HEAT:
Habitat Evaluation and Assessment Tools

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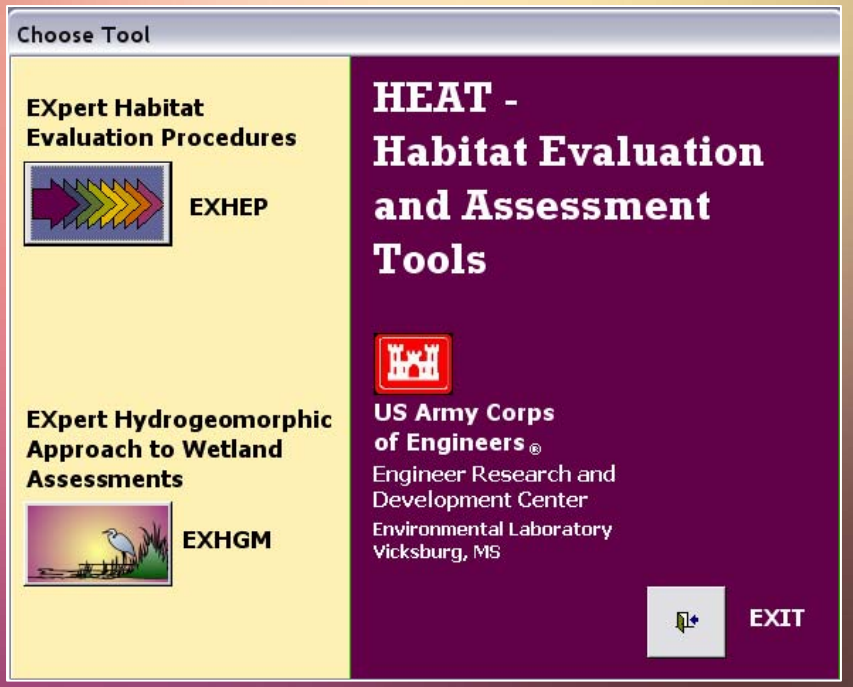
The rapid assessment of changing habitat conditions and the evaluation of the effects these changes have on species, communities and ecosystems must be determined by planners, resource managers, and biologists when comparing environmental design alternatives.



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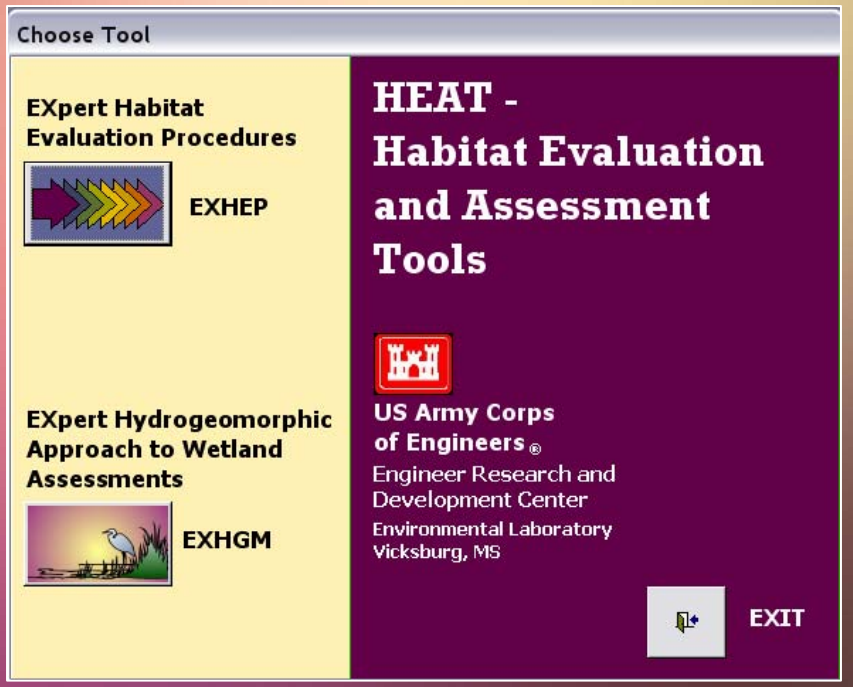
Many techniques (e.g., population assessments, qualitative matrices, life-history modeling, and habitat evaluation techniques) have been developed to investigate and predict environmental impacts on ecological systems at numerous scales with varying degrees of success.



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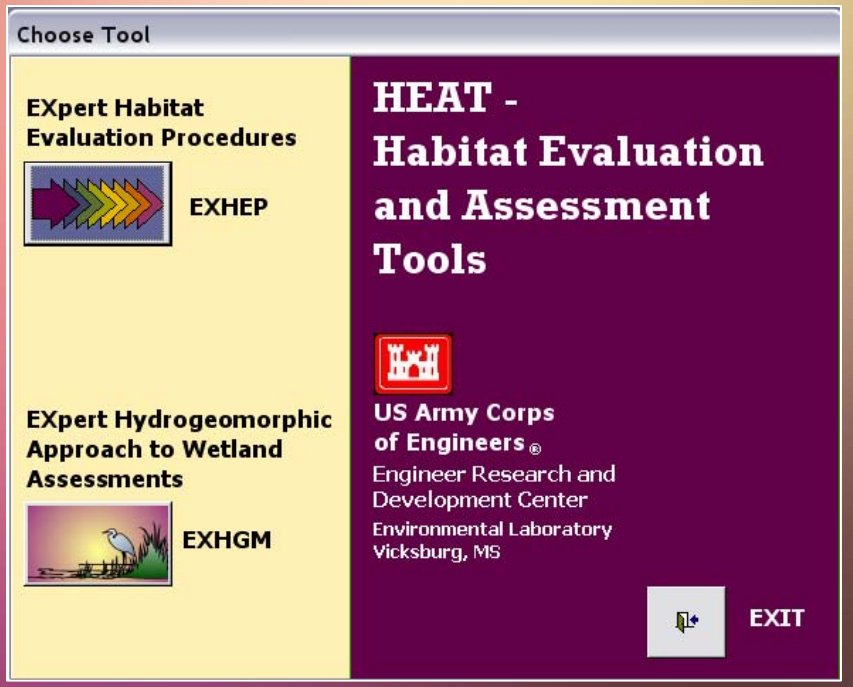
Advances in technology have led many agencies to automate and distribute automated environmental evaluation tools to users.

The value and validity of these packages depends greatly on their objectivity, repeatability, and efficiency.

To guarantee their constant use by the users, these systems must be easy to apply, cost-effective, and instantly responsive.



