



Natural Resources Level One Inventories: What are the Needs and Process for Corps Projects?

By Chester O. Martin, Jeff Krause, and Donald N. Wiese

INTRODUCTION: Engineer Regulation (ER) 1130-2-540, Section 2-2.c(1) mandates that natural resources inventories be conducted at Corps of Engineers operational projects in order to provide the data needed to make the best management decisions for project lands. However, since inventory standards were not established on Corps projects nationwide, many districts and projects developed their own types and levels of inventories to meet specific project needs. Methods used in these inventories were highly variable, and no criteria existed for standardizing data for upward reporting. Thus, prior to 2005, data collected on different projects were often inconsistent, and there was no protocol for comparing and summarizing natural resources data across project and district boundaries. To address this issue, the Corps' Stewardship Advisory Team (SAT) prepared a Statement of Need (SON) for natural resource inventories on project lands (Krause et al. 2004). The SAT established that professional natural resources management must be tracked and monitored through a consistent inventory protocol and related performance measures that would be implemented nationally.

The basic inventory to be conducted by all Corps projects was identified as the "Natural Resources Level One Inventory." A current budget-based performance measure has been established to track trends in completing the inventory at project sites. Projects can now enter their inventory results into the Corps Operations and Management Business Information Link (OMBIL) using standards described in this paper for upward reporting (Figure 1). OMBIL results will also be used to automatically calculate performance measures to complete the Natural Resources Level One Inventory.

The screenshot shows a web-based application window titled "PROJECT SITE VEGETATION CLASSIFICATION". It contains several input fields and a table. The "Project Site" field is filled with "RAYSTOWN LAKE" and the "Fiscal Year" field is filled with "2005". A red text note states: "** THE FOLLOWING CLASSIFICATION INFORMATION (EXCLUDING CONDITIONS) IS DERIVED FROM THE NATIONAL VEGETATION CLASSIFICATION SYSTEM **". The "Project Fee-Owned Area" field is filled with "28903". Below these fields is a table with five columns: "Division", "Order", "Class", "Sub-Class", and "Sub-Class Acreage". The table contains four rows of data, each with a "Condition" button to its right. The first row is "VEGETATED", "Herb Dominated", "Herbaceous Vegetation", "Perennial forb vegetation", with an acreage of 220. The second row is "VEGETATED", "Tree Dominated", "Closed Tree Canopy", "Deciduous closed tree canopy", with an acreage of 15000. The third row is "VEGETATED", "Shrub Dominated", "Shrubland (Scrub)", "Deciduous shrubland (scrub)", with an acreage of 3000. The fourth row is "NON-VEGETATED", "Non-Vegetated", "Non-Vegetated", "Non-Vegetated", with an acreage of 8300. At the bottom of the table, there are two summary rows: "Total Classified Acreage" with a value of 26520, and "Total Unclassified Acreage" with a value of 2383. A "More Info" button is located at the bottom left of the screen.

Figure 1. OMBIL screen example of level one data input for vegetation.

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This technical note is a product of the Ecosystem Management and Restoration Research Program (EMRRP) work unit titled “Natural Resource Inventories for Special Status Species on Corps Operating Projects.” It provides an overview of the Natural Resources Level One Inventory procedure and proposes an approach for conducting inventories of Special Status Species. The reader should refer to Krause et al. (2004) for additional details and background information on Level One Inventories.

Why are Inventories Needed? Basic natural resource inventories have not been completed at the majority of Corps projects, and a consistent protocol for conducting these inventories has not been established. Although numerous projects have initiated surveys of species of interest (e.g., game animals and protected species such as bald eagles (*Haliaeetus leucocephalus*), inventory data are limited for most non-game species. Information on habitat types is also missing for many projects. Without this essential baseline data, the Corps is limited in its ability to effectively manage its resources and establish priorities for species conservation and habitat management. In other words, if you don’t know what species occur on project lands, management priorities and funding may not be directed where most needed. The adoption of a consistent Natural Resources Level One Inventory, especially a consistent vegetation classification system, for all projects will allow for the identification of trends and needs that can be directly tied to performance measures and professional stewardship of Corps lands (Krause et al. 2004). Completing inventories is also critical to understanding the significance of Corps-managed natural resources, and ultimately the value of these resources to the nation. Completed and consistent inventories would provide a format for the programmatic identification of high priority issues such as the decline of threatened and endangered species. The use of a standard system nation-wide will permit the evaluation of Corps lands on a national basis and allow for consistent upward reporting (Krause et al. 2004).

