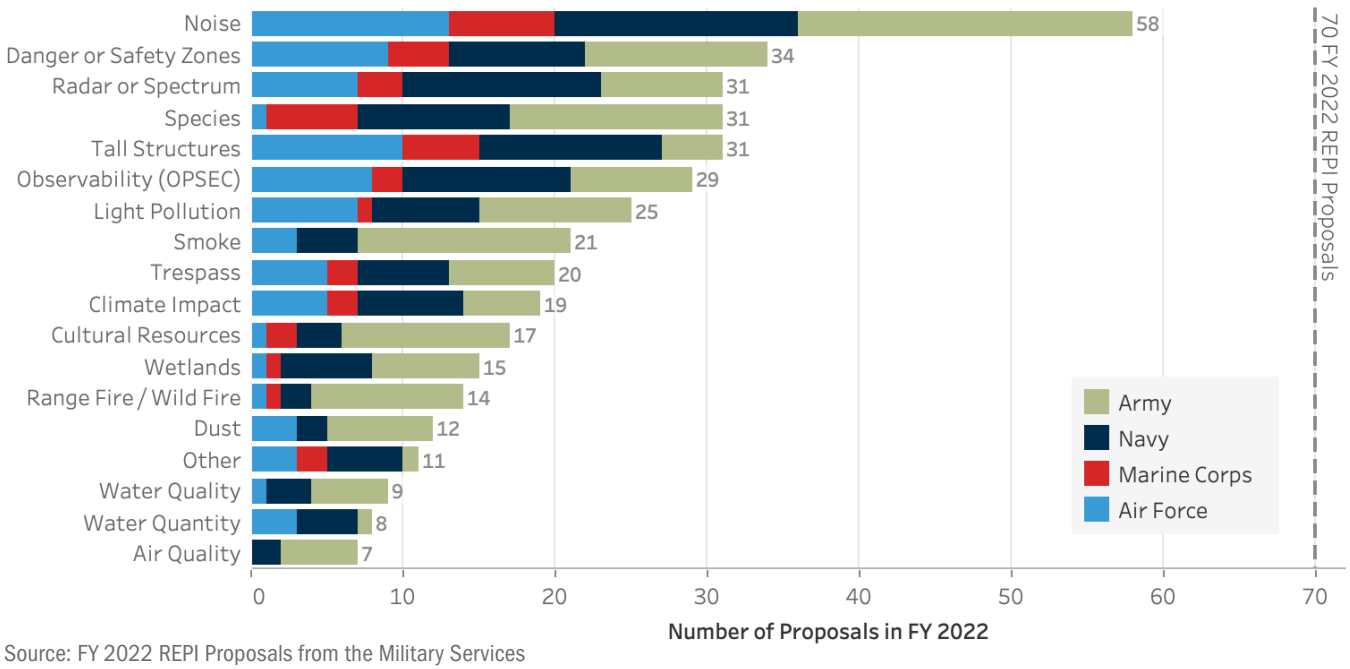
Habitat Loss and Endangered Species Act Restrictions

- Residential and commercial development that destroys or fragments threatened and endangered species habitat around DOD lands increases DOD's responsibility to manage species on its land.

Climate Change and Extreme Weather

- Riverine and surface water flooding may disrupt access to and from installations; cause utility closure; contribute to land degradation; impact training and testing activities, including use of rangelands; and damage off-base housing and support systems, in addition to damaging infrastructure, equipment, materiel, vehicles, and aircraft
- The effects of drought can vary regionally and include reduced water supplies for municipal, industrial, or agricultural purposes; decreased stream flows for navigation and energy generation; decreased water quality; loss of soil moisture and therefore, vegetation stress and die-off; and increased wildfire risk. Because droughts can result in widespread vegetation die-off, the ground surface may be exposed to increased erosion by wind and water (when next it rains).

Figure 1 Encroachment Risks Identified in FY 2022 REPI Proposals[1]



Source: FY 2022 REPI Proposals from the Military Services

- Wildfire may pose a significant risk to military bases, can impact the timing and type of training and testing activities on a given base, and can divert military resources to firefighting activities. There are numerous examples of live-fire activities igniting wildfires during dry conditions with both on- and off-base impacts.
- Sea level rise and storm surge near coastal and riverine installations contribute to erosion and flooding that damage existing infrastructure, create added costs, and impede military operations; and
- Warmer temperatures and increased drought conditions contribute to a reduction in water supply, degradation of natural lands, more frequent wildfires, and heat-related illness, restricting training activities and putting DOD personnel at risk.

Figure 1 illustrates the significance of various encroachment risks, as indicated in FY 2022 REPI proposals. Of the 70 proposals the Military Services submitted in FY 2022, 81 percent, or 58 proposals, report that noise adversely impacts their installations. For the fourth year, addressing noise complaints and pressure to avoid noise impacts has ranked as the most common encroachment risk identified among all proposals submitted. Development near or proximate to danger or safety zones, including accident potential zones near the ends of airfield runways, was the second most common encroachment risk listed, reported in 34 proposals. Radar and spectrum, tall structures, and species encroachment risk followed, reported in roughly 31 proposals.

Climate change and installation resilience continue to grow in importance to installations with REPI projects. Notably, the number of REPI proposals that identified climate change as an active threat to the installation increased from 8 proposals in FY 2021 to 19 in FY 2022—an increase of 137 percent over that period. Furthermore, in FY 2022, nine projects identified climate change as a primary justification on proposed parcels, increasing from three proposals in the FY 2021 cycle. All four Military Services proposed new installation resilience projects, with the Air Force and Navy submitting two and three new projects, respectively. Section 4 provides additional analyses regarding climate change and installation resilience.

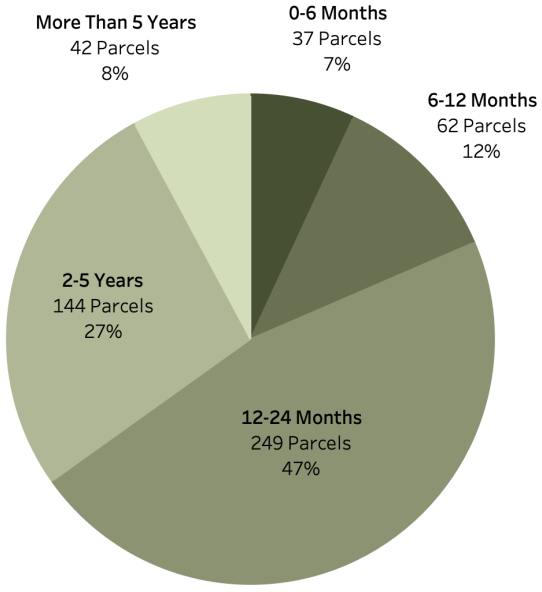
The encroachment risks most frequently cited in REPI proposals are driven or exacerbated by the increasing development of natural and agricultural lands. Often caused by the sale of inherited farmland, large landholdings adjacent to military installations are converted to smaller, subdivided units. These

[1] Projects may select multiple encroachment risks. Projects that reported more than one encroachment risk are included in all categories selected. Installations that did not submit an FY 2022 proposal are not included. These totals do not reflect the severity of the threat, nor do they include encroachment pressures mitigated by other means. For underlying data by Military Service, see Table B1 in Appendix B.

overarching factors, in combination with recent real estate booms and access to expanded local transportation, utility, and other infrastructure networks across lands once considered less attractive to developers, are compromising vital spaces that DOD counts on to preserve training, testing, and operations. **Figure 2** illustrates the estimated timeframe of development potential for parcels proposed for FY 2022 funding.

Consistent with trends in FY 2021, installations expected development of nearly three-quarters of the proposed FY 2022 parcels within one to five years. An additional 19 percent of the parcels proposed in the FY 2022 cycle were expected to be developed within a year, heavily contrasting with FY 2020 trends but consistent with FY 2021 trends. In the FY 2020 cycle, over half of the parcels were expected to be developed within one year. It is important to note that the projections of development are estimates made by the local installation and validated by the Military Service Headquarters. Projecting impending development involves a combination of quantifiable measures (e.g., published development plans) and qualitative measures (e.g., assessments of emerging housing trends).[2]

Figure 2 Estimated Timetable to Preserve Compatible Land Use of Parcels Targeted in FY 2022 REPI Proposals



Source: FY 2022 REPI Proposals from the Military Services

HOW THE REPI PROGRAM ADDRESSES ENCROACHMENT

Since its inception, the REPI Program has coordinated with local, state, and federal agencies and non-governmental organizations to preserve and enhance military missions by addressing the threats identified in Figure 1. Enacted in December 2002, 10 United States Code (U.S.C.) § 2684a authorizes the Department to enter into cost-sharing agreements with state and local governments as well as environmental protection organizations. Through these agreements, DOD can avoid restrictions on training, testing, and operations by encouraging compatible development; preserving habitats near, or ecologically related to, military installations and ranges; and maintaining or enhancing military installation resilience. One of the key steps in these partnerships is establishing an agreement area, also known as a REPI partnership opportunity area.

An agreement area is the total geographic area in which an installation and its partners are authorized to execute REPI projects pursuant to a cooperative agreement, encroachment protection agreement, or another real property agreement. Key partnership opportunity areas are defined within the agreement area according to Service-specific methodologies, for which REPI parcels will be targeted and executed. Various case studies throughout this report provide detailed information on specific REPI projects, such as maps that illustrate the relationship between the overarching agreement area, the key partnership opportunity areas, and parcels protected through FY 2022.

These win-win partnerships leverage DOD funding with significant contributions from other federal, state, local, and private sources to share the cost of easement acquisitions, off-base nature-based solutions, collaborative conservation initiatives, development rights, or other interests in land from willing sellers near installations and ranges. In some cases, the partner will hold title to the easement subject to the right of the Military Service to demand or transfer the title if necessary to ensure the property maintains compatibility with the mission. Alternatively, the partner may hold fee title while the Military Service obtains an easement. The ability to leverage partner and Military Service

[2] Given the vast proportion of proposals estimating parcel development within six months after the FY 2020 proposal cycle, the REPI Program issued clarifying guidance to improve the accuracy of the installations' estimates. The guidance likely contributed to the decrease in estimated development timeframes reflected in FY 2021 and continued in FY 2022 REPI proposals.

contributions is essential to relieving restrictions from suburban sprawl, Endangered Species Act (ESA) listings, and changing environmental conditions. REPI projects reduce risks to installation assets and operational capabilities from encroachment at various Military Service installations, joint bases, ranges, and reserve centers. All DOD installations in the United States and its territories are eligible for REPI Program funds. **Figure 3** displays new, in-progress, and completed REPI projects across the nation as of the end of FY 2022.

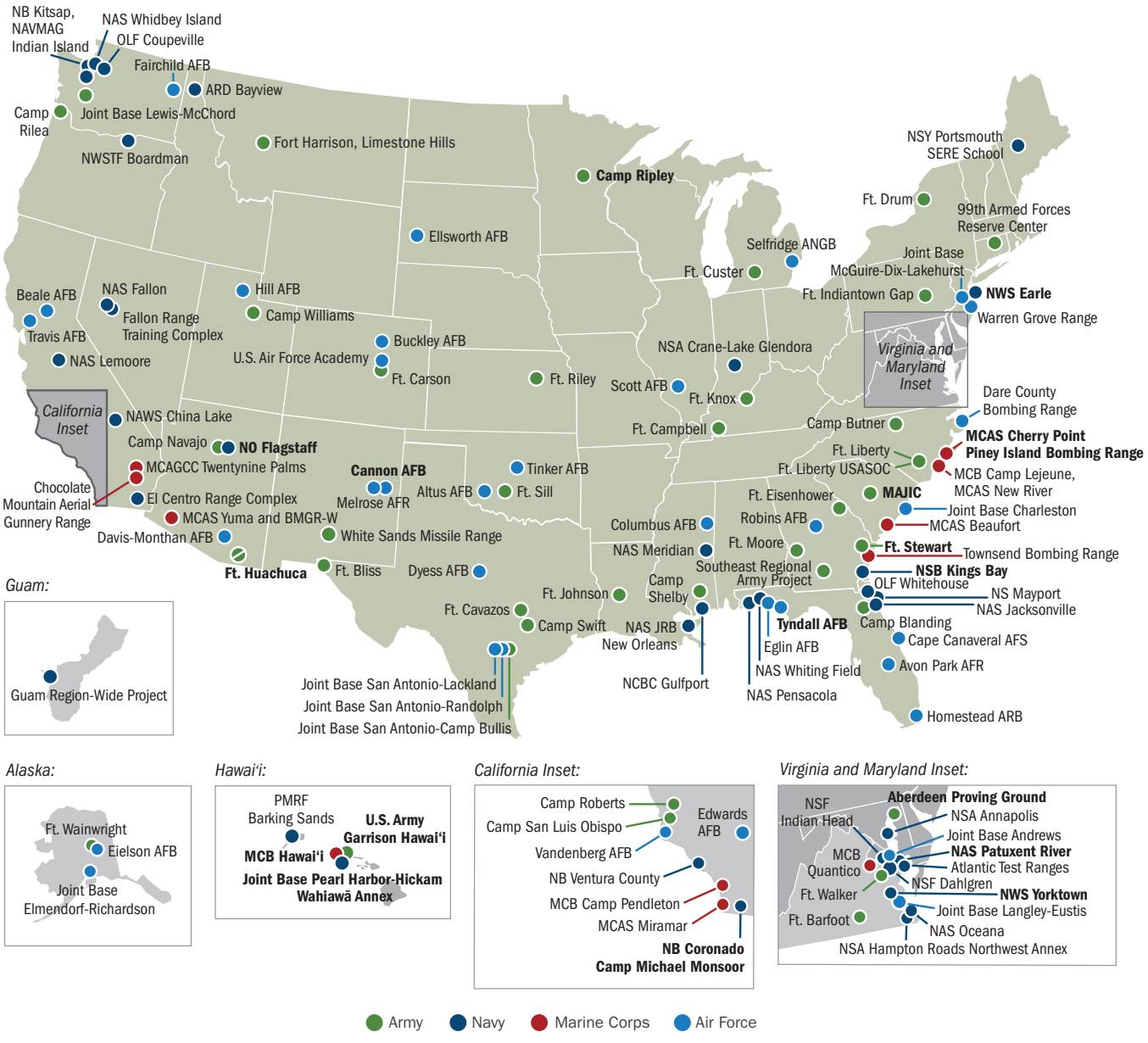
REPI PROJECT FUNDING FUNDAMENTALS

The REPI Program leverages funds and resources from DOD, other federal agencies, state and local governments, and private organizations to finance efforts to mitigate and prevent encroachment. There are three specific types of funding for REPI projects:

REPI Program Funds

The Military Services submit proposals requesting REPI funds annually. Proposals are reviewed and scored based on several factors, including the viability of the project and the quality of the submission. REPI funds are obligated based on the outcomes of the annual proposal review process. In addition to this annual internal DOD funding process, REPI partners can apply for and receive REPI funds through the annual REPI Challenge in which state governments or private entities

Figure 3 REPI Project Locations through FY 2022



request funds for efforts that conserve land at a greater scale, test promising ways to finance land preservation, and harness the creativity of the private sector and market-based approaches to support military installations in the United States and its territories. Finally, REPI partners can also apply for REPI funds through National Fish and Wildlife Foundation (NFWF) programs such as the National Coastal Resilience Fund (NCRF) and America the Beautiful Challenge. In recent years, DOD has committed over $15 million in REPI funds to these programs through cooperative agreements with NFWF.

Historically, REPI Program funds have accounted for 34 percent of total project costs. Congress provides program funding as a line-item appropriation in DOD's annual budget. In FY 2023, the Presidential Budget requested $170 million for the REPI Program, an increase of $20 million since FY 2022. The continued increase in the Presidential Budget requests allows the REPI Program to significantly expand the amount of funding available for climate resilience projects at military installations in the United States and its territories, while still leaving a greater amount of funding remaining to address other priority encroachment risks.

Military Service Funds

The Army, Navy, Marine Corps, or Air Force can expend Operations and Maintenance (O&M) or Research, Development, Test, and Evaluation funding to help finance their REPI projects. Since the program's creation, Military Service expenditures have covered 18 percent of total project costs.

Partner Funds

In addition to DOD funds, Military Services can leverage partner funding to meet total funding requirements for REPI projects. External partner contributions account for just under half of the total REPI project costs to date, or 48 percent of the total project costs. Partner contributions can include, but are not limited to, other federal grants, state and local grants or cost-savings programs, private capital from conservation partners, bargain sales or donations from willing landowners, and in-kind services.

As illustrated in **Figure 4**, leveraging REPI funds with Military Service and partner contributions is critical to maximizing the value that REPI projects provide to mission capabilities, as the total Military Service REPI funding requests consistently exceed, and often double, available REPI funding. As investments continue to demonstrate the value of the REPI Program and its partnerships to Congress and taxpayers, DOD funding has steadily grown since the program's start in the early 2000s.

