

STATEMENT OF WORK

Provide Ecosystem Management Technical Assistance at U.S. Marine Corps Base Quantico (2022-2027)

A. Introduction

The purpose of this project is to support the implementation of the Integrated Natural Resources Management Plan (INRMP) of Marine Corps Base (MCB), Quantico, Virginia. The Natural Resources and Environmental Affairs Branch (NREA) is responsible for executing projects outlined in INRMP to include threatened and endangered species management, ecosystem management, dispersed outdoor recreation, and scientific research efforts. MCB Quantico is approximately 59,000 acres of primarily forested habitat with lesser components of early successional habitat and wildlife openings. The MCBQ INRMP requires these lands to be managed within an ecosystem context while providing optimal landscape benefits for realistic military training. Multiple use land management also provides opportunities for the harvest of fish, game, and forest products. The project will support the continuation and improvement of ecosystem management and dispersed outdoor recreation programs.

B. Objective

The cooperator will be responsible for technical and scientific research assistance to the NREA Branch in order to implement the INRMP, to include the tasks described in Section C (Services Requested) of this project and additional tasks contained in Appendix 1 (Option Years and Additional Services) which will be dependent on the availability of funds. These tasks will include the review of monitoring protocols and techniques as well as develop more efficient and effective methods using newer technologies.

C. Services Requested

Task 1: Threatened and Endangered Species Surveys

The cooperator will assist with development and execution of threatened and endangered species surveys required to comply with Endangered Species Act (ESA). Currently, the following species are known to occur, or have recently occurred, on MCB Quantico and are federally listed: small whorled pogonia (*Isotria medeoloides*), dwarfwedge mussel (*Alasmidonta heterodon*), harperella (*Ptilimnium nodosum*), northern long-eared bat (*Myotis septentrionalis*), Indiana bat (*Myotis sodalis*), and Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*). Additional species that are federally listed and have the potential to occur on MCB Quantico are sensitive joint vetch (*Aeschynomene virginica*), rusty patched bumble bee (*Bombus affinis*), and yellow lance (*Elliptio lanceolata*). The cooperator will follow all species specific survey guidelines established by US Fish and Wildlife Service. A summary report of all activities and findings will be provided to MCBQ.

Task 2: Habitat Management

The cooperator will assist with development and execution of vegetation management strategies in three major areas described below:

2.a. *Wildlife Plantings*

The cooperator will assist with the development of fall and spring wildlife enhancement plantings. The cooperator will test < 75 soil samples per year and assist in planting based on the results of the soil test. A geodatabase will be created and maintained that quantifies the soil amendments, treatments, and effectiveness of the wildlife plantings. A summary report of all activities and findings will be provided to MCBQ.

2.b. *Early Successional Habitat Creation*

The cooperator will work with MCBQ to develop and implement treatments to create and enhance early successional habitats. The cooperator will utilize both mechanical and chemical treatments to accomplish multiple habitat management objectives focused on early successional habitat. The cooperator will monitor success of treatments and make recommendations to improve results. A summary report of all activities and findings will be provided to MCBQ.

2.c. *Invasive Species Control*

The cooperator will survey MCBQ for invasive species. Areas and target species will be determined by MCBQ based on field surveys. The cooperator will focus on those species considered to be highly invasive and a threat to the ecosystem such as Japanese knotweed (*Polygonum cuspidatum*), kudzu (*Pueraria lobata*), and autumn olive (*Eleagnus umbellata*). The cooperator will research online resources to identify the newest invasive control techniques and protocols, ultimately leading to recommendations for the control of specific invasive species. A detailed geodatabase containing the location of invasive species and treatment approach/ results for each management area will be developed and provided to MCBQ for archiving. A summary report of all activities and findings will be provided to MCBQ.

Task 3: Biological Research

The cooperator will implement and aid in improving established MCBQ research and monitoring protocols for threatened and endangered species, fish, game, and nongame species on a seasonal basis depending upon species behavior and objectives. Methods include, but are not limited to, spotlight counts, spring gobbler surveys, chemical immobilization, autonomous ultra-sonic and audio recorders, animal handling, trapping, aerial surveys, radio-telemetry, and camera trapping. The cooperator shall assist MCB Quantico staff conduct aerial surveys (either directly or with the utilization of an Unmanned Aerial Systems) of bald eagle nests on the installation. The bald eagle survey may require the cooperator to board a Government aircraft contingent on authorization from the unit responsible for operating the aircraft. Data collected under Task 3 will be used to predict and evaluate population increases or declines and develop management recommendations for submission to MCBQ wildlife management personnel.

Task 4: Game Management

4.a. Data Collection and Analysis

All hunters must check-in and out before each hunting trip and report all harvested game to the MCBQ game check station. The cooperators will assist with collecting biological information on harvested game at MCBQ game check station collection and summary of metrics for measuring hunter use patterns and behavior. The cooperators shall collect biological data on harvested game including, but not limited to, weight, antler characteristics, age, and sex. This data will be reported in a Game Harvest report. The cooperators will update and implement an annual archery hunter survey, update a database of current and historical archery survey data, produce a written report analyzing and summarizing archery hunter survey data collected to date. Analysis of the archery hunter data will include number of buck fawn observed, number and type of other wildlife species observed, and duration hunted. This information will be reported in an Archery Hunter Survey report. The cooperators will interview/survey hunters on MCBQ and collect summary metrics for measuring hunter use patterns and behavior. Collected information will be used to develop management recommendations based on the survey results and reported in a Hunter Survey Report.

4.b. Protocol Evaluation

The cooperators will evaluate current data collection protocols at the MCBQ game checking station and determine if these techniques are in need of updating. The cooperators will develop and test any new data collection methodologies needed to improve current data collection efforts. Data collected during this process will allow the cooperators to assist in developing effective management strategies, understanding hunter behavior impacts on game populations, and improving recreational opportunities at MCBQ.

D. Role of Marine Corps Base, Quantico Personnel

1. MCBQ will provide office space and use of government furnished items, to include tools (hand tools such as shovels, rakes, axe, etc.; work gloves and safety glasses; weight scales and measuring tapes for recording data from game species; binoculars, compass, Global Positioning System [GPS]; acoustic recording devices for wildlife; mist nets for capturing birds and bats). Navy Marine Corps Internet Common Access Card (CAC) or Defense Biometric Identification System Card (DBIDS) will be provided to permanent personnel working under this agreement.
2. Substantial Government involvement in all tasks listed above is expected. Government involvement will include participation in all field work and data collection for threatened and endangered species surveys; wildlife plantings; invasive species control; biological research and game management. In addition, Government personnel will provide project assistance, technical assistance / oversight and coordinate safety planning for projects and provide a job hazard analysis for installation projects.
3. When available, allow access to informal conservation-related on the job training opportunities from subject matter experts.
4. MCBQ will participate in the planning and implementation of each task described in the scope of work. Government will determine which projects are implemented and prioritize them based on mission requirements.

5. MCBQ will provide GIS data layers necessary to complete deliverables.

E. Role of the Cooperator

1. To initiate a Tier 1 background investigation in accordance with Federal Investigate Standards on all new personnel requiring a Common Access Card (CAC). All personnel will obtain either CAC or a Defense Biometric Identification System (DBIDS) card to access the installation.
2. To furnish all materials, equipment, supplies, labor and services necessary to conduct the aforementioned technical assistance and research except as outlined in paragraph D.1, "Government Furnished Items".
3. To equip personnel with a digital camera and computers equipped with Microsoft Office software, ArcGIS software, statistical software, and internet access.
4. To equip personnel with one pickup truck or other vehicle suitable for off-road transport of personnel and supplies.
5. To comply with all Occupational Safety and Health Administration (OSHA) requirements. It is the cooperators responsibility to conduct all field activities safely and avoids damage property. MCBQ is not responsible for any injuries during the time of this project.
6. To coordinate each visit to range and training areas with the designated points of contact within the NREA Branch and Range Management Branch.
7. To have at least one employee onsite who has been certified as a Virginia commercial pesticide applicator.
8. To obtain all applicable permits and licensing in accordance with local, state, and Federal laws and regulations necessary to perform required surveys.

F. Products/Deliverables

1. Progress Reports. Cooperator will compose quarterly progress reports summarizing the work accomplished under each task in Section C. Quarterly reports will be sent to MCBQ point of contact and should be an electronic MS Word file, with accompanying data provided in MS Excel or Access.
2. All spatial data must be collected according to the guidelines outlined in Appendix 2.
3. Final Report. Shall be provided to the MCBQ point of contact as an electronic MS Word file. All raw data will be produced and submitted in MS-Excel or -Access. Hard copies of spatial coverage data with appropriate metadata will be provided to the MCBQ point of contact. This report should minimally include the following attachments:

- a. Archery Hunter Survey report
- b. Deer Spotlight Survey report
- c. Habitat Management report
- d. Game Harvest report
- e. Threatened and Endangered Species report
- f. Camera Trapping report

G. Period of Performance

The period of performance will be 12 months from the date of award. Appendix 1 contains optional years and tasks to extend the agreement beyond base period (to September 2027) and includes scopes of work describing additional services that can be executed under this agreement. The cost of optional years and tasks will be negotiated during the base year award. The award of optional years are the Government's first priority and will be planned and executed on a yearly basis dependent on the availability of future funds. Award of optional tasks will also be contingent on the availability of funds and could be executed during the base year award or during any of the optional years. It is expected that the cooperators that are awarded the base period, can perform all the additional services requested.

H. Points of Contact

Principle Investigators: TBD

NAVFAC Contracting Officer Representative

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Appendix 1

Option Years and Additional Services

Optional Years:

Option 1

Extend the cooperative agreement for an additional year. The cooperator will offer services to accomplish all tasks outlined in base period agreement for an additional 12 months after expiration of base period (September 2023 - September 2024).

Option 2

Extend the cooperative agreement for an additional year. The cooperator will offer services to accomplish all tasks outlined in base period agreement for an additional 12 months after expiration of base period (September 2024 - September 2025).

Option 3

Extend the cooperative agreement for an additional year. The cooperator will offer services to accomplish all tasks outlined in base period agreement for an additional 12 months after expiration of base period (September 2025 - September 2026).

Option 4

Extend the cooperative agreement for an additional year. The cooperator will offer services to accomplish all tasks outlined in base period agreement for an additional 12 months after expiration of base period (September 2026 - September 2027).

Optional Additional Services:

Option 5

Cooperator will execute mussel survey as outlined in the statement of work contained in this appendix.

Option 6

Cooperator will execute pollinator survey as outlined in the statement of work contained in this appendix.

