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Integrated Climate Assessment for Army Enterprise Planning

Threatened and Endangered Species Model User's Guide

Byron M. Garton

July 2019



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Threatened and Endangered Species Model User's Guide

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Abstract

Climate change is an important emerging concern for the Department of Defense (DoD) and the Army. Key among the issues is climate change driven increases in the number of species listed under the U.S. Endangered Species Act (ESA) and stress to federally listed species already listed. Both pose additional management requirements and challenges as well as potential restrictions on training land use.

This document describes the process of executing the Threatened and Endangered Species Model, as it exists at the time of this writing, within the common computational environment established under the software integration effort of the Integrated Climate Assessment for Army Enterprise Planning work package.

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Preface

This research was conducted for the U.S. Engineer Research and Development Center-Construction Engineering Research Laboratory (ERDC-CERL) under Project 402188, Integrated Climate Assessment for Army Enterprise Planning. The Technical Monitor was Dr. James D. Westervelt of ERDC-CERL.

The work was performed by the Information Technology Laboratory (ITL), Scientific Software Branch (SSB), of the Computational Science and Engineering Division (CSED). At the time of publication, Mr. Timothy W. Dunaway was Chief of the SSB, Dr. Jerrell R. Ballard was Chief of the CSED, and Dr. Robert M. Wallace was the Technical Director. The Deputy Director of ERDC-ITL was Ms. Patti S. Duett, and the Director was Dr. David A. Horner.

COL Ivan P. Beckman was the Commander of ERDC, and Dr. David W. Pittman was the Director.

1 Introduction

1.1 Background

The Threatened and Endangered Species Model attempts to predict the vulnerability to stress of plant and animal species listed under the U.S. Endangered Species Act on various Department of Defense (DoD) installations. Growing degree days (GDD) is a weather-based indicator related to heat accumulation from air temperature for assessing the suitability for growing plant life in a specific region.

1.2 Approach

An approach was developed for characterizing this component of installation climate change vulnerability that integrates multiple factors related to exposure, sensitivity, adaptive capacity, and number of listed and at-risk species. The approach was applied to Continental United States (CONUS) Army installations having Integrated Training Area Management (ITAM) programs. Additionally, the vulnerability assessment was used to rank installations across the Army based on the aggregate vulnerabilities of species.

The approach to vulnerability assessment demonstrated by this model is suitable for evaluating whether climate change driven impacts to listed and at-risk species is likely to affect installation resilience. The predicted effect of climate change on the vulnerability of threatened and endangered species is intended to be utilized in other force stationing analysis applications as a Military Value Analysis (MVA) attribute.

1.3 Objective

This model makes use of a common computational environment and a user assistance application that were implemented as part of the Software Integration effort within the Integrated Climate Assessment for Army Enterprise Planning work package. The virtual environment will be referred to throughout this document as the Virtual Machine or VM, and the user assistance application will be referred to as the Wizard. For more information about the Software Integration effort, the virtual environment, and the user assistance application, refer to the Analytical

Model Integration Methods technical report listed in the references section of this document.

Executing the model is a multiple step process that requires using MS Excel® and an internet browser. Each step for viewing and building data sets is thoroughly documented in the following sections to limit user confusion and ensure accurate results.

1.4 Requirements

Software requirements for the Threatened and Endangered Species Model include MS Excel® version 2013 or higher. Data collection prior to model execution requires an internet connection and internet browser.

A working knowledge of Microsoft Office products is recommended as well as a basic understanding of accessing websites and downloading files from the internet.

2 Viewing Computed Data

Pre-built dataset viewing is available to end users by accessing the model from within the Wizard application. The Wizard is accessible from the Integrated Climate Assessment for Army Enterprise Planning VM by clicking the shortcut located on the desktop (Figures 1–3).

Figure 1. Wizard application shortcut.