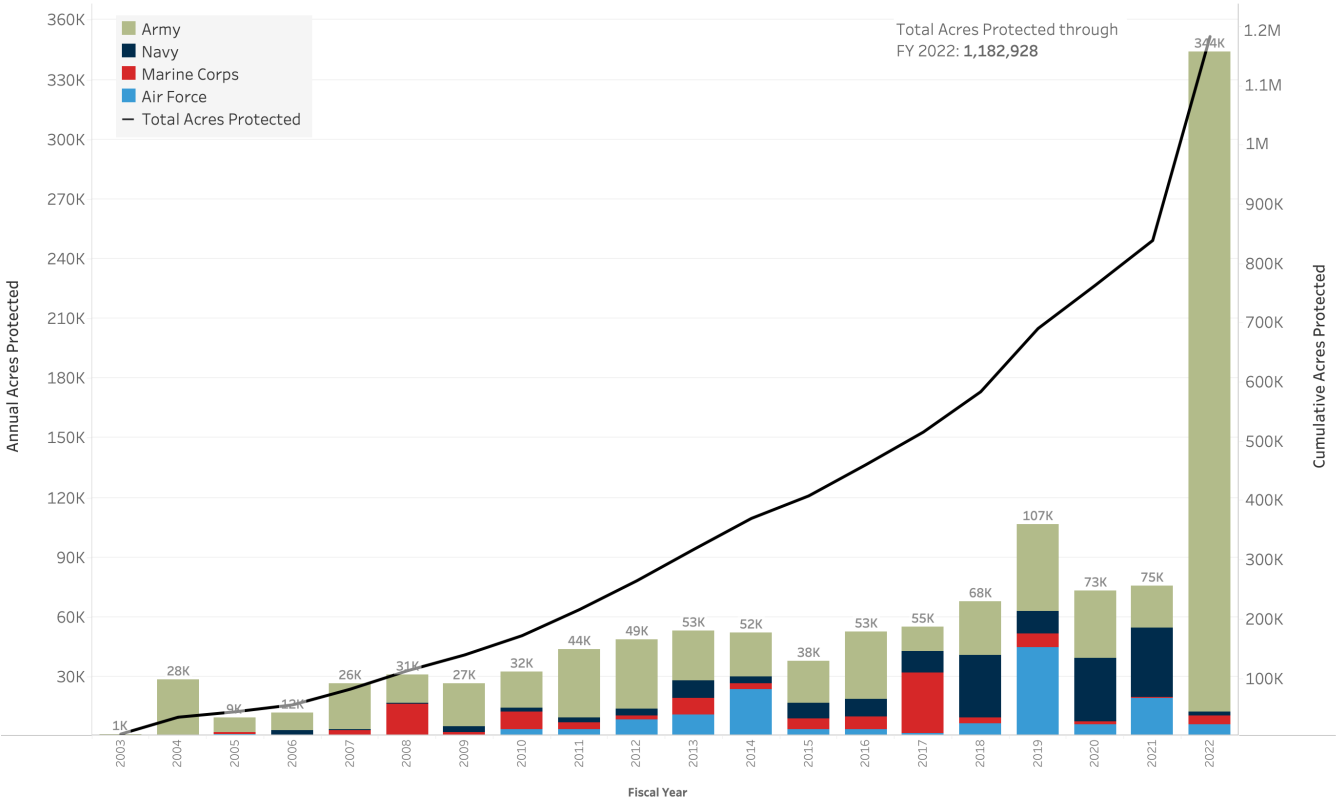
Figure 4 REPI Program Funding History

Source: Congressional Appropriations Data through FY 2023 and REPI Proposals from the Military Services through FY 2022

3 THE REPI PROGRAM HAS PROTECTED OVER 1 MILLION ACRES SINCE INCEPTION

Through the REPI Program, DOD and its partners have protected 1,182,928 acres at 120 REPI project locations in 35 states and territories through FY 2022. REPI projects include lands that are conserved to preserve compatible land use, protect the natural habitats of endangered or threatened species, and increase installation resilience to climate change and severe weather. Preserving these lands through the REPI Program enables installation commanders to successfully accomplish vital training, testing, and operational missions with fewer restrictions. **Figure 5** illustrates the steady increase in acres of natural and agricultural lands protected over time, commensurate with the level of DOD and partner investments over that

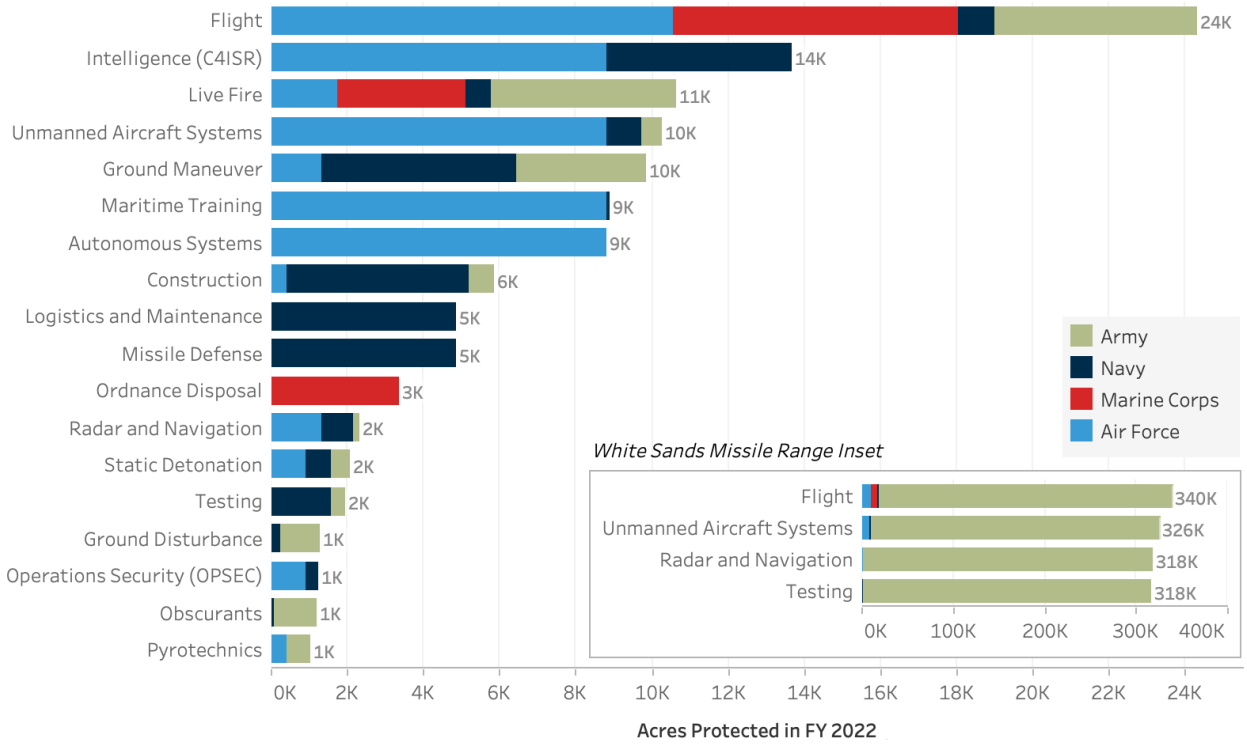
Figure 5 Total Acres Protected by REPI Projects through FY 2022[3]



Source: Execution Data Submitted by the Military Services in the REPI Database through FY 2022

[3] Data is current as of the end of FY 2022, as reported in the 2023 REPI Report to Congress.

Figure 6 Acres Protected to Preserve or Enhance Mission Capabilities in FY 2022[4]



Source: FY 2022 REPI Proposals and FY 2022 Execution Data Submitted by the Military Services

same period. The figure highlights a sizeable increase in acres protected in FY 2022, due to the protection of nearly 316,000 acres at White Sands Missile Range (WSMR)—representing the single largest protection in the REPI Program's history. WSMR is a critical national testing and training asset, as it is the largest land-based Major Range and Test Facility Base in the United States.

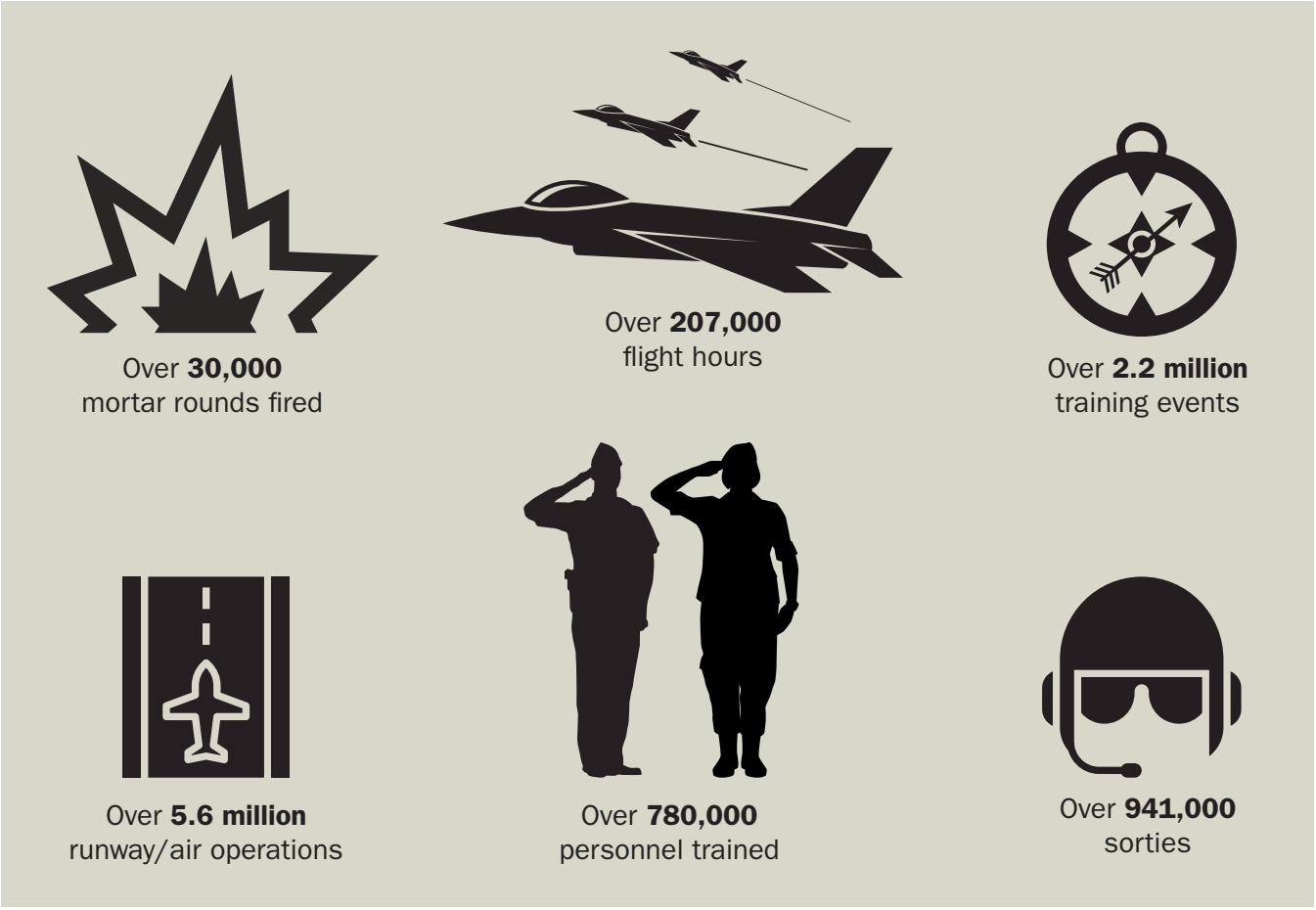
The scale and timeline for completing a real estate transaction to permanently protect lands with REPI funds is influenced by the availability of funding, local real estate markets, landowner interest, and due diligence requirements. In addition to protecting lands via a real property interest, DOD and its partners invest in managing and enhancing natural lands outside installation boundaries. Conservation activities authorized under 10 U.S.C. § 2684a, 16 U.S.C. § 670c-1, and 10 U.S.C. § 2679 include implementing nature-based solutions to support ecosystem health and build installation resilience to climate change and extreme weather.

Each REPI project must support a military installation or range mission as required by 10 U.S.C. § 2684a, 16 U.S.C. § 670c-1, or 10 U.S.C. § 2679. Such mission benefits reflect training, testing, and operational capabilities that are currently restricted or could potentially be restricted without REPI actions. While the REPI Program is a useful tool for preserving or enhancing the capabilities of DOD installations and ranges, the absence of an imminent encroachment risk or interested funding partner may require alternative solutions at specific locations.

Figure 6 details the primary mission capabilities that the REPI Program supports, sorted by acres protected. When analyzing this data, it is critical to recognize that a single parcel can support multiple mission capabilities, and, in that case, those parcel acres for which the Military Services reported more than one mission capability are displayed in all associated categories. The most recent example of this is the protection of 316,00 acres at WSMR to preserve

[4] The Military Services may select multiple mission capabilities for each parcel. Acres protected are included in all mission capability categories displayed if the Military Services reported more than one for any given parcel. Starting in FY 2020, the REPI Program established the requirement to report protected mission capabilities for each parcel preserved. Therefore, not all parcels have associated mission capability data. Excludes roughly 4,000 acres for parcels that were protected in FY 2022 but do not have any corresponding mission capability data. For underlying data by Military Service, see Table B3 in Appendix B.

Figure 7 Examples of Annual Usage or Throughput of Mission Capabilities Preserved or Enhanced by REPI through FY 2022[5]



Source: FY 2022 REPI Proposals from the Military Services

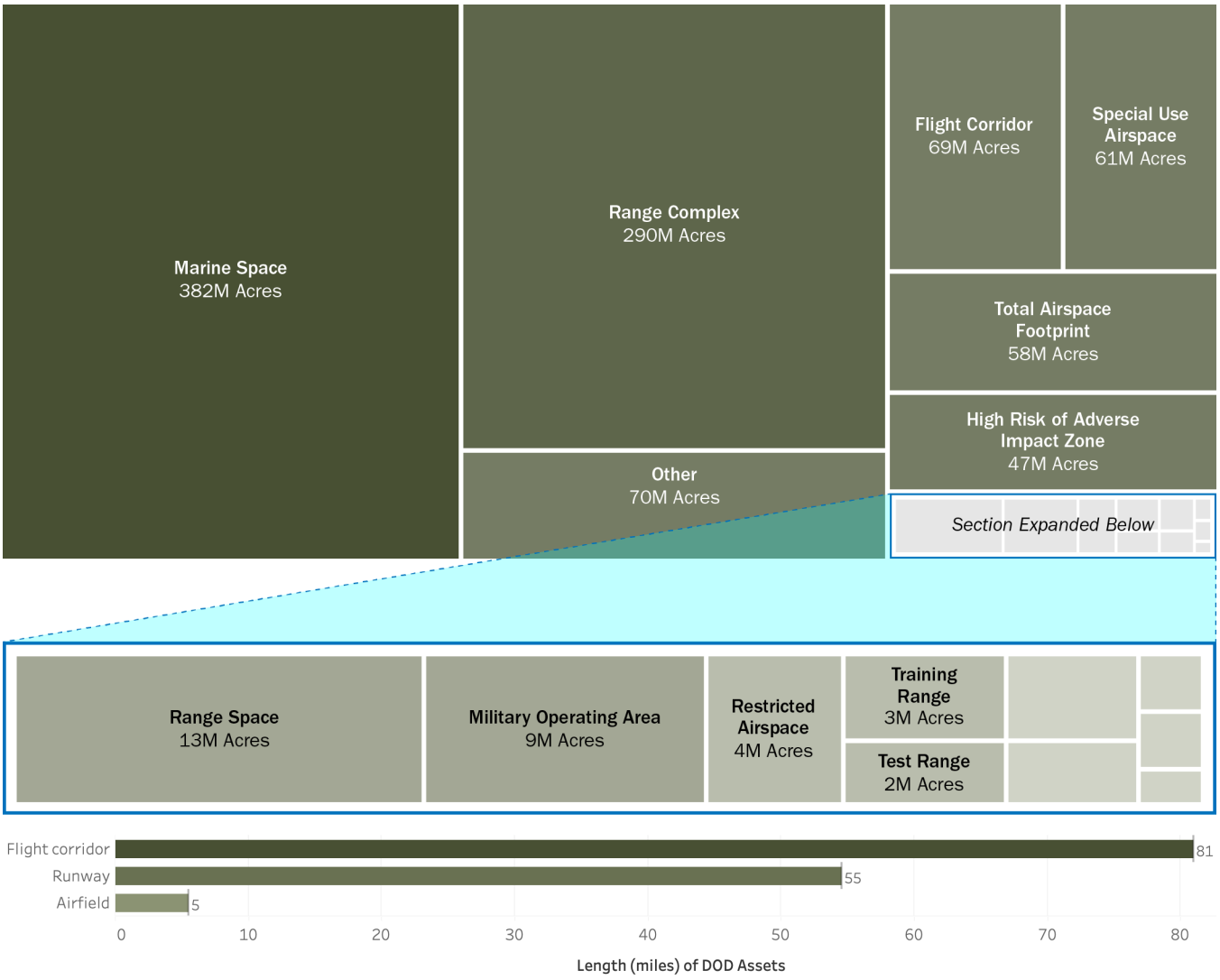
multiple mission capabilities, as reflected in the inset in Figure 6. Including the WSMR acreage, the top four mission capabilities the REPI Program preserved in FY 2022 were flight operations (fixed-wing and rotary-wing flight training), unmanned aircraft systems, radar and navigation, and testing.

The preservation of installation mission capabilities and the annual usage and throughput of those preserved capabilities are critical to preparing Service members and their equipment for combat. Aggregated statistics on annual usage or throughput of mission capabilities that REPI projects seek to preserve or enhance are depicted in **Figure 7**.

In support of the vital mission capabilities outlined above, proposed REPI projects in FY 2022 seek to shield almost 553 million acres of total training, testing, and operating land within the boundary or control of the installations, as shown in **Figure 8**, which includes military areas on land, in the air, and across the water. Through the REPI Program, installations are preserving and enhancing their largest assets—including more than 380 million acres of marine space, 290 million acres of range complexes, and 58 million acres of total airspace footprint—in addition to protecting smaller assets such as 2 million acres of test ranges and nearly 60 miles of runways. Unimpeded operation of these assets is essential to realistic testing and training operations. With realistic testing and training ensured, DOD can increase warfighting lethality.

[5] Projects may not provide usage and throughput data as part of their REPI proposals. These totals reflect usage and throughput data reported in the FY 2022 REPI proposals and should not be interpreted as comprehensive statistics for the entirety of REPI projects nationwide. Usage and throughput data from installations that did not submit an FY 2022 proposal are not included.

Figure 8 Area (Acres) and Length (Miles) of DOD Assets that Proposals Seek to Preserve or Enhance in FY 2022[6]



Source: FY 2022 REPI Proposals from the Military Services

[6] These totals reflect asset capacities reported in the FY 2022 REPI proposals and should not be interpreted as comprehensive statistics for the entirety of REPI projects nationwide. Assets at installations that did not submit an FY 2022 proposal are not included. Submissions using linear units (e.g., miles) to describe traditionally multi-dimensional assets (e.g., range complex) or using multi-dimensional units (e.g., acres) to describe traditionally linear assets (e.g., runway) are not included. Feet and nautical miles were converted to miles—then, square miles, square nautical miles, and square feet were converted to acres. Not all items are depicted to scale.

CASE STUDY

White Sands Missile Range

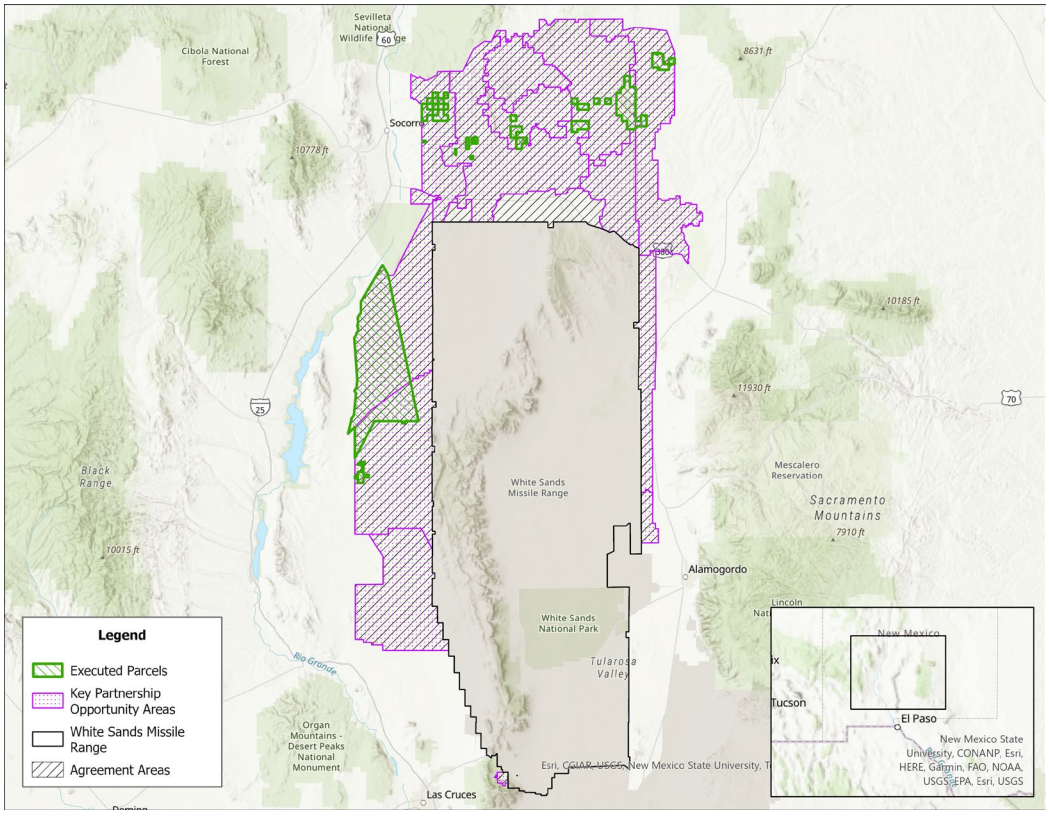
Overview

WSMR is the largest fully instrumented open-air range and includes invaluable airspace for DOD and its partners. WSMR's large expanse allows for unique simulation of nuclear and chemical situations that may not be possible at other facilities, and its restricted airspace is critical in providing testing and evaluation capabilities for longer distances. However, increased pressure from commercial development surrounding the range could compromise critically important training and testing operations.

Encroachment Risks

WSMR is vulnerable to transmission lines and wind energy development bordering the installation's boundary. WSMR hosts 100 percent of the military's remote pilot aircraft training, 70 percent of F-22 and F-16 pilot training, and nearly all of the training for nearby Holloman Air Force Base (AFB). Tall vertical structures and urban development may constrain installation capabilities to perform adequate aircraft testing, present risks to low-flying missile operations, and affect the use and choice of radar locations. WSMR is also susceptible to the conversion of compatible land use along the installation's borders that could lead to impacts caused by noise, air quality degradation, and dust. Projected population growth and recent land sales indicate that the likelihood of these issues is only increasing with time. Encroachment compromises invaluable airspace for the DOD and its partners, potentially limiting long-range weapons testing and training operations for F-22 and F-16 pilots. Preserving the lands near and adjacent to WSMR is critical to maintaining autonomous drone systems; long-range precision firing capability; future directed energy buffering; and missile, hypersonic, and other critical weapon modernization testing.

Map 1 WSMR Installation Map and REPI Partnership Areas[7]



[7] Agreement Areas include the total geographic area in which an installation and its partners are authorized to execute funding pursuant to a cooperative agreement, encroachment protection agreement, or other real property agreement under the relevant authority leveraged for the project. Key partnership opportunity areas contain the installation's priority geography, as determined by the installation and Military Service planning process.

REPI Solution

WSMR has partnered with local stakeholders to purchase easements bordering the installation to mitigate encroachment. Purchasing easements has allowed military training to continue and has benefited local ranching communities vulnerable to development. These efforts help prevent development to preserve the installation's critical mission capabilities and preserve habitat for several wildlife populations in the area.

Through the FY 2021 REPI Challenge, WSMR received $5 million in REPI funds to protect over 300,000 acres surrounding the installation, making it the largest acreage acquisition in REPI and Army Compatible Use Buffer Program history. This includes an easement that added 315,709 acres to the WSMR Western Call Up Area, a fully instrumented open-air range that is critical to DOD's testing mission. The easement was completed in FY 2022 as reflected in the acreage in Figure 5 and Figure 6. By conserving this easement, the REPI Program has helped protect over 360,000 acres surrounding the installation since the program's inception. WSMR's partnerships with local stakeholders have generated benefits that extend far beyond military readiness as the installation is a leader in archeological preservation and an ally supporting the surrounding area's wildlife, economic, and recreational interests.

Partners

- Bureau of Land Management
- Compatible Lands Foundation
- U.S. Department of Agriculture—Natural Resources Conservation Service
- New Mexico Land Conservancy
- New Mexico Military Base Planning Commission
- New Mexico State Lands Office
- Socorro Agricultural Land Trust
- The Nature Conservancy

Return on Investment

To date, WSMR has leveraged **$19 million** in DOD funding with over **$20 million** in partner contributions to permanently prevent development and enhance installation resilience on over **360,000 acres** surrounding the installation. This REPI investment has helped to preserve or enhance nearly **$6.2 billion** in critical assets and mission capabilities including:

- Installation infrastructure (valued at **$2.5 billion**)
- Real estate value of the Western Call Up Area protected by REPI (estimated at **$202 million**)
- Real estate value of the Northern Call Up Area protected by REPI (estimated at **$286 million**)

Upon completion, WSMR's REPI project will promote compatible land use that preserves its critical hypersonic and long-range missions, low altitude training flights, and ballistic missile intercepts. The REPI project will promote responsible water management in high drought areas and minimize soil erosion to keep grasslands viable for grazing. These efforts will reduce potential impacts to the installation's groundwater resources while preserving the surrounding working lands for local ranchers.

4 REPI INVESTS IN DOD PRIORITIES

The 2022 National Defense Strategy identified several goals to strengthen deterrence, promote global security, and build enduring advantages for the future U.S. Joint Force. While the guidance is an overarching document that reaches far beyond the responsibilities of DOD and the REPI Program, there are two key goals that the REPI Program directly addresses and positively impacts: reducing the threats posed by climate change and strengthening the United States' position in the Pacific region.

CLIMATE CHANGE, RESILIENCE, AND THE REPI PROGRAM

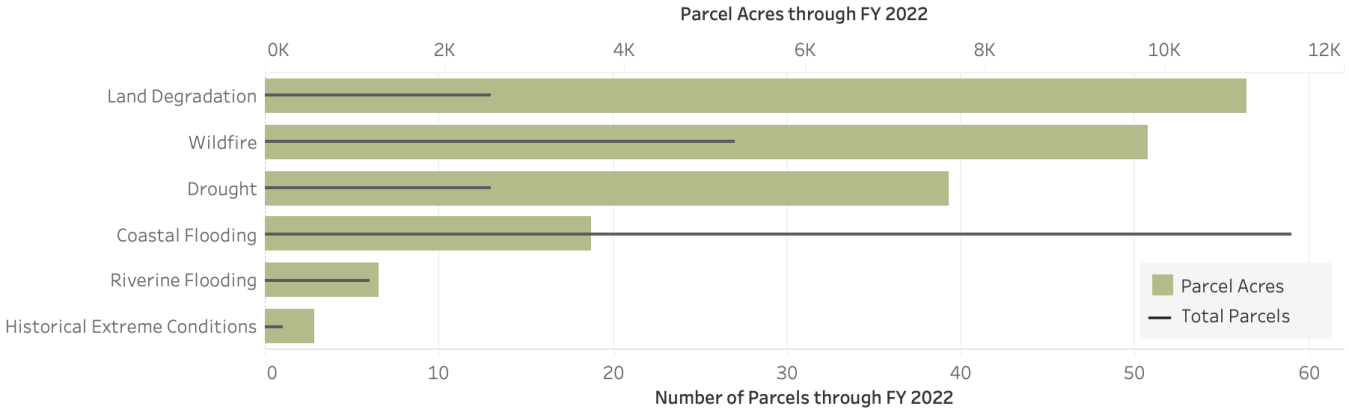
For nearly a decade, DOD has emphasized that climate change is a critical threat to national security, through the degradation of installation lands and infrastructure. In October 2021, as required by Executive Order 14008, the White House released Climate Adaptation Plans from all federal agencies, including DOD. The DOD Climate Adaptation Plan details the Department's posture on the impact of climate change—specifically, its impact as a critical national security issue for the warfighting mission. The plan also emphasizes the role of adaptation and resilience efforts to reduce risks from the threat of climate change to national defense.

The REPI Program plays a significant role in addressing and implementing plans to address climate change impacts to DOD installations and ranges by exercising the 16 U.S.C. § 670c-1 "Sikes Act" authority, the 10 U.S.C. § 2679 Intergovernmental Support Agreement authority, and the expanded authority under 10 U.S.C. § 2684a. Congress amended 10 U.S.C. § 2684a in FY 2019 and FY 2021 authorizing REPI projects to engage in activities to plan, prepare for, and recover from unanticipated changes in environmental conditions or extreme weather events. Environmental conditions threatening DOD missions include, but are not limited to, coastal and riverine flooding, wildfire, drought, and extreme weather events such as hurricanes or tropical storms. The REPI Program has the capacity to fund off-base nature-based solutions to effectively address climate impacts near installations and ranges to preserve DOD's mission. As this section details, the REPI Program has begun building a pipeline of resilience projects across the United States and its territories since the statute was amended in FY 2019.

Beginning in FY 2022, the REPI Program added the following seven climate threat categories to the available list of encroachment risks that an installation can report as a restriction to mission activities: coastal and riverine flooding, drought, wildfire, heat, historical extreme conditions, and land degradation. The expanded categories are recorded at the parcel level, including proposed acreage alongside parcel expenditures for each climate category. These parcels were protected through the REPI Program to preserve compatible land use and conserve critical habitat; however, the proposals indicated climate threats as a restriction to military activity.

Figure 9 illustrates the reported acreage and number of parcels proposed to preserve mission activities that are impacted by climate threats. When measured by acreage, the top climate threat identified in REPI Proposals was land degradation, which is defined as the deterioration or loss of the productive capacity

Figure 9 Acreage and Number of Parcels Impacted by Climate Threats Identified in REPI Proposals through FY 2022[8]



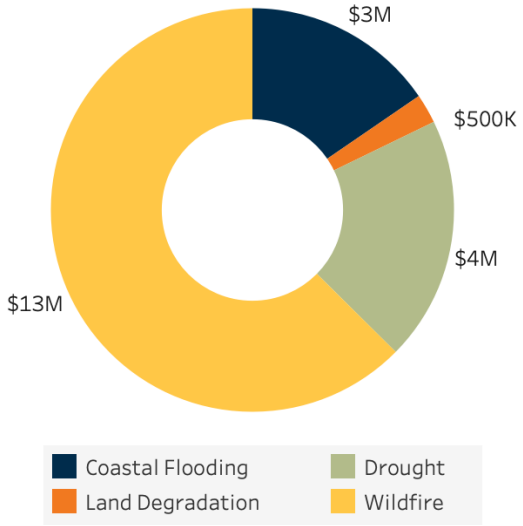
Source: REPI Proposals from the Military Services through FY 2022

of soils presently or in the future. Nearly 15 parcels totaling 11,000 acres identified land degradation as a climate threat. Wildfire and drought represented the second and third highest, with nearly 9,500 and 7,000 acres proposed, respectively. While coastal flooding represents the fourth-highest ranked climate threat measured by acres preserved, it is the highest ranked threat when measured by number of parcels—with 60 proposed parcels exposed to the hazard in FY 2022. The higher parcel count and lower acreage for coastal flooding impacts, as compared to the other climate threat categories, suggests that, while coastal flooding is the most common threat, it is often experienced on a smaller geographic scale. Additionally, coastal parcels are typically more expensive than inland parcels, so there is less funding per acre available to preserve or enhance parcels along coastlines than for inland parcels.

Building upon the climate threat data referenced above, in FY 2022 REPI projects expended $17 million in REPI funding to preserve lands with active climate threats. **Figure 10** displays REPI expenditures by the specific climate hazards threatening those preserved parcels. Similar to the data in Figure 1 and Figure 9, a single parcel can face multiple climate threats, and, in this case, expenditures are displayed in all associated categories. In FY 2022, expenditures to preserve lands facing drought and wildfire threats were the greatest. Over $13 million was expended toward land experiencing wildfire threats, including nearly $2 million expended at Avon Park Air Force Range (AFR) and over $4 million to projects experiencing drought threats, including roughly $2 million expended at Camp Roberts.

In addition to the preservation and improvement of lands that experience climate threats, the development of REPI projects to specifically and primarily target the climate threats mentioned above has steadily grown since FY 2019. In FY 2022, the number of proposed REPI projects with installation resilience cited as a primary parcel justification tripled, growing from three projects in FY 2021 to nine, as illustrated in **Figure 11**.