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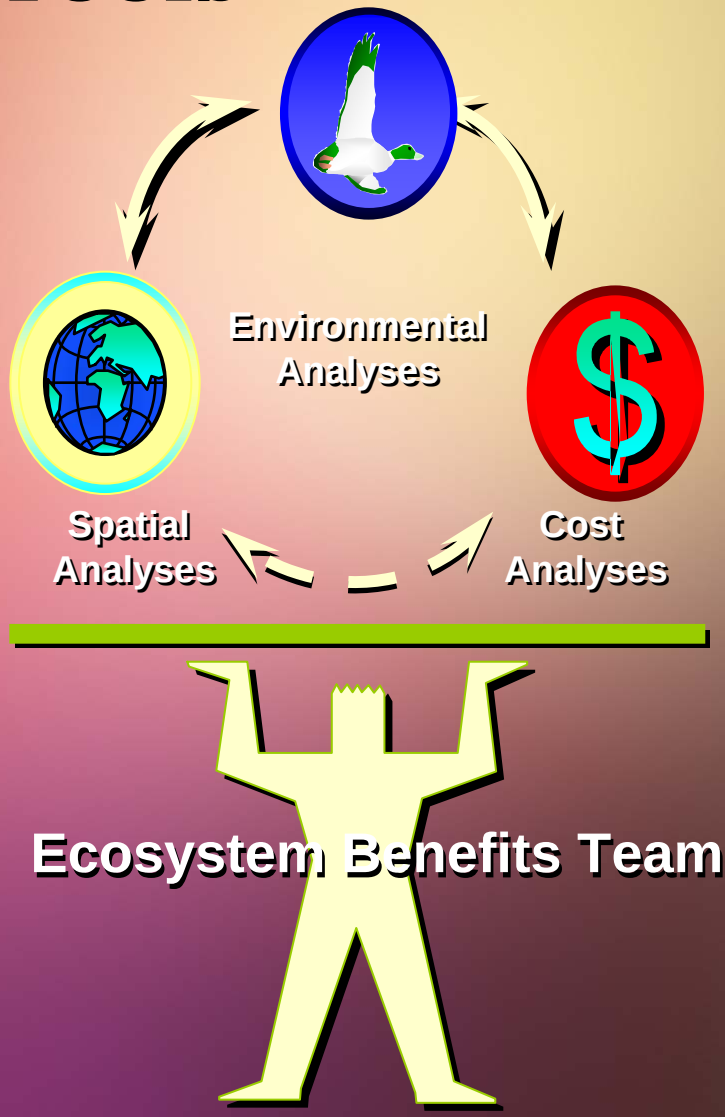
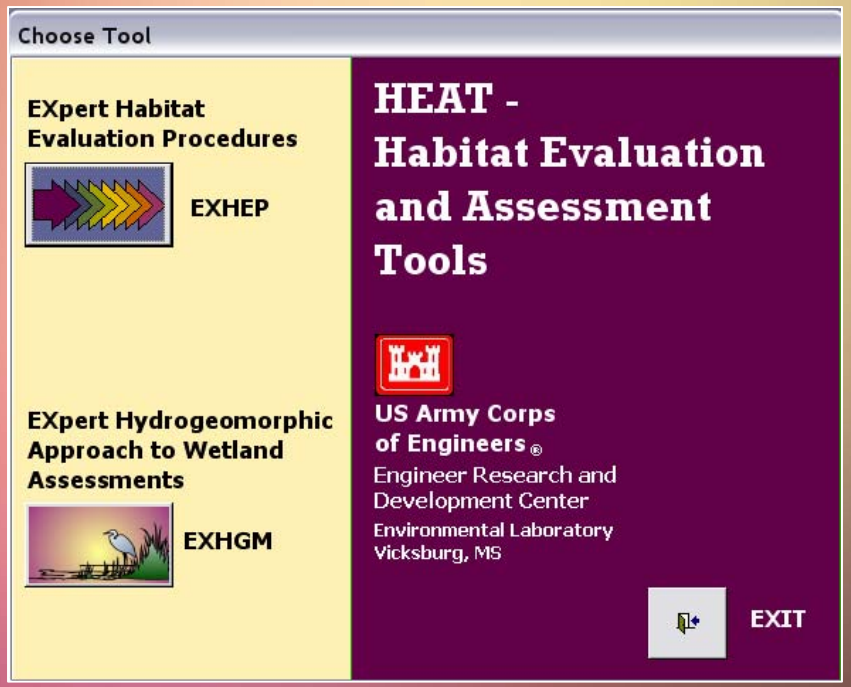
The US Army Engineer Research and Development Center's Environmental Laboratory (ERDC-EL) develops and adapt methods and models to quantify and document the effects of Corps activities under Environment, Flood and Storm Risk Management, and Navigation Business areas in terms of Threatened and Endangered species, ecosystem services and benefits through research, application, facilitation, knowledge management, and technical support.



Getting Started

The *Habitat Evaluation and Assessment Tools (HEAT)* software was developed to provide a user-friendly (intuitive), flexible, and efficient means to conduct Habitat Evaluation Procedures (HEP) and the Hydrogeomorphic Approach to Wetland Assessments (HGM), using Microsoft® Windows programming capabilities.

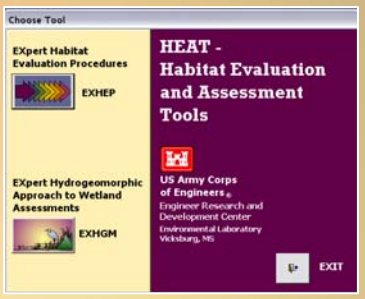


Current Platform: Windows XP and MS Office 2003 – but it's been upgraded for MS Office 2007

User Note:

Installation of the software requires temporary administrative privileges and for USACE employees, must be completed via ACE-IT. Contact the authors for more details.