Option 7

Cooperator will execute small whorled pogonia survey as outlined in the statement of work contained in this appendix.

Option 8

Cooperator will execute harperella survey as outlined in the statement of work contained in this appendix.

Option 9

Cooperator will execute sensitive joint vetch survey as outlined in the statement of work contained in this appendix.

Option 10

Cooperator will execute listed bat survey as outlined in the statement of work contained in this appendix.

Option 11

Cooperator will execute remote sensing surveys as outlined in the scope of work contained in this appendix.

Option 12

Cooperator will execute Conservation Volunteer Program review and coordination as outlined in the statement of work contained in this appendix.

Option 13

Cooperator will execute habitat management project as outlined in the statement of work contained in this appendix.

Option 14

Cooperator will execute fisheries management project as outlined in the statement of work contained in this appendix.

Statement of Work: Option 5

Freshwater Mussel Assessment on Marine Corps Base Quantico

Objective

The objective of this study is to assess mussel species abundance and distribution, habitat conditions, and host species availability and generate management recommendations based on historic data, survey results, and installation priorities.

Introduction

Streams in the eastern United States contain the greatest diversity of freshwater mussels in North America. Because changing patterns of land use, climate, and other emerging pressures threaten to increase the number of imperiled mussel species in this region. Installations need current and comprehensive information about mussel populations and habitat conditions to proactively manage these species and mitigate potential impacts to military readiness.

A reproducing population of the federally endangered *Alasmidonta heterodon* (dwarf wedgemussel) was discovered in a section of Aquia Creek in 1990. Since its initial discovery, subsequent surveys in Aquia Creek have produced declining occurrences of the dwarf wedgemussel. Surveys in 2004, 2009, 2014, 2019, & 2020 yielded no occurrences of dwarf wedgemussel. There is still a need to reassess historic locations of dwarf wedgemussel to confirm their extirpation and continue to assess the status of their populations throughout the installation, focusing on areas identified as needing additional surveys.

The occurrence of several other mussel species were documented on MCBQ from previous surveys and more information is needed about these species due to the overall decline in mussels regionally. Within the last 10 years, several species in Virginia were either listed or considered for listing under the Endangered Species Act. Given trends in mussel populations, degradation of aquatic ecosystems, and the potential for military activities to alter critical aquatic habitat, a greater understanding of freshwater mussel distributions, dynamics, habitats and emerging threats is crucial to making informed land management decisions. The cooperators will assess historical, current, and predicted status of mussel populations on the installation utilizing the most current techniques.

Methods

Field Work

The cooperators must be on the USFWS approved list prior to conducting surveys. Sites will be surveyed during the warmer months, late May to early October, when the likelihood for detection is greatest (i.e., freshwater mussels are available for detection at the substrate surface). Freshwater mussels tend to be located deeper in the substrate during cooler months. Depending on the species potentially distributed on the installation, more specific surveying time frames may be recommended. Coordinates of the sampling sites identified during geospatial analyses will represent the mid-point of each survey reach.

Summaries and Analysis of Field Data

Data collections and survey efforts will be organized and put into a structured database (Excel, Access, or other preferred program) that will allow resource managers to efficiently query data and update information. Qualitative sampling data will be used to assess species distributions across the installation and determine site-specific species presence (species richness), relative abundance, and catch-per-unit-effort (CPUE). Statistical analyses will be conducted in software programs currently accepted by peer reviewed literature. Survey sites and collection data will be georeferenced in ArcMap

and a distribution map will be developed.

Quantification of Mussel Populations – Cooperator will monitor species-specific population demographics such as population size and growth, survival, and recruitment for determining long-term viability and assessing the status of populations. Population demographics (e.g., density, abundance, survival, and recruitment) will be used to evaluate temporal and spatial trends, changes in diversity, abundance, and population vital rates. To obtain accurate and precise estimates of these parameters, probability-based designs will be used for sampling. The objective will be to evaluate mussel density, abundance, and age-class structures of mussel populations on the installation. The cooperator will use the distribution data collected during the initial qualitative assessments to optimally allocate time-intensive quadrat survey efforts to sampling sites with evidence of mussel presence.

The number of sampling units (0.25-m² quadrat samples) required to estimate population density (mean mussels/m²) for a given level of precision at each reach will range from 25–300 units. For smaller survey reaches (< 10 m wetted width), the Cooperator will sample quadrats using a systematic sampling design. Because mussel density tends to be greater along the stream banks (i.e., clustered) of larger reaches (≥ 10 m wetted width), the Cooperator will sample quadrats using a stratified random design so as to concentrate sampling efforts where mussels are densest and to gain precision in parameter estimates. Quadrats will be hand excavated to 15–30 cm below the substrate surface and all individuals encountered will be identified to species, measured for length, and be documented as observed at the surface or below before returning them to their collection point. Assume that all individuals ≥ 1 year old had a 100% probability of detection within a quadrat. Time to complete quadrat surveys will be dependent on the number and size of survey sites and the number of sampling units required. The Cooperator will also evaluate feasibility of eDNA surveys on the installation and test the technique if determined to be viable sampling strategy.

Deliverables

Deliverables will include: 1) adding to the existing database of population surveys, habitat suitability, geospatial data, and literature review; 2) georeferenced locations and GIS layers for survey efforts, data collections, habitat conditions and distribution maps, 4) and a final report containing a comprehensive review and field assessment of freshwater mussel distributions on the installation, species descriptions, and recommendations for future conservation, monitoring efforts, and adaptive management strategies. 5) photographs of representative mussel species found during surveys.

Statement of Work: Option 6

Assessment of Pollinator Fauna and Habitat on MCB Quantico

Objective

The objective of this study will be to conduct follow-up pollinator surveys on MCBQ, utilizing previous records and installation priorities, to identify pollinator species occurrence and distributions and important habitats.

Introduction

Recent research suggests populations of many pollinators have declined in the past few decades. Threats to both honey bee (non-native), native bee, and butterfly species include disease, pesticides, climate change, habitat loss, and habitat fragmentation. The native bee fauna of Virginia is poorly known, with limited information currently available on the distribution and status of each species in the state. Beyond expanding the overall knowledge of pollinator species composition and abundance on MCBQ, there is potential for the occurrence of species listed under the Endangered Species Act. Although recent surveys did not detect a listed species, MCBQ falls within the historic range and contains suitable habitat for the federally endangered Rusty-patched Bumblebee (*Bombus affinis*). Those same surveys also detected the presence of the Monarch butterfly, which has been proposed for listing as threatened under the Endangered Species Act. The Cooperator will expand on previous surveys and further define the pollinator fauna and important habitats of MCBQ through limited but intensive sampling.

Methods

The cooperator will conduct base-wide work to conduct pollinator surveys using both passive and active sampling methods. During fieldwork, pertinent field observations and other data will be recorded, including date, time, weather conditions, habitat characteristics (including relative abundance of nectar sources), geographic coordinates of surveys and notable biological observations. The locations of all sampling sites will be recorded using hand-held GPS units. Collected individuals will be identified to species whenever possible using on-line taxonomic keys, published literature, and comparison to reference collections. Significant specimens collected in killing traps will be processed, labeled, and pinned for display.

Deliverables

Deliverables will include: 1) adding to the existing database of population surveys, habitat suitability, geospatial data, and literature review; 2) georeferenced locations and GIS layers for survey efforts, data collections, habitat conditions and distribution maps, 4) and a final report containing a comprehensive review and field assessment of pollinator distributions and recommendations for future conservation, monitoring efforts, and adaptive management strategies. 5) pinned displays of representative species found in killing trap surveys.

Statement of Work: Option 7

Small Whorled Pogonia Presence Survey at MCB Quantico

Objective

The objectives of this study will be to identify small whorled pogonia (SWP, *Isotria medeoloides*) occurrence and distributions, evaluate suitable habitat, and provide management recommendations on installation in order to comply with Endangered Species Act and fulfill NEPA requirements on MCB Quantico.

Introduction

Provide an assessment of the federally listed threatened species, SWP at Marine Corps Base (MCB), Quantico, Virginia. A detailed map will be provided by MCBQ for all required surveys. This work is necessary to implement the MCB Quantico Integrated Natural Resources Management Plan to manage forest resources and protect threatened and endangered species.

Methods

Each area on the map provided by MCBQ will be surveyed during the growing season to check for the occurrence of the SWP. These areas will be walked by surveyors who will visually search for the presence of SWP using standard field protocols for the SWP. The Cooperator will ensure the surveyors conducting presence surveys are on the list of approved SWP contractors that is maintained by the Virginia Field Office of the USFWS. If they are not on the approved list, they must be added to the list prior to commencing work. Potential surveys areas are timber harvest units, construction projects, and other areas of interest to MCB Quantico. This survey will minimally cover 500 acres. Not all areas will be suitable SWP habitat and require extensive visual inspection but all areas must be assessed for SWP suitability and confirmed onsite. Any areas with the potential to support SWP will need to be surveyed according to USFWS guidelines.

Deliverables

The cooperators must report the finding of any SWP stems to the Fish, Wildlife and Agronomy Program, NREA Branch, within 24 hours after detection of the plant and be available to escort MCB, Quantico, personnel to the site for identification purposes. The Cooperator will record a GPS coordinate for each site containing SWP. Additionally, the Cooperator shall mark all located SWP sites with flagging tape on adjacent trees. The Cooperator will submit a final written report by 31 December following completion of the field survey that includes a map of the surveyed parcels, the locations of stems found, habitat descriptions, and status of all encountered SWP stems. Cooperator will incorporate new survey results into the existing installation database of SWP information and make recommendations on species management and monitoring protocols.

Statement of Work: Option 8 Harperella Surveys at MCB, Quantico

Objective

The objective of this study will be to conduct follow-up Harperella (*Ptilimnium nodosum*) surveys on MCBQ, utilizing previous records and identified data needs, on the installation to identify species occurrence and distribution.

Introduction

MCB Quantico is approximately 59,000 acres located in Fauquier, Prince William, and Stafford Counties. The dominant cover type is upland forest however there is approximately 3,900 acres of wetland habitat. Harperella is typically associated with perennial streams and there is one known site on base. The purpose of this work is to comply with Endangered Species Act and enable implementation of the MCB Quantico Integrated Natural Resources Management Plan.

Methods

Minimally 400 acres of suitable habitat will be surveyed by US Fish and Wildlife Service (USFWS) approved surveyors during the USFWS designated survey window using standard field protocols. The Cooperator will ensure the surveyors conducting presence surveys is on the list of approved contractors that is maintained by the Virginia Field Office of the USFWS. If they are not on the approved list, they must be added to the list prior to commencing work. The Cooperator must report the discovery of any harperella plants to the Fish, Wildlife and Agronomy Program, NREA Branch, within 24 hours after detection and be available to escort MCB, Quantico, personnel to the site for identification purposes. The Cooperator will record a GPS coordinate for each site where listed plants are found. Additionally, the Cooperator shall mark all located sites with flagging tape on adjacent trees.

Deliverables

The cooperator will submit a final written report and all spatial data by 1 March after the conclusion of fieldwork. The final report will include description of survey methodology, survey results, a map of the surveyed parcels and the location, habitat, and status of harperella. Cooperator will incorporate new survey results into the existing installation database and make recommendations on species management and monitoring protocols.

Statement of Work: Option 9

Sensitive Joint Vetch Surveys at MCB, Quantico

Objective

The objective of this study will be to conduct follow-up Sensitive Joint Vetch (SJV; *Aeschynomene virginica*) surveys on MCBQ, utilizing previous records and identified data needs, on the installation to identify species occurrence and distribution.

Introduction

MCB Quantico is approximately 59,000 acres located in Fauquier, Prince William, and Stafford Counties. The dominant cover type is upland forest however there is approximately 3,900 acres of wetland habitat. SJV is typically associated with tidal marshes and there are no known sites on the installation. The purpose of this work is to comply with Endangered Species Act and enable implementation of the MCB Quantico Integrated Natural Resources Management Plan.

Methods

Minimally 400 acres of habitat for SJV will be surveyed by US Fish and Wildlife Service (USFWS) approved surveyors during the USFWS designated survey window using standard field protocols. The Cooperator will ensure the surveyors conducting presence surveys is on the list of approved contractors that is maintained by the Virginia Field Office of the USFWS. If the Cooperator is not on the approved list they must be added to the list prior to commencing work. The cooperator must report the finding of any listed species to the Fish, Wildlife and Agronomy Program, NREA Branch, within 24 hours after detection of the plant and be available to escort MCB, Quantico, personnel to the site for identification purposes. Shoreline surveys will require the use of boat and access to restricted waterways due to proximity to Marine Corps Airfield Quantico. The Cooperator will record a GPS coordinate for each site where listed plants are found. Additionally, the Cooperator shall mark all located sites with flagging tape on adjacent trees.

Deliverables

The cooperator will submit a final written report and all spatial data by 1 March after completion of fieldwork. The final report will include description of survey methodology, survey results, a map of the surveyed parcels and the location, habitat, and status of SJV. Cooperator will incorporate new survey results into the existing installation database and make recommendations on species management and monitoring protocols.

Statement of Work: Option 10
Assessment of Federally Listed and At-Risk Bat Species on Marine Corps Base Quantico, Virginia

Objective

The objective of this project will be to conduct an assessment of federally listed and at-risk bat species on the Marine Corps Base Quantico to identify species occurrence and distributions and to aid in proactive management.

Introduction

MCBQ is approximately 59,000 acres of primarily forested habitat and provides excellent habitat for bats. Military training, forest management, fire, and other disturbances may influence how bats use this landscape. More information about how bats use the installation is needed to comply with the Endangered Species Act, National Environmental Policy Act, and to update the MCBQ Integrated Natural Resource Management Plan (INRMP). Initial surveys for listed bat species have detected the presence of two federally listed species: Indiana bat (*Myotis sodalis*) and northern long-eared bat (*Myotis septentrionalis*). Additionally, the presence of 2 state endangered bat species was detected: little brown bat (*Myotis lucifugus*) and tri colored bat (*Perymyotis subflavus*). Priority will be given to gathering data for the federally listed species (Indiana bat and northern long-eared bat). All bat species recorded will be included in final report.

Methods

Mist netting

The primary objective is to determine if listed and at-risk bat species occur in proposed project areas provided by MCBQ. Minimally 42 net nights will be surveyed. Cooperator must follow the current United States Fish and Wildlife Service (USFWS) Range-Wide Indiana Bat & Northern Long-eared Bat Survey Guidelines. Cooperator must also be on the USFWS Approved Surveyor List held by the USFWS Virginia Field Office. The Cooperator and primary personnel working under this contract are required to have all appropriate state and federal permits and licenses. They shall provide copies of all appropriate permits prior to commencement of fieldwork to MCBQ project manager. The Cooperator will keep copies of all permits on site while conducting work. If a federally listed or at risk bat species is captured, Cooperator must place a radio-tracking transmitter on the individual following the current year USFWS summer survey guidance. Priority will be given to Indiana and northern long-eared bats. Cooperator must conduct the surveys from 15 May to 15 August. Captured bats shall be identified to species and the sex, age, reproductive status, mass, and forearm length of each bat recorded. To alleviate possible transmission of white nose syndrome (WNS), Cooperator must follow current USFWS decontamination protocols.

Radio-Tracking

The cooperator shall purchase all radio-transmitters and supply the frequencies of each unit to MCBQ personnel. The number of transmitters required will be dependent upon success of mist netting target bat species. Cooperator must be prepared to equip targeted individuals (females and juveniles of listed species) with a transmitter on each survey night. The Cooperator must capture and instrument reproductively active (i.e., pregnant, lactating, post-lactating) female bats or juveniles of either species and track them to roost sites. The monitoring of bats with radio-transmitters will adhere to the current year USFWS summer survey guidance. The Cooperator shall follow the USFWS's guidance regarding transmitter weight to body weight ratio and use their professional judgment when deciding if a

particular bat is physically capable to receive a transmitter. A permitted biologist must oversee handling and attachment of transmitters to targeted bats. Bats outfitted with transmitters will be tracked to roost locations during daylight hours. If a radio-tagged bat cannot be successfully relocated, then the Cooperator shall include a map in their final report depicting all of the roads that were traversed during their daily searches. For each roost tree identified, Cooperator will record minimally, GPS location, species, DBH, other roost tree characteristics, and a general habitat description. Each tree will be tagged at breast height with a weather-resistant numbered tag.

Deliverables

Deliverables will include: 1) adding to the existing database of population surveys, habitat suitability, geospatial data, and literature review; 2) georeferenced locations and GIS layers for survey efforts, data collections, habitat conditions and distribution maps, 4) and a final report containing a comprehensive review and field assessment of listed and at-risk bat species distributions on the installation, species descriptions, and recommendations for future conservation, monitoring efforts, and adaptive management strategies. 5) photographs of representative bat species found during surveys.

Statement of Work: Option 11

Remote Sensing of Flora and Fauna on Marine Corps Base Quantico

Objective

The objective of this study is to utilize remote sensing tools and technology to survey for targeted flora and fauna on MCBQ to support implementation of Integrated Natural Resources Management Plan (INRMP).

Introduction

Marine Corps Base Quantico manages 59,000 acres of primarily forested habitat through an INRMP. Implementation of INRMP requires the management of threatened and endangered species, fish, game, forest products, and dispersed outdoor recreation in balance with military missions and cultural resources. It is difficult to assess the conservation status of various species in such a context using traditional research methods. Recent advances and proliferation of satellite imagery and unmanned aircraft systems (UAS) have demonstrated their ability to efficiently provide reliable natural resource data for large acreages using data from across the electromagnetic spectrum. This project aims to further define the flora and fauna of Virginia through holistic remote surveys of MCINCR-MCBQ in Fauquier County, Stafford County and Prince William County, Virginia to determine species composition and activity throughout the electromagnetic spectrum.

Methods

The cooperators will conduct base-wide surveys using satellite data or UAS with various sensor suites. UAS types will be both fixed-wing and rotary-wing. UAS should meet Program of Record or non-Program of Record UAS requirements published by the Naval Air Warfare Center. Sensors will include: 1) color video; 2) thermal; 3) multispectral; 4) hyperspectral; 5) Light Detection and Ranging (LIDAR). These sensors will quickly capture data on a wide variety of species and activities, to include: flora and fauna species identification and prevalence, forest health, agricultural health, wildfire and controlled burn monitoring, storm damage and effects, water flows, pollutant releases. During field work, pertinent field observations and other data will be recorded, including date, time, weather conditions, habitat characteristics, geographic coordinates of surveys and notable biological and cultural observations. The locations of all sampling sites will be recorded using hand-held GPS units. Following collection, imagery data will be post-processed and analyzed for species identification and activities. Cooperators will produce an annual report detailing level of effort and preliminary results, to include a complete list of species encountered.

Deliverables

A report with a complete list of the selected flora, fauna, and sites will be prepared and include aerial imagery and geospatial data of the sites surveyed with observations attributed to each site. Cooperators will produce an annual report detailing level of effort and preliminary results, to include a complete list of species encountered.

Statement of Work: Option 12

Evaluation of Conservation Volunteer Program MCB, Quantico

Objective

The objective of this project is to evaluate Conservation Volunteer Program operations and make recommendations to improve performance and refine protocols and procedures. The cooperator will also be responsible for continuously monitoring effectiveness of recommended modifications to policies and procedures and assist the Government with execution of program.

Background

The Conservation Volunteer Program (CVP) was established at MCBQ in 1986. Volunteers have been vital in assisting Base personnel in almost all natural resources programs. MCBQ policy and procedures for the use of volunteers was provided by the Base order, MCBQ 11015.3, "Conservation Volunteer Program." In recent years, the CVP program has been limited in activity and influence on Base. CVP policy and procedures are also in need of updates and adjustments to help address the current needs of the MCBQ. A rigorous review of program operations, available resources, obstacles, and opportunities for growth is needed to develop recommendations to rebuild and revitalize the CVP program.

Tasks

Initial Program Evaluation

Cooperator will review and evaluate the current status of the CVP and its active participants. Throughout the process cooperator will coordinate with NREA staff to determine program needs and discuss progress. Regular meetings will be facilitated with government staff to discuss and provide guidance with CVP overview. Cooperator will gather input from other base organizations, volunteers, and regional partners and synthesize this information for Government. Cooperator will make recommendations to improve program and work with Government to implement modifications to policies and procedures

Continuous Monitoring

Modifications to policy and procedures will be continuously monitored by the Cooperator to evaluate effectiveness of changes and adapt operations to ensure desired outcomes are achieved. Cooperator will identify and refine effective recruitment and communication strategies for a diverse group of volunteers. Cooperator will also identify existing and emerging deficiencies with the program and work with Government and volunteers to resolve issues.

Program Assistance

- 1) Assist with recruitment of new volunteers and organization of existing volunteers
- 2) Coordinate with NREA staff to determine program needs and timelines
- 3) Support the training of volunteers
- 4) Coordinate with volunteers to implement pre-determined program needs
- 5) Engage with external groups to support project development and execution

Final Report

Report will contain an assessment of the overall effectiveness of program, future challenges, and final recommendations on policies, procedures, and enhancements needed for program. Volunteer use and satisfaction data will be analyzed and incorporated into final report.

Statement of Work: Option 13 Habitat Management Coordination at MCB, Quantico.

Objective

The objective of this project is to implement and review specific habitat management projects on MCBQ to accomplish management goals on MCBQ.

Introduction

Marine Corps Base Quantico manages 59,000 acres of primarily forested habitat through an Integrated Natural Resources Management Plan (INRMP). INRMP implementation requires the management of fish, game, forest products, threatened and endangered species, and dispersed outdoor recreation in balance with military missions and cultural resources. The habitat management program on MCBQ is focused on supporting the military mission, improving habitat and species diversity, and facilitating dispersed outdoor recreation. Management practices that are utilized on Base include mechanical treatments (e.g. tillage, brush removal, logging, etc.), chemical treatments (e.g. treating invasive species, removing weed competition, etc.), prescribed fire, and various other practices. The treatment of invasive and non-native plant species, especially shrub species and cool season grasses, is a practice that is often labor intensive and costly. However, the removal of these species is often the first and key management tool in creating early successional cover and increasing the overall habitat diversity. Establishing early successional cover provides benefits to a wide array of wildlife species due to the diversity of plant species, structure, and composition. Implementing treatments to promote increased early successional cover and surveying the plant community to those treatments is key to analyzing and adapting habitat management plans and prescriptions on MCBQ.

Methods

The cooperator will coordinate mechanic, chemical, or other habitat management treatments on minimally 40 acres. Habitat management objectives will be prescribed by NREA staff in coordination with Cooperator. Prior to treatments, cooperator will note plant species occurrence and composition in project area. Cooperator will coordinate and oversee the implementation of management actions to ensure NREA prescriptions are followed. Data points will be established to monitor vegetative response to management actions. Cooperator will evaluate success of treatments and ensure they are consistent with management objectives. All actions will also adhere to applicable Federal, State, or DOD permit, regulatory, or procedural requirements.

Deliverable

The cooperator will submit a final written report and all spatial data by 31 December after completion of fieldwork. The final report will include description of habitat management methodology used, results, maps of treatments, and evaluation of the condition of habitat. Cooperator will incorporate findings into the existing installation database and make recommendations on habitat management and monitoring protocols.

Statement of Work: Option 14

Fisheries Management Coordination at MCB, Quantico

Objective

The objective of this project is to implement and oversee target fisheries management projects on MCBQ to accomplish management goals on MCBQ.

Introduction

Marine Corps Base Quantico manages approximately 550 acres aquatic habitats through an Integrated Natural Resources Management Plan (INRMP). INRMP implementation requires the management of fish, game, forest products, threatened and endangered species, and dispersed outdoor recreation in balance with military missions and cultural resources. Over 2,000 fishing licenses were sold on MCBQ in 2021 that resulted in 3,321 check-ins for fishing base. MCBQ offers opportunities to fish for a variety of species in a variety of settings including stream, ponds, lakes, and tidal waters. Previously utilized fisheries management practices on MCBQ have included measures to adjust water conditions, creating artificial fish habitat and fish attractors, construction of fishing platforms and other structures, fish stockings, and fish sampling and inventories. To appropriately prioritize needed management practices, especially any augmentation of water quality or aquatic vegetation a baseline of existing conditions is needed. Sampling of Submerged Aquatic Vegetation on many of the reservoirs or tidal waters has not been completed recently. Information about the status of fish communities is also needed.

Methods

The cooperator will coordinate the design and implementation of water quality, aquatic vegetation, fish population surveys on the reservoirs and tidal waters. The specific water bodies will be determined in coordination with NREA staff. A minimum of 100 acres of water will be surveyed as part of this project. Cooperator will synthesize results of surveys and produce management recommendations to enhance fisheries management.

Deliverable

The cooperator will submit a final written report and all spatial data by 31 December after completion of fieldwork. The final report will include description of survey methodology, survey results, a map of the surveyed parcels and status of aquatic habitats and fish communities. Cooperator will incorporate new survey results into the existing installation database and make recommendations on fisheries management and monitoring protocols.

Appendix 2: GIS SPECIFICATIONS

DELIVERABLE REQUIREMENTS

The primary objective of this section is to provide detailed specifications for collection and delivery of Geographic Information System (GIS) data. In addition, this section shall provide guidance to ensure that all GIS data delivered is compatible and will add value to the Marine Corps Base (MCB) Quantico Installation Geospatial Information and Services (IGI&S) Geodatabase. Failure to comply with the specifications outlined in this section will result in non-acceptance of data deliverables. Deliverables will conform to the Spatial Data Standards for Facilities, Infrastructure and Environment (SDSFIE) GeoFidelis Data Model. Data will be natively collected using the World Geodetic System 1984 (WGS84) datum in the Universal Transverse Mercator (UTM) coordinate system using UTM Zone 18 North and using meters as the standard unit of measurement.

METADATA

For each digital file delivered containing geographic information, the Contractor shall provide documentation consistent with the Federal Geographic Data Committee (FGDC) Content Standards for Digital Geospatial Metadata (CSDGM). Both 'GEOFidelis Mandatory' and 'FGDC Mandatory' fields shall be completed for each geographic data set. The Geospatial Information & Services (IGI&S) Metadata Authoring Guide will be provided to the Cooperator by MCBQ project manager. Metadata generation tools included in the ArcGIS suite of software (or equivalent technology) shall be used in the production of the required metadata in XML format. Regardless of the tools used for metadata creation, the Contractor must ensure that the metadata is delivered in XML format and can be easily imported into the IGI&S Geodatabase. A copy of the FGDC metadata standard can be obtained on the Internet at <http://www.fgdc.gov>. The metadata shall be formatted from the Government perspective, not the Contractor project perspective. Therefore, such items as POC should be the POC currently associated with the data and NOT the Contractor's project manager. The Contractor shall use language and format consistent with existing metadata.

Metadata must include an accuracy statement at the 90% or 95% confidence interval. Accuracy statements should include the method of determination, preferably from a recognized standard such as National Standard for Spatial Data Accuracy (NSSDA) as outlined in "Geospatial Positioning Accuracy Standards, Part 3: National Standard for Spatial Data Accuracy," published by FGDC, dated July 1998.

DATA INTEGRITY

Data accuracy standards for all deliverables will be in accordance with those set forth in the section entitled 'Data Collection Procedures'. All deliverables should include an accuracy report in the metadata referencing an established standard such as National Map Accuracy Standard (NMAS) or American Society for Photogrammetry and Remote Sensing (ASPRS).

The Cooperator shall employ appropriate QA/QC standards to ensure that data is topologically correct, accurate and complete (to include):

No erroneous overshoots, undershoots, dangles or intersections in the line work.

Point and line features will be snapped together where appropriate to support networks. For example, do not break linear features for labeling or other aesthetic purposes.

Lines should be continuous and point features should be digitized as points. For example, point features, such as roost trees, should not be drawn using only a circle (polygon) to represent its location. Use an attribute block symbol that has an insertion point in the center of the data point.

No sliver polygons.

Digital representation of the common boundaries for all graphic features must be coincident, regardless of feature layer.

A summary of the methods used to correct inconsistencies and any remaining errors by case should be included in the metadata under the 'Logical Consistency Report' and 'Completeness Report' sections.

DATA MODEL

The geodatabase schema shall follow the Marine Corps adaptation of the GIS Data Guide implementation of the SDSFIE data model and data layers will be captured accordingly. Information on the core SDSFIE data model can be found at: <http://www.sdsfie.org>, and information about the Marine Corps adaptation of this data model will be provided by the MCBQ project manager. If new data is being created, the Cooperator must provide a data dictionary identifying all of the SDSFIE Entity Types, attributes, and/or domain values associated with the new feature(s), the geographic area(s) covered by the data and Spatial extent information prior to the creation/editing of GIS data. Acceptable formats: MS Excel, MS Word, PDF. Local attributes (meeting SDS experienced level) will require precise schema definitions.

GOVERNMENT FURNISHED MATERIALS

MCBQ will provide the Cooperator access to necessary geospatial data (via personal file geodatabase), reports, schematics, or other pertinent information as described in the SOW. When requesting data, the Cooperator will identify the current SDSFIE feature classes or datasets they require. MCBQ project manager will be contacted prior to the release of any information to verify requirements. A Limited-use/non-disclosure agreement will need to be completed prior to the release of any data. The Cooperator must verify with MCBQ project manager that they are working with the most recent version of the dataset at the beginning of each year and must delete any copies of data in their possession at the end of agreement. Copying of the database is prohibited.

DATA COLLECTION PROCEDURES

All data collection must include Feature Attributes. The cooperator shall work with MCBQ project manager to identify appropriate attributes for the data collected. MCBQ project manager will provide the Cooperator with Features and Attributes Tables for all existing layers pertaining to the area of study.

FIELD COLLECTION

Where field data collection is stipulated in the cooperative agreement, the Cooperator shall utilize conventional Global Positioning System (GPS) equipment in accordance with the applicable Geospatial Positioning Accuracy Standards published by the FGDC. At a minimum, the cooperator shall provide GPS data collection at horizontal and vertical accuracy levels of +/- 5 m.

DATA SUBMITTAL ENVIRONMENTS

The Cooperator will be required to create and deliver a copy of all data in ArcGIS personal file geodatabase using ArcGIS 10.2 or higher if a higher version is being utilized by MCBQ at the time the deliverable is being developed.

The Cooperator will provide 3 complete sets of the project ArcGIS personal file geodatabase. Specific transmittal instructions will be provided to the Cooperator when the data is ready to be delivered.

Acceptable Delivery Media:

CD-ROM

DVD-ROM

External Hard Drives (only if pre-approved by MCBQ)

Digital media must have an external label listing a short description of contents, a sequence number if there are multiple volumes, and the date of media creation.

GOVERNMENT REVIEW

The Government shall review the submitted data and documentation upon completion of all stated work. Missing or incomplete items will be documented and forwarded to the cooperator for completion. Failure to adhere to any of the stated delivery specifications could result in rejection of deliverables and withholding of payment. Cooperators must submit data and documentation samples at 25%, 75% and draft final project completion to avoid the rejection of final deliverables.