

***Explicit Expressions of Ecological Protection:
U.S. EPA's Guidance on Selecting "Assessment
Endpoints" for Ecological Risk Assessment***

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Research and Development at EPA



- 1,950 employees
- \$700 million budget
- \$100 million extramural research grant program
- 13 lab or research facilities across the U.S.
- Credible, relevant and timely research results and technical support that inform EPA policy decisions

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National Center for Environmental Assessment

NCEA's work focuses on:

Human Health --

- Conducting human health risk assessments and to manage the Agency's Integrated Risk Information System (IRIS)
- Producing Air Quality Criteria Documents
- Providing risk assessment research, methods, guidelines, training materials, and technical and regulatory support to EPA's Program Offices and Regional Offices and the public

Ecological Health --

- Developing methods for integrating, deriving, and synthesizing cause and effect relationships for application in causal and risk assessments
- Conducting priority ecological assessments, particularly of watersheds, that apply these approaches and relationships
- Providing tools and guidance that will increase the accessibility of our methods to EPA's Program Offices and Regional Offices and the public

And... → Assessment of global change
→ Expert staff support to the Agency's Risk Assessment Forum

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Summary

- **Ecological risk assessment** is a process for evaluating the likelihood that adverse ecological effects may occur or are occurring as a result of exposure to one or more stressors.
- A critical early step in conducting an ecological risk assessment is **deciding which aspects of the environment will be selected for evaluation**.
- This step is **often challenging** because of the remarkable diversity of species, ecological communities, and ecological functions to choose from and because of statutory ambiguity regarding what is to be protected.
- This presentation summarizes a **new EPA guidance** document which builds on existing Agency guidance and experience to assist those who are involved in carrying out this step, which in the parlance of ecological risk assessment is termed "selecting assessment endpoints."
- This document describes a set of endpoints, known as **Generic Ecological Assessment Endpoints (GAEs)**, that can be considered and adapted for specific ecological risk assessments. These GAEs are not exhaustive or mandatory, but are provided to assist EPA programs, researchers, and decision makers, as well as, ecological risk assessors outside the Agency.

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A Brief History of Ecological “Assessment Endpoints” at EPA

- 1989: **Definition** of an “assessment endpoint” involves two steps: identifying the valued attributes of the environment at risk, and defining these valued attributes in operational terms (Suter 1989).
- 1992: This concept was adopted in the **Framework for Ecological Risk Assessment** (USEPA 1992). “Assessment endpoints are explicit expressions of the actual environmental value that is to be protected.”
- 1994: “EPA needs to establish an initial, overall set of ecological concerns to be considered in the development of regulations, policies, and assessment endpoints for ecological risk assessments.” **Managing Ecological Risks at EPA: Issues and Recommendations for Progress** (Troyer and Brody 1994).
- 1997: “A common list of entities and ecological principles for the entire Agency can provide many advantages...” **Priorities for Ecological Protection: An Initial List and Discussion Document for EPA** (Barton, et al. 1997).
- 1998: The “assessment endpoint” concept is retained and expanded in the final **Guidelines for Ecological Risk Assessment** as “explicit expressions of the actual environmental value that is to be protected, operationally defined by an ecological entity and its attributes” (USEPA 1998).
- 2003: EPA’s Risk Assessment Forum publishes the supplemental guidance entitled: **Generic Ecological Assessment Endpoints (GAEs) for Ecological Risk Assessment** authored by a technical workgroup composed from EPA’s program, regional, and science offices (USEPA 2003).

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Common Problems with Assessment Endpoints

- **Expressed as a goal not well suited for scientific inquiry.**
- **Vague, not well defined.**
- **Not a valued attribute for scientists, managers and/or stakeholders.**
- **Not exposed, or otherwise irrelevant to the location or site of concern.**
- **Inappropriate with respect to the temporal or spatial scale of the assessment.**
- **Not sensitive to the stressor of concern.**
- **Values insufficiently considered.**

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Generic Ecological Assessment Endpoints (GEAEs)

Applicable to a wide range of environmental issues and ecological risk assessments.

Reflect the programmatic goals of the Agency.

May be estimated using existing assessment tools.