Figure 10 DOD Expenditures Toward Parcels Impacted by Climate Threats through FY 2022[8]



Source: REPI Proposal and Execution Data Submitted by the Military Services through FY 2022

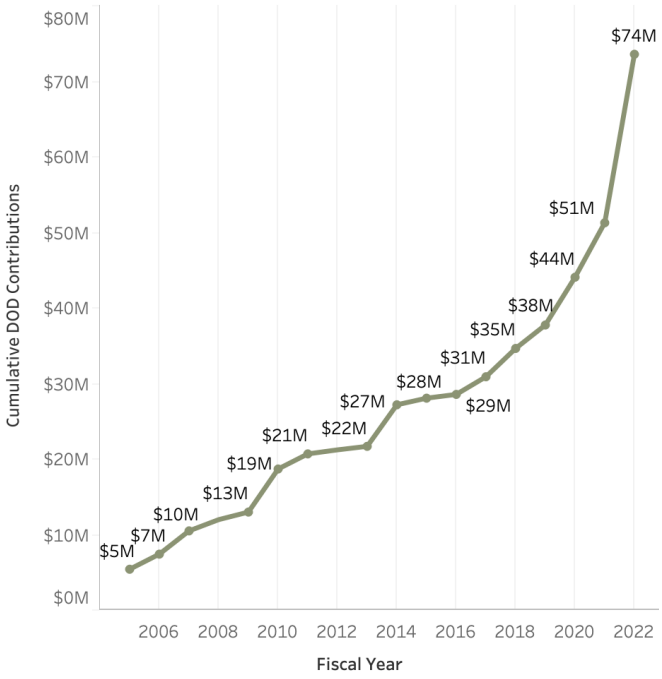
[8] Projects may select multiple encroachment risks. Projects that reported more than one encroachment risk are included in all categories selected. Installations that did not submit an FY 2022 proposal are not included. These totals do not reflect the severity of the threat, nor do they include encroachment pressures mitigated by other means. For underlying data by Military Service, see Table B1 in Appendix B.

Historically, proposed REPI resilience projects have come from the Navy and Air Force—however, in FY 2022, the Army and Marine Corps each funded a REPI resilience project. Since 2019, 14 REPI projects have received REPI Challenge funds for projects that promote installation resilience to climate change and extreme weather. Additional metrics on the REPI Challenge can be found in Section 4.

REPI'S INVESTMENTS IN THE PACIFIC REGION

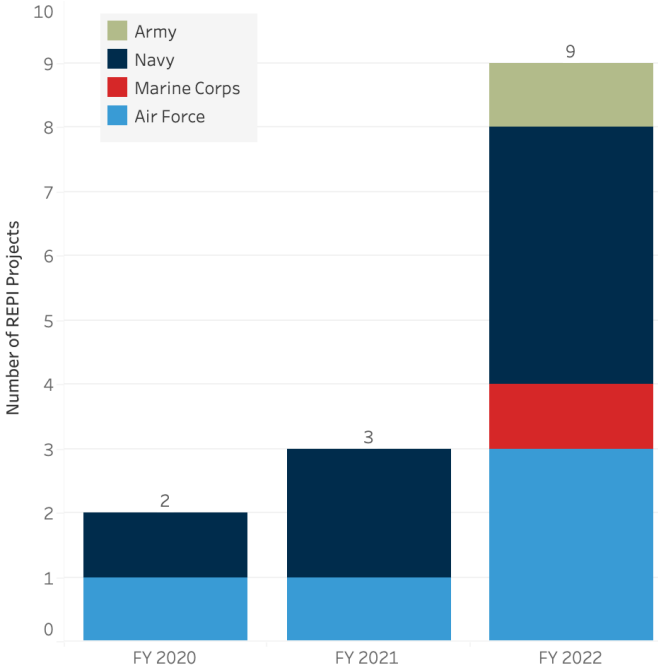
As stated in the 2022 National Defense Strategy, DOD is strengthening its presence in the Pacific region to deter aggression and prepare for success in conflict if necessary. The REPI Program has positioned itself as a key player in the conservation of natural and agricultural lands in the Pacific region to protect existing installations from varying forms of encroachment, prevent land degradation, and lessen the impacts from climate change.

Figure 12 DOD Contributions to Projects in the Pacific Region through FY 2022[10]



Source: REPI Obligation Data to the Military Services through FY 2022

Figure 11 REPI Proposals that Feature Installation Resilience as a Primary Justification through FY 2022[9]



Source: REPI Proposals from the Military Services through FY 2022

As of the end of FY 2022, the REPI Program has eight projects spread throughout Hawai'i, Alaska, and Guam at varying stages of completion. Projects in this region are not limited to a single focus but rather have several encroachment risks currently or potentially impacting the installations and neighboring communities. Of the eight Pacific projects, with some projects having more than one focus, five are focused on preserving natural and agricultural lands, five provide natural resource management, and two seek to support installation resilience. Many of the installations have leveraged 10 U.S.C. § 2684a to address these varying encroachment risks; however, installations have increasingly used the Sikes Act authority to expand species and natural resource preservation opportunities that help both DOD and the surrounding community. Since 2019, following the expansion of the 2684a authority to include installation resilience, DOD funding in the Pacific region has more than doubled. As seen in **Figure 12**, nearly $74 million has been committed in DOD funding to support annual REPI and REPI Challenge projects in the Pacific region.

[9] Does not include REPI Challenge projects. These proposals viewed climate change adaptation and resilience as the primary focus of the project. REPI projects may have other primary justifications for the proposed conservation and protection but can have clear secondary benefits in support of installation resilience and climate change adaptation.

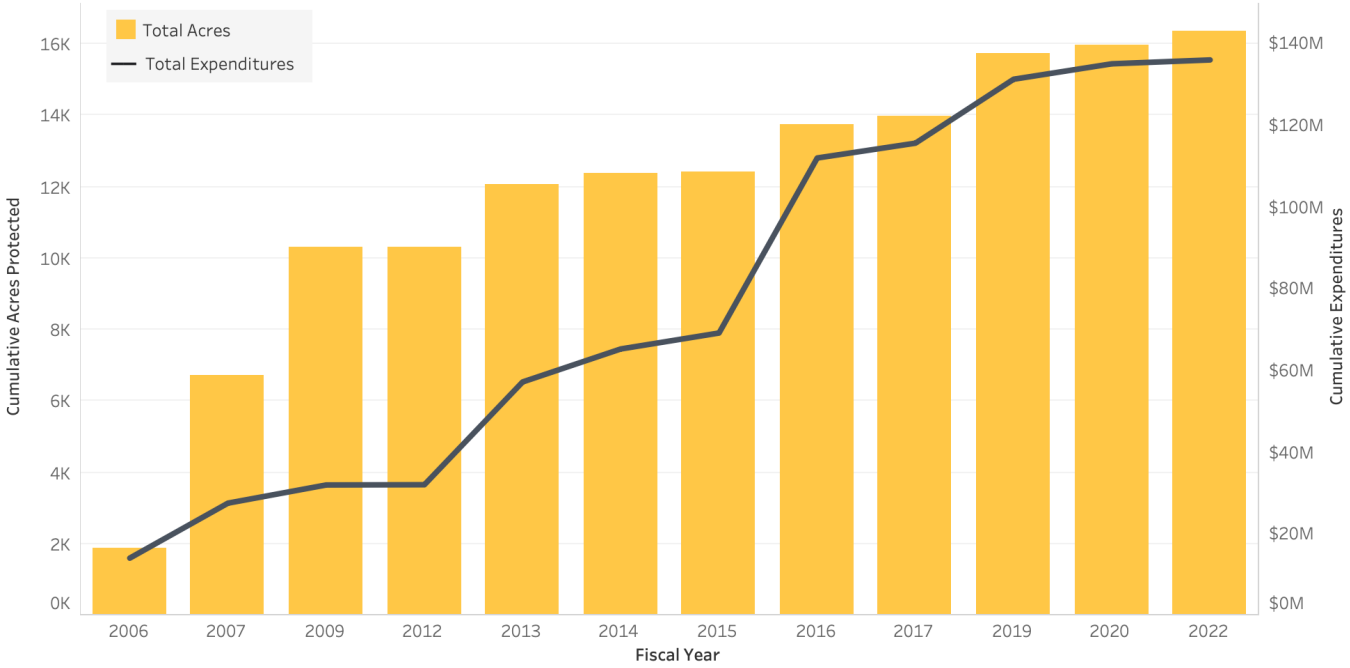
[10] Data is current as of the end of FY 2022, as reported in the 2023 REPI Report to Congress. For underlying data by Military Service, see Table B2 in Appendix B.

Installations in the Pacific region are highly unique; installations on the islands of Hawai'i and Guam both have limited land available for habitat and cultural preservation to ensure military operations are compatible with community priorities. Installations in the Pacific region require years of planning and partnership building to make progress to reduce risks to the military mission and surrounding communities. Transparent coordination to achieve both mission assurance and safeguard vital local heritage and culture is essential to the REPI Program efforts in the Pacific.

The significant time and financial requirements are compounded by the fact that half of the proposed REPI lands may convert to incompatible use within two years. Installations in the Pacific region must work rapidly to protect lands where surrounding development is expected within two years while also working diligently to plan for species and climate change impacts within five years. As seen in **Figure 13**, installations in the Pacific region have expended nearly $137 million in annual REPI and partner funding to protect 16,363 acres from FY 2005 through FY 2022. These REPI projects also include a 76-percent partner cost share equating to nearly $104 million in DOD cost savings to preserve these valuable installations in the critical region.

To date, four installations have established REPI projects in Hawai'i, all of which face various encroachment risks related to noise, ESA regulations, cultural resources, wildfires, and water resources. Installations in Hawai'i have protected over 15,000 acres of land though the REPI Program since 2006, successfully reducing encroachment impacts that threaten key mission capabilities. Based on submissions by the eight bases in the Pacific region, there is an estimated $38 billion in DOD assets that the REPI Program preserves. Some of the tangible assets in this region include an automated multi-purpose training range at Joint Base Elmendorf-Richardson in Alaska valued at $22 million; a collection of ammunition storage locations, ranges, runways, and wharves valued at $138 million in Guam; and the Aegis Ashore Missile Defense Test Complex at Pacific Missile Range Facility (PMRF) Barking Sands in Hawai'i with an estimated value of $59 million. This is just a sampling of the critical assets at DOD installations in the Pacific region. It is also important to note that the total estimated value of these assets does not include their invaluable strategic location, which significantly underrepresents the actual value of these installations to DOD's overall mission.

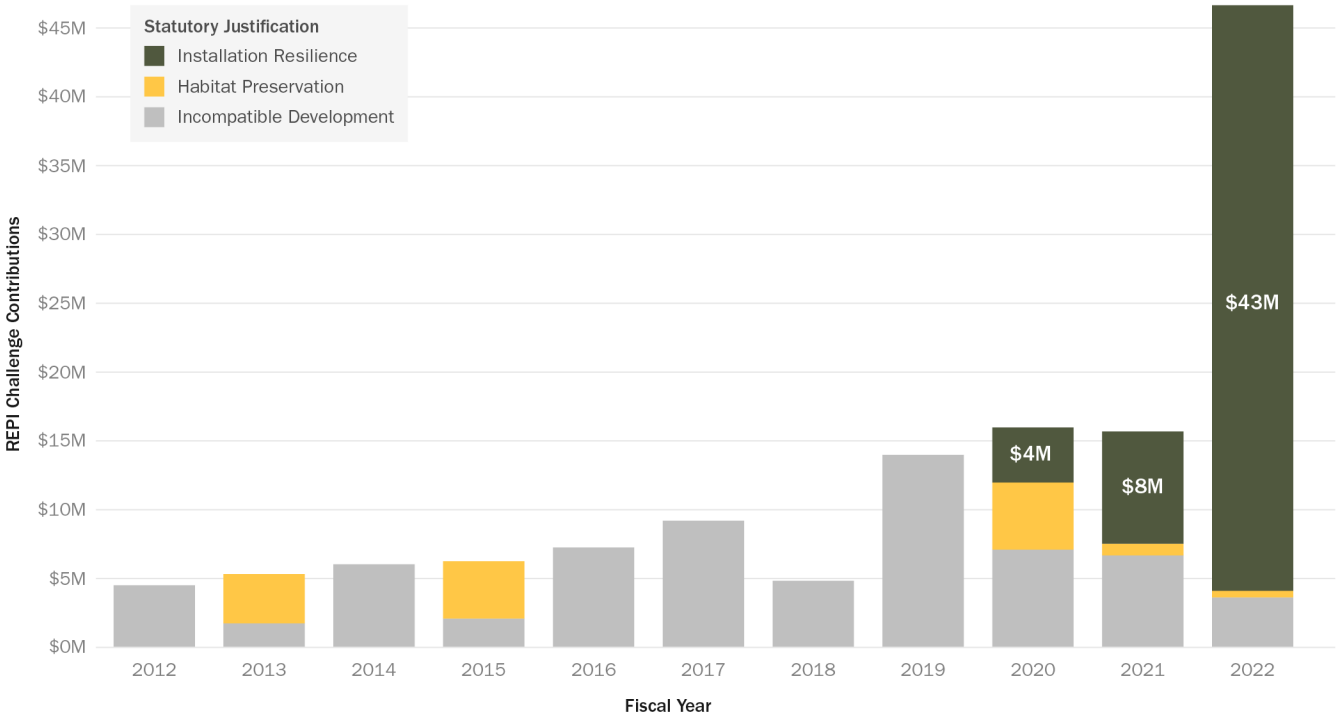
Figure 13 REPI Project Expenditures and Acres Preserved in the Pacific Region through FY 2022[11]



Source: Execution Data Submitted by the Military Services in the REPI Database through FY 2022

[11] Data is current as of the end of FY 2022, as reported in the 2023 REPI Report to Congress. For underlying data by Military Service, see Table B2 in Appendix B.

Figure 14 REPI Challenge Contributions by Statutory Justification through FY 2022[12]



Source: REPI Challenge Obligation Data to the Military Services through FY 2022

REPI CHALLENGE: A LEVER TO SUPPORT PRIORITY MISSIONS AND LOCATIONS

In 2012, the REPI Program began funding projects through the REPI Challenge, an annual competition that aims to cultivate partner-driven projects to support the REPI Program in meeting its ambitious conservation goals. By harnessing the creativity of organizations with shared priorities to access unconventional funding sources and leverage market-based approaches to access and leverage unconventional sources of funding, REPI Challenge projects achieve benefits not obtainable by annual REPI projects. These projects are typically able to conserve land at a greater scale and test innovative ways to finance land preservation. Since 2012 and through FY 2022, the REPI Program has provided almost $135 million in REPI funds for Challenge projects, matched by nearly $395 million in partner funding.

The REPI Challenge and Installation Resilience

As **Figure 14** demonstrates, projects seeking REPI Challenge funding have historically focused on habitat protection or preserving compatible land use. Since the REPI Challenge began funding installation resilience projects in FY 2020, it has contributed nearly $54 million in REPI funds to support military resilience, comprising roughly 40 percent of REPI Challenge funding since its inception. Consistent with other climate change and resilience projects, REPI Challenge projects have drawn partner contributions and cost-share rates exceeding the 58-percent partner cost-share rate typically seen in the REPI Program. Total contributions for installation resilience Challenge projects have totaled nearly $200 million since FY 2020, with a non-Military Service partner cost share of 64 percent. In total, these resilience projects seek to protect roughly 318,000 acres across installations of strategic importance.

The REPI Challenge in the Pacific Region

REPI Challenge projects in the Pacific region address various climate threats, leveraging both REPI and partner funds to implement innovative nature-based solutions on natural and agricultural lands. In FY 2022, several installations of strategic importance in the Pacific region leveraged REPI Challenge funding to support mission priorities, including JBPHH, PMRF Barking Sands, and U.S. Army Garrison Hawai‘i. These three Hawai‘i projects comprised 25 percent of the projects selected for FY 2022 REPI Challenge funding and made up nearly 42

[12] Data is current as of the end of FY 2022, as reported in the 2023 REPI Report to Congress. For underlying data by Military Service, see Table B2 in Appendix B.

percent, over $19 million, of the committed funding in the FY 2022 funding cycle. REPI Challenge projects in Hawai‘i address the following risks to the military mission and surrounding community:

- The U.S. Army Garrison Hawai‘i project at Pōhakuloa Training Area uses REPI Challenge funding to reduce wildfire risk by implementing wildfire management tools, such as fuel and fire breaks and road improvements. This project will promote installation resilience to increasing drought risks and reduce the severe disruptions to military training, damage to property and critical ecosystems, and safety concerns for DOD personnel caused by wildfires.
- The PMRF Barking Sands Challenge project uses nature-based solutions, including creating open floodable space, to reduce the effects of sea level rise and improve the quality of water discharged from the agricultural drainage ditches into the nearshore environment. With a 72-percent partner cost-share, this project will also enhance PMRF Barking Sands' efforts to promote conservation and preserve natural resources while making mission capabilities more resilient to climate change and extreme weather events.
- The REPI Challenge project at JBPHH provides long-term preservation of 7,155 acres of forested lands directly above the installation, improving and replenishing the water supply vital to the military mission at JBPHH and its neighboring residential communities. This project will also improve water quality to ensure safe operations and training conditions for Navy personnel and ship movements. The case study below examines the impact of the REPI Challenge project at JBPHH.

CASE STUDY

Joint Base Pearl Harbor-Hickam

Overview

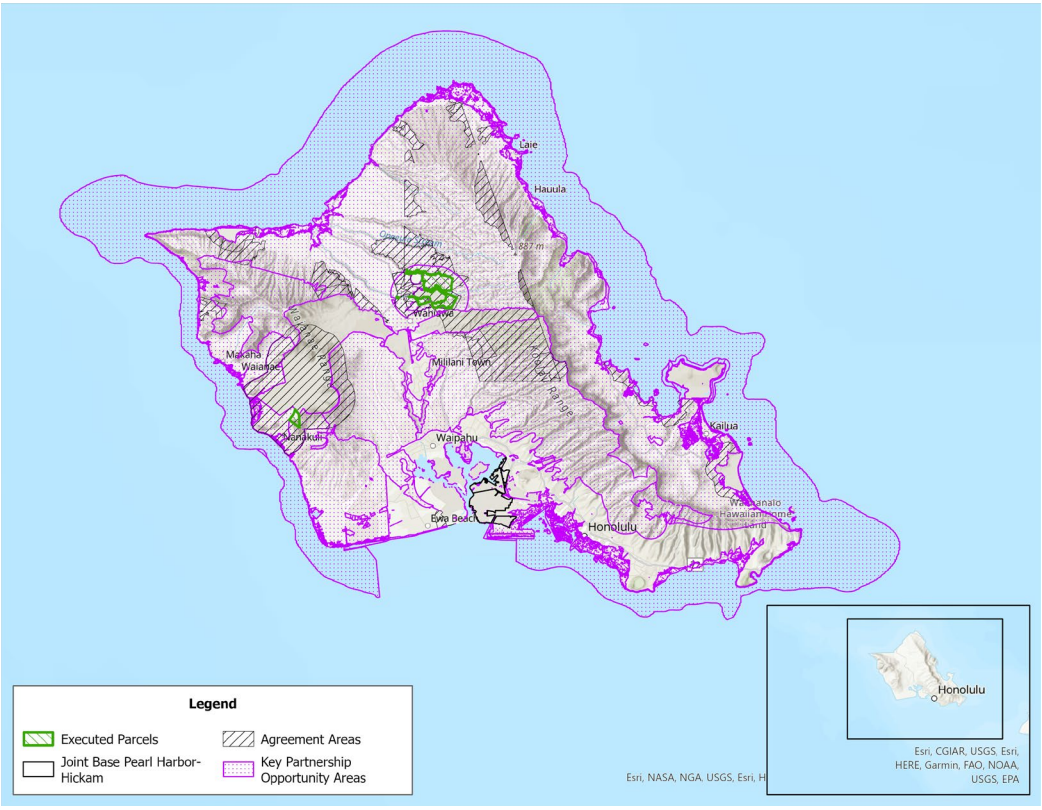
JBPHH is a strategic point of support for military activities in the Pacific including ship, submarine, and Navy Special Warfare Command operations and training. JBPHH and its associated shore facilities support ship and submarine navigation, training, berthing, maintenance and repair, munitions, and Navy Special Warfare Command operations. The installation's Wahiawā Annex is one of several annexes and serves as a communication hub for the Navy and DOD in the Pacific. Development of natural and agricultural lands obstructs communication infrastructure surrounding the Wahiawā Annex. Additionally, climate change and invasive species threaten native forests that replenish the Pearl Harbor aquifer. REPI projects at JBPHH aim to promote compatible development across surrounding lands, preserve upland native forests north of the installation, bolster water security and water quality, and ensure future training and vessel movements within Pearl Harbor.

Encroachment Risks

JBPHH's Wahiawā Annex provides satellite-based, telephone and data communication services from antennas on the island of O'ahu, directly supporting warfighter and other government missions globally. Accelerating development and tall obstructions on nearby lands impacts the Navy's training mission, where even partial obstructions compromise the quality and efficiency of transmitting and receiving large volumes of voice and data communications.

Threats from climate change and invasive species degrades native forests, exacerbates storm water runoff, and impacts the natural functions of the forest to replenish the Pearl Harbor Aquifer, which is a vital water supply for Navy personnel at JBPHH and much of the island's population. Additionally, native forests provide a buffer from significant storm events that cause erosion and flooding. If native forests are not safeguarded, water quality and quantity are at risk, directly impacting installation operations and mission.

Map 2 JBPHH Installation Map and REPI Partnership Areas



REPI Solution

Since 2014, the REPI Program has helped protect 2,175 acres surrounding the installation. The Navy works with the Trust for Public Land to protect surrounding land from development by limiting building heights, creating a security buffer for the Navy, and transitioning land to the State of Hawai'i for agricultural production. These efforts bolster state plans to jump-start farming for agribusiness on O'ahu as part of an overarching goal focused on food security and productive, non-tourism based economic development. The JBPHH project enhances long-term sustainability of drinking water sources by increasing effective groundwater capture, demonstrating the Navy's continued commitment to ensuring adequate and clean water for JBPHH and much of O'ahu's residents. This REPI project provides the additional benefit of maintaining undeveloped lands underneath an overflight area for operations from the nearby Wheeler Army Airfield, multiplying its value to DOD and the entire region.

JBPHH received $15 million in REPI funds through the FY 2022 REPI Challenge to expand watershed preservation of 7,155 acres of forested lands directly north of the installation. The installation and partners are implementing erosion control measures to reduce the volume of runoff into Pearl Harbor, enhancing habitat for several threatened and endangered species. Other protection methods include constructing fences around native forests to deter large-hooved mammals from the area; managing areas with native plant species; outplanting native species; and monitoring, controlling, and removing invasive plant and animal species. This project increases and improves both the water quality and supply vital to the mission capabilities and resilience of JBPHH.

Partners

- City of Honolulu
- County of Honolulu
- MA'O Organic Farms
- State of Hawai'i Agribusiness Development Corporation
- State of Hawai'i Department of Land and Natural Resources
- State of Hawai'i Division of Forestry and Wildlife
- The Trust for Public Land

Return on Investment

To date, JBPHH has expended over **$6 million** in DOD funding with nearly **$16 million** in partner contributions to prevent neighboring development and enhance installation resilience on almost **2,200 acres** surrounding the installation. REPI funding has helped to preserve or enhance over **$1 billion** in critical assets and mission capabilities including:

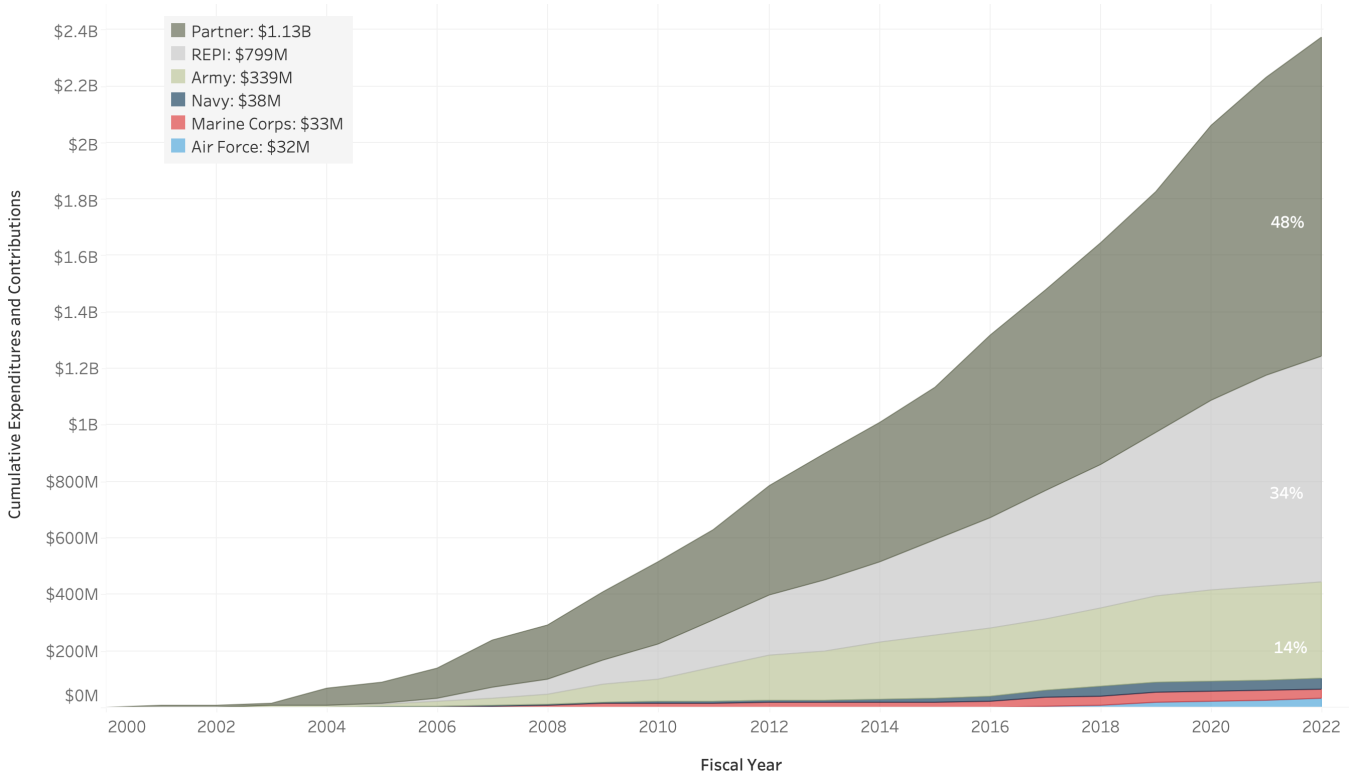
- Future modernization plans for next generation Constellation (**$200 million**)
- Recent DOD investments in new construction, roadway infrastructure, and existing facility modernization at Wahiawā Annex to increase mission capabilities and sustain reliable operations into the future (**$845 million**)

Upon completion of its REPI Project, JBPHH will preserve compatible land use to incur no physical obstructions or electromagnetic interference to antennas, regulate non-military use and access along Navy roads, and protect land in its natural state from development, particularly in agricultural areas near outlying annexes which are at risk of development. The JBPHH REPI Project will also preserve and maintain native forests and improve erosion and sediment control in off-installation lands and upland watersheds which will improve the water recharge rate of the Pearl Harbor Aquifer, the water quality, and bolster the water security of the installation and surrounding community.

5 DOD'S FINANCIAL RETURN ON THE REPI PROGRAM'S EFFORTS

REPI partnership agreements have drawn partner funding that almost doubles the investments made by DOD. Since the REPI Program's creation in 2002, partners have invested over $1.13 billion in REPI projects to match the $1.24 billion invested by DOD, bringing total investments in REPI projects to over $2.37 billion, as seen in **Figure 15**. The Military Services continue to provide funding toward projects, but at a rate lower than the REPI Program. The REPI Program has provided $799 million to projects compared to $442 million from the Military Services, the majority of which the Army has provided. In FY 2022, REPI partners surpassed $1 billion in cumulative expenditures on REPI projects since the program's inception, demonstrating continued and growing support that amplifies the REPI Program's impact and value to DOD.

Figure 15 Cumulative DOD Expenditures and Partner Contributions through FY 2022[13]



Source: Execution Data Submitted by the Military Services in the REPI Database through FY 2022

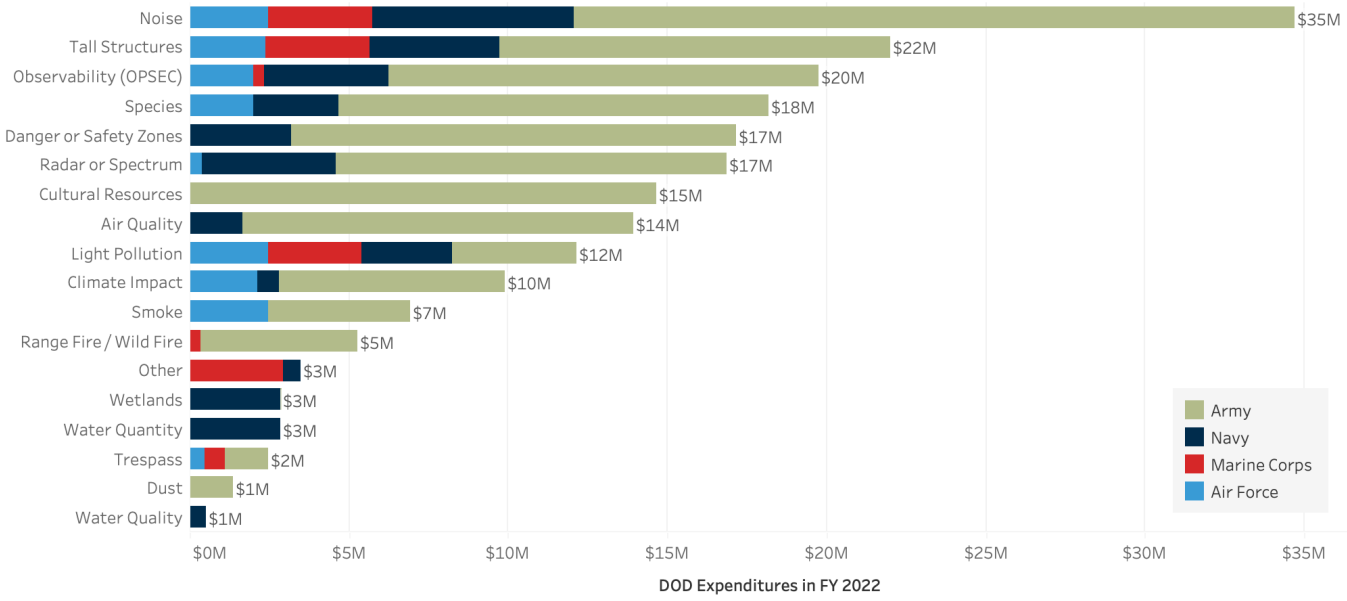
[13] Includes reported land protection efforts prior to 2003. For underlying data by Military Service, see Table B4 in Appendix B.

DOD strategically spends REPI funds to address the most prevalent encroachment risks, which have historically included noise, species, observability, and tall structures. **Figure 16** displays REPI expenditures by the encroachment risks they address. It is important to note that a single parcel expenditure can address multiple encroachment risks; those expenditures are displayed in all associated categories. Noise, tall structures, observability (OPSEC), and species impacts presented the most common encroachment risks REPI funds prevented or mitigated over the past year. This included protecting parcels from tall structures, radar, or spectrum threats at Naval Air Station (NAS) Patuxent River and Townsend Bombing Range. Expenditures addressing tall structures, OPSEC, and species totaled between $18 and $22 million each. Unsurprisingly, DOD spent the greatest amount, $35 million, to address noise-related encroachment issues in FY 2022, including but not limited to parcels at Beale AFB, Camp Blanding, Fort Harrison, Marine Corps Air Station (MCAS) Cherry Point, Marine Corps Base (MCB) Hawai'i, Naval Base (NB) Coronado, and WSMR. The ability to address multiple encroachment restrictions with REPI funding underscores the secondary benefits that REPI provides to installations and the surrounding communities.

Notably, climate impacts moved from the lowest threat expended toward in FY 2021 to the tenth highest encroachment risk expended toward in FY 2022. These expenditures protected lands impacted by wildfire, drought, coastal flooding, and land degradation (see Figure 10 for more information). The overall increase in funding to address climate impacts is partly due to the recent amendments to 10 U.S.C. § 2684a that expanded the types of projects REPI investments can support. The funding increase also speaks to the recognition of the growing threat climate change poses to DOD mission capabilities.

Investments made through the REPI Program are critical in sustaining valuable DOD assets and capabilities, with many identified as high priority for national security and policy. Unrestricted access to and use of training, testing, and operations across DOD installations maintains a lethal Joint Force capable of protecting the American people and preserving the nation's vital interests. **Figure 17** organizes these capabilities by value, presenting the array of assets and capabilities that REPI efforts protect from encroachment. Overall, installations have reported almost $675 billion in assets and capabilities that have benefited from the REPI Program's protection through FY 2022, including $54 billion more in asset capabilities compared to last year.