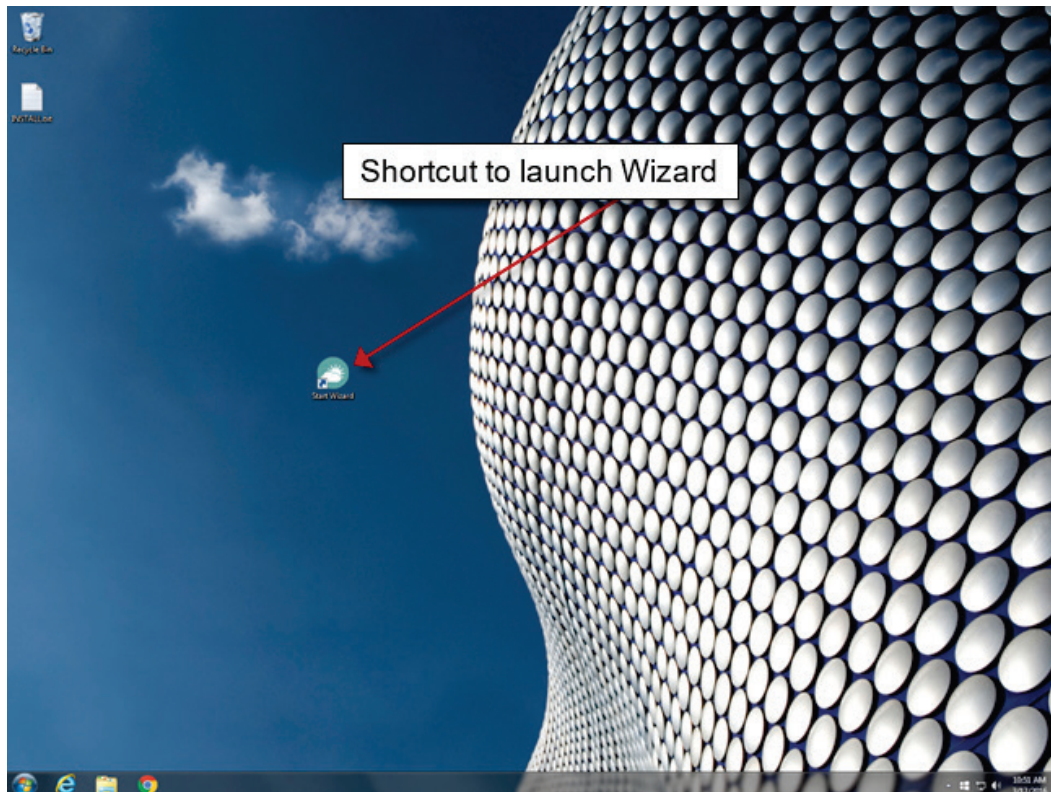


Figure 2. Threatened and Endangered Species Model icon.

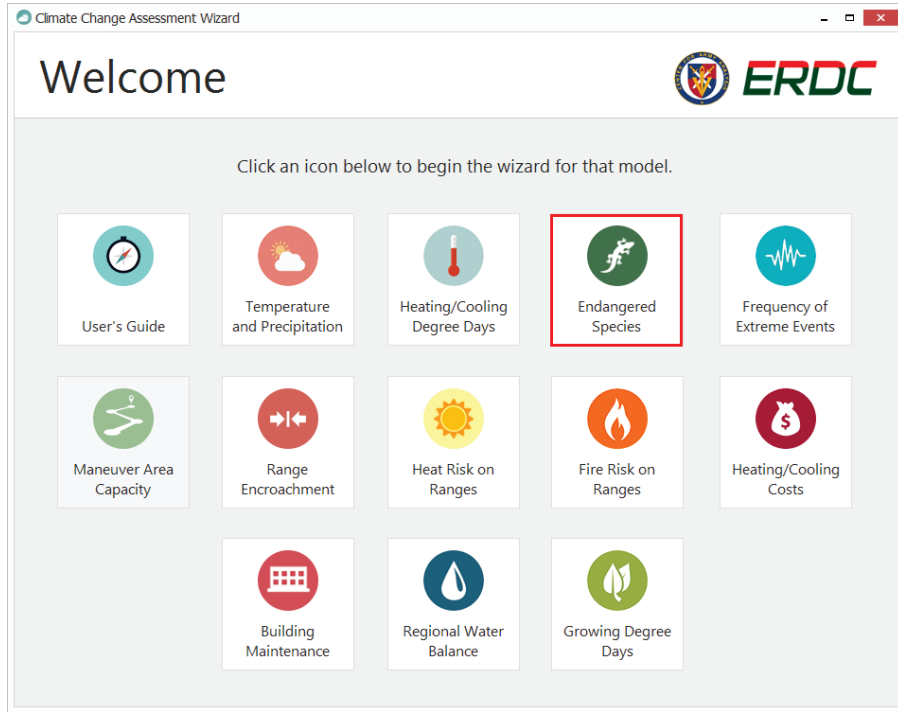
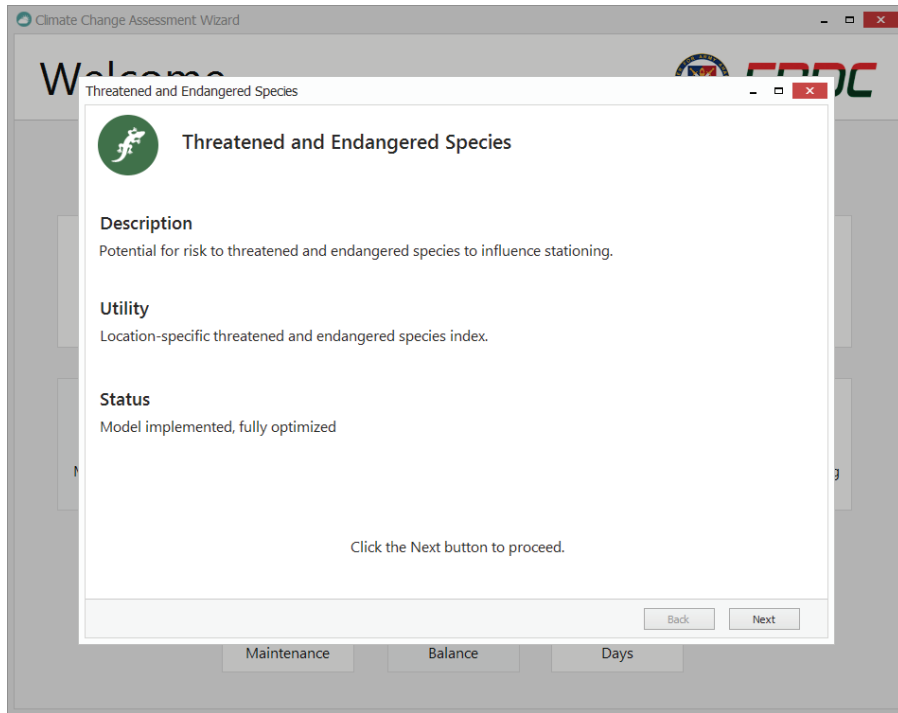


Figure 3. Threatened and Endangered Species Model first screen.



The second screen within the model (Figure 4) allows the end user to view the datasets in tabular mode. Use the Launch Model button on the second model screen to view the data in a table layout within an MS Excel® spreadsheet. This MS Excel® file is located within the VM at C:\Models\TES\Model\TES-Model.xlsx (Figure 5).

Figure 4. Threatened and Endangered Species Model second screen.

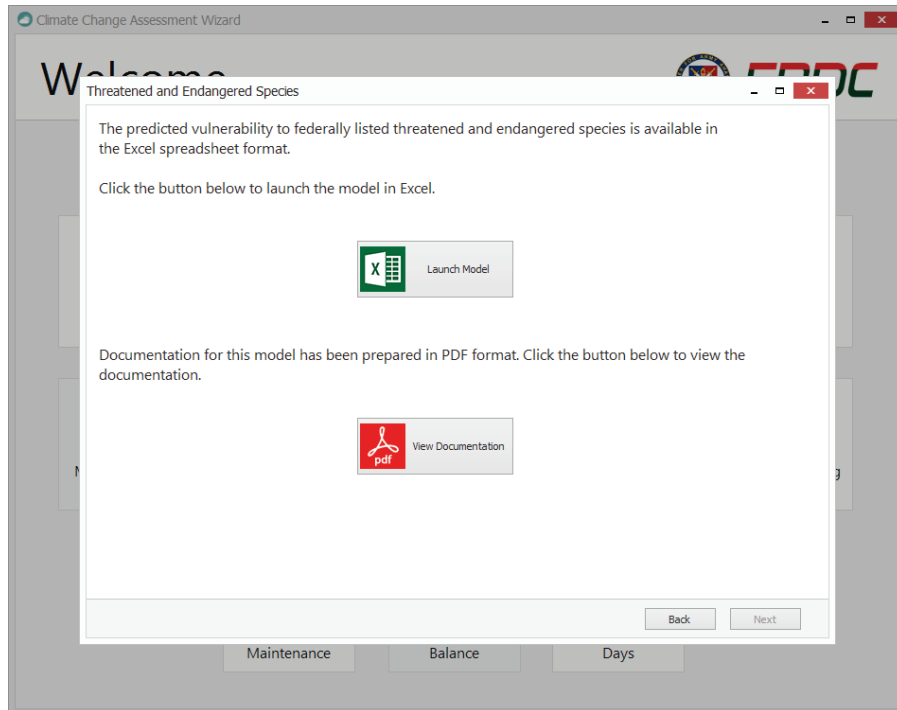
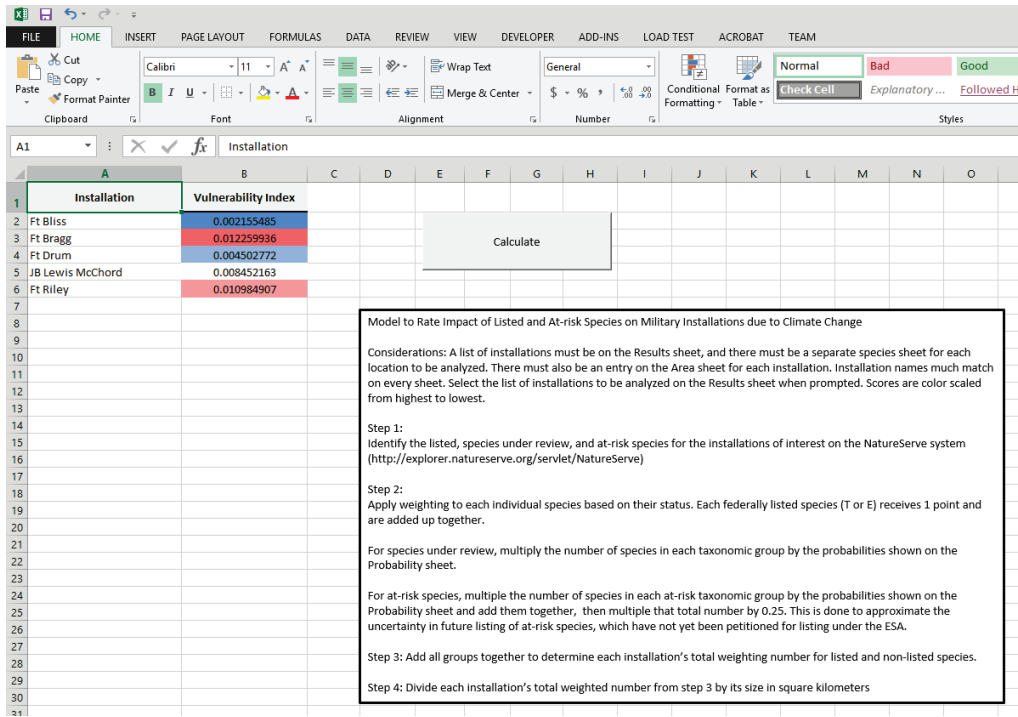


Figure 5. Results in the MS Excel® window.



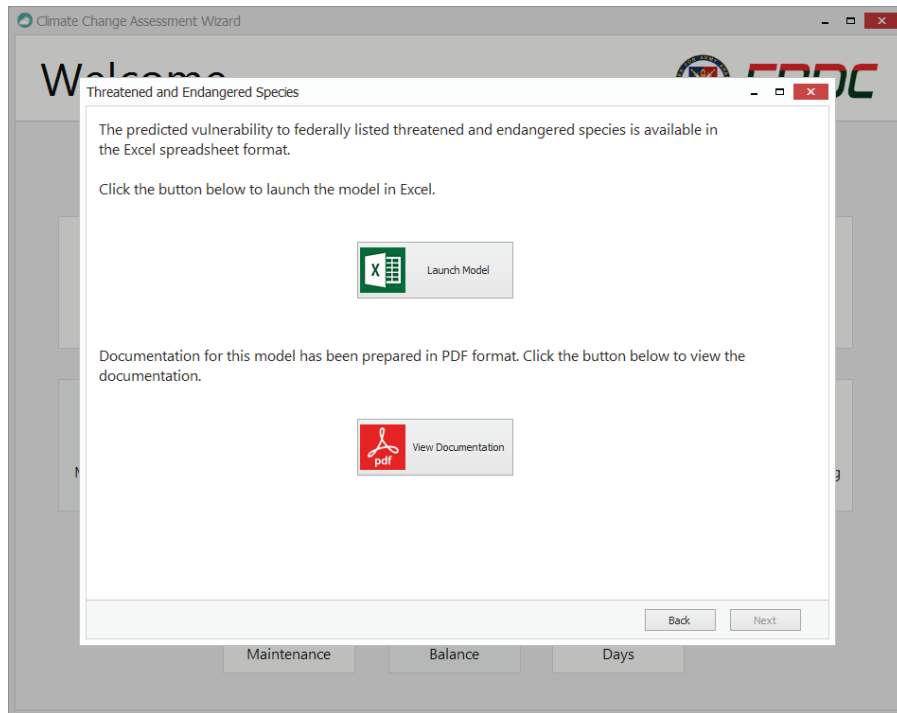
Each installation that was analyzed is assigned a Vulnerability Index score which may be used as an MVA attribute in other force stationing analysis applications. A color scale was added to the values to help distinguish the upper and lower bands. These colors do not correspond with any doctrinal thresholds and are simply for aesthetics.