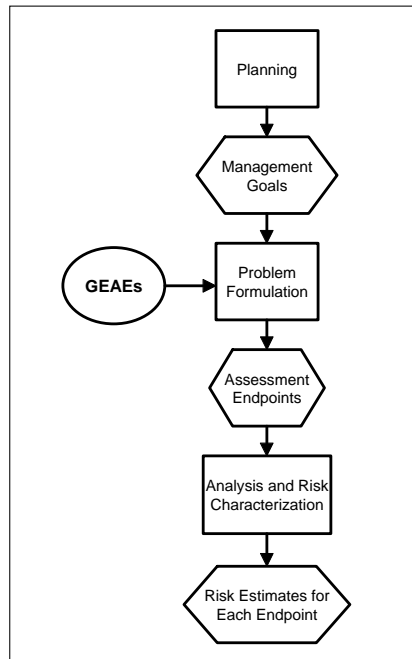
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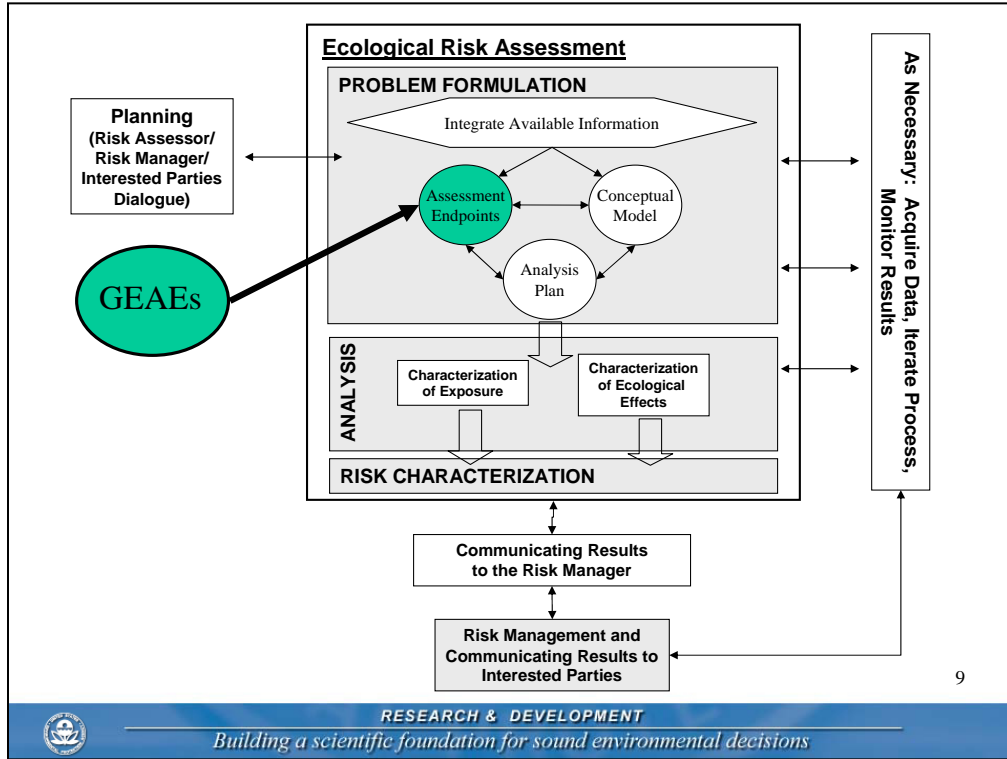
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**Where GEAEs
fit into the
Ecological
Risk
Assessment
Process...**



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What GEAEs are Not

- **Not a complete list of what EPA protects.**
- **Not, by exclusion, an indication of what is not protected.**
- **Not mandatory.**
- **Not applicable without assessment-specific interpretation.**

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Why GEAEs?

- **To give risk managers a basis for action similar to commonly employed human health endpoints.**
- **To provide a threshold for preventing environmental degradation by ensuring that certain values are at least considered for an assessment.**
- **To comply with legal requirements.**
- **To improve the consistency of ecological risk assessment and management across the Agency.**
- **As models of site-, action-, or region-specific endpoints.**

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Why GEAEs (cont.)?

- **For screening-level assessments that need to rapidly develop assessment endpoints with little input.**
- **To provide scientists and engineers with a clear direction for the development of ecological methods and models.**
- **To facilitate communication with stakeholders by creating a set of familiar and clear EPA endpoints.**
- **To reduce the time and effort required for conducting assessments.**

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Criteria used for these first generation GEAEs

- **Generally useful** in EPA's decision making process as documented in:
 - » Policies
 - » Regulations
 - » Legal decisions
 - » Guidance
 - » Other Precedents
- **Practical** to measure, test, or model.
- **Well defined** with a clear entity and an attribute.

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Organism-Level GEAEs

Entity	Attribute	Identified EPA Precedents
Organisms (in an assessment population or community)	Kills (mass mortality, conspicuous mortality)	Vertebrates (e.g., fish, birds)
	Gross anomalies	Vertebrates Shellfish Plants
	Survival, fecundity, growth	Endangered species Migratory birds Marine mammals Bald and golden eagles Vertebrates Invertebrates Plants

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Population-Level GEAEs

Entity	Attribute	Identified EPA precedents
Assessment population	Extirpation	Vertebrates
	Abundance	Vertebrates Shellfish
	Production	Vertebrates (game/resource species) Plants (harvested species)

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“Assessment Populations”

A group of conspecific organisms occupying an area that has been defined as relevant to an ecological risk assessment.

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Community and Ecosystem-Level GEAEs

Entity	Attribute	Identified EPA precedents
Assessment communities, assemblages, and ecosystems	Taxa richness	Aquatic communities
	Abundance	Aquatic communities
	Production	Plant assemblages
	Area	Wetlands Coral Reefs Endangered/rare ecosystems
	Function	Wetlands
	Physical structure	Aquatic ecosystems

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“Assessment Communities or Assemblages”

A multispecies group of organisms occupying an area that has been defined as relevant to an ecological risk assessment.