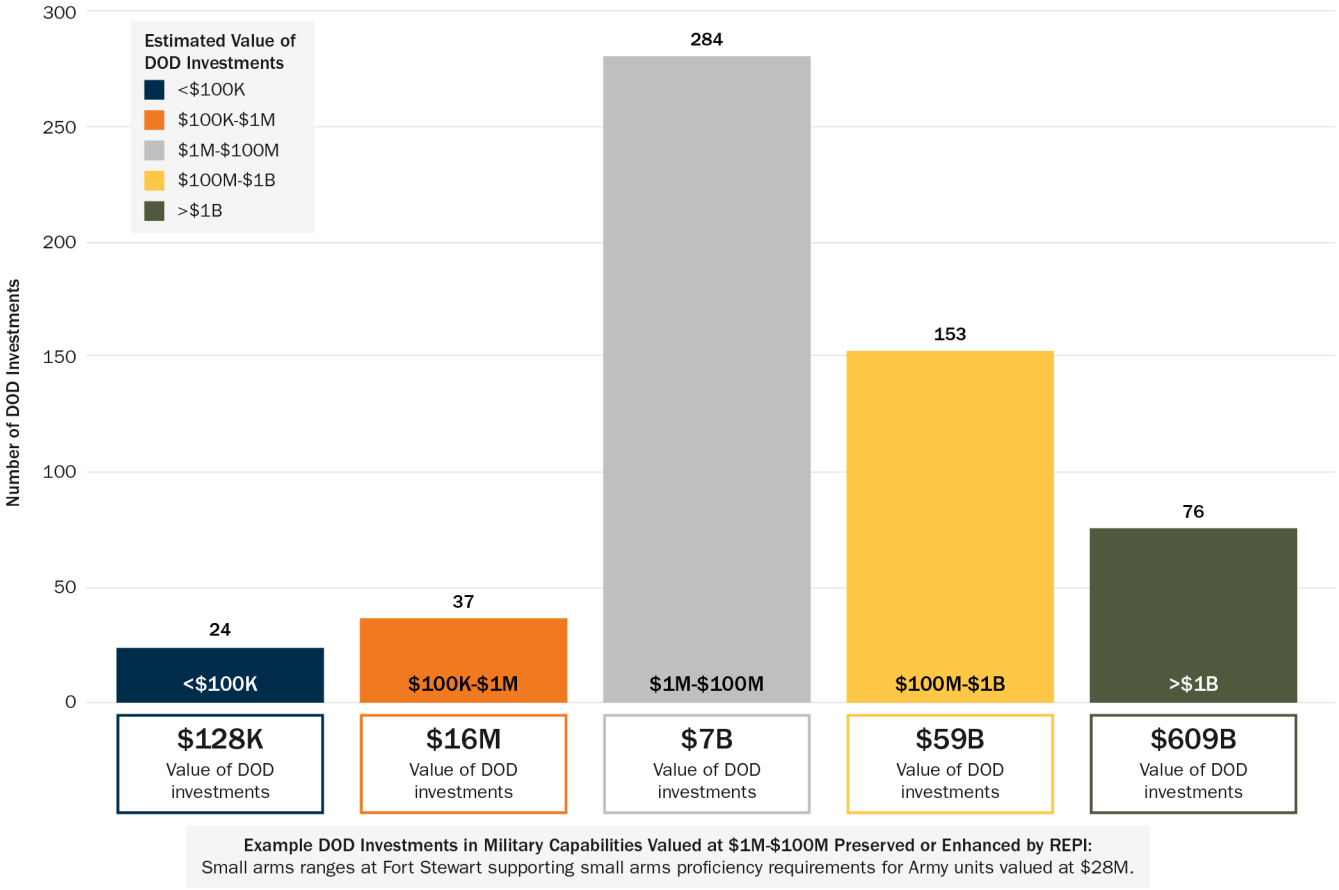
Figure 16 DOD Expenditures to Address Encroachment Risks in FY 2022[14]



Source: FY 2022 Execution Data Submitted by the Military Services in the REPI Database

[14] "DOD Expenditures" include REPI and Military Service expenditures. The Military Services may select multiple encroachment risks for each parcel that has expenditures. Expenditures are included in all encroachment categories displayed if the Military Services reported more than one for any given parcel. Excludes $15,555,846 spent on parcels in FY 2022 that do not have any corresponding encroachment risk data. Expenditure data is current as of the end of FY 2022. For underlying data by Military Service, see Table B5 in Appendix B.

Figure 17 Estimated Values of DOD Investments in Mission Capabilities Preserved or Enhanced by REPI through FY 2022[15]



Source: FY 2022 REPI Proposals and FY 2022 Execution Data Submitted by the Military Services

It is important to note that some projects submitted by installations provide estimates of the value of the entire installation, as REPI projects often support all missions at the installation. As with projected development timelines, the REPI Program is working with the Military Services to portray the protected parcels more accurately with the value of the assets they shield from encroachment. At this stage in reporting, the valuations submitted by the installations and validated by Service Headquarters remain as reported in their proposals. This includes approximately $335 million in infrastructure projects planned in support of the F-35 aircraft training mission at MCAS Beaufort; a $350 million state-of-the-art airfield, which includes a fielding of the Ground-Based Sense and Avoid radar system to support Gray Eagle unmanned aerial systems operations, at Fort Riley; and the 10 surface ships and 18 submarines homeported at JBPHH, valued at $1.96 billion. The REPI Program supports a wide variety of assets ranging from warfighting assets to natural infrastructure services that are critical in support of the National Defense Strategy.

As Figure 17 shows, REPI, Military Service, and partner contributions prevent and mitigate the impact of encroachment risks that can adversely affect billions of dollars of DOD capabilities and assets. Assets valued between $1 million and $100 million, a reasonable range of DOD's small value capabilities and assets, account for over $7 billion in capabilities preserved or enhanced by REPI. Therefore, the submitted value of existing installation infrastructure, real estate, MILCON projects, capital improvement projects, O&M costs, and natural resources that REPI projects partially or fully shielded from encroachment risks is significantly higher than DOD's investment of over $1.24 billion in REPI projects.

[15] Projects may not provide monetary values for mission capabilities as part of their REPI proposals. These examples reflect a small sample of mission capability value data reported in the FY 2022 REPI proposals and should not be interpreted as comprehensive statistics for the entirety of REPI projects nationwide.

CASE STUDY

Marine Corps Base Camp Lejeune

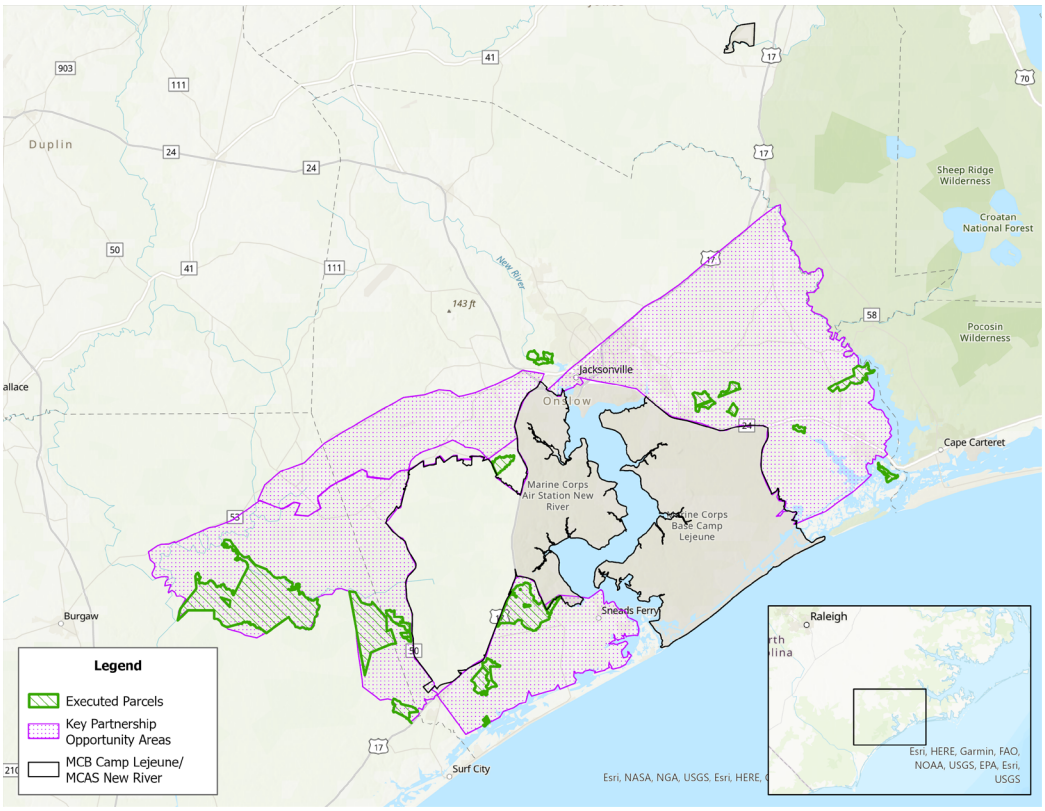
Overview

MCB Camp Lejeune is DOD's largest amphibious training facility, is home to the II Marine Expeditionary Force (II MEF), and is one of five key installations that anchors the Eastern North Carolina Sentinel Landscape. MCB Camp Lejeune comprises 156,000 acres along the Atlantic Ocean, including 98 maneuver areas, 34-gun positions, 50 tactical landing zones, a state-of-the-art urban terrain facility, 78 live-fire ranges, and 11 miles of beach capable of amphibious operations. The installation faces impacts from climate hazards such as wildfire and coastal flooding, conversion of compatible land use, and critical habitat destruction from population growth that adversely impacts the military mission. The REPI Program aims to safeguard the installation's invaluable training lands, ranges, and routes, while sustaining the North Carolina coastal plain and assisting red-cockaded woodpecker (RCW) recovery.

Encroachment Risks

MCB Camp Lejeune faces conversion of compatible land use that threatens installation training capabilities and reduces viable farmland, forestland, and natural areas. Residential and commercial infrastructure have rapidly replaced small farms and woodlots, creating species habitat-related training challenges for the installation. Development of natural and agricultural lands has decreased the size of longleaf pine habitats near the installation, leading to the RCW ESA listing. This has prompted a variety of environmental restrictions and workarounds for training at MCB Camp Lejeune. The installation is also vulnerable to coastal erosion, sea level rise, wildfire, and degradation of natural resources. These threats strain operations, infrastructure, and training missions, while simultaneously reducing habitat connectivity.

Map 3 MCB Camp Lejeune Installation Map and REPI Partnership Areas



REPI Solution

Since MCB Camp Lejeune has worked with a variety of partners within the Onslow Bight Conservation Forum to preserve land near the base and protect the RCW through the RCW Recovery and Sustainment Program (RASP). Since 2005, the REPI Program has protected nearly 20,000 acres on 18 parcels. The land preservation not only manages and preserves the longleaf pine ecosystem that supports the RCW, but also preserves on-installation live-fire and maneuver training and ensures the ability to conduct helicopter training and other activities that generate significant noise. The success of the RCW RASP program has allowed MCB Camp Lejeune to make a strategic shift in its project's desired end state, from establishing and preserving a natural habitat corridor for the RCW to focusing on military operational impacts within its mission footprint.

The Marine Corps has also implemented an innovative regional approach to preserving activities for all Marine Corps installations in eastern North Carolina by creating REPI's first multi-installation agreement. The agreement facilitates collective projects with state and non-profit partners at MCAS Cherry Point, MCAS New River, and MCB Camp Lejeune.

Partners

- Conservation Forestry
- NFWF
- North Carolina Clean Water Management Trust Fund
- North Carolina Coastal Land Trust
- North Carolina Division of Parks and Recreation
- North Carolina Natural Heritage Trust Fund
- Onslow County
- State of North Carolina
- The Conservation Forestry Partners
- The Conservation Fund
- The Nature Conservancy
- Tobacco Trust Fund
- U.S. Fish and Wildlife Service
- Working Lands Trust

Return on Investment

To date, MCB Camp Lejeune has leveraged **$33 million** in DOD funding with over **$10 million** in partner contributions to permanently promote compatible development, preserve longleaf pine habitat, and enhance installation resilience on nearly **20,000 acres** surrounding the installation. This REPI investment has helped to preserve or enhance at least **$81 million** in critical assets and mission capabilities including:

- Planned MILCON costs at Outlying Field Camp Davis South (**$14 million**)
- Capital improvements at a tactical vehicle maneuver course (**$40 million**)
- SR-10 Tank Range (plant replacement value estimated at **$12 million**)

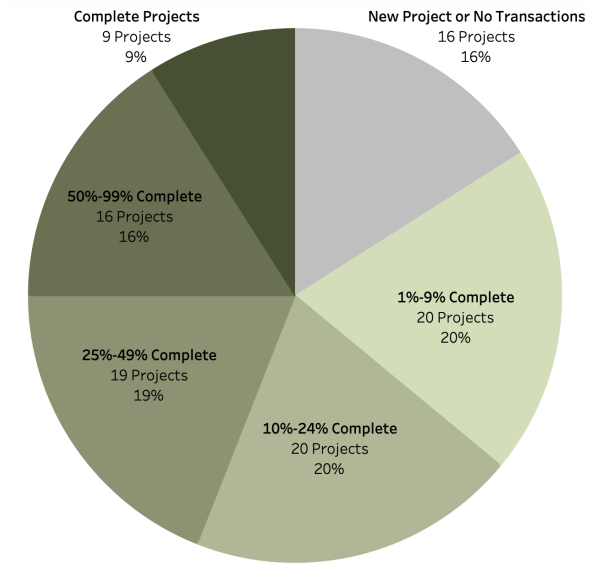
Upon completion of its REPI Project, MCB Camp Lejeune will preserve compatible land use that maintains current and future mission capabilities with no additional training restrictions. By promoting compatible land use and establishing wildlife corridors, MCB Camp Lejeune will avoid training and testing restrictions that would negatively impact its mechanized and armored training capabilities. The REPI project will minimize additional time of day restrictions related to flight hours, live fire, or demolitions; increases in noise or smoke complaints; and increases in spectrum interference from development and communication towers.

6 THE STATUS OF REPI'S DESIRED END STATE

During the REPI Program's annual proposal process to request funding, the Military Services must articulate each project's desired end state. This includes a summary of the long-term encroachment management actions necessary to promote compatible development, preserve off-base habitat to relieve current or avoid future environmental restrictions on military operations, or maintain or improve military installation resilience to climate change and extreme weather events. Through FY 2022, the REPI Program has preserved over 37 percent of the land targeted for protection using 10 U.S.C. § 2684a, representing a marked increase from 16 percent at the end of FY 2020. This increase was driven by NAS Whiting Field, Naval Submarine Base Kings Bay, Naval Weapons Station Yorktown, and NB Coronado making significant progress toward their respective project completion.

Figure 18 shows the distribution of REPI projects under 10 U.S.C. § 2684a, based on the percentage of targeted acres preserved through FY 2022 compared to the project's proposed desired end state. Through FY 2022, nine REPI projects were completed by reaching the percentage of land targeted for protection identified in their REPI proposals. It is important to recognize that REPI projects do not need to be completed for installations to benefit from REPI investments. For example, while Edwards AFB has completed only 3 percent of its desired end state, the installation has already protected nearly 15,000 high-priority acres.

Figure 18 Distribution of Progress Toward Completion for REPI Projects by Status[16]



Source: FY 2022 REPI Proposals and Execution Data Submitted by the Military Services through FY 2022

In the FY 2022 proposal cycle, the REPI Program received three new projects—Dyess AFB, Tyndall AFB, and Fairchild AFB.[17] Representative of the increasing threat climate change poses to installations, each of the new REPI projects proposed actions to build installation resilience to various climate impacts. The Dyess AFB project will mitigate inland flooding by preserving and increasing permeable surfaces around the installation, building installation resilience, and

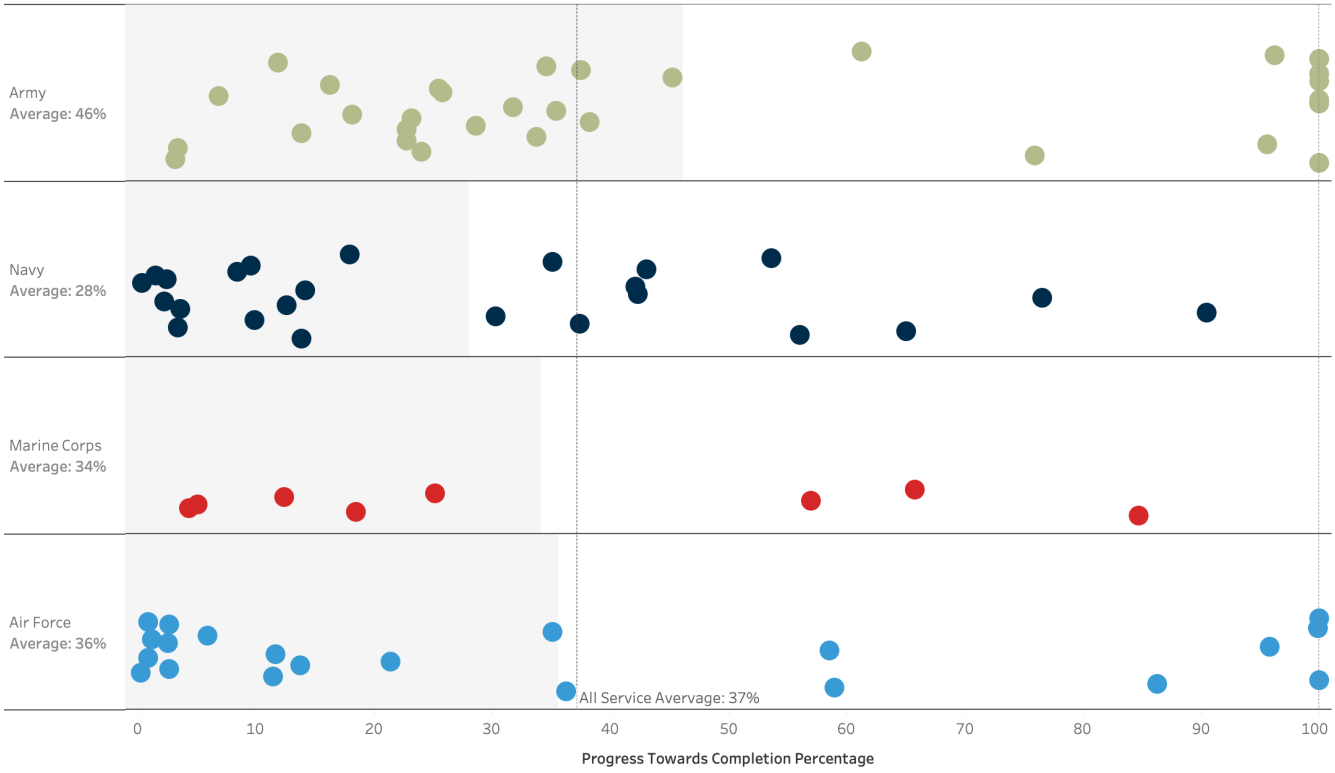
[16] For underlying data by Military Service, see Table 6 in Appendix B. Data does not include projects that have not closed any parcels or projects with incomplete or invalid desired end state data. As of FY 2022, 19 Army, Navy, and Air Force projects had incomplete or invalid desired end state data; see a list of those installations in Table B6 in Appendix B.

