POWER ENGINEERS

WEIGHT OF EVIDENCE

CREATING TRANSPARENCY IN EVALUATING UNREASONABLE ADVERSE IMPACTS

Can the EPA's ecological risk assessment framework be applied as an objective and transparent method for determining unreasonable adverse impacts on energy projects? Consider the steps below and see more information on the back page.

EXISTING INFORMATION

PHASE 0
Problem Scoping and Issue Identification

Problem Scoping
- » Regulations
- » Stakeholders

Issue Identification
- » Purpose and need of proposed project
- » What are the potential environmental risks?
- » What ecological components are at risk?

Scientific Management Decision Point

LANDSCAPE | SCREENING LEVEL DATA

PHASE 1
Problem Formulation

Impact | System

Assessment Endpoint* A ↔ Conceptual Model Exposure Pathway

Assessment Endpoint* B ↔ Conceptual Model Exposure Pathway

Hypothesis and Questions

*Assessment Endpoints—explicit expression of the environmental value that is to be protected. (e.g., will nesting sage grouse have reduced nesting success). They will characterize the risk.

Scientific Management Decision Point

DATA COLLECTION (some may be qualitative)

PHASE 2
Planning

Lines of Evidence
- » What types of information will be used?
- » Existing vs required data

Measurement Endpoints**

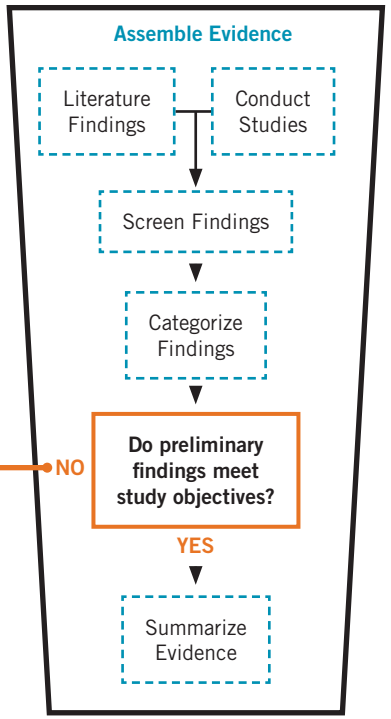
Ecological Objectives
- » Agree upon study objectives where if met will determine unreasonable adverse impact
- » What is severe?
- » What is too long?
- » What are the regulatory metrics?
- » What is a reasonable cost and timeline?

Study Design
- » How will data be obtained?
- » Proper statistical power?
- » Required data gaps to be filled?

**Measurement Endpoints—measurable ecological characteristic that is related to the valued characteristic chosen as the assessment endpoint (e.g., do courting or feeding sage grouse collide with turbines)

DATA COLLECTION

PHASE 3
Weighting Evidence



Informing Decisions
Not all information has the same impact on a decision. Weighting evidence shows all stakeholders what the data is, and how it will be used to characterize impacts.

STRENGTH COHERENCE CONSISTENCY RELIABILITY RELEVANCE

Scientific Management Decision Point

PHASE 4
Risk Characterization

Confirmation of Utility
- » Has the risk been addressed?
- » Summarize the confidence of weighted evidence

Risk Character
- » Estimate the risk to the various assessment endpoints based on weighted evidence
- » Summarize uncertainties and ambiguities of evidence weights
- » Which hypotheses are supported by weight of evidence and with how much weight?
- » Which hypotheses are not supported by the weighted evidence and why?

Risk Communication
- » Summarize risk character and how it relates to the overall Ecological Objectives, Study Design, Regulatory Implication of Risk Character.

PHASE 4
Risk Management

Informed Decision Making
- » Is there an unreasonable adverse impact?
- » How will mitigation options reduce risk?
- » What are the regulatory options?
- » Be prepared to evaluate the next project like this reusing similar metrics, data, conclusions, decision points.

Scientific Management Decision Point
While there is continual communication between regulators and stakeholders, there are specific points where decision makers prepare findings of compliance with stated biological objectives.

Stakeholder Involvement
A structure for internal and external stakeholder involvement knits the whole process together, providing transparency, clarity, consistency, and reasonableness.

WEIGHT OF EVIDENCE

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LET'S TALK WoE

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A Little History on WoE

The first consideration of weight of evidence (WoE) in environmental assessment was Austin Hill's 1965 *The Environment and Disease: Association or Causation?* Recognizing that data may have value even if it shows no statistical correlation, Hill argued that evidence with greater or less strength helps us answer a fundamental question: Is there any way to explain a set of facts beyond just cause and effect?

This question paved the way for EPA's 1990s framework for ecological risk assessment that has successfully guided complex cleanup efforts at some of the most polluted places in the U.S. Today, we propose applying the EPA's framework to energy projects for an objective and transparent method to determine unreasonable adverse impacts.

Applying WoE to Energy Projects

The weight-of-evidence technique examines strengths and limitations of various measurement endpoints when determining whether a specific stressor (e.g., wind turbines) has caused or could cause an unreasonable impact to a species or group of species. The WOE approach has been adapted for use qualitatively or quantitatively depending on the defensibility of the measurement endpoints for exposure and effects.

Using ecological risk assessment for effects estimation has been an accepted analytical framework and has been used to help structure effects analysis in complicated environmental evaluations. It is ideal for analyzing effects of energy projects because it is flexible, allows full use of all available data, and encourages development of protocols for data collection to support appropriate environmental decisions.

Benefits of WoE

Applying the objective weight-of-evidence approach to environmental assessment could satisfy the needs of all stakeholders—the public, agencies, and project proponents. WoE can provide the following benefits:

- **Transparency**—The analysts seek to disclose methods, assumptions, logic, rationale, uncertainties, and strength.
- **Clarity**—Decision-making is readily understood by parties not involved in the process; there is not a lot of jargon used.
- **Consistency**—The process can be repeatable for a type of projects within a particular regulatory and ecological environment.
- **Reasonableness**—The framework employs sound methods that allow state of the art science under certain cost limitations.

For more about this topic, check out Gino's article *How Might Henry Ford Evaluate Ecological Impacts?*