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A Process for Natural Resource Managers to Integrate Downscaled SWAP Information with INRMPs

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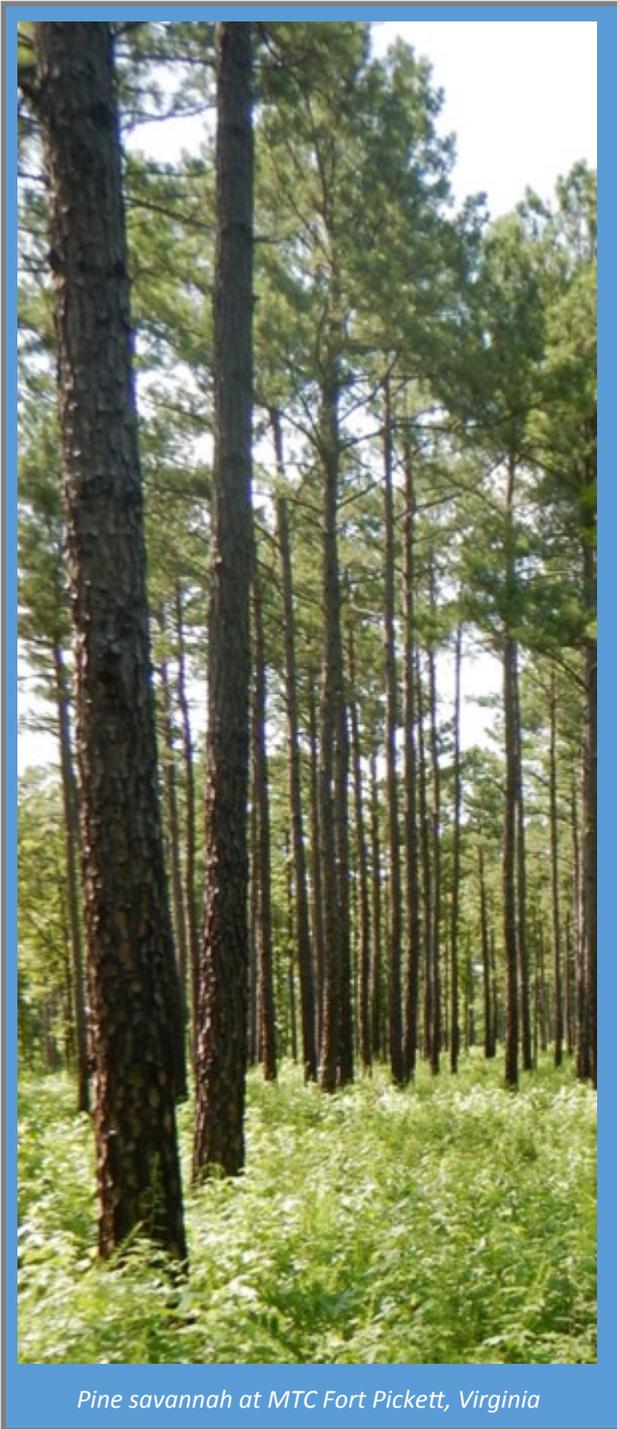
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Pine savannah at MTC Fort Pickett, Virginia

Introduction

This manual was designed to guide installation natural resource managers (NRMs) through an efficient process to help them align their integrated natural resources management plans (INRMPs) with their corresponding State Wildlife Action Plan (SWAP). Coordination of these plans will reduce potential conflicts to the training mission and identify where opportunities exist to maintain or enhance conservation actions benefiting at-risk species.

SWAPs are typically written to address species at the state scale. While comprehensive, this information may not be easily incorporated into natural resource management practices on an installation due to a lack of specificity or local landscape context. Further, information on actions, threats, and directives present at the installation scale may not be considered in the SWAP. If the SWAP is to result in effective wildlife conservation, then it must support actions at the property, or installation, level.

This manual outlines a process for integrating SWAP species and habitat information with INRMPS – a process we refer to as "downscaling". Downscaling SWAP information to the installation landscape allows NRMs to better-understand the opportunities and importance of their actions in managing at-risk wildlife. This process requires several steps and specific information, some of which may be complex. To illustrate the process, we provide examples from several different installations.

Wildlife Action Plans and INRMP
Wildlife Action Plans

Since the 1970s, state wildlife agencies have learned many important lessons. First, working to restore an endangered species can require decades of work and tens of millions of dollars. Second, by the time a species is declared to be endangered, populations have often declined to a point where conservation may not be possible. Third, once endangered, there are likely a limited number of individuals left, and regulations put in place to protect the species may also reduce or prevent innovative approaches to restoration. Finally, an endangered species crisis, played out in the media, can require years of effort that does not address the underlying conservation problems in a proactive and collaborative manner. In the early 1990s, the Association of Fish and Wildlife Agencies (AFWA) described the federal Endangered Species Act (ESA) as an "emergency room" for species in crisis (Belanger and Kinnane 2002). Further, AFWA indicated this "emergency room" was often needed but also expensive and stressful for both property owners and conservationists (Belanger and Kinnane 2002).

State agencies initiated a collaboration with AFWA in the 1990s to develop proactive programs to help keep species from becoming endangered. As part of this effort, AFWA and states worked with Congress, the White House, the United States Fish and Wildlife Service (USFWS), and thousands of stakeholders to develop a new funding mechanism to support this strategic conservation effort. In 2000, Congress created the State and Tribal Wildlife Grants (STWG) program to help state and tribal wildlife agencies work with at-risk species and prevent endangered species listings. This program currently provides funding to all 50 states, the five U.S. territories, and the District of Columbia, making the STWG Program an invaluable conservation resource.

As a condition for receiving STWG funding, Congress mandated that each state and territory develop Wildlife Actions Plans (WAP) by October 2005. The WAPs were conceived as an effort to guide states in identifying and addressing the needs of a wide array of wildlife and habitats of greatest conservation need. These WAPs were also used to ensure the effective use of STWG funding. To guide development of these plans, Congress identified Eight Essential Elements that had to be addressed before an WAP could be approved by the director of the USFWS (Public Law 106-291). These Eight Essential Elements include:

1. Information on the distribution and abundance of species of wildlife, including low and declining populations as the state fish and wildlife agency deems appropriate, that are

indicative of the diversity and health of the state's wildlife; and

2. Descriptions of locations and relative condition of key habitats and community types essential to conservation of species identified in (1); and

3. Descriptions of problems which may adversely affect species identified in (1) or their habitats, and priority research and survey efforts needed to identify factors which may assist in restoration and improved conservation of these species and habitats; and

4. Descriptions of conservation actions determined to be necessary to conserve the identified species and habitats and priorities for implementing such actions; and

5. Proposed plans for monitoring species identified in (1) and their habitats, for monitoring the effectiveness of the conservation actions proposed in (4), and for adapting these conservation actions to respond appropriately to new information or changing conditions; and

6. Descriptions of procedures to review the Plan-Strategy at intervals not to exceed ten years; and

7. Plans for coordinating, to the extent feasible, the development, implementation, review, and revision of the Plan-Strategy with federal, state, and local agencies and Indian

tribes that manage significant land and water areas within the state or administer programs that significantly affect the conservation of identified species and habitats; and

8. Congress has affirmed through the Wildlife Conservation and Restoration Program and STWG that broad public participation is an essential element of developing and implementing these Plans-Strategies, the projects that are carried out while these Plans-Strategies are developed, and the Species in Greatest Need of Conservation that Congress has indicated such programs and projects are intended to emphasize.

All states and territories submitted their first WAPs to the USFWS in October 1, 2005. Congress required the states and territories to revise their plans in 10 years or less . Many states opted for the 10 years; however, some updated their WAPs after 5 years.

For this manual, we provide examples of the downscaling process for installations in two states: Virginia and Maryland. Both Virginia and Maryland updated their plans in 2015. A brief summary of the type of information you can find in both plans is below. Most SWAPs will contain similar information, although the presentation of information and approach will differ from state to state.

Virginia

Virginia's WAP (Virginia Department of Game and inland Fisheries [VDGIF] 2015) is intended to be a strategy for statewide wildlife conservation and a framework for coordination and cooperation between agencies, academics, communities, and private conservation groups. The VDGIF, and partners have used the WAP to identify key species and habitats in need of conservation and implement projects and research needed to address those issues on behalf of all Virginians. VDGIF updated and significantly redeveloped Virginia's Wildlife Action Plan in 2015.

More specifically, the updated WAP identifies 883 species that are either critically imperiled or in decline. Habitat loss is the single greatest challenge impacting these species. The WAP identifies strategies to conserve and restore these species. In addition to a statewide overview, the WAP describes strategies for 21 multi-county planning regions, which are roughly consistent with Virginia's Planning District Commissions (PDC). For each planning region, the WAP identifies the local wildlife priorities, the habitats those species rely upon, threats impacting these species and habitats, and conservation actions that can be taken to address those threats. The WAP also identifies priority places for either conservation or restoration within each planning region, programs working to address threats or define best management practices, and data that could be used to document and evaluate the

success of conservation actions. Finally, the updated WAP describes climate trends that have been projected for Virginia and identifies actions that can be taken to conserve wildlife under changing climatic conditions.

Virginia's WAP was updated with significant input from Virginia's conservation community. Substantial efforts were also made to obtain feedback from the local land-use planning authorities and the general public. This updated WAP serves as the basis for much for much of the analysis in this manual.

Maryland

The Maryland Wildlife Action Plan was developed by the Maryland Department of Natural Resources (MDDNR) in coordination with federal, state, and local partners. The overall goals of Maryland's WAP are to keep common species common and keep them from becoming listed as threatened or endangered, and to help recover species so that they no longer need that legal protection (MDDNR 2016). The WAP sets the overall framework for wildlife and diversity conservation within the state.

Maryland's WAP outlines information on the state's species of greatest conservation need (SGCN), which include 610 mammals, birds, reptiles, amphibians, fishes, insects, freshwater mussels, and other invertebrates. The SGCN includes all state and federally listed threatened and endangered (T&E) species, rare species,

endemic species, declining species, and "responsibility species" for which Maryland harbors a significant portion of the overall population. This list includes a more substantial emphasis on invertebrates as well as priority plant species of concern. Habitats important to these SGCN are identified as "key wildlife habitats," which are listed and described using a new classification system that follows regional guidelines. The WAP includes 59 key wildlife habitats within the following categories: terrestrial/upland, wetland, aquatic, subterranean, and other habitats, including managed grasslands and artificial structures (MDDNR 2016).

The 2015 WAP also takes into account new information on climate change and its impact on Maryland's wildlife and their habitats. It incorporates new information on mapping resources, threats, and conservation needs, while it applies the AFWA Best Practices and USFWS guidance (AFWA 2012).

Integrated Natural Resource Management Plans

INRMPs integrate ecosystem management principles and are designed to manage natural resources, including fish, wildlife, and plants in a way that best protects those resources while also ensuring a military installation's mission readiness. The INRMPs are required under the Sikes Act (1960) based on a 1997 amendment that called for INRMP development and coordination

between military installations, the USFWS, and state fish and wildlife agencies. INRMPs allow installations to manage their resources in coordination with stakeholders while integrating resource conservation, stewardship, and military readiness.

INRMPs serve various functions for military lands. They provide information on the installation and its history and mission, management goals and objectives, projects and costs, how reconciling military mission and training requirements with protecting natural resources will occur, legal requirements relating to biological and natural resources, information about the installation and surrounding ecosystem, and input from stakeholders, including USFWS, state fish and wildlife agencies, and the public. More specifically, the Sikes Act requires INRMPs to provide for the following:

1. Fish and wildlife management, land management, forest management, and fish and wildlife-oriented recreation.

2. Fish and wildlife habitat enhancement or modifications.

3. Wetlands protection, enhancement, and restoration, where necessary for support of fish, wildlife, or plants.

4. Integration of and consistency among the various activities conducted under the plan.

5. Establishment of specific natural resources management goals and objectives, and time
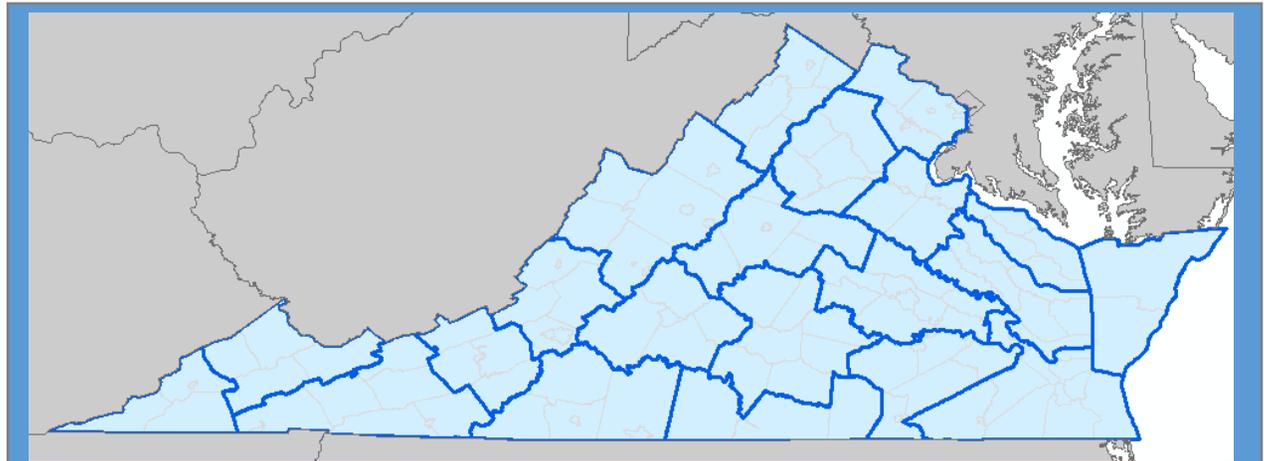
Virginia used Planning District Commission (PDC) boundaries as a base unit for its SWAP. PDCs are aggregations of counties with similar environmental conditions, landscape factors, and socioeconomic characteristics. The PDC boundaries coincide with the county boundaries. The Virginia SWAP provides separate, downscaled analysis for each of these PDCs.

frames for proposed actions.

6. Sustainable use by the public of natural resources to the extent that the use is not inconsistent with the needs of the fish and wildlife resources.

7. Public access to the military installation that is necessary and appropriate for the use described in #6, subject to requirements necessary to ensure safety and military security.

8. Enforcement of applicable natural resources laws and regulations.

9. No net loss in the capability of military installation lands to support the military mission of the installation.

INRMPs guide the actions of the NRMs in support of both the training mission and the stewardship of natural resources on the installation. The availability of SWAPs and the comprehensive nature of their information related to species-at-risk make them ideally suited for incorporation into the INRMP process.

Military training lands comprise a significant resource for SWAP managers as well. Too often, the information from installations does not get included in state-level planning and assessment.

We hope this manual will help strengthen both the INRMPs and the SWAPs in all states where military lands comprise a significant part of the natural landscape.

Manual Development

This manual provides installation natural resource managers a clear, efficient methodology to help them align their INRMPs with their corresponding SWAP in terms of conservation opportunities as well as potential conflicts to the training mission. To make the WAP more useful to installation NRMs, the manual outlines a process for integrating WAP species and habitat information with INRMPS and provides several methods for down-scaling WAPs to an installation level, using several different installations as examples.

To develop the manual, we worked directly with installation NRMs at Aberdeen Proving Ground (PG; Aberdeen, Maryland); Marine Corps Base (MCB) Quantico (Quantico, Virginia) and Military Training Center (MTC) Fort Pickett (Blackstone, Virginia). These three installations represent several types of training uses and landscapes, and the processes and approaches outlined within this document for downscaling the SWAPs are applicable to any installation.

Downscaling information in WAPs allows managers to identify priority SGCN specific to their installation and to design management objectives that act on relevant conservation opportunities and mitigate potential conflicts to training. The downscaling process provides a prioritized list of SGCNs for the installation based on the overall importance of its landscape compared to the statewide distribution of the species. To conduct the downscaling of WAPs to an installation level, we used all available geospatial information, along with information in the WAPs, to identify potential SGCN distributions (or habitat as appropriate) within the installation landscape. Those species with a relatively high proportion of their distribution within the installation landscape were prioritized and analyzed to determine what factors are driving decline and what actions the installation can make to contribute to conservation and avoid conflict with the training mission.

The processes outlined in the following sections provide installation managers a step by step process they can use to take their state's WAP and put it to use for their INRMP and management of their installations. Each step in the process has its own chapter that includes a description of the step and related actions as well as using examples from the case studies to illustrate various ways the actions can be implemented. The steps in the process relate to gaining background information, preparing data and information, and conducting the downscale. A case study is for each installation is provided with this manual and includes extensive descriptions of how WAPs were downscaled to each installation with written processes and quantitative details.

The overall approach has several key steps that involve identification of species of greatest conservation need. The objective at each step is to reduce the number of SGCNs in consideration until a set of installation priority species has been identified.

The sections that follow provide significant detail on how installations can implement these steps based on the information they have available to them in their INRMP and state WAP. Processes and actions may vary depending on the structure and data available within the documents and for the installation itself as well as the state (e.g., type of land-use maps available – Maryland does not include military installations in its conservation lands data layer). A final section outlines how installations can use this information to demonstrate to state fish and wildlife agencies the type of conservation actions they are already taking to benefit a wide range of SGCN, actions installations may now plan to take, how this information can help an installation make decisions related to specific species or habitat management, and help them make the case for continuing or stopping specific actions that may affect the military mission (i.e., information to back up already helping possible newly listed T&E, etc.).

Resources needed for the downscaling process

In developing this manual, we have tried to keep in mind the many demands and deadlines placed on installation natural resource management staff. Further, specialized knowledge and resources may not be readily available to allocate towards incorporating SWAP information into installation activities.

We will outline a process that may be greatly enhanced by the incorporation of available species survey data and geospatial information. Access to these resources will likely vary from installation to installation.

We strongly recommend that those interested in conducting a downscale for their installation take stock of available geospatial knowledge, software, and data so that they can develop a good plan for completing the analysis. If these resources are not available within the installation's capacity, then partner organizations may be able to provide assistance.

We should note that incorporation of geospatial information, while very informative, is not an absolute requirement to actively incorporating SGCNs into INRMPs. NRMS that have knowledge of their installations can use that information to match up SGCNs and their related information from the SWAP.

Geospatial information may provide NRMs some efficiency and ability to make modifications to the analysis over time, and we feel this is justifies any extra effort it requires. Further, by anchoring installation prioritizations to geospatial information that can be shared with other partners, the NRMs may better inform others engaged in overall effort to conserve SGCNs throughout the state.

The Maryland SWAP identifies 610 species of greatest conservation need (SGCN). These species represent a number of different taxa and include both vertebrate and invertebrate species. Many states choose to include other groups of mammals such as marine species (as applicable), other invertebrates, or plants as well.
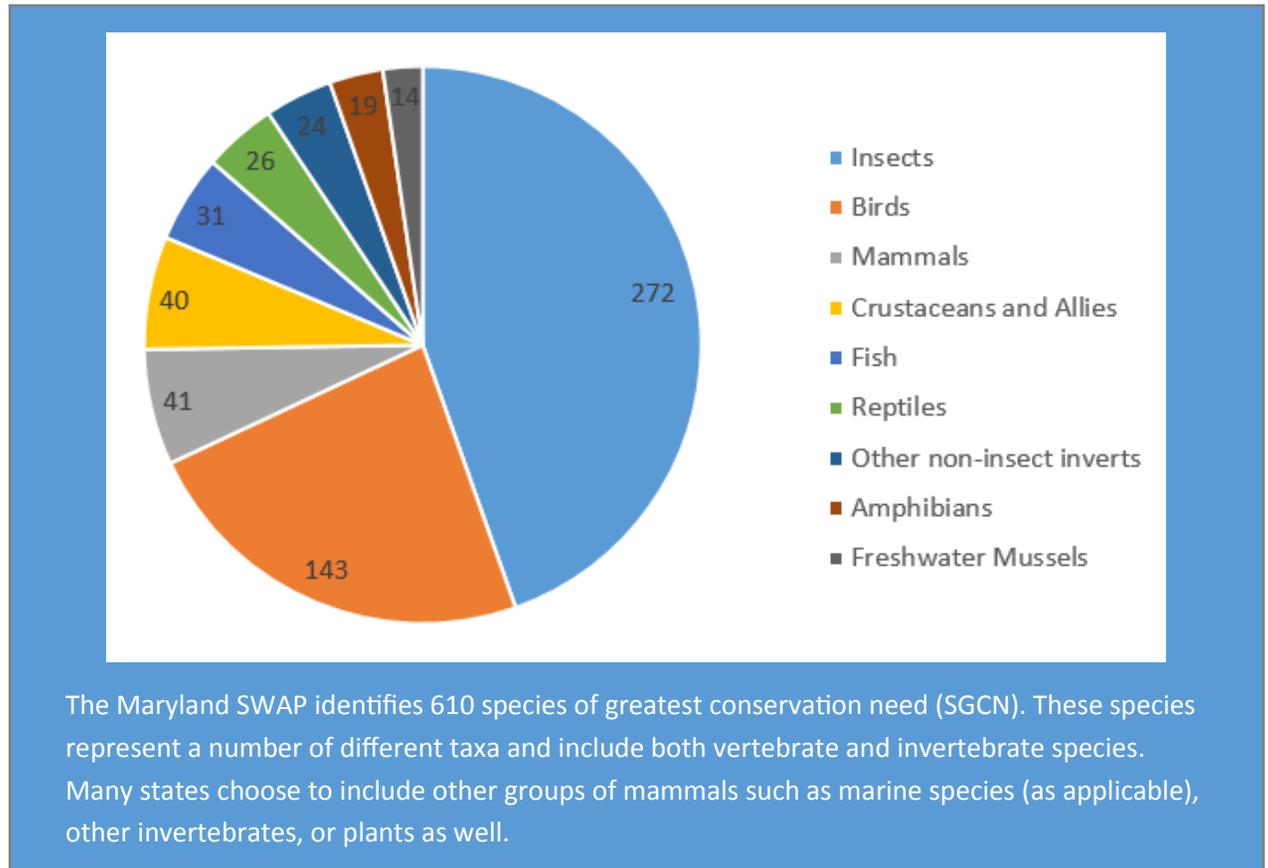
1.0 Determine the Installation Landscape

The installation landscape is a critical component to the downscaling process. In defining the installation landscape, the NRM is establishing spatial context for the analysis.

This context helps to frame the importance of this area within the greater set of habitats for each SGCN. For example, the installation may contain old growth riparian forest on which some SGCNs depend. This habitat type may be fairly abundant at the state level but may not occur within the greater installation landscape. Therefore, the stands of old growth riparian forest found on the installation have some regional significance. Further, SGCNs using that habitat persist within the landscape because of its availability on the installation.

With this contextual information the importance of the installation, to this habitat and the SGCNs that utilize it is clear and can be considered in subsequent decision making.

The appropriate installation landscape (or landscapes) to include in the downscale are typically the product of both political and ecological factors. NRMs should consider both when identifying the installation landscape.

1.1 Identify spatial units for the installation landscape

Species of plants and animals are arrayed on the landscape based on habitat, not parcels. Thus, when considering where an SGCN is likely to occur we should consider the spatial units applicable to understanding and representing this distribution.

Species distribution maps are often based on vegetation (rather than true habitat) maps, which are scale dependent and may get very complex.

For the purpose of this approach, we are really interested in whether habitat for an SGCN is known or likely to occur within the installation landscape. The exact amount or location is less important at this stage (although may be very important when specific management actions are developed).

The choice of spatial units may depend entirely on the information already available in either the INRMP, the SWAP, or other sources. The important thing to consider is whether the spatial units, be they county boundaries, identified compatible use buffers, or watersheds, are understandable and can be easily incorporated into the INRMP.

> ### All species in the state
>
> ### Species identified as SGCN
>
> ### SGCN in installation landscape
>
> ### Priorities for installation
>
> This approach aims to reduce the number of SGCN at each step of the downscaling process. These allows the installation to understand which SGCNs are found within their identified landscape, and make informed decisions as to which should be prioritized for management and conservation based on factors like available habitat, existing regulations, and installation specific objectives. This information can be incorporated into installation management plans and can be communicated with partner agencies and organizations.

1.2 Identify conservation partners and adjacent lands to consider in addition to the installation

Downscaling priority SGCN to an installation level requires knowledge of the specific boundary of the installation; however, installations often work with partners outside their boundaries or manage species and habitats that cross these boundaries. It is important for the installation NRMs to determine how they would like their boundary defined because this affects the overall context of the downscale.

It is also important to consider the conservation partners that work with the installation and their

lands as well as other buffer or adjacent lands for which the installation may work or have an interest. Utilizing the hydrologic units (i.e., watershed) may capture these boundaries, while in other cases focusing on counties may be better. Alternatively, having a very specific boundary to encompass partner lands may be necessary.

1.3 Identify and obtain any existing or needed spatial data to define the installation landscape

Once the installation landscape has been determined, the NRM should finalize the borders that define this area. The resulting boundary should incorporate all the ecological and partner

Should open water areas or out lying parcels be included in the installation landscape?

The natural resource managers at Aberdeen Proving Ground (APG), established the installation boundary as the installation landscape for their downscale effort (black lines). A large portion of this area is comprised of open water of the Chesapeake Bay and its tributaries.

The Maryland Department of Natural Resources identifies several marine species in their SWAP and these may be included within the installation landscape as shown. NRMs may wish to consider whether these species will be included in their analysis, or should be excluded for some other reason. Installation NRMs may not have included open water habitat in their current INRMP, and given the importance of this type to SGCNs in Maryland they may determine this is an area to consider updating.
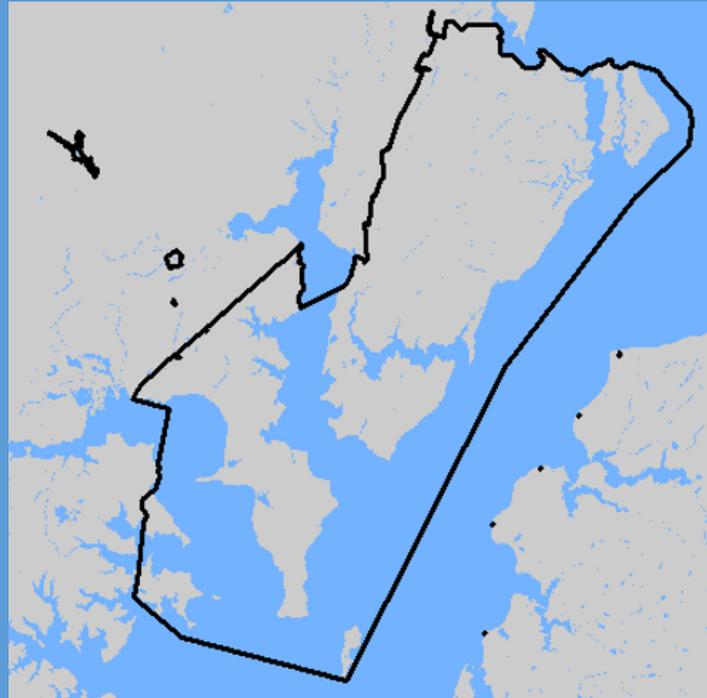
Similarly, this installation has several small outlying parcels. While these outlying areas comprise very little of the total installation area they do expand the footprint of APG into areas with habitat types different than those found on the main base. The parcels in the northwest portion of this image are actually found in a different physiographic province than the rest of the installation areas, and that may result in the inclusion of SGCNs that were not considered during the development of the INRMP. The NRMS at APG elected to include the outlying parcels in the downscale project to ensure that any SGCNs that might occur on or around them were incorporated.

concerns at a spatial scale matching the critical features. Additional decisions may be required such as whether open water areas within the boundary should be included in the analysis (see sidebar next page), or how inholdings should be considered. The spatial information should be formatted so that any subsequent spatial analysis will incorporate these (or exclude) these areas and avoid mismatched results later in the process.

2.0 Identify WAP SGCN and Associated Information

The WAP for each state was revised in 2015. Once approved by the USFWS, the SWAP should be made available for users via the Internet. In most cases, the state fish and wildlife agency website will have additional information on the SWAP as well as links to any available documents (including the entire plan), summaries, spatial data, or associated online tools . These resources are provided to enhance the user's ability to understand and implement the conservation actions outlined in the plan, so these agencies have great interest in seeing this information put to good use.

2.1 Retrieve and review relevant SWAP for your state

Reviewing and understanding the relevant SWAP is the primary first step in this process. Each

state's plan is different but all are guided by the eight essential elements outlined by the USFWS (see page 5).

Understanding how your SWAP was developed is valuable when planning a downscale. Some specific things to find out are:

1. Did the SWAP use any sort of regionalization for their analysis?

2. How did the state define and use habitats?

3. How were SGCNs identified? Did they use any system of prioritizing SGCNs?

4. What sorts of threats or stressors were identified?

5. Were there any specific conservation actions identified?

The initial review of the SWAP may yield information that will allow for direct match ups to known issues for your installation. For example, the SWAP may indicate that coastal beach habitats and species associated with them are identified as SGCN of high priority. If the installation has coastal beach, then there is likely an opportunity to focus on these species as potential priorities. Especially if the threats to the habitat include coastal development that do not occur on the installation. Alternatively, sea level rise may be the most significant threat which affects coastal beach area regardless of land management.

There is much to learn from the SWAP, and the time spent familiarizing yourself with how it was created will improve the installation downscale.

2.2 Contact relevant state fish and wildlife office if needed

There is likely no better resource available to the installation NRMs than the state agency personnel that developed and maintain the SWAP. These individuals were directly involved in the discussions, revisions, writing, and decision making that went into the SWAP, and they have unique insight into how the installation can be an active partner in meeting the conservation goals outlined.

While state agency personnel are unlikely to be able to complete an installation downscale for you, they are certainly able to answer questions and provide guidance in using the SWAP. Do not hesitate to identify the appropriate people and contact them.

2.3 Review list of WAP SGCN

All WAPs identify SGCN for their state. As noted in an earlier section, WAPs focus on these SGCN and their habitats, defining the threats they face as well as conservation actions to address those threats. States may choose how they wish to identify SGCN for their state, but the SGCN often include threatened and endangered species, species of concern, endemics, species with declining populations, etc. State lists can be different as they result from separate processes; thus, in instances where an installation borders two (or more) states, the installation should be prepared to do some reconciliation between the SGCNs identified in each WAP.

The installations used in this project are located in Virginia and Maryland. Virginia includes 883 SGCN, and Maryland includes 610 SGCN. Both plans have species ranging from mammals to fish to invertebrates. Virginia ranks their species based on imperilment and conservation opportunity. Maryland uses NatureServe's G and S ranking system as well as a variety of other systems to rank SGCN. Maryland also provides an overall "status" ranking of A to E that condenses the G and S ranking system into a simpler format.

Compare the list of SGCN from your state's WAP to those listed in your INRMP. In some cases, the NRMs on the installation will have included SGCN and noted it within the INRMP, making this task more straightforward. In many cases, this process will need to be completed as part of the downscale effort and involve sorting and comparing lists.

The number of species present in both installation and state SGCN lists will vary from installation to installation and state to state, because some INRMPs may not have referenced a WAP. If the INRMP does include SWAP information, it may be from the 2005 version and require updating. It is also possible a WAP missed important species that are located on the installation, and this is an opportunity to check WAPs to ensure they highlight all important species in the state.

## 2.4 Review habitat classifications and descriptions

States vary in how they define and describe habitats. It is important to understand how the WAP designates and defines habitats and how they relate habitats to species. This is a critical function of the SWAP, so the information should be clear and identifiable in the document. Either note this information, or pull any related tables or appendices, as this data will be needed in a variety of steps later in the process. Specifically, this information and associated data may be necessary for downscaling WAP species information as well as helping to determine threats and actions for SGCN.

Both Maryland and Virginia used habitat classifications specific to their state and analysis approach. Maryland developed a classification containing 59 Key Wildlife Habitat types that includes terrestrial and aquatic features. The WAP also provides detailed descriptions and distributions of each habitat type used. In addition, the WAP provides information on how the Key Habitat Types are cross referenced with other classifications of vegetation (i.e., National Vegetation Classification Standard) and habitat (i.e., the Northeast Terrestrial Habitat Classification System and (NETHCS) Northeastern Aquatic Habitat Classification System).

Virginia based their habitat classification system on more generalized types than the NETHCS. This is more an artifact of how the SWAP was completed in 2005 and updated. Thus, where the NETHCS might identify four or more riparian forest types in Virginia, the SWAP may simply list one as "riparian forests". For each SGCN, a habitat description is provided, along with maps indicating where SGCN are found within the state at a hydrologic unit code (HUC) level based on occurrence data and other known habitat association data. The plan does not provide specific information on how those habitats were used to create the species distributions.

This information is invaluable to the installation downscale process as it provides insight into how the authors of a SWAP view the important habitat types, and it allows NRMs to align what they know about their installation to these habitat representations more accurately.

Terrestrial Habitat Map for the Northeast US and Atlantic Canada
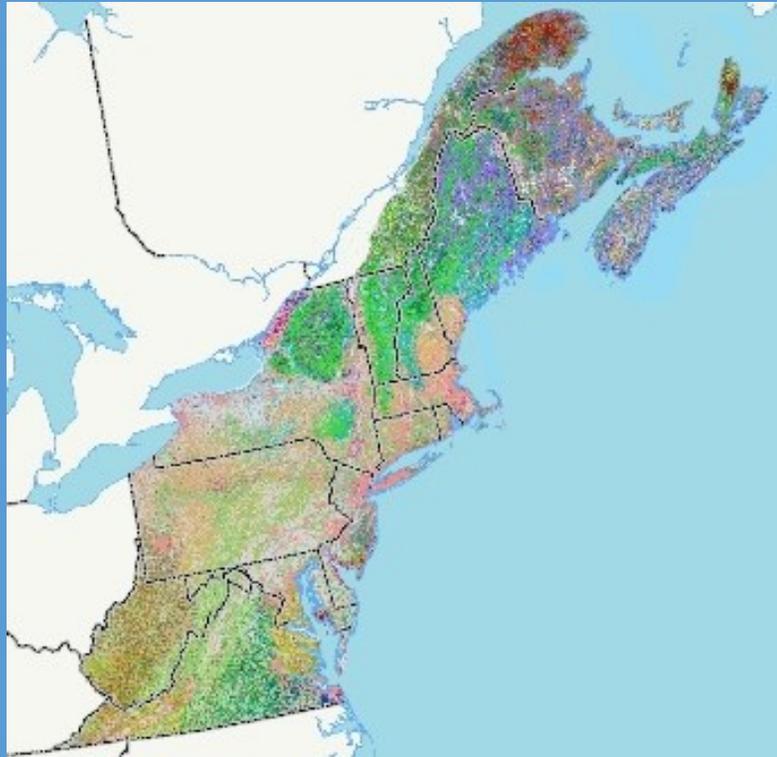
The Nature Conservancy s Eastern Conservation Science team created a map of terrestrial habitats . The map is based on over 4,000,000 data points and polygons from numerous sources. Over 40 organizations in the US and Canada provided guidance and comments.

The dataset provides both the type and distribution of 140 unique classes of forests, wetlands, tidal systems, and other rare types and is based on NatureServe's ecological system concept.

https://www.conservationgateway.org/ConservationByGeography/NorthAmerica/UnitedStates/edc/reportsdata/terrestrial/habitatmap/Pages/default.aspx

2.5 Review threat and conservation action information

Understanding how threats and conservation actions are described within a state's WAP will help further along in the process once priority SGCNs are identified for the installation. Part of this approach includes an analysis of how the installation is already addressing priority SGCN and how they might enhance their efforts in ways that benefit SGCN and habitats as well as the military mission. Thus, knowing how this information is presented within the WAP is important from the beginning. Most WAPs include a section that focuses on overall threats and conservation actions at a state level. Additionally, WAPs will include more specific threat and conservation information, often by SGCN and/or by habitat or another relevant category. Again, noting the location of this information or pulling relevant sections will be important for later use.

Maryland includes a separate chapter for threat and conservation actions. Each threat has a section that details how the specific threat affects different habitats in the state. Threats are defined based on the International Union for Conservation of Nature threat categorization scheme. The chapter on conservation actions includes sections on types of actions, generally, as well as specific conservation actions for different habitats and taxa groups.

Virginia's WAP includes a general discussion of the types of threats facing its habitats and SGCN in its statewide chapter. It also includes a discussion of general conservation actions. Virginia's WAP is divided into 21 chapters based on the planning regions within the state. Within each of these Local WAP Summaries, threats and conservation actions are described based on the habitat types found within the region. For example, all planning regions contain riparian and aquatic habitats; thus, each of the 21 chapters includes information on the threats facing rivers and streams as well as actions to address those threats.

2.6 Obtain relevant spatial data if available

Downscaling SWAP information to the installation scale is an inherently spatial process. Certainly, this process can be completed by comparing state SGCN lists to an installation's species list, but the true benefits are realized when this information can be evaluated at the landscape scale. To incorporate that information, the NRM will likely require access to several key spatial datasets including:

- the habitat features described in the SWAP

- any SGCN distributions derived from the habitat features and/or other datasets (e.g., county range maps)

- spatial data used to subdivide the state into regions or other units described in the SWAP (e.g., planning districts, ecoregions).

There may be several other examples of spatial information that would provide NRMs a great deal of information and support for the downscale process.

As with all spatial information, it is wise to also preserve metadata or accompanying narrative information with the spatial files for future reference. Often, this information can be lost or overlooked during acquisition, but it is a critical piece of information to have to ensure the data are used appropriately.

3.0 Identify Species within the Installation Landscape

The primary objective of the downscaling effort is to identify SGCN found on an installation, or its surrounding landscape. This section outlines some methods to develop potential species lists for the installation landscape, which may then be used to develop a priority list.

For our downscale case studies, we make extensive use of spreadsheet software. The spreadsheet allows us to organize lists of species and habitats and related them to other databases, and the geographic information system (GIS). It also facilitates formatting and presentation of the information in reports and analyses.

3.1 Retrieve and review INRMP from installation

This is a step consultants or an outside entity would conduct as an initial part of the analysis. If this process is being conducted internally by

installation natural resource staff, this step can be skipped; however, if there are staff that are not as familiar with the details of the INRMP, it will necessary to review it. There are several key aspects of INRMPs that should be noted in preparation to compare it with the state's WAP.

During the review, pay close attention to mission, landscape, habitat types, and species present on installation. Use s spreadsheet or some other tool to document and organize the species that are mentioned within the INRMP as well as any habitat information. You may wish to also record why they were included, or in what sections.

For example, the MCB Quantico INRMP provides a comprehensive list of species in its appendices as opposed to the main text of the document. This makes it relatively simple to transfer the information into a spreadsheet. It should also be noted that many of the records are dated from 10 to 20 years prior to the publication of the INRMP. Is it likely the species has persisted within the installation? Has its abundance changed?

These types of details are all important to note so that comparisons to information in the state's WAP can be better analyzed and compared as well as to help understand where gaps in information may occur at the installation level.

Alternatively, the species described within Aberdeen PG's INRMP are embedded within the main text of the INRMP; thus a species list had to be compiled by identifying them from various sections and copying them into a spreadsheet.

There are several other details from the INRMP that will not be used at this stage, but they are important to note for later use. These include documenting:

- The threats and conservation actions described in the INRMP;

- How the INRMP was developed and what the review/update cycle is; and

- What spatial data are available for the area.

The INRMP is certainly the most important component to the analysis. You will likely find some species have been documented that were not listed as present in the area by the SWAP.

Photo by V. Emrick

This kind of knowledge is invaluable to both the installation and the state natural resource management agency and demonstrates an opportunity for better communication and coordination. This is especially true for situations where regular installation training activities result in the creation and maintenance of unique habitats not found elsewhere in the landscape, or even the state.

Fire is common on military installations that have live fire ranges. Fire frequencies have remained constant or increased on US military installations since the 1940s. Outside of impact areas and buffers, many US military installations use prescribed fire for a variety of purposes that range from fuel reduction to endangered species habitat maintenance.

4.0 Identify WAP Priority SGCN on the Installation

We want to use the information from the SWAP to identify which SGCN occur within the installation landscape. Some questions to consider are:

- How many SGCN are predicted to occur within the installation landscape?

- How much of this species' habitat occurs within the installation landscape?

- Which habitats on the installation help the greatest number of SGCN?

- What other factors are important for identifying a SGCN as a priority for this installation?

We will answer these questions by using the information contained in the SWAP on SGCN distribution as well as habitats to connect species with habitats, and then map those across the landscape. By establishing this information within the context of the installation landscape, we will be able to understand how important the area is to overall SGCN conservation in the region and state. We can use this information, along with installation-specific factors, to identify those species that will be prioritized.

In some states, this will be a straightforward exercise. Some states have identified priority species, and those that occur within the installation landscape can be adopted as priorities in the INRMP.

For example, using the Action Plan Tool provided for the Virginia SWAP we can quickly learn that MCB Quantico has 12 priority SGCN within its defined boundary and MTC Fort Pickett has 24 priority SGCN based on the data from the WAP. If the installation NRMs choose, they can simply target these priority species with actions that work within the training mission. However, NRMs may wish to expand this analysis to provide a better representation of SGCNs within their region as well.

It is likely that installation NRMs will desire some level of downscaled information to incorporate into their INRMP and conservation activities either because no state-level prioritization guidance is available, or they want to ensure that SGCNs with local significance are included. In these cases, additional work will be required to identify those priority SGCNs.

4.1 Represent SGCN spatially on the landscape

The method for spatially representing SGCN on the landscape (if represented spatially) will vary by SWAP. This information may be readily available within the Plans, or it may require some analysis on the part of NRMs to determine the spatial extent of SGCN within their states. Spatial data for SGCN will be imperative to determining which SGCN are likely within an installation landscape.

If the WAP provides SGCN distribution

information, then you will be able to more easily determine which species are likely on your installation landscape. WAPs may provide maps of SGCN locations based on observational and /or modeled data. Most likely, a state will use this type of data but map SGCN to a larger unit (e.g., watersheds) so as not to include specific locations.

For example, in Virginia, the VDGIF staff developed new distribution maps for each SGCN identified within the 2005 WAP where distribution information was available. These new maps were based on 12-digit watersheds (referred to as HUC12 watersheds ; Weary and Doctor 2014). Virginia's HUC12 watersheds range in size from approximately 15 square miles to 70 square miles. Each of Virginia's counties typically encompasses 10 to 15 HUC12 watersheds.

HUC12 distribution maps were created for approximately 500 of the 2005 SWAP's 925 SGCN. The majority of these were vertebrates, freshwater mollusks, and crayfish.

By mapping SGCN distributions within HUC12 watersheds, the updated WAP is able to identify areas that support multiple SGCN (see next page). Likewise, HUC12 maps are at a fine enough scale to identify priority areas within a county or planning region, but at the same time, they are coarse enough to hinder illegal collections or be perceived as a threat to private landowners. Given this work was already completed as a part of the WAP, installation managers have information on SGCN at a local scale that they can use at the

installation level by using VDGIF's online Action Plan Web Tool.

Virginia also identified priority SGCN at a planning district commission (PDC) level. Upon reviewing the local SGCN lists and conferring with partners, it was determined that the initial PDC SGCN lists were too long to provide a useful information for prioritization because they included numerous species outside the core of their range, or species that were found throughout the state.

The VDGIF implemented a "10 percent rule" to identify locally important species. Under the 10 percent rule, an SGCN is considered as a priority if the that PDC provides at least 10 percent of that species' range in Virginia. This modification reduced the size the number of SGCNs for management prioritization by half or more and allows local conservationists to focus efforts on those species for which they can make the greatest impact.

It should be noted that this 10 percent rule is arbitrary. In discussions, VDGIF staff and partners recommended using values ranging from 2 percent to 40 percent. A literature review and follow-up discussions failed to provide any significant guidance as to what value would be most appropriate. Lacking additional input or peer-reviewed justification, VDGIF's WAP Coordinator selected 10 percent as it produced manageable SGCN lists and was acceptable to the majority of staff and partners.

Alternatively, if WAPs do not include distribution data for SGCN, they likely provide some type of SGCN/ habitat association. Most commonly, this involves chapters or sections on habitats with a listing of associated SGCN within the state. Translating this information into spatial data takes additional analysis on the part of NRMs. Generally, the SGCN will need to be translated from the text or a table in the WAP to a database (e.g., Excel) and associated to their specific habitat. This can be done in a variety of ways, but our approach was to list SGCN along the first column of a spreadsheet and all habitat types identified within the WAP along the top row. For each species, we then put a "1," or some other marker, in any corresponding habitat column
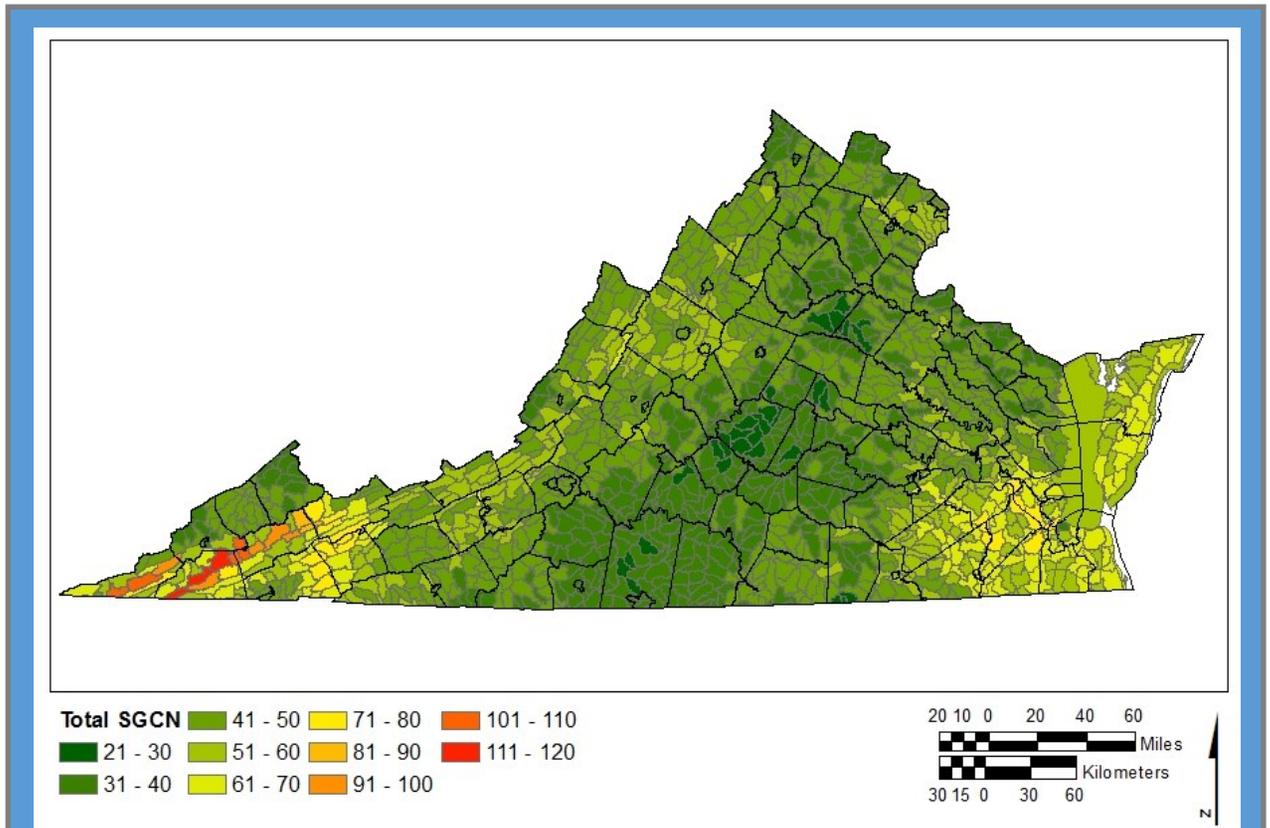
Virginia used 12 digit hydrologic units to map distributions of SGCNs across the state. This permitted a local level analysis. Hydrologic units work well for aquatic species and are based on ecological units rather than political ones (e.g., counties). More information is available via the Virginia SWAP Interactive Tool (http://vafwis.dgif.virginia.gov/WAP2/).

where the WAP notes that SGCN is found. This information can then be incorporated into a GIS database and attached to a map of the habitat types to generate representations of potential species distributions.

The spatial data layers representing the habitat classification used within an WAP will also need to be acquired. Depending on the habitat classification system used (e.g., land cover, NETHCS), this data may be readily available online or you may need to work with state partners to obtain it. Using the database of SGCN associated to specific habitats and the spatial habitat layer, SGCN can be mapped on the landscape.

For example, Maryland's WAP includes 59 unique "key wildlife habitats" for the state. The plan also includes maps of these habitats and lists the SGCN found within each of these habitat types. This information is provided in tabular format; however, there is no corresponding spatial map available digitally.

Maryland did provide a crosswalk from these types to the NETHCS and map representations of this classifications are available. To create spatial data representing where SGCN likely occur, we developed a spreadsheet that listed all 52 habitat types across the top row. Then, each SGCN in the WAP was listed along the first column with the corresponding habitat type numbers following it. For each SGCN, we coded a "1" in corresponding habitat columns to indicate use (see Aberdeen PG case study). This information was then put into a

GIS system and connected to the NETHCS map data to identify locations within the state SGCN may be found.

There are several important points to make here regarding this approach. The first point is that the resulting distribution maps merely connect SGCNs to appropriate habitat types through a spatial representation . No additional information on known ranges, habitat quality, or suitability are considered. Thus, the map will tend to over-predict places where an SGCN *might* occur. Second, this approach will only be as accurate as our knowledge of the SGCN-habitat association or the mapped representation of habitat. Thus, it is imperative that the user understand the limitations of that information before applying it the prioritization.

In executing this analysis for Aberdeen PG, we were able to create species distributions using the NETHC map and available information. When that process was completed, we noted that the marshland on the installation was labeled as "Tidal Salt Marsh and Shrubland" by the NTHC map, but it was identified as "Tidal Freshwater March and Shrubland" in the Maryland WAP. This distinction affected the resulting species distribution maps and required additional discussion and analysis to ensure the classification for the Aberdeen PG downscale was correct. In this instance, we elected to stay with the INRMP classification as saltwater and completed our analysis, accordingly.

4.2 Downscale priority SGCN to the installation landscape

With SGCN mapped on the landscape, we can combine this layer with the installation landscape and/or boundary data layer to understand the context of the installation within the greater reference area. This helps decision makers understand the importance of lands under their control for specific conservation actions.

Where SGCN are not already prioritized at a localized level, a NRM can calculate importance values of SGCN for the installation. The importance value for each SGCN is calculated by dividing the total area of distribution in the state by the total area of SGCN habitat within the installation landscape. The resulting importance value can be calculated for the entire suite of SGCN found in the installation area and sorted in descending order as a measure of relative importance. Other factors can be incorporated to reflect additional importance placed on the SGCN by the installation or other entity (e.g., total number of occurrences in the state). This process provides a more specific context for the importance of the installation to each SGCN in the installation landscape. This approach also enables installation managers to understand how important the installation is to each SGCN. This will also allow managers to identify which SGCN benefit as a direct result of installation management (e.g., Henslow's sparrow in large grassland areas), or may present challenges to

Downscaling SGCN Distributions: An example from Aberdeen Proving Ground

Using the information from the SWAP, we are able to match SGCN to key habitat types. We use a spreadsheet to organize the data by SGCN and habitat type (see table to the left).

This allows us to connect a species to a habitat class on a map. In the GIS, we can see which SGCNs potentially occur on the installation.

We will use the boat tailed grackle as an example. The SWAP lists this species as using key habitats of 10, 18, 35, and 36 (Maritime Forest and Shrubland, Maritime Dune and Grassland, Tidal Brackish Marsh and Shrubland, and Tidal Salt Marsh and Shrubland).

We used the crosswalk from the key habitat types to the Northeastern Terrestrial Habitat Classification map to create a key habitat type map for Maryland. Then, we used the information from the habitat table to create potential species distributions.

With these distributions, we are able to determine which SGCNs potentially occur in the installation landscape and how important the installation landscape is relative to the reference area.

The model predicts that the boat tailed grackle has approximately 889 km^2 of habitat in the state of Maryland, and 27.5 km2 of that is located within the installation landscape. We calculated the importance score for this species to be 0.031 (27.5/889).

Example of the key habitat types used by each SGCN

Common	Habitat	1	2	3	...	59
Allegheny woodrat	1 7,12 15,52,59	1	1	1	...	1
American mink	2 8,19 31,34 36,38 46,57	0	1	1	...	0
Appalachian cottontail	1 4,12,13,15	1	1	1	...	0
Big brown bat	1 15, 18 31, 33 36, 38 46, 52, 54, 58, 59	1	1	1	...	1
Blue whale	51	0	0	0	...	0
Bobcat	1 9, 11 15, 19 30, 33 36, 54 55	1	1	1	...	0

+
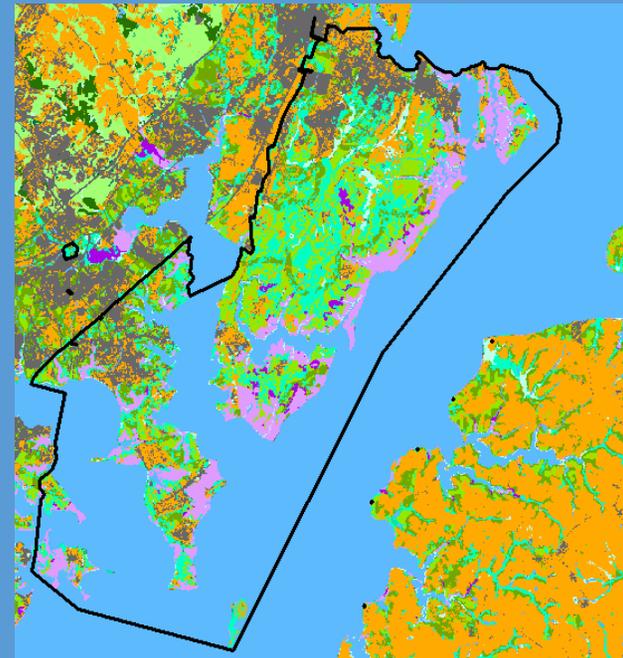
Key habitat types

training without conservation action.

The most basic example would be in the case of a rare endemic species. Envision a species with its entire statewide range located within a single installation landscape. The importance value for this SGCN would be 1.0, since the total distribution on the installation and the total distribution in the state is equal. Clearly, the conservation decisions surrounding that species and habitat are squarely on the NRM for that facility since the species is not found anywhere else in the state. This is a species that would likely be prioritized in the INRMP due to its rarity and its potential impacts on the training mission of the installation.

Building on that example, consider another species that is found throughout at 10 county area in the vicinity of the installation. Using what we know about that species and the habitats it uses, along with maps of where that habitat occurs, we can develop and quantify the total amount of habitat available. We can then use defined boundaries (like the installation landscape) to understand how much of the species habitat is within this area.

Assume that the species is predicted to occur on 100,000 acres in the 10-county area. If the installation had 500 acres of the expected distribution then the importance score would be low (0.005), and it may be prudent to focus our conservation attentions on other SGCN. However, if the installation contained 15,000 acres of the

species habitat, we would recognize that the installation is quite significant to the overall management of this species with a score of 0.15.

The important point is to understand the context of the installation landscape within the surrounding state or region and incorporate that information into conservation decisions and actions.

Importance Values

We calculated an importance value for each SGCN using this formula:

$$\frac{\textbf{Total Distribution in Installation Landscape}}{\textbf{Total Distribution in Reference Area}}$$

For example, if the distribution of species X in the state is 1,000,000 acres, and its distribution within the installation landscape is 80,000 acres then the importance value for that species would be:

$$80{,}000 \,/\, 1{,}000{,}000 = 0.08$$

The maximum value is 1.0 and minimum is 0.0.

5.0 Determine the Installation Priority SGCN

At this point in the process, an installation NRM has a list of WAP SGCN within the installation landscape based on observational, habitat, or other data (not solely a comparison of species lists between INRMPs and WAPs). Additionally, managers are equipped with a priority ranking of these SGCN based the level of importance of habitats within the installation (as described above based on observational or habitat information). The next and most important step is to determine which of these SGCN should be considered priorities for the installation.

A first step, however, is to review the list of priority SGCN for the installation and determine if based on survey and/ or staff knowledge, if any of the SGCNs are unlikely to be found on the installation. An SGCN may be misrepresented on the list if it occurs in a habitat that is only present on the installation to a small degree or in a habitat that is transient on the installation landscape. Additionally, perhaps events have occurred within the installation landscapes that have affected the presence of an SGCN (change from forest to early successional habitat, translocation of a species that may be affected by training, etc.). Document these changes and update the list of SGCN to be considered priorities for the installation.

Once a review of the priority SGCN on the installation is complete, there are several approaches that can be taken – an installation can

use all approaches or pick and choose which are most relevant and useful to their situation.

You can consider a variety of factors when evaluating which priority SGCN identified during the process described may be installation priority SGCN. We outline several factors/ questions below. They include the following:

- Are there endemic SGCN to the installation?

- Do you hold a significant portion of the available habitat within the state or region?

- Do you have multiple species utilizing one habitat?

- Does the WAP provide a prioritization process based on distribution within the state?

- Does the WAP provide a ranking system of SGCN within the Plan?

- Which SGCNs' have federal or state legal status?

- Are there other factors that may come into play specific to the installation?

5.1 Consider all WAP priority SGCN occurring on the installation

Depending on the number of SGCN and priority SGCN within the installation landscape, you might consider all of these species as installation priorities. The objective of this downscale is to identify the SGCNs that can be positively affected by on-the-ground management actions. If the installation can install specific actions to enhance SGCN habitat, or use this information to further justify ongoing land management practices, then it is certainly appropriate to identify a full suite of SGCNs.

5.2 Consider species endemic to the installation

It is unlikely that an installation will contain a species found nowhere else, but it can occur. Species like the red-cockaded woodpecker persist on the landscape largely due to military installations and, without them, may have declined to the point of extinction. These species should be prioritized by the installation for conservation (and in many cases already are).

A more common scenario would be where an installation harbors the last remaining regional instances of a species found elsewhere. While the installation population may be relatively small, it still represents a valuable component to the greater population and warrants prioritization.

5.3 Develop a ranking system for the SGCN that occur on the landscape

Prioritization is often necessary because available resources of time and funding are insufficient to provide effective conservation of everything. Therefore, NRMs are required to make decisions on how to allocate their assets efficiently to maximize effectiveness to those SGCNs that need it most.

Efficiency and effectiveness are not determined by state or federal regulations, or by population / habitat metrics. They are a product of capacity and judicious planning. The task of determining what can be done with the resources available will fall squarely on the installation NRM. They are empowered to determine what is important to their installation, constituents, and mission and use that information to develop a ranking system.

The downscaling process described above is one option, but certainly may be modified. Adding criteria for things like recreational or cultural significance, state or federal designation, or compatibility with prevailing training management could all be incorporated into the ranking system. The most important thing to remember is that each prioritization decision should be well-documented, and its relative weight against other variables should be noted. Otherwise, the outcomes of the ranking system will not be transparent or repeatable.

For example, an installation may decide that northern bobwhite is an important game bird on the installation. Regionally, this species may occur only on installation lands opened and managed for hunting and few other locations. The NRMs may determine that this species should be prioritized both as an SGCN and its habitats managed for collateral benefits to other species. While this species may not have received a high importance score in the downscaling process, it will be included in the installation priorities list.

Comparing SGCN lists from SWAP and INRMPs at MCB Quantico

		INRMP		
		Present	Absent	Total
SWAP	Present	42	15	57
	Absent	25		25
	Total	67	15	82

Using the all SGCN HUC12 watershed data, we determined that within the eight watersheds that make up Quantico, there are 57 SGCN predicted to occur.