3 Building New Data

Building new datasets can be accomplished within the MS Excel® spreadsheet that contains the Vulnerability Index scores. The following instructions should be followed carefully to produce new data from this model.

The MS Excel® spreadsheet may be launched automatically from the Wizard application or accessed manually by opening `C:\Models\TES\Model\TES-Model.xlsx` from within MS Excel® (Figure 6).

Figure 6. Launch MS Excel® from the second model screen within the Wizard.



After opening the MS Excel® spreadsheet, enable macros if requested in the banner below the ribbon menu. Follow these steps carefully to calculate new vulnerability scores.

1. List the installations to be analyzed in column A on the *Results* worksheet. Note: These installation names must match throughout the process.
2. Identify the listed species under review and at-risk species for the installations of interest. This is accomplished by accessing the federally

listed species database by accessing the NatureServe Explorer website at <http://explorer.natureserve.org/servlet/NatureServe>. Use the Location search feature as shown in Figure 7.

A tabular list of all listed species for each DoD installation of interest must be retrieved from the NatureServe Explorer system. The system allows users to search for results by state or by county and download them in MS Excel® format. Place the exported data into the model MS Excel® workbook by adding a new sheet and naming it according to the previously defined list of installations. Make sure the name matches the original list on the *Results* worksheet exactly. Repeat this process for all listed installations.

3. Locate the area for each of the installations to be analyzed and enter it into columns A and B on the *Area* worksheet. Area is defined as the square kilometers of land that an installation occupies. Google searching is generally the best method of obtaining this data. Make sure to enter the installation name exactly as it appears on the *Results* worksheet.

Return to the *Results* worksheet and click the *Calculate* button to start the calculation process. This process runs very quickly and populates the Vulnerability Index values in Column B (Figure 5).

Figure 7. NatureServe Explorer web application.

The screenshot displays the NatureServe Explorer web application interface. At the top, there is a navigation bar with links for "Data Search", "About the Data", "About Us", "Contact Us", and "Help". Below this, there are tabs for "Plants/Animals" and "Ecological Communities & Systems", along with a "Site Index" dropdown menu. The main content area is titled "Search by Location" and offers three search options: "U.S. States & Canadian Provinces", "U.S. Counties", and "U.S. Watersheds". The "U.S. States & Canadian Provinces Search" section is currently active, showing search criteria for "U.S. States" and "Canadian Provinces". Each section has a "Select All" and "Deselect All" button. The "U.S. States" section lists 50 states with checkboxes, and the "Canadian Provinces" section lists 10 provinces and territories with checkboxes. Below the search options, there are two sections for "Your Current Plant/Animal Search Criteria" and "Your Current Ecological Units Search Criteria", both showing "None yet selected." and an "Update Criteria" button. At the bottom, there is a "Return to Top" link and a footer with the NatureServe logo, copyright information (© 2015), and version information (Version 7.1 (2 February 2009), Data last updated: October 2015).

4 Known Issues and Limitations

There are no known issues or limitations at the time of publication.

5 Additional Help

Additional questions or concerns should be directed to the Program Manager of the Integrated Climate Assessment for Army Enterprise Planning program.

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References

- Garton, B. M. 2019. *Analytical Model Software Integration Methods*. Special Report on Integrated Climate Assessment for Army Enterprise Planning. ERDC/ITL SR-19-4. Vicksburg, MS: Engineer Research and Development Center, Information Technology Laboratory (ERDC-ITL)

Appendix A: Acronyms and Abbreviations

Term	Definition
CONUS	Continental United States
DoD	Department of Defense
ERDC	Engineer Research and Development Center
ERDC-CERL	Engineer Research and Development Center, Construction Engineering Research Laboratory
ERDC-ITL	Engineer Research and Development Center, Information Technology Laboratory
ESA	Endangered Species Act
ITAM	Integrated Training Area Management
MVA	Military Value Analysis
NSN	National Supply Number
PM	Program Manager
SAR	Same As Report
SF	Standard Form
VM	Virtual Machine

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