What is a Natural Resources Level One Inventory? Natural Resources Level One Inventories are identified as inventories of a general nature conducted to provide baseline information for Master Plan and initial Operational Management Plan development purposes. Level One Inventory data will be used to support resource objectives and land use classifications of the Master Plan (Krause et al. 2004). Four data sets (vegetation, wetlands, soils, and Special Status Species; Figure 2) are recognized in ER 1130-2-540 as important basic components of natural resources management. The Level One Inventory is based on the following basic, nationally recognized information standards that are commonly utilized by other Federal and state agencies and designation of Special Status Species as defined by the SAT:

- Project vegetation acreage classification and quantification, in accord with the Federal Geographic Data Committee (FGDC) *National Vegetation Classification System (NVCS)* (through subclass; see Figure 3)
- Project wetland acreage classification and quantification, in accord with the U.S. Fish and Wildlife Service *Classification of Wetlands and Deepwater Habitats of the United States* (Cowardin et al. 1979)
- Project land (soils) capability classification and quantification, as defined by the Natural Resources Conservation Service (NRCS) – land capability classes
- Special Status Species (Federally listed threatened and endangered species and state-protected species) – potential occurrence on project lands

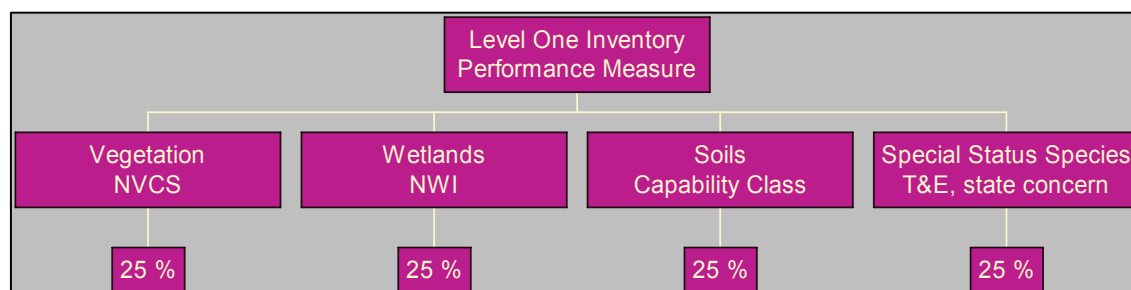


Figure 2. Diagram of Natural Resources Level One components.

Division	Class	Sub-class
Vegetated	Closed Tree Canopy	Evergreen Forest
		Deciduous Forest
		Mixed evergreen-deciduous
	Open Tree Canopy	Evergreen Forest
		Deciduous Forest
		Mixed evergreen-deciduous
	Shrubland	Evergreen Forest
		Deciduous Forest
		Mixed evergreen-deciduous
	Dwarf Shrubland (less than 0.5 m tall)	Evergreen Forest
		Deciduous Forest
		Mixed evergreen-deciduous
	Herbaceous Vegetation	Perennial graminoid vegetation
		Perennial forb vegetation including ferns, clover
		Hydromorphic herbaceous
Annual graminoid or forb vegetation		
Non-Vascular Vegetation	Bryophyte Vegetation	
	Lichen Vegetation	
	Alga	
Sparse Vegetation		
Non-vegetated	Includes open water, facilities, parking lots, beaches	

Figure 3. Structure of the National Vegetation Classification System to the sub-class level.

The SAT emphasized that Level One inventories should be accomplished through the use of GIS or other mapping procedures to expedite data collection (Figure 4). Standard GIS programs should facilitate the delineation of major habitat types at the NVCS subclass level (e.g., acreage of “Deciduous Forest” in the “Closed Tree Canopy” class) and also make efficient use of existing electronic data sets for soils and wetlands.

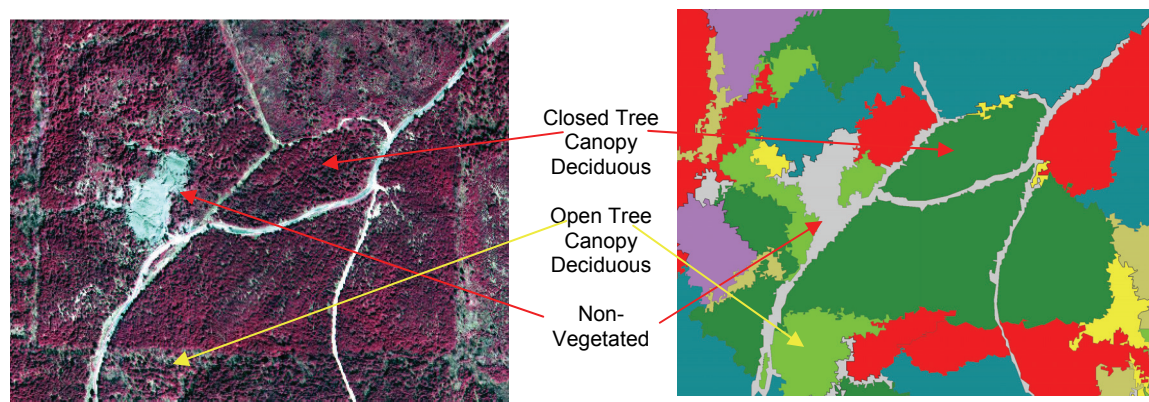


Figure 4. Level One inventories could be accomplished through the use of GIS.

To accomplish the Level One Inventory, existing inventory data for each project should be evaluated to determine if the available information meets the core requirements of the minimum Level One Inventory data standards. Although habitats or cover types may have been designated previously using other methods, acres should only be reported where the current data are mapped or described using the appropriate adopted data standard format. Inventory data are now summarized using OMBIL data input screens under the Environmental Stewardship module that calculates the following acreages and provides a performance measure report (Figure 5):

- Acres of project fee-owned lands classified under the NVCS
- Acres of project fee-owned lands where wetlands are inventoried and classified using the USFWS Cowardin system
- Acres of project fee-owned lands where land (soils) capability classes have been inventoried and identified
- Acres of project fee-owned lands where Special Status Species (federally listed threatened and endangered species and state-protected species) have been identified and inventoried

Fiscal Year 2005	
Fiscal Year Soils	$= (\text{Sum All Soil Types} / (\text{Project Fee Owned Acreage} - \text{Fee Land Submerged})) * 100$ (No Data / (28903-8674)) * 100 = N/A
Fiscal Year Vegetation	$= (\text{Sum Vegetation Sub-Classes} / \text{Project Fee Owned Acreage}) * 100$ (26520 / 28903) * 100 = 91.76%
Fiscal Year Wetland	$= ((\text{Sum Wetlands} + \text{Non-Wetlands}) / \text{Project Fee Owned Acreage}) * 100$ ((8300 + 20000) / 28903) * 100 = 97.91%
Fiscal Year Species	$= (\text{Count Species Listed and Confirmed} / \text{Count Species Listed}) * 100$ (12 / 14) * 100 = 85.71%
Fiscal Year Level One Completion Index	$= (\text{Fiscal Year Soils} + \text{Fiscal Year Vegetation} + \text{Fiscal Year Wetland} + \text{Fiscal Year Species} / 4) * 100 = .8345$

Figure 5. Example of OMBIL Performance Measure Report for Natural Resource Level One Inventory.

ASSESSING CONDITIONS OF CORPS LANDS AND WATERS: Another important component of the SAT directive is the development of project lands “natural resources condition measures.” This assessment is intended to provide a basic measure that is results-based rather than process oriented, whereby the information can be used to determine actions necessary to maintain or improve the condition of vegetation cover types. The sustainability of resources is also a budget-based performance measure that will be evaluated for budget packages. The Corps goal would be to have all lands and waters sustainable for future generations.

This system assigns condition ratings for assessed acreage of each vegetative subclass occurring on a project as (a) sustainable, (b) transitioning, (c) degraded, or (d) not assessed. The following definitions have been developed by the SAT to standardize condition ratings:

SUSTAINABLE – Meeting desired state. The acreage is not significantly impacted by any factors that can be managed and does not require intensive management. The acreage also meets operational goals and objectives set forth in the project OMP or other applicable management document. These acres are considered healthy and sustainable for future generations. Only minor management practices may be required to maintain the health of this acreage.

TRANSITIONING – Managed to meet desired goals. The acreage is impacted by human or other environmental factors that require management of the acreage to meet goals and objectives outlined in the project OMP or other applicable management document.

DEGRADED – Does not meet desired goals. The acreage is significantly impacted by human or other environmental factors that prevent the acreage from meeting desired goals outlined in the project OMP or other management documents. The acreage is not considered healthy. Intense management may be required to meet desired goals.