[17] Fairchild AFB and Tyndall AFB are installations with a previously established REPI partnership. However, in FY 2021 both installations submitted proposals for new REPI projects that are unrelated in scope or outcome to their previous proposals.

improving its ability to recover from extreme weather events, drought, and flooding. It will also ensure the quantity and quality of drinking water for both Dyess AFB and the city of Abilene, all while maintaining and enhancing military readiness and preserving working lands. The new Tyndall AFB project is part of extensive efforts to build installation resilience following the destruction from Hurricane Michael in 2018. Tyndall's project will reduce coastal erosion that can impair critical infrastructure, mitigate wave energy impacting the shoreline, and create habitat that supports conservation outcomes. Fairchild AFB's new REPI project seeks to conserve over 15,000 acres surrounding the installation. This project will preserve the economic value of working lands and agricultural fields; secure sustainable water resources for the agricultural industry and urban population; and provide conservation corridors for wildlife and climate change adaptation.

Figure 19 demonstrates the completion progress of REPI projects across each Military Service's portfolio, through the FY 2022 proposal and annual reporting process. The Military Services often adjust a project's desired end state due to shifts in missions, priorities, and encroachment restrictions at their respective installations. These updates, along with greater accuracy in data and the addition of new or previously excluded projects, can cause fluctuations in Service-specific and DOD-wide progress metrics. The Army has protected 46 percent of land toward its desired end state across 38 projects. The Air Force raised its completion percentage to 36 percent in FY 2022, a significant increase from 5 percent last year. Finally, the Navy and Marine Corps also significantly increased their completion percentages, going from 21 and 20 percent to 28 and 34 percent, respectively.

Figure 19 Distribution of Progress Toward Completion for REPI Projects by Military Service[18]



Source: FY 2022 REPI Proposals and Execution Data Submitted by the Military Services through FY 2022

[18] Progress is represented by the number of acres that a project has preserved as a proportion of its desired end state goal requiring protection under 10 U.S.C. § 2684a; it does not include projects that have not closed any parcels or projects with incomplete or invalid desired end state data. As of FY 2022, 19 Army, Navy, and Air Force projects had incomplete or invalid desired end state data; see a list of those installations in Table B6 in Appendix B. Completed acreage is current as of the end of FY 2022. For underlying data by Military Service, see Table B6 in Appendix B.

CASE STUDY

Avon Park Air Force Range

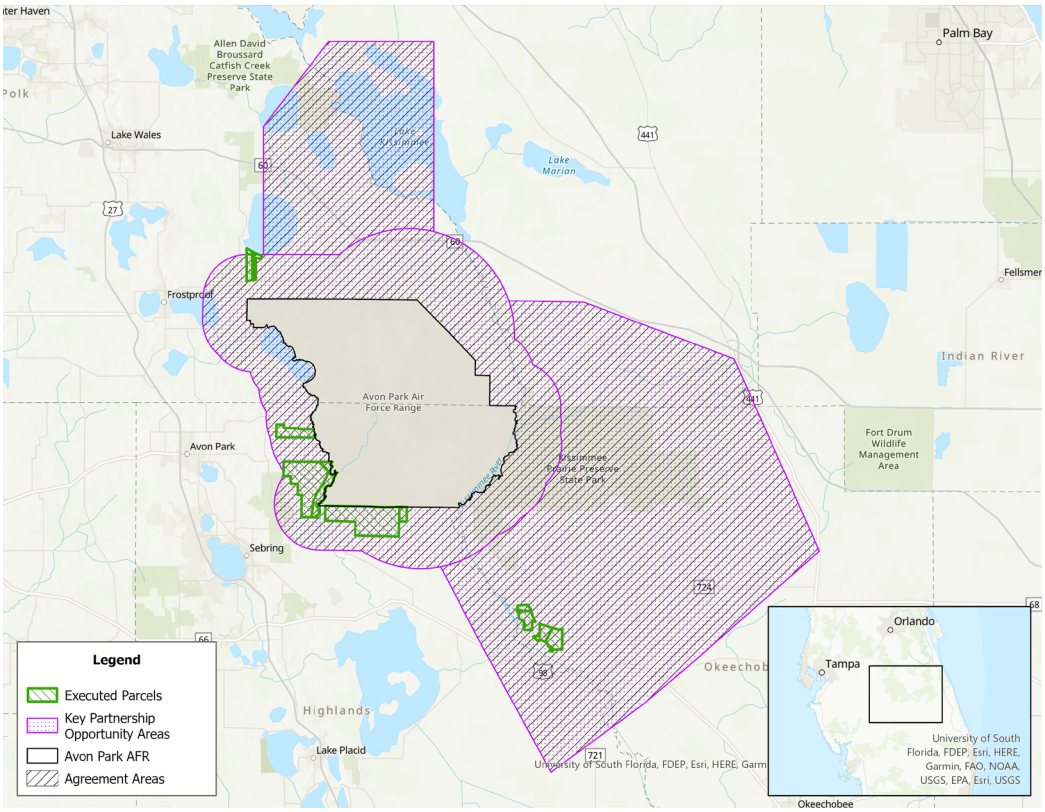
Overview

Avon Park AFR is a 106,000-acre bombing and gunnery range located in central Florida. Avon Park AFR is the primary training range for Homestead Air Reserve Base and is used extensively by four Military Services and multiple federal, state, and local agencies. The range hosts numerous squadron and unit-level deployments from across the nation and nearby Air Force bases, with its large, restricted airspace and operating area offering a critical training space. Population growth has led to development surrounding the installation and threatens the military's ability to carry out training and testing activities. Through Avon Park AFR's status as a sentinel landscape, the REPI Program has partnered with local stakeholders to purchase restrictive easements on lands that limit development and buffer the range in one of the fastest-growing regions in the United States.

Encroachment Risks

Population growth near Avon Park AFR has led to increased commercial and residential development that presents challenges to the range's aviation maneuver and night flying training. Development has the potential to limit restricted airspace operations and future missions, including F-35 training, and raises the probability of noise complaints and light pollution that limit night training. The Avon Park AFR REPI project works with local landowners to conserve lands surrounding the installation used for farming, ranching, and forestry. The REPI project also seeks to protect species in the surrounding Everglades Headwaters National Wildlife Refuge that are vulnerable to changes in their natural landscapes.

Map 4 Avon Park AFR Installation Map and REPI Partnership Areas



REPI Solution

Since 2005, the REPI Program has helped protect 13 parcels of land surrounding the range, enabling Avon Park AFR to maintain existing capabilities and keep pace with increasing requirements for new aircraft. Restrictive easements aim to restrict tall objects and promote compatible development so the range can effectively use its low-altitude airspace, which is necessary to carry out its national defense mission. These lands also preserve water resources and wetlands, including lands essential to the Everglades—one of only three designated wetland areas of global importance. Avon Park AFR is a designated sentinel landscape, allowing for landscape-scale actions designed to protect the installation and its surrounding ecosystem. Large landscape-scale conservation in this region provides opportunities to align federal resources from DOD, the Department of the Interior, and the U.S. Department of Agriculture and strengthen locally led conservation initiatives.

Partners

- Central Florida Regional Planning Council
- Conservation Florida
- Florida Defense Alliance
- Florida Defense Support Task Force
- Florida Department of Agriculture and Consumer Services
- Florida Department of Environmental Protection
- Florida Forest Service
- Highlands County
- Highlands County Economic Development Commission
- Polk County
- South Florida Water Management District
- The Nature Conservancy
- U.S. Department of Agriculture—Natural Resources Conservation Service
- U.S. Fish and Wildlife Service

Return on Investment

To date, Avon Park AFR has leveraged nearly **$17 million** in DOD funding with nearly **$13 million** in partner contributions to permanently preserve compatible land use and enhance installation resilience on almost **14,200 acres** surrounding the installation. This REPI investment has helped to retain and enhance at least **$731 million** in critical assets and mission capabilities including:

- Arbuckle Field (plant replacement value estimated at **$187 million**)
- Ranges and range space (plant replacement value estimated at **$75 million**)
- Repairs to runways and unsatisfactory roads (valued at **$46 million**)

Upon completion of its REPI Project, Avon Park AFR will ensure the proactive preservation of its restricted airspace, range capabilities, and freedom of maneuver that the installation provides to all military services, federal, state, and local agencies. Additionally, the REPI project will contribute to recharge of the aquifer that Avon Park AFR relies on and expand wildlife corridors, which will reduce environmental restrictions and ensure unfettered access to all capabilities of this premier air and ground range.

LOOKING AHEAD

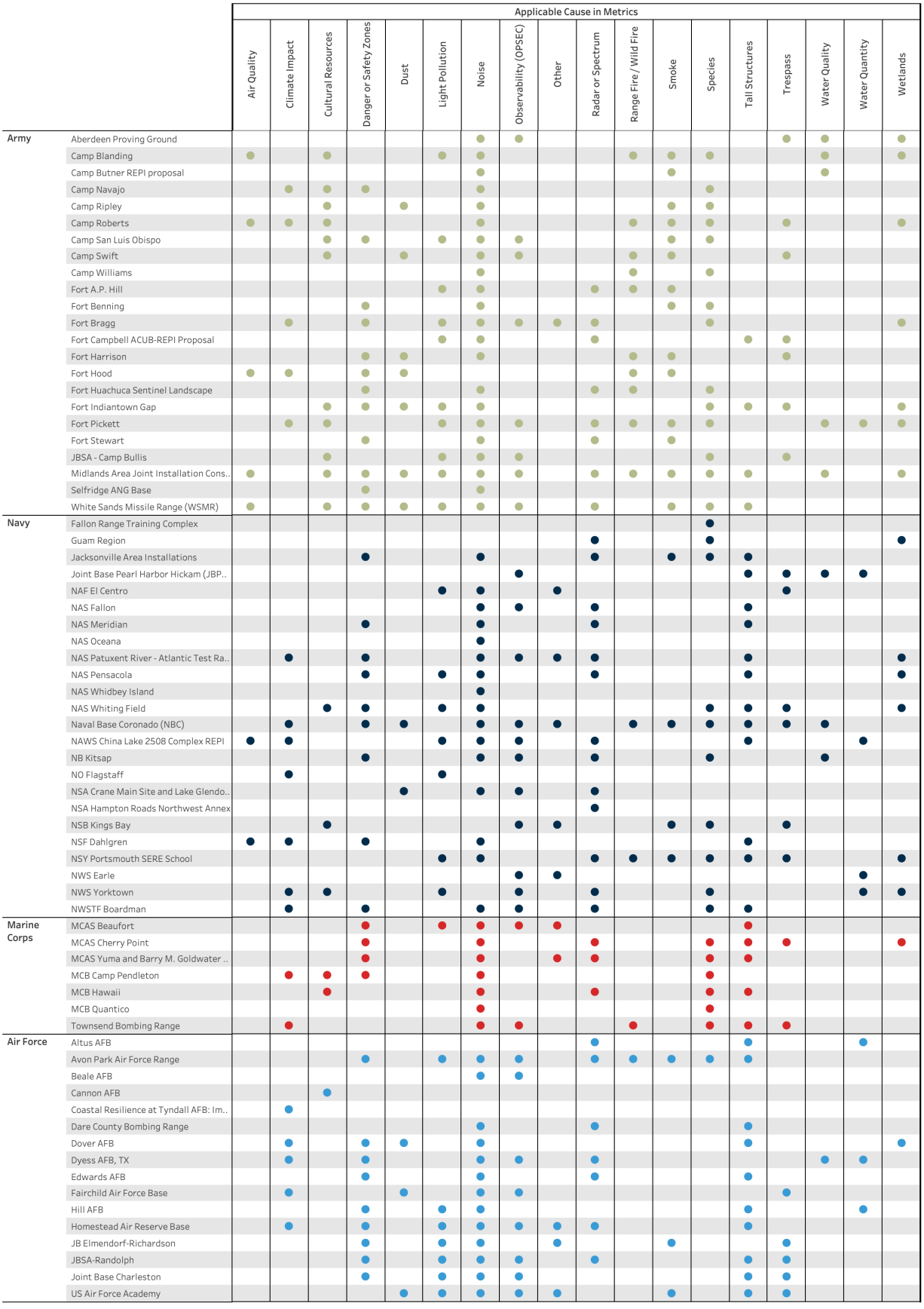
The creation of three new REPI projects demonstrates the continued and growing need for the Military Services to promote and preserve compatible land use surrounding their installations. In addition to the preservation of natural and agricultural lands, the Military Services have taken advantage of REPI's new authority to address significant and growing encroachment risks by investing in projects that enhance installation resilience to climate change and severe weather events. The REPI Program expects to receive new and innovative resilience projects over the coming years, with the Military Services signaling a steadily growing demand to fund these types of encroachment projects. The REPI Program is prepared to meet this demand through continued collaboration with partners such as NFWF through the NCRF and America the Beautiful Challenge, the Federal Emergency Management Agency through the Building Resilient and Infrastructure and Communities Program, and the National Park Service through the Land and Water Conservation Fund.

As the 2022 National Defense Strategy indicates, protecting installations in the Pacific region is of paramount importance to the nation and critical to the DOD mission. The implementation of REPI projects in the Pacific region will contribute to the overall integrity of integrated deterrence and bolster operational strategy in the region. REPI will continue to engage with installations and increase collaboration with partners to preserve critical mission capabilities and improve resilience in the Pacific region.

Most REPI projects are multi-year projects, with many requiring over a decade of sustained planning with partners and landowners to mitigate encroachment risks. The REPI Program has seen a significant increase in the number of installations reporting encroachment risks, with the types of encroachment pressures impacting military missions continuing to evolve. As installations identify emerging encroachment risks, such as increased frequency of wildfire on and around installations, base water shortages, and potential infrastructure impacts from severe weather events, the REPI Program will continue to demonstrate its strength in providing the Military Services with the tools to combat new challenges. By supporting innovative projects that promote compatible development, preserve critical habitat, and mitigate the impacts of climate change, the REPI Program ensures the continued readiness and resilience of the nation's installations to safeguard U.S. national security interests.