The group may include all organisms in a defined area, in a taxon, a plant community or bird community, or in a collection of environmental samples (e.g., macro-invertebrates enumerated from Hester-Dendy samples).

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Officially designated GEAEs

Entity	Attribute	Identified EPA precedents
Critical habitat (for threatened or endangered species)	Area	Endangered Species Act
	Quality	
Special Places	Ecological properties that relate to the special or legally protected status of the place	<u>Examples include:</u> World Heritage Sites National Parks National Wildlife Refuges Wilderness Areas Wild and Scenic Rivers Estuarine and Marine Sanctuaries Nature Conservancy Preserves Great Lakes

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How to Begin Using GEAEs

- **Choose from the set and decide**
 - Is this GEAE susceptible, relevant, and important in this case?
 - For example, is a wetland present and potentially susceptible, relevant and important to this risk assessment?
 - If so, are we concerned about the area of a particular type of wetland, or a function, or both?
- **And/or match to prior concerns**
 - For example, if stakeholders are concerned about a wetland,
 - support for wetland GEAEs in EPA's guidance document provides support for its consideration in an EPA ecological risk assessment.

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Make your chosen GEAEs specific

- **Define the specific entity of concern, attribute, and spatial/temporal context of the GEAE to be used.**
- **For example, you're concerned about kills you say?**
 - **Of what?** (e.g., Birds in general? Turkey vultures? European starlings?)
 - **How specifically defined?** (e.g., Mass, conspicuous, or any number of kills? A certain threshold or number of deaths?)
 - **Where exactly, and at what spatial scale?** (e.g., NIMBY or "widespread")
 - **Over what time period and frequency?** (e.g., seasonal or annual, repeated or irregular?)
- **Note: you may derive more than one GEAE from a concern about bird kills alone.**

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Finish the List of Assessment Endpoints

- **Add any relevant, susceptible, and important assessment endpoints not already on the GEAE list.**
 - Support them the best you can in site-specific terms

- **Edit the list.**
 - Eliminate redundancies, and
 - Reduce it to a manageable number of assessment endpoints:
 - Given time and resources
 - Considering their relative importance, and
 - The thought that its better to do the most important endpoints well

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Future Directions and Progress

- **This set of GEAEs is based on existing policy and practice rather than an evaluation of all potentially useful assessment endpoints for the Agency.**
- **Recommendation #1: Develop and support a continual, open process for reviewing, amending, and creating new GEAEs over time...**
 - As different stressors challenge our Nation's ecosystems,
 - As our scientific understanding of ecosystems improves,
 - As laws change
 - As policy advances
 - As new ecological assessment endpoints gain acceptance

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Future Directions and Progress (continued...)

- **Recommendation #2: Develop a readily accessible and searchable database of existing and new ecological assessment endpoints.**
 - Document new rationales, assessment endpoints, and precedents being established by risk assessors and managers in EPA's programs and regions.
 - This will hopefully assist *INNOVATION* and continued *PROGRESS* in this area.

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Good Endpoints are Good for Managers

- Recall that EPA's mission is to protect human health and the environment.
- Agency decision-makers need to understand EPA's mission and precedents for ecological protection (not just human health).
- The primary goal of this guidance document is to enhance the application of ecological risk assessment at EPA, thereby improving the scientific basis for ecological risk management decisions.
- It represents an Agency-wide scientific consensus on ecological assessment endpoints.
- Thus, decision-makers should feel more comfortable with and supportive of these ecological assessment endpoints...

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*And that is...
Good for the Environment !*



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Available from the Internet...

U.S. EPA. 2003. *Generic Ecological Risk Assessment Endpoints (GEAEs) for Ecological Risk Assessment*. Washington, DC: U.S. Environmental Protection Agency, Risk Assessment Forum. EPA/630/P-02/004F. Available from:
<http://cfpub2.epa.gov/ncea/cfm/recordisplay.cfm?deid=55131>

U.S. EPA. 1998. *Guidelines for ecological risk assessment*. Washington, DC: U.S. Environmental Protection Agency, Risk Assessment Forum. EPA/630/R-95/002F. Available from: **<http://cfpub2.epa.gov/ncea/cfm/recordisplay.cfm?deid=12460>**

U.S. EPA. 1997. *Priorities for ecological protection: An initial list and discussion document for EPA*. Washington, DC: U.S. Environmental Protection Agency. EPA/600/S-97/002. Available from: **<http://www.epa.gov/ORD/WebPubs/priorities/>**

Troyer, M.E. and M.S. Brody. 1994. *Managing ecological risks at EPA: issues and recommendations for progress*. Washington, DC: U.S. Environmental Protection Agency. EPA/600/R-94/183. Available from: **<http://www.epa.gov/ORD/WebPubs/ecorisk.pdf>**.

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