These ratings will be applied to each vegetation category by assessing the land or water components or parcels that make up each vegetative sub-class (Figure 6). The assessment of the condition of these resources will provide valuable information to project managers, the District, Division, or Corps Headquarters to assess the state of natural resource projects locally or across the nation. Project staff should evaluate OMP objectives and environmental impacts against the stated definitions to assess acreages within the different vegetation types. Impacts may be any factor that potentially degrades a resource such as erosion, foot traffic, invasive species, over-browsing by deer, lack of desired species diversity, and development. Acreage that has not been evaluated or impacts that are not understood should not be classified and should be left as “not assessed.”

Again, this information will be of value across the nation, and as part of a performance measure, will ensure that the Corps is efficient in the management of funds for natural resources. Budget priorities may be given to projects that can most efficiently (lowest cost per acre moved to sustainable) restore habitat.

THE INVENTORY OF SPECIAL STATUS SPECIES: Procedures are now in place for categorizing and reporting major vegetation types, wetland habitats, and soil condition classes. The following paragraphs address considerations for providing Level One Inventory data for Special Status Species.

Condition	Condition Acreage
SUSTAINABLE	1200
TRANSITIONING	10000
DEGRADED	1200

Total Sub-Class Acres Not Assessed: 2600

Figure 6. OMBIL data input screen for condition assessment of a vegetation cover type.

Requirements for conducting Level One Inventories for Special Status Species have not been previously defined. The following recommendations are considered conceptual at this time and need to be reviewed and field tested before implementation. The authors emphasize that the Corps is in need of a species inventory protocol that is consistent throughout the Corps. Since the completion of Level One Inventories is a budget-linked performance measure, Corps managers need to know that their Special Status Species inventory efforts are consistent with others.

The protocol requires that any Level One Inventory of Special Status Species be initiated by defining and delineating the project or project area where those species are likely to occur. These should initially include only broad vegetative categories consistent with the sub-class level of the NVCS or USFWS Cowardin Classification system. These vegetation types can be further refined at a later date as more specific habitat information is available. Major habitat types should be mapped and entered into a GIS database, and total acres of each vegetation type should be tallied. An important result of this exercise will be a visual assessment of the interspersion and juxtaposition of habitats.

The next step should be to identify potential sources of information available to help determine Special Status Species that *potentially* occur on the project. These include (but are not limited to) those listed below.

Information Sources

- Corps project documents (e.g., environmental assessments, feasibility reports)
- State Natural Heritage Program (should have county records of many non-game species, especially species protected at the state level)
- State Fish and Wildlife Agency (should have survey information of most game and furbearing species in the area, including aerial surveys of waterfowl, etc.)
- U.S. Fish and Wildlife Service state or area office (should have survey information on bald eagles and other species of interest)
- Natural Resources Conservation Service (NRCS)
- National Audubon Society (local or state chapter of the Audubon Society will often have a list of species reported from Breeding Bird Surveys and Annual Christmas Bird Counts)
- Universities (biology and wildlife and fisheries departments often have regional information on wildlife and plants)
- Special interest organizations (groups such as Partners in Flight (PIF), Bat Conservation International (BCI), and Partners for Amphibian and Reptile Conservation (PARC) should be contacted for information on Special Status Species)

A species that has been identified as potentially occurring in the region based on referenced sources and the appropriate vegetation class present on the project would receive a species occurrence designation of “potential” (Figure 7). **Potential** is defined as “species historic range includes the project site and existing habitat on the project is capable of supporting the species requisites, but species occurrence on the site has not yet been assessed.” Potential is selected because the species is not confirmed through actual observation or sampling (Figure 7).

The selection of occurrence listings other than potential identifies that the species has been confirmed on the site. To ensure consistency throughout the Corps, the next section will address the documentation of species through different sampling or observation techniques.

CONFIRMING SPECIES PRESENCE THROUGH INVENTORY METHODS: The next step should be to evaluate broad-based inventory methods for communities and species groups that assist in confirming the presence of a species on the project (Figure 8). Addressing Special Status Species at the community level will allow multiple species to be surveyed within a community type. This approach has been shown to be efficient and cost-effective on selected military lands (Martin et al. 2001). Available broad-based methods for selected species groups include the following:

- Songbirds – point-counts, line transects, area searches
- Raptors – perch counts, nest surveys, aerial and boat surveys
- Owls – call counts
- Shore and wading birds – aerial surveys, boat surveys, standardized shoreline counts
- Large mammals – aerial surveys, roadside counts, scent stations

PROJECT SITE SPECIAL STATUS SPECIES

Project Site: Fiscal Year:

☒ Federal List ☐ State List

Species	Fed/ State List	Inventoried Occurrence	Biological Opinion Issued
Eagle, bald	FED	Common	☐
Bat, Indiana	FED	Rare	☐
Northeastern(=Barbed bristle) bulrush	FED	Potential	☐
		Abundant	☐
		Common	☐
		Occasional	☐
		Rare	☐
		Uncommon	☐
		Absent	☐

Figure 7. OMBIL input screen for Special Status Species and occurrence status.

- Small mammals – trap-line transects, direct counts, pitfall traps
- Bats – mist-net surveys, ultrasonic sound detection surveys
- Reptiles and amphibians – transect searches, quadrat surveys, auditory surveys



Figure 8. Broad-based inventory methods are available for many species and communities.

After evaluating available broad-based methods, the method or methods appropriate for the project setting should be selected. Application of field survey methods initiates the Level Two Inventory process for Special Status Species. Once a species is observed or encountered through these broad-based surveys, the appropriate occurrence is selected based on the following (after U.S. Fish and Wildlife Service (1996)):

Abundant: Species is present on project site and very numerous.

Common: Species is present on project site and certain to be seen or heard in suitable habitat.

Uncommon: Species is present, but not certain to be seen or heard.

Occasional: Species is present on project site, but seen only a few times or during seasonal events.

Rare: Species is present on project site and seen at intervals of 2 to 5 years, or is present in limited numbers.

Absent: Species historic range includes the area of the project site, but habitat assessments or inventory for this species have confirmed that the species is not present.

It should then be determined if specific survey methods are required by the U.S. Fish and Wildlife Service and/or the National Marine Fisheries Service for federally listed species that may occur on the project. For example, standard point-count surveys may be suitable for most species in a closed canopy forest or mixed evergreen-deciduous woodland (Hamel et al. 1996, Fischer and Guilfoyle 1999, 2001; Guilfoyle and Fischer 2003). However, there may be specific protocols that need to be followed for valid surveys of federally listed threatened and endangered species.

The final step should be to make the necessary preparations for applying the selected survey methodology to project lands. This should include the following tasks:

- a. Determine the timing, duration, and frequency of surveys.
- b. Estimate costs and manpower requirements.
- c. Establish data collection and reporting procedures.
- d. Coordinate with appropriate Corps/other agency personnel.

It is essential that data collection and upward reporting be consistent throughout the Corps. As more specific surveys are developed for habitat types and/or species, the SAT will post protocols and examples on the Natural Resources Management Gateway (U.S. Army Corps of Engineers 2006).

PROJECT EXAMPLE FOR APPLYING LEVEL ONE INVENTORIES: Using sources of information noted above, each species identified should then be assigned as potentially occurring

within one or more broad cover types (Figure 9). The following hypothetical example is provided.



Figure 9. Level One Inventories of a Special Status Species should be initiated by delineating the project area where the species is likely to occur.

The project in question contains the following major vegetation/habitat types:

- Closed Tree Canopy Evergreen Forest
- Closed Tree Canopy Deciduous Forest
- Closed Tree Canopy Mixed Forest
- Mixed Evergreen-Deciduous Shrubland
- Perennial Graminoid Vegetation
- Perennial Forb Vegetation
- Annual Graminoid or Forb Vegetation
- Lacustrine Limnetic Open Water
- Lacustrine Littoral Emergent Wetland
- Lacustrine Littoral Unconsolidated Shore
- Riverine Lower Perennial Unconsolidated Shore

Three Special Status Species were identified as potentially occurring on the project based on county records and field information provided by local fish and wildlife agencies. Species X is a resident forest-dwelling species that prefers mature hardwoods but may occasionally be found in mixed forests. Species Y is a migratory species that spends the winter in native perennial

grasslands and mixed grass/forb habitats. Species Z is a transient species that uses lakes and associated wetlands as stopover feeding areas. Based on this information, inventories for the species in question need only be conducted in the vegetation/habitat types shown below.