APPENDIX A:
ENCROACHMENT RISKS AND RESTRICTED ACTIVITIES REPORTED IN REPI PROJECT PROPOSALS

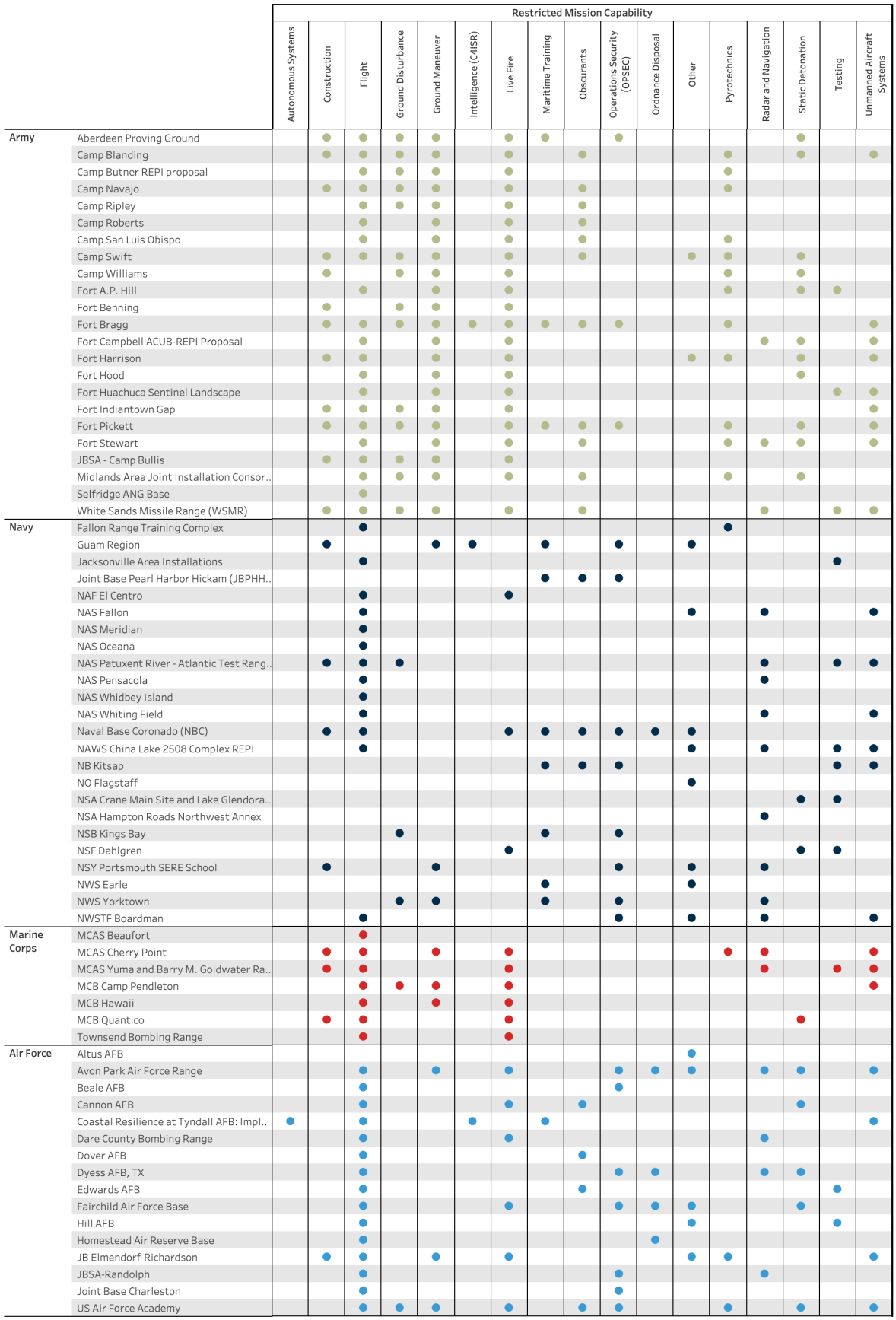
Figure A1 Encroachment Risks Reported in REPI Project Proposals[19]



Source: REPI Proposals from the Military Services through FY 2022

[19] Only projects that submitted restricted mission capabilities data in their proposals are included. This includes existing or potential restrictions avoided or mitigated by the REPI project but does not include restrictions addressed by other means.

Figure A2 Restricted Mission Capabilities Reported in REPI Project Proposals[20]



Source: REPI Proposals from the Military Services through FY 2022

[20] Only projects that submitted restricted mission capabilities data in their proposals are included. This includes existing or potential restrictions avoided or mitigated by the REPI project but does not include restrictions addressed by other means.

APPENDIX B:
MILITARY SERVICE DATA TABLES

Table B1 Encroachment Restrictions Identified in FY 2022 REPI Proposals by Military Service (Number of Proposals)[21]

Encroachment Threat	Air Force	Army	Marine Corps	Navy	Total
Noise	14	23	7	20	**64**
Danger or Safety Zones	10	13	4	12	**39**
Radar or Spectrum	7	9	3	17	**36**
Species	1	16	6	13	**36**
Tall Structures	10	4	5	16	**35**
Observability (OPSEC)	8	9	2	13	**32**
Light Pollution	7	11	1	7	**26**
Smoke Complaints or Avoidance	3	15	0	6	**24**
Climate Impact	5	6	2	8	**21**
Trespass	5	7	2	6	**20**
Cultural Resources	1	11	2	3	**17**
Wetlands	1	8	1	7	**17**
Range Fire / Wild Fire	1	10	1	2	**14**
Other	3	2	2	6	**13**
Dust	3	7	0	2	**12**
Water Quality	1	5	0	3	**9**
Water Quantity	3	1	0	4	**8**
Air Quality	0	5	0	2	**7**

Table B2 Total Acres Protected by REPI Projects through FY 2022 by Military Service[22]

Military Service	Fiscal Year																				Total Acres Protected
	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	
Army	6,040	28,402	8,114	8,676	23,026	14,436	21,850	18,394	34,460	35,003	25,945	22,311	21,346	33,897	12,252	26,997	43,669	33,974	20,688	331,497	**770,974**
Navy	-	48	-	2,508	402	430	3,088	1,729	2,595	3,163	8,711	3,398	8,156	8,712	10,708	31,438	11,506	31,875	35,080	2,341	**165,889**
Air Force	-	-	236	-	246	275	21	3,669	3,530	8,212	10,131	23,332	2,972	3,361	1,508	6,478	44,757	6,177	19,674	6,079	**140,656**
Marine Corps	-	-	821	475	2,716	16,052	1,777	8,672	3,349	2,200	8,491	3,011	5,507	6,771	30,530	3,057	6,775	1,084	12	4,111	**105,409**
Total Annual Acres Protected	**6,040**	**28,450**	**9,171**	**11,659**	**26,389**	**31,193**	**26,736**	**32,464**	**43,934**	**48,578**	**53,277**	**52,051**	**37,981**	**52,740**	**54,997**	**67,969**	**106,707**	**73,110**	**75,454**	**344,029**	**1.18M**
Cumulative Acres Protected	**6,040**	**34,490**	**43,661**	**55,320**	**81,709**	**112,902**	**139,638**	**172,102**	**216,037**	**264,615**	**317,892**	**369,943**	**407,923**	**460,663**	**515,660**	**583,629**	**690,335**	**763,445**	**838,899**	**1.18M**	

[21] Projects may select multiple encroachment threats. Projects that reported more than one encroachment threat are included in all categories selected. Installations that did not submit an FY 2022 proposal are not included. These totals do not reflect the severity of the threat, nor do they include encroachment pressures mitigated by other means.

[22] Data is current as of the end of FY 2022, as reported in the 2023 REPI Report to Congress. Includes reported land protection efforts prior to 2003.

Table B3 Acres Protected in FY 2022 to Preserve or Enhance Mission Capabilities by Military Service[23]

Military Service	Mission Capability																	
	Construction	Flight	Ground Disturbance	Ground Maneuver	Intelligence (C4ISR)	Live Fire	Logistics and Maintenance	Maritime Training	Missile Defense	Obscurants	Operations Security (OPSEC)	Ordnance Disposal	Other	Pyrotechnics	Radar and Navigation	Static Detonation	Testing	Unmanned Aircraft Systems
Air Force	402	10,547	-	1,334	8,806	1,740	-	8,806	-	-	932	-	-	402	1,338	932	-	8,806
Army	684	321,010	1,045	3,393	-	4,872	-	-	-	1,133	-	-	103	631	315,867	473	316,082	316,267
Marine Corps	-	7,479	-	-	-	3,368	-	-	-	-	-	3,368	-	-	-	-	-	-
Navy	4,778	984	251	5,129	4,878	662	4,878	75	4,878	75	326	-	-	-	838	662	1,580	913
Grand Total	**5,865**	**340,020**	**1,296**	**9,857**	**13,685**	**10,643**	**4,878**	**8,881**	**4,878**	**1,207**	**1,258**	**3,368**	**103**	**1,033**	**318,043**	**2,067**	**317,662**	**325,986**

Table B4 Cumulative DOD Expenditures and Partner Contributions through FY 2022 (Millions)[24]

Source	Fiscal Year											
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Partner	$0.8	$5.2	$0.2	$3.3	$49.4	$14.9	$32.0	$61.0	$25.4	$49.6	$50.2	$29.0
REPI	-	-	-	-	-	$4.6	$5.7	$26.8	$17.0	$32.1	$37.0	$43.4
Army	-	-	-	$6.4	$1.0	$1.7	$8.5	$7.8	$9.5	$26.6	$17.5	$41.6
Navy	-	-	-	-	$0.5	-	$1.7	$0.4	-	$2.0	$0.2	$1.0
Marine Corps	-	-	-	-	-	$1.7	$1.4	$1.6	$2.4	$6.6	$1.3	-
Air Force	-	-	-	-	-	-	-	-	-	$0.2	$0.1	-
Grand Total	**$0.8**	**$5.2**	**$0.2**	**$9.7**	**$50.9**	**$23.0**	**$49.3**	**$97.6**	**$54.3**	**$117.1**	**$106.4**	**$115.0**

Table B4 (Continued) Cumulative DOD Expenditures and Partner Contributions through FY 2022 (Millions)[23]

Source	Fiscal Year										
	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Partner	$64.2	$61.3	$50.3	$43.5	$105.1	$61.9	$77.8	$64.7	$126.7	$79.3	$73.7
REPI	$48.5	$37.4	$30.6	$54.4	$54.5	$62.5	$54.7	$70.7	$88.8	$77.7	$52.6
Army	$37.4	$13.5	$30.1	$20.6	$19.3	$10.4	$26.3	$27.9	$17.5	$8.0	$7.7
Navy	$1.2	$0.9	$1.7	$4.5	$4.7	$8.4	$6.5	$2.3	$0.9	$0.6	$0.5
Marine Corps	$3.2	-	$0.3	-	-	$14.2	$0.1	-	$0.4	-	-
Air Force	-	-	$0.2	$0.2	$0.9	$0.6	$4.4	$12.6	$3.4	$3.5	$5.9
Grand Total	**$154.5**	**$113.1**	**$113.3**	**$123.2**	**$184.4**	**$158.1**	**$169.7**	**$178.2**	**$237.7**	**$169.1**	**$140.3**

[23] The Military Services may select multiple mission capabilities for each parcel. Acres protected are included in all mission capability categories displayed if the Military Services reported more than one for any given parcel. Starting in FY 2020, the REPI Program established the requirement to report protected mission capabilities for each parcel protected. Therefore, not all parcels have associated mission capability data. Excludes roughly 4,000 acres for parcels that were protected in FY 2022 but do not have any corresponding mission capability data.

[24] Includes reported land protection efforts prior to 2003.

Table B5 DOD Expenditures in FY 2022 to Address Encroachment Restrictions by Military Service (Millions)[25]

Encroachment Threat	Air Force	Army	Marine Corps	Navy	Total
Air Quality	-	$12.3	-	$1.7	**$13.9**
Climate Impact	$2.1	$7.1	-	$0.7	**$9.8**
Cultural Resources	-	$14.7	-	-	**$14.7**
Danger or Safety Zones	-	$14.0	-	$3.1	**$17.2**
Dust Complaints or Avoidance	-	$1.4	-	-	**$1.4**
Light Pollution	$2.5	$3.9	$2.9	$2.8	**$12.2**
Noise Complaints or Avoidance	$2.5	$22.6	$3.3	$6.3	**$34.7**
Observability (OPSEC)	$2.0	$13.5	$0.3	$3.9	**$19.7**
Other	-	-	$2.9	$0.6	**$3.5**
Radar or Spectrum	$0.4	$12.3	-	$4.2	**$16.9**
Range Fire / Wild Fire	-	$4.9	$0.3	-	**$5.3**
Smoke Complaints or Avoidance	$2.5	$4.5	-	-	**$6.9**
Species	$2.0	$13.5	-	$2.7	**$18.2**
Tall Structures	$2.4	$12.3	$3.3	$4.1	**$22.0**
Trespass	$0.5	$1.4	$0.6	-	**$2.5**
Water Quality	-	-	-	$0.5	**$0.5**
Water Quantity	-	-	-	$2.8	**$2.8**
Wetlands	-	-	-	$2.8	**$2.8**

[25] "DOD Expenditures" include REPI and Military Service expenditures. The Military Services may select multiple encroachment risks for each parcel that has expenditures. Expenditures are included in all encroachment categories displayed if the Military Services reported more than one for any given parcel. Excludes $15,555,846 spent on parcels in FY 2022 that do not have any corresponding encroachment risk data. Expenditure data is current as of the end of FY 2022.

Table B6 Progress Toward Completion through FY 2022 by Military Service[26]

Army	Navy	Marine Corps	Air Force
Complete Projects			
99th Armed Forces Reserve Center	NAS JRB New Orleans		Cape Canaveral AFS
Fort Carson			Robins AFB
Fort Custer			Warren Grove Range
Fort Knox			
Fort Polk			
Southeast Regional Army Project			
50%-99% Complete			
Camp Blanding	Jacksonville Area Installations	MCAGCC 29 Palms	Beale AFB
Camp Ripley	Joint Base Pearl Harbor-Hickam	MCB Camp Lejeune and MCAS New River	Buckley AFB
Fort Campbell	NAS Oceana	Townsend Bombing Range	Joint Base Langley-Eustis
U.S. Army Garrison Hawai'i	NAS Whiting Field		Joint Base San Antonio-Camp Bullis
White Sands Missile Range	NWS Yorktown		
25%-49% Complete			
Camp San Luis Obispo	NAS Fallon	MCB Quantico	Avon Park AFR
Camp Williams	NAS Meridian		Melrose AFR
Fort A.P. Hill	NB Coronado ATWTC		
Fort Bragg USASOC	NB Kitsap		
Fort Campbell	NSB Kings Bay		
Fort Huachuca	NSY Portsmouth SERE School		
Fort Pickett			
Fort Riley			
Fort Stewart			
10%-24% Complete			
Camp Butner	Fallon Range Training Complex	MCAS Beaufort	Dare County Range
Camp Roberts	NAS Pensacola	MCB Camp Pendleton	Eglin AFB
Camp Shelby	NAWS China Lake		Ellsworth AFB
Camp Swift	NSF Dahlgren		Joint Base Elmendorf-Richardson
Fort Benning	NWSTF Boardman		
Fort Bragg			
Fort Hood			
Fort Indiantown Gap			
Midlands Area Joint Installation Consortium			

Table B6 (Continued) Progress Toward Completion through FY 2022 by Military Service[26]

Army	Navy	Marine Corps	Air Force
1%-9% Complete			
Aberdeen Proving Ground	NAF El Centro	MCAS Cherry Point	Davis-Monthan AFB
Camp Navajo	NAS Patuxent River-Atlantic Test Ranges	MCAS Miramar	Dover AFB
Fort Harrison	NAS Whidbey Island		Edwards AFB
	NB Ventura County		Hill AFB
	NO Flagstaff		Joint Base San Antonio-Randolph
	NSA Annapolis		Joint Base Charleston
	NSA Hampton Roads		Joint Base McGuire-Dix-Lakehurst
			Travis AFB
			Vandenberg AFB
New Project or No Transactions			
	ARD Bayview	Chocolate Mountain Aerial Gunnery Range	Altus AFB
	Guam Region	MCAS Yuma and BMGR-W	Cannon AFB
	NWS Earle	MCB Hawai'i	Columbus AFB
			Homestead ARB
			Joint Base San Antonio-Lackland
			Scott AFB
			US Air Force Academy
			Dyess AFB
			Fairchild AFB
			Tyndall AFB
Incomplete or Invalid Data			
Camp Rilea	NAS Key West		Selfridge ANG Base
Joint Base Lewis-McChord	NAS Lemoore		Tinker AFB
Fort Drum	NCBC Gulfport		Eielson AFB
	Pacific Missile Range Facility Barking Sands		Joint Base Andrews

[26] Progress is represented by the number of acres that a project has preserved as a proportion of its desired end state goal requiring protection under 10 U.S.C. § 2684a. Does not include projects that have not closed any parcels or projects with incomplete or invalid desired end state data. Completed acreage is current as of the end of FY 2022. This year's analysis includes all installations listed in the FY22 Report to Congress.

REPI investments reduce risks to training, testing, and operational assets that the Department spent much of the past decade building or modernizing. As training, testing, and operations increase, the ability to leverage REPI partner contributions to relieve restrictions becomes even more important. Investing in and taking advantage of current opportunities to advance REPI's key objectives is paramount to securing the training, testing, and operational viability of local installations. Through REPI's partnerships and engagement efforts we can continue to support the warfighter, provide value to the taxpayer, and reduce risks to military readiness.

For more information about the REPI program and supportive DOD efforts, visit **www.REPI.mil** *or contact* **osd.repi@mail.mil**.

FY 2022 Metrics Report on REPI Program Outcomes and Benefits to Military Mission Capabilities

This report has been prepared by Booz Allen Hamilton in support of the Office of the Assistant Secretary of Defense for Energy, Installations, and Environment.