HEAT Modules

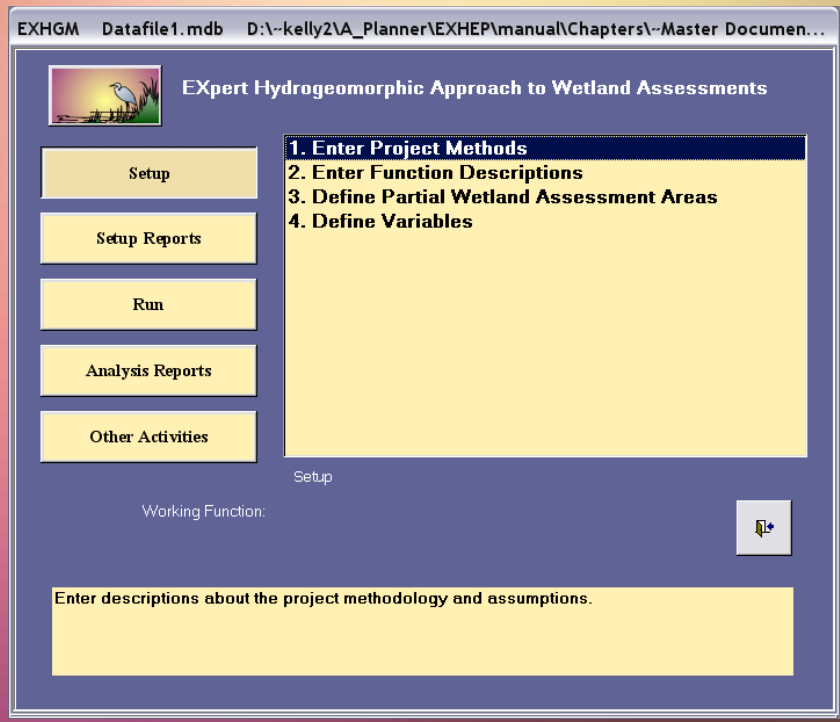


The sheer number of calculations necessary to conduct a HEP or HGM evaluation in a study necessitates the use of automated systems to complete the assessments in a timely manner.

ERDC-EL has developed HEAT – Habitat Evaluation and Assessment Tools to address this need.

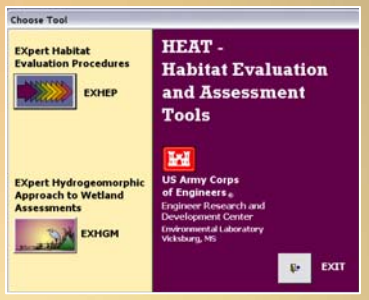
Currently comprised of two evaluation MS Access 2003 modules:

- EXHEP: EXpert Habitat Evaluation Procedures, and
- EXHGM: EXpert Hydrogeormorphic Approach to Wetland Assessments



The system provides a fully automated interface to facilitate simultaneous HEP and HGM assessments.

System Capabilities



HEAT was designed to process large quantities of data quickly and efficiently, handling a large number of index models simultaneously.

It's basically a Index-based Accounting System where Currency is a "Unit" and a Unit = Quality X Quantity

In HEAT, each model can incorporate any number of:

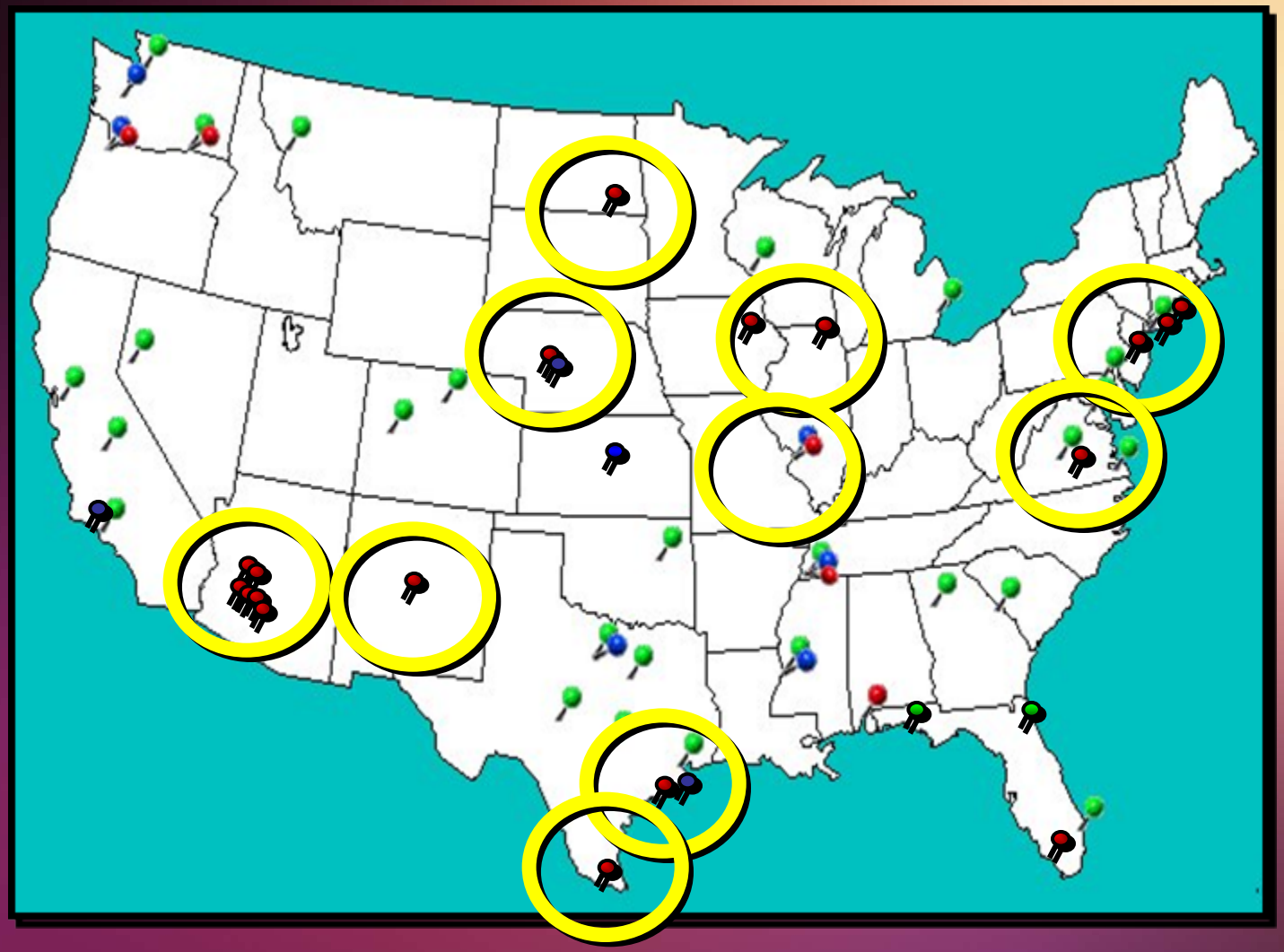
- Cover types
- Variables
- Functions
- Target Years