It is important to understand that the SWAP distributions are predictions based on habitat distribution and species associations. They are not perfect, and in this case, these models can be evaluated against INRMP information. For MCB Quantico the models have:

- % agreement with INRMP of 51% (42 of 82 are the same)

- Of these, 42 are also found in the SGCN list derived from the INRMP (42/57 =74%);

- % species predicted that have not been observed (i.e., potential commission) of 26% (15 of 57 predicted to occur)

- % species not included that are known to occur at MCBQ is 37% (25 of 67 known to occur)

The discrepancies between these lists should not be construed as errors. There are several reasons why species predicted to occur at MCBQ are not found on INRMP lists. Several of these species are aquatic species, particularly mussels, and these may not have been well surveyed on the installation. Alternatively, some species are fossorial or otherwise behaviorally cryptic making them difficult to document through surveys. In these cases, absence from the INRMP does not provide sufficient evidence to presume absence.

Likewise, there may be legitimate reasons for species to appear on INRMP species lists but not in SWAP distribution models.

Neither method is perfect, so there should be some latitude given to the installation natural NRM to make decisions about which SGCNs and lists are used to identify priority species. In this case, there could be as many as of 82 potential species to consider if one chose to err on the side of abundant caution.

In this case, we already can see that there are at least 67 candidates for prioritization based on those SGCN appearing in the INRMP alone and that may be sufficient to proceed. We also can see that the aquatic species may not be well documented during previous surveys and additional work there might improve our understanding of where those species occur within the installation landscape. Thus, the SGCN list we are likely to start with is between 67 and 82 species.

5.4 Compare downscaled list of WAP priority SGCN for the installation with species listed in the INRMP

The primary reason for going through the downscale process is to better-understand which SGCN (of the entire suite for the state) are likely to occur in and around the installation itself. With this information, we can identify those SGCN that may occur within the installation landscape but have not been documented through surveys associated with the INRMP.

The decision to include these species falls to the installation NRM. Many installation NRMs might

choose to focus only those SGCN that have been confirmed on the installation, and that is certainly acceptable. This additional information may identify some opportunities to conserve SGCNs that were previously unknown and could be impactful for SGCN conservation.

We would recommend being open to including these species in the process. There are several reasons why an SGCN predicted to occur within an installation does not appear in the species list included in the INRMP. Perhaps the SGCN simply does not occur and the information used to develop the distribution is incorrect, or maybe the types of surveys used to populate the INRMP species list are not conducive to detecting that SGCN. The NRM will need to consider these for each species to be thorough in the process.

For example, because Virginia's WAP provides data on priority SGCN and all SGCN present within a watershed, we could compare the state priority SGCNs for the 12-digit HUC watersheds that intersect MCB Quantico to those listed in its INRMP. Of the 12 priority SGCN in these HUC watersheds, only one appears in the INRMP.

It is also important to note that it is likely the species listed in the INRMP may demonstrate the presence of a SGCN not listed as occurring in the installation landscape. In this case, the information may be used to support refinements to the SWAP.

Again , MCB Quantico provides us an example. The INRMP species list contains a total of 67

SGCN. We then examined all SGCN located within each HUC watershed and compared that list to the 67 SGCN listed within the INRMP. At this level, there was an overlap of 42 SGCN (see sidebar page 21), that is, these species were predicted to occur at Quantico MCB and were observed there. Most of the SGCN that overlapped were bird species. Of the SGCN that were not in the INRMP, many were mussel and fish species, indicating that perhaps additional surveys may need to be conducted.

In some cases, the list of priority SGCN may be long, such as for Aberdeen Proving Ground, especially when downscaling using the habitat analysis described above. However, this method allows managers to determine which SGCN are associated to the most valuable habitats on the installation. This ratio can allow for ranking priority SGCN to help in determining priority for the installation as well as for comparing to SGCN listed in INRMPs.

For Aberdeen PG, we might want to consider the first tier priority SGCN to be those that depend on habitats that are found greater than three times more on the installation than would be predicted based on the habitat distributions throughout the state. This included 26 highest priority SGCN. Of these, two priority SGCN overlapped with the 45 listed in Aberdeen's INRMP. We then compared the SGCN in the INRMP to the second tier priority SGCN (47), of which no additional SGCN overlapped with SGCN

listed within the INRMP. Lastly, we compared the third tier priority SGCN (38) with the SGCN listed within the INRMP and found an overlap of four more SGCN (see Case Study for Aberdeen PG).

5.5 Consider SGCNs that occur within a habitat that is in high abundance within your installation

Habitats comprising a significant amount of area within your installation landscape are important to identify. If you can take actions to decrease threats to these more abundant habitats, then you may be able to benefit a wider range of species in terms of diversity as well as number.

Again, turning to Aberdeen PG for an illustration, we noted that much of the installation is comprised of Tidal Salt Marsh. This is a habitat type with a diverse array of SGCNs associated with it. Are all these species found on Aberdeen PG? Likely not, but the marshes found within this installation landscape are certainly important and worthy of continued protection especially when considering how few instances of this type occur on managed land in the upper Chesapeake Bay.

5.6 Consider SGCN in habitats where some level of efficiency exists

Similar to 5.5, considering habitats where there are multiple types of priority SGCNs or a habitat that may be beneficial to a range of SGCN even outside your installation but where partnerships exist will be an important factor.

The Tidal Salt Marsh and Shrubland key habitat

type is used by over 60 SGCN in Maryland. Actions aimed at maintaining or improving the condition of this type will likely result in increase benefits to a number of species concurrently. These species may be prioritized as a result.

5.7 Use the state's WAP SGCN ranking system to determine installation priority SGCN

If WAPs rank SGCN in some way, then managers can also utilize the system to rank all priority SGCN (or any subset described above) that are within the installation.

Virginia provides a Tier ranking I-IV based on imperilment as well as a Conservation Opportunity Ranking a to c based on opportunities to conserve and protect SGCN. Using this system, SGCN can be ranked and a cut off could be determined to help select installation priorities.

For example, of the 12 priority SGCN identified by the SWAP for Quantico MCB, only three are Tier I-II. These might be prioritized over the remaining SGCN.

Maryland developed a five-tier status ranking (A-E) that integrates NatureServe's G and S ranking system. Aberdeen PG may decide to include these rankings as a factor when completing their rankings.

5.8 Use legal status or another designation to help determine installation priority SGCN

Installations can also consider looking at which SGCN are threatened and endangered at a federal and/ or state level. For the most part, INRMPs identify species federal or state protected status for priorities already to comply with the Sikes Act, but the downscale process may provide additional information to assist in refining management actions on the installation as well as provide additional information about how the species is managed elsewhere in the state.

The G and S rankings from Natureserve offer another option. Maryland used this information when prioritizing their SGCN list.

5.9 Work with experts (within installation and partners) to determine which priority WAP SGCN to consider as installation priorities

Natural resource managers can work with relevant staff at the installation level as well as partners surrounding the installation and/or state partners to go through the priority SGCN within the installation and decide which SGCN should be a focus for the installation.

The objective of this process is to reduce the number of SGCNs that the installation actively manages for to improve effectiveness. Partner organizations are a key element to include so that their efforts can be incorporated and, hopefully, complimented. Further, it will be important for these partner organizations to better-understand how the installation is meeting its responsibilities by considering SGCNs and contributing to the overall management actions outlined in the SWAP. In some states, military installation lands are not considered as elements of the protected lands system. By actively including these groups and experts in the prioritization process, the installation can solidify their place as an active partner in SGCN conservation.

Developing a priority list may seem like a daunting task. There are a lot of factors to be considered but the result will provide a very useful product for building effective INRMPs.

6.0 Identify Associated Threats and Conservation Actions

Once an installation has identified the list of priority SGCN on which it would like to focus, the next step is to use the WAP to determine what threats the SGCN and their habitats face within the installation landscape and what conservation actions are necessary. Equipped with this information, the NRMs can determine what actions they already may be taking to protect these species; what other actions may be needed and feasible; and/ or what actions are compatible with the training mission. Additionally, managers may realize they are already taking actions that help implement the WAP that they were not aware of before this process. This type of information is important to understand and relay to the appropriate state agencies.

In the second step of this manual, we

Name	Scientific Name	Tier	Rank	Threats	Conservation Actions
Atlantic pigtoe	*Fusconaia masoni*	I	a	Sedimentation, contaminants loading, water chemistry alteration, temperature regime alteration, stream nutrient dynamics alteration	Establish vegetated riparian buffers and incorporate riparian buffers into land use planning and management
					Reforest erodible forest lands
				Impacts from development and other land use changes	Implement erosion and sediment control practices
				Loss of connectivity	Restore aquatic connections
				Invasive Species	Monitor and address invasive species impacts
				Climate change impacts	Monitor temperature changes and changes to intensity of precipitation events
Bachman's sparrow	*Aimophila aestivalis*	I	a	Land Use Changes/ loss of habitat	Restore native grasses, shrubs, and forbs
					Maintain existing open habitats with periodic disturbance (e.g., prescribed burning, mowing, disking, etc.)
					Conserve, via acquisition, easement, collaboration, or agreement, patches from 20 acres to 100 or more acres. Focus also should be placed on protecting circular or square patches rather than rectangular areas to minimize edge effect
				Invasive Species	Remove non-native species

This table provides an example of an organized list of SGCN, status, threats, and conservation actions for MTC Fort Pickett. With this information installation NRMs can evaluate their current practices, or identify new opportunities to address SGCN concerns.

recommended reviewing your state's Wildlife WAP to determine what type of habitats it includes as well as threats and conservation actions. This information becomes essential at this point in the process. To understand the threats SGCN are facing, a manager needs to know how threats are described in the WAP. In some WAPs, threats are outlined at a state, habitat, and SGCN level. In others, threats are explained by habitats only. In the latter case, SGCN will need to be associated to specific habitats (if not already done

so as part of the process of depicting SGCN spatially on the landscape).

In many cases, this will be simple. It is likely the WAP includes a table of SGCN with their habitats. We use similar information when creating species distribution maps as part of the downscale process. Both Virginia and Maryland SWAPs provide information for threats and conservation actions at the habitat level and these can be refined using local knowledge to arrive at specific actions the NRMs can take to

address priority SGCN conservation on their installation. By associating a SGCN to a habitat, we are able to identify the threats to that habitat and the conservation actions recommended for mitigating them.

6.1 Organize threats to installation priority SGCN

Once the installation priority SGCN are determined, you can use a spreadsheet or other database to organize the SGCN and habitat information. You might choose to order them

according by those occupy the most habitat within the installation or by their priority ranking. You can then list each habitat the SGCN will use along with applicable threats, and conservation actions. In many cases, there will be multiple threats or stressors associated with each habitat, or multiple conservation actions associated with each threat. Logically, this will often result in several species conservation actions that the installation may consider for each SGCN on the priority list.

In some cases, the information you need may already be in table format. For example, Maryland's Wildlife Action Plan Appendix 7 contains tables for habitats and taxa groups that includes specific threats for each and associated conservation actions. In a case such as this, an installation can use these tables to pull out the threats for its installation priority SGCN relatively easily – using threats to SGCNs' habitat type and/ or by taxa. Conservation actions are also already associated in this way.

Other states may have threats listed by just SGCN or by habitat type only. Virginia's WAP, includes threats at the habitat level and considers the threats to affect all the SGCN associated with a specific habitat type. However, Virginia also organizes its WAP into regional Local Action Plan Summaries. Thus, to consider threats and actions for any Virginia installation's priority SGCN, an NRM would need to use the relevant Local Action Plan Summary for its installation. In the case of Quantico MCB, the Local Action Plan Summary is

the Northern Virginia Local Planning Summary, and for MTC Fort Pickett, it is the Commonwealth Regional Commission Local Summary. Within in each summary, threats are listed by habitat type. For example, a manager can apply all Aquatic and Riparian habitat threats to any SGCN located within in that habitat type such as Atlantic sturgeon. Conservation actions are also included by habitat type and in the section following information on threats.

6.2 Review the list of threats and actions to determine which are applicable on installation and remove those that are not

Once you have organized threat information from your respective WAP for your installation priority SGCN, review the threats for each and remove any threats that are not relevant within your installation boundary. If there are corresponding actions that also are now not relevant, please remove those as well.

6.3 Add any additional threats and actions specific to the installation

During this step, we also added threats that the WAP does not include but that we know exist for the installation. You may work with the NRMs or other staff as well as consider other installation sources/ documents/ plans for this step. This may include situations like planned range management, buildings, or stream crossing work. The downscaling process should allow NRMs to make more specific assessments of how

these sorts of activities will likely impact SGCN (or not as the case may be).

At this point, you will have a comprehensive set of information for each of the installation priority SGCN. The next step is to work through this information to help understand conservation management opportunities and where existing installation management efforts may already be contributing to the overall management of some of these SGCN ,as well as where there may be mission training conflicts.

7.0 Conservation Opportunities, Existing Efforts, and Potential Mission Conflicts

The final step in this process of downscaling SGCN to the installation level is to understand where an installation is already implementing its WAP, where there may be new conservation opportunities, and where there may be potential mission conflicts or concerns. To do this, natural NRMs should convene relevant staff and work through this matrix of information to determine what conservation management actions the installation is already implementing, actions that may need to now be considered, and other management efforts that may already be supporting these SGCN that are not recognized within the WAP. Additionally, it will be important to understand which of these conservation actions may be in conflict with training missions and

ensuring readiness – detailing this and having this information available to state agencies and other partners will be valuable. Working through the threats and conservation data will also allow the installation managers to identify any additional challenges to conserving these SGCN and their habitats as well as opportunities both within the military base and the surrounding areas. For some SGCN the issue is species specific, while in many other cases it is a habitat issue; thus, and installation may be able to address a threat to multiple SGCN with habitat management actions.

7.1 Identify common or overlapping conservation management opportunities from the WAP and INRMP for installation priority species (and habitats)

In many cases, some of the conservation opportunities outlined in the SWAP will align with existing management directives in the INRMP. This is particularly true where installations are widely-known to contain unique habitats and species. For example, pine savannahs managed for training also harbor many species appearing on SGCN lists in the Southeastern US, and those installations are likely already aware of their importance and management requirements.

These instances provide a natural point of interface between installations and collaborating agencies and partners, especially if those partnerships are not already in place. The state agency responsible for SWAP implementation needs to understand how installation INRMPs are already contributing to SGCN conservation and be able to use that information to report back to the USFWS.

7.2 Look for SGCN that share habitat and determine whether the INRMP or other management activities on the installation address these habitats

Consider whether a suite of installation priority SGCN are located in a common habitat type and if this habitat type is widespread or of high value within the installation landscape. If this is the case, determine which threats are most pervasive, immediate, and feasible to address, then determine conservation actions at the habitat level that are realistic for the installation to implement. By doing only one or two actions for a high value habitat with a variety SGCN, the installation will be addressing multiple threats and SGCN in an effective and more efficient manner.

An example of where this type of analysis applies is on Aberdeen PG. Within the installation tidal marsh and shrub habitat is found disproportionately higher than its statewide distribution. Thus, it is an important habitat within the installation. Additionally, of over 60 SGCN are known to use this type.

The installation NRMs could consider what the common threats are to the marsh as presented in the SWAP. Those include threats of coastal development and sea-level rise. The installation can conclude that there are no immediate plans to build or develop tidal marsh area on the installation, so this is not a threat for this habitats. However, sea-level rise may still pose a threat since this stressor is largely beyond the immediate control of the installation NRM.

Decisions to use the marsh area for specific training exercises may be a potential installation-level threat not considered in the SWAP. If and when using these areas for active training comes up for discussion, the NRM can incorporate the downscaled SWAP information to guide options for mitigation or avoidance as appropriate. For example, proposed training may be a disturbance issue only during periods of nesting. If those periods could be avoided, training may occur at other times of the year without significant negative impacts on SGCN.

7.3 Consider if installation contains generally rare habitats and associated SGCN for the state/region

If an installation has only a small percent of a specific habitat type, but it is an important one within the state with multiple rare SGCN that are present, then this would be an area to analyze further for conservation opportunities . It will be important to determine what threats training or other installation management activities may pose. Alternatively, management actions may take minimal effort to protect a high value area.

On Aberdeen PG, there are multiple SGCN that

depend on vernal pools. These are high-value and rare habitats. Aberdeen may be able to implement actions such as limiting the application of road salt in the winter near these areas. This action would provide great conservation benefit to vernal pool quality with little expense.

Likewise, it is important to note where training activities directly contribute to habitat maintenance. Prescribed fire is a prime example of a tool that has great benefits for training management and to SGCN habitat as well.

7.4 Consider SGCN that installation did not know were (or could be) present

If the analysis suggests SGCN that are likely on the base based on habitat associations or previous observations, then the installation will need consider how their ongoing and planned actions may affect these SGCN.

In some cases, it may be prudent to determine whether the SGCN is, in fact, present through dedicated survey and/or monitoring. If the SGCN is determined as likely to occur within the installation but is not in their INRMP or other management plans, then NRMs may need to consider what its presence may mean for these documents and training. In terms of conservation opportunity, managers can consider if they are already managing the habitat these SGCN are likely in, then there could be a conservation opportunity that the installation can consider.

Alternatively, if habitat still exists, then the

installation could consider the challenges and/or benefits of reintroduction. Reintroduction could occur naturally or through specific management actions as part of a broader program.

In this instance, SGCN could pose a challenge to training mission that will need to be defined and considered. Remember that the purpose of the SWAP is to identify those species that are in decline in order to reverse that trend *before* listing under the Endangered Species Act (ESA) is warranted. Proactive conservation strategies will likely reduce the likelihood of severe encroachment and would be a preferred option over mandated restrictions typically accompanying ESA compliance.

7.5 Consider current land management activities and potential conservation opportunities for installation priority SGCN

Often, the activities used to actively manage training lands result in the creation of unique habitats. For example, the use of prescribed fire to clear ranges or create open understory for vehicular training may also provide large patches of early successional habitat that would otherwise be absent from the landscape.

In these instances, it is essential that the NRMs identify how active training provides for at-risk species and ensure those actions are maintained. SGCNs that benefit directly from training management can be prioritized.

7.6 Consider plans for the installation and whether new/ different training or activities could threaten installation priority SGCN

It is also beneficial to understand how changes to training area management activities might change the benefits to SGCN. While range management activities like timber harvest, prescribed fire, and road maintenance are critical for the training mission, we can use information from the SWAP to understand potential impacts on SGCN and plan accordingly. Often, changes in training management activities can benefit SGCNs if those linkages are identified early in the process and are included in the overall plan.

7.7 Determine whether there are other WAP SGCN that are not within the installation priority SGCN list that may benefit from actions for the priority SCGN

While much of our downscaling efforts have focused on identifying priority SGCN for the installation, we should understand that any conservation actions implemented will likely benefit other SGCN. Successful habitat management for priority species will provide collateral benefits to SGCNs utilizing those same habitats. We can further prioritize certain management practices when we understand the how it benefits both the priority species and a number of other species of concern.

Summary

The process outlined in this manual is a guideline. The prioritization of SGCNs at an installation level must be completed by the NRMs who bear the responsibility of meeting the dual mission of readiness and conservation.

The primary objective of the downscaling effort is to make the SWAP information useful at the local level, improving the likelihood that efficient, effective SGCN conservation actually occurs. The best approach for diffusing conflicts between military training and endangered species is to ensure that species do not become endangered in the first place. The goal of the SWAP is to keep common species common, and achieving that goal requires effective management wherever the opportunity arises.

Military lands provide that opportunity. The INRMP has been an effective tool in environmental sustainability and provides a solid platform for addressing at-risk species issues.

We hope this manual, and the examples provided in the following appendices, facilitate the use of SWAP information in integrated natural resource management planning, and assist NRMs in meeting their goals.

Acknowledgements

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Freshwater marsh at Aberdeen PG, Maryland

Table of Abbreviations

AFWA	Association of Fish and Wildlife Agencies
ESA	Endangered Species Act
GIS	Geographic information system
HUC	Hydrologic unit code
INRMP	Integrated Natural Resource Management Plan
MCB	Marine Corps Base
MDDNR	Maryland Department of Natural Resources
MTC	Military Training Center
NETHCS	Northeast Terrestrial Habitat Classification System
NRM	Natural resource manager
PDC	Planning District Commission
PG	Proving Ground
SGCN	Species of greatest conservation need
STWG	State and Tribal Wildlife Grant
SWAP	State wildlife action plan

T&E	threatened and endangered
USFWS	United States Fish and Wildlife Service
VDGIF	Virginia Department of Game and Inland Fisheries
WAP	Wildlife action plan