- Species X – Habitat (closed tree canopy deciduous forest and closed tree canopy mixed forest) - seasonal surveys
- Species Y – Habitats (perennial graminoid vegetation and perennial forb vegetation) - winter surveys only
- Species Z – Habitats (lacustrine limnetic open water, lacustrine littoral emergent wetland, lacustrine littoral unconsolidated shore) - spring and fall surveys only

Results of the natural resources condition assessment for each habitat category will also help with setting inventory priorities. For example, if Species X is a federally listed species and habitats are degraded, priority should be given to completing Level Two surveys and developing restoration measures. On the other hand, if Species Y is state listed and the species occurrence is only occasional, it may be less important to conduct habitat improvement measures. Species Z would also be a lesser priority because it has not been confirmed on the site. Table 1 illustrates priority determination for Special Status Species based on occurrence, protection status, and habitat condition. The example provides information on occurrence of these species for degraded land only; a complete assessment would include acreage of habitat for each species in all land condition categories (sustainable, transitioning, degraded).

Table 1 Illustration of Species, Habitat, Condition and Priority Rating						
Species	Habitat	Acres Degraded	Potential/Confirmed	Occurrence	Status	Priority
Species X	Closed Tree Deciduous	200	Confirmed	Rare	Federally Endangered	1
Species Y	Herbaceous Graminoid	100	Confirmed	Occasional	State Listed	2
Species Z	Emergent Wetland	10	Potential	Uncommon	State Listed	3

CONCLUSIONS: Level One Inventories have been defined by Headquarters, U.S. Army Corps of Engineers (HQUSACE) as “inventories of a general nature conducted to provide baseline information for Master Plan and Operational Management Plan development purposes.” Level One Inventories are based on the following components: (a) vegetation acreage as determined using the FGDC National Vegetation Classification System (through subclass), (b) wetland acreage according to the USFWS Cowardin system, (c) soils classification using the NRCS capability class system, and (d) potential occurrence of Special Status Species on project lands.

Special Status Species are defined as “federally listed threatened and endangered species and state-protected species.” As determined by HQUSACE and the SAT, Natural Resources Level One Inventories for Special Status Species do not include on-ground field surveys of fauna or flora. Rather, Level One activities primarily consist of coordination and collection of

preliminary information of Special Status Species that potentially occur at Corps projects. Broad-based methods proposed in this document may be used to confirm the presence of a species and determine the general level of occurrence, such as abundant or rare. The proposed Level One Inventory protocol for Special Status Species is summarized below:

Step 1 – Obtain preliminary list of species from the OMBIL listing.

Step 2 – Identify potential Special Status Species using OMBIL information and other applicable information sources.

Step 3 – Define and delineate the project or project area where Special Status Species are likely to occur (should initially include only broad vegetative categories consistent with the NVCS sub-class level or USFWS Cowardin system); vegetation types where species are likely to occur should be tallied and entered into a GIS database.

Step 4 – Using available information sources, assign each Special Status Species as potentially occurring within one or more broad vegetative cover types.

Step 5 – Evaluate broad-based inventory methods for communities and species groups.

Step 6 – Select broad-based method, if appropriate, for subject species and vegetation types to confirm species presence and level of occurrence.

Step 7 – Determine if specific survey methods are required by the USFWS/NMFS for federally listed species.

Step 8 – Develop specific procedures for applying survey methodologies to project land.

Step 9 – Utilize information on condition of lands, habitat types, and occurrence level of Special Status Species to develop natural resource measures in Operation Management Plans.

Project implementation plans should address timing, duration, and frequency of surveys, costs and manpower requirements, and data collection and reporting procedures. All levels of the survey should be coordinated with appropriate Corps and other-agency personnel.

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SUMMARY: This technical note is provided as an overview of Natural Resources Level One Inventories and their application to Corps of Engineers projects. Level One Inventories are considered inventories of a general nature that provide baseline information for Master Plan and

OMP development purposes. The adoption of a consistent Natural Resources Level One Inventory for all Corps projects will allow for the identification of trends and needs that can be directly tied to performance measures and stewardship of Corps lands. Level One Inventories are based on vegetation acreage as determined by the National Vegetation Classification System, wetland acreage based on the USFWS Cowardin system, soils classification using the NRCS capability class system, and the potential occurrence of Special Status Species. Special Status Species are defined as federally listed threatened and endangered species and state-protected species. This technical note provides examples of Natural Resources Level One Inventory input into the OMBIL processing screens and presents a recommended protocol for conducting inventories for Special Status Species.

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