These capabilities support the examination of complex studies with large numbers of permutations.

HEAT Applications

Developed to address any occasion, the HEAT tools can be used in restoration, planning & design, and any type of wetland impact assessments.

HEAT Applications Nationwide (1993 – Present)



- Training (10)
- Case Studies (23)
- Technology Transfer (29)

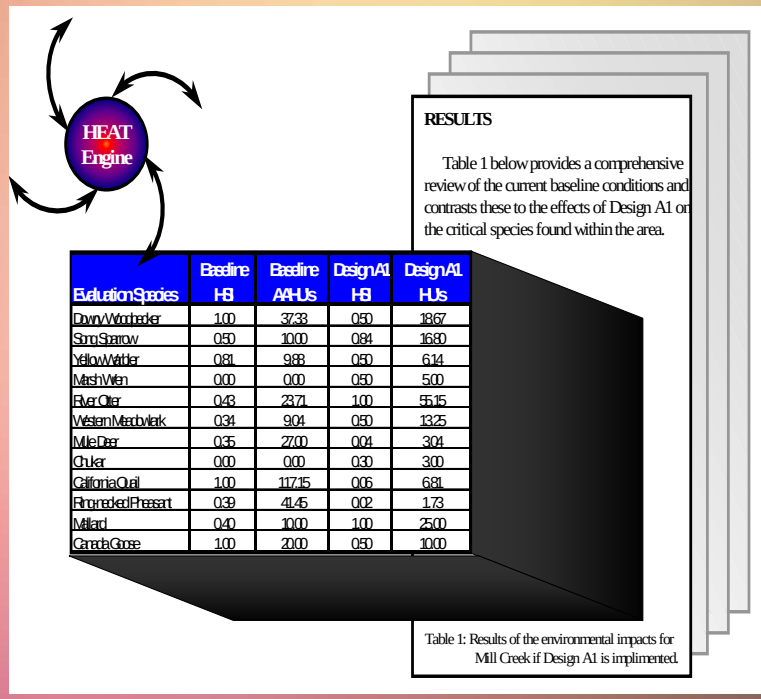
So how does it work?

- There are 12 steps to complete when applying HEP in an ecosystem evaluation.

1. Build a multi-disciplinary evaluation team.
2. Define the project.
3. Map the site's cover types or PWAAs.
4. Select, modify and/or create index model(s).
5. Conduct a baseline inventory.
6. Perform data management and statistical analyses.
7. Calculate baseline conditions.
8. Set goals and objectives, and establish the assessment's temporal scale.
9. Generate without-project conditions and calculate outputs.
10. Generate with-project conditions and calculate outputs.
11. Perform trade-offs.
12. Report the results of the analyses.

So how does it work?

- Once a model or models have been selected or developed (Step 4), and the evaluation team has inventoried the site using the model's parameters (i.e., Step 5), it becomes necessary to generate outputs.



Evalution Species	Baseline HSI	Baseline AAHUs	Design A1 HSI	Design A1 HUs
Down Woodpecker	1.00	37.33	0.50	18.67
Song Sparrow	0.50	10.00	0.84	16.80
Yellow Warbler	0.81	9.88	0.50	6.14
Marsh Wren	0.00	0.00	0.50	5.00
River Otter	0.43	23.71	1.00	55.15
Western Meadowlark	0.34	9.04	0.50	13.25
Mule Deer	0.35	27.00	0.04	3.04
Chukar	0.00	0.00	0.30	3.00
California Quail	1.00	117.15	0.06	6.81
Ring-necked Pheasant	0.39	41.45	0.02	1.73
Mallard	0.40	10.00	1.00	25.00
Canada Goose	1.00	20.00	0.50	10.00

- It is at this point the HEAT software can be fully deployed. A series of steps have been devised to move through this process quickly and cleanly:

1. Gather the pertinent information,
2. Setup the models in EXHEP,
3. Associate the models,
4. Enter the baseline data and generate baseline results,
5. Enter the without-project conditions and calculate the effects,
6. Enter the with-project conditions and calculate the effects, and
7. Recycle the datafile and evaluate alternative designs.

What to pull together

It is also important to gather all information supporting the application of the models prior to setting up the software. Collect basic information (i.e., references, cover types, variables, sampling protocols, SI curves, HSI formulas, etc.) early on. The software can be setup incrementally as this information becomes available, but analysis cannot commence without these basics.

Component	Items	Example
Evaluation Data		
	Target Years	Baseline, end of construction, and life of the project (including additional years when needed). Example: TY — Calendar Year 0 — 2002 1 — 2003 51 — 2053
	Acres	Baseline acres per cover type Without-project acres per cover type With-project acres per cover type for each alternative
	Variables	Baseline means/modes per cover type Without-project means/modes per cover type With-project means/modes per cover type for each alternative

Component	Items	Example
Background Information		
	Project Name	Mill Creek Ecosystem Restoration Study
	Alternative Name	Design 1
	Methods	Model References and Support Documentation Model Modifications List of Evaluation Team Members Goals and Objectives Data Management Strategies Evaluation Strategies (including tradeoff approaches) Field Sampling Team and Metadata (include locations, assumptions, dates, etc.)
Model Specifics		
	Model(s) and Life Requisite Names	Species/Community and life requisites (both short-hand names or codes and detailed descriptions). Examples: Model: Slider Turtle Life Requisite: Food and Cover
	Cover Type(s)	Short-hand names or codes and detailed descriptions Examples: Deciduous Forested Wetlands Herbaceous Wetlands Freshwater Lakes Riverine Deciduous Scrub-Shrub Wetland
	Variables	Short-hand names or codes, detailed descriptions, sampling protocols, and data management (statistical) activities. Examples: Emergent and submerged vegetation Water depth Water regime Water temperature Velocity
	SI Curves	X,Y coordinates for all variables included in the model(s). For example: 0,0.2,90,1,100,1
	LRSI and HSI Formulas	Mathematical algorithms for each function in each wetland subclass. Example: $Index_{SliderTurtle}$ = Minimum of ($LRSI_{FoodCover}$ or $LRSI_{WQ}$ or $LRSI_{WaterTemp}$)

(Continued)

Support

- Software Demonstrations
- On-Site Installation
- Training Workshops
- User Guides
- On-Site Technical Consultations

How does it work?

- Live demonstration

Status of the Software

User Guide & CD available from the authors:

Burks-Copes, K. A., A. C. Webb, M. F. Passmore and S.D. McGee-Rosser. 2010. HEAT - Habitat Evaluation and Assessment Tools for Effective Environmental Evaluations. User's Guide. Final Report. U. S. Army Engineer Research and Development Center, Environmental Laboratory, Vicksburg, MS. 312 pp. + appendices.

Software & Guide have been externally peer reviewed and "recommended" for model certification.

Upon final certification, the software will be available for free download at:

https://swwrp.usace.army.mil

or through the Ecosystem Restoration Gateway at:

https://cw-environment.usace.army.mil

Summary

- Flexible Programming - Interchangeable
- Dynamic Linkages to Reports
- Multiple Applications
- Full Support Available

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