

**Integrating Ecological Assessment and Decision-Making at EPA**  
**2011 RAF Ecological Assessment Action Plan**  
**August 11, 2011**

This document is a working draft for external review, and is not to be quoted or used for citation. Descriptions of proposed action areas are brief, by design; and more detail can be found in the document from which this plan is derived, located at: <http://www.epa.gov/raf/publications/pdfs/integrating-ecolog-assess-decision-making.pdf>

The Risk Assessment Forum (RAF) Ecological Assessment Action Plan (Plan) reflects recommendations from the 2009 Intra-Agency Colloquium on Ecological Risk and Decision Making (see Section 1.3), and prioritization of those recommendations by the RAF. The Action Plan is composed of six high priority, overarching science policy recommendations (listed in 1.1 and summarized in Section 2) and seven specific technical problems in ecological assessment applications and technical practices (listed in Section 3).

The Plan was submitted for Science and Technology Policy Council (STPC) email review on June 9, 2011. Three sets of comments were received from STPC and incorporated into this revision.

Comments received from OSWER recommend “that, in cases where the RAF has identified a need for Agency-wide policy in a particular area, that question should be referred to the STPC for further discussion prior to initiation of RAF projects in these areas.” It is through this Plan that the RAF is requesting STPC attention to these policy issues pertaining to strengthening the scientific rigor for ecological risk assessment. The RAF anticipates that the STPC will require more substantive development of the identified policy issues than is possible in the context of this Plan in order to reflect on policy implications and to make recommendations. It is for this reason that these policy issues have been recommended for issue paper development. The RAF will proceed with whatever approach the STPC decides for taking up the identified policy issues for consideration.

## **1.0 RAF Ecological Assessment Action Plan**

The RAF Ecological Assessment Action Plan addresses the highest priority policy-focused issues identified by EPA ecologists at the 2009 Colloquium on Ecological Risk and Decision Making. Two RAF technical panels have begun work, and these issues are included in the Plan. The remaining policy issues will be taken up in turn as resources allow.

### **1.1 Overarching Science Policy Recommendations**

The RAF believes that the quality, scope, and application of ecological assessments in environmental decisions will be improved through development and implementation of Agency-wide science policies in six transformative areas.

- *Apply Systems Approaches to Ecological Assessments, and Integrate Different Types of Assessments to Solve Broad Environmental Problems*
- *Improve Communication of Ecological Assessment Issues and Results [Panel established]*
- *Incorporate Ecosystem Services and Benefits in Assessment as Methods and Tools Become Available [Panel established]*
- *Strengthen Science Policies that Promote Agency-Wide Ecological Protection Goals*
- *Incorporate Adaptive Management as a Formal Science Policy for EPA*
- *Develop Weight of Evidence as an option for inference in ecological assessments*

The RAF asserts that these six transformative science policy initiatives are important for improving ecological assessments and better informing decision-makers. Development and implementation of these policies will also assist in clarifying the perceived confusion regarding

how EPA uses ecological assessments that has been published in the peer reviewed literature and by advisory bodies such as the EPA Science Advisory Board (SAB) and National Research Council (NRC). Summaries of the policy initiatives are described in Section 2.0.

## 1.2 Specific Improvements in Ecological Assessment Applications and Technical Practices

Although Colloquium participants emphasized the need for broad transformative science policy, they also recognized the ongoing need for improvements in specific ecological assessment methods and applications. Seven specific recommendations were developed at the colloquium, and have been incorporated into the RAF proposed Action Plan under section 3.0 “Specific Issues and Technical Practices.”

## 1.3 Background on the Action Plan Recommendations

An Intra-Agency Colloquium on Ecological Risk and Decision making was convened in 2009 by a Technical Panel of the RAF. The colloquium was in response to a 2007 SAB report entitled *Advice to EPA on Advancing the Science and Application of Ecological Risk Assessment in Environmental Decision-Making*. While the colloquium was being planned, the NRC released its 2009 report *Science and Decisions: Advancing Risk Assessment*, which the RAF Panel also made a focus of the discussions. Notably, the colloquium was the first Agency-wide gathering of ecological assessors since finalization of the *Guidelines for Ecological Risk Assessment* in 1998. The SAB and NRC advice offered both recommendations for broad science policy and suggested future risk assessment directions for EPA. A need for greater clarity, understanding, and communication of the design and application of ecological assessments at EPA was highlighted. This was evidenced by a call for clearer a priori science policies, environmental protection goals, and guidance, particularly at the risk assessment-risk management interface. Several long-standing issues were also raised, including weight of evidence, cumulative risk, uncertainty analysis, and hypothesis development in risk assessment. Colloquium participants evaluated the current state of the practice for ecological assessment at EPA, associated science policies, and major gaps in SAB and NRC recommendations and Agency practice.

The RAF Ecological Oversight Committee reviewed the colloquium recommendations, which are contained in the report [Integrating Ecological Assessment and Decision Making at EPA: A Path Forward](#). The RAF Ecological Oversight Committee’s initial prioritization resulted in the formation of two new technical panels, one addressing improved communication of ecological assessments, and the other to incorporate the use of ecological services as assessment endpoints.

## 2.0 Science Policy Initiatives

### ACTION PLAN TABLE-POLICY INITIATIVES

	<b>ACTION</b>	<b>OUTCOME</b>
1	Apply Integrated Environmental Assessment	Guidelines for integrated transdisciplinary environmental assessment
2	Improve Communication of Ecological Risk Assessments (ERA)	Recommendations for improving the communication of and use of ERAs
3	Incorporate Ecosystem Services in Assessments and Decisions	Addendum to the Guidance on Generic Ecological Assessment Endpoints
4	Strengthen Agency-Wide Ecological Goals	Develop Science Policy recommendations that promote Agency-wide ecological protection goals
5	Incorporate Adaptive Management as a policy option	Develop recommendations for use of adaptive management strategies in program management
6	Develop Weight of Evidence as a policy option	Develop recommendations for use of Weight of Evidence in ecological assessments

### ***2.1 Apply Systems Approaches to Ecological Assessments and Integrate Different Types of Assessments to Solve Broad Environmental Problems***

The Agency is poised to move beyond conventional risk assessment and to consider an expanded assessment framework and assessment types to better inform decisions. The RAF believes that many emerging environmental issues facing the Agency cannot be addressed adequately within conventional risk assessment paradigms. Broader science policies are necessary for categorizing and integrating existing assessments that address conditions, causes, costs, benefits, and sustainable outcomes – as well as risks. The design and conduct of complex large-scale assessments currently facing EPA (e.g., global change, sustainability, estuarine and coastal hypoxia, integrated nitrogen control, biofuels, hydraulic fracturing of deep geologic formations for methane extraction, mountain top mining, and deep sea oil spills) requires this broader assessment framework. Ecological assessors, particularly regional staff, argued that the focus on media- and chemical-specific assessments have inhibited ecological protection by not adequately recognizing that pollutants move among media, that multiple sources cause combined exposures, that multiple pollutants affect multiple receptors, and that effects on one ecological receptor have consequences for other ecological receptors and for humans. The RAF recommends that the Agency develop a systems approach to ecological assessments, such as the integrated assessment framework published by S. Cormier and G. Suter in 2008.

### ***2.2 Improve Communication of Ecological Assessment Issues and Results***

The strongest and most consistent recommendation of the Colloquium participants was that methods be developed for better communication with decision-makers and stakeholders. This applies to communicating ecological assessment issues during both planning of assessments and presentation of results. In part, this is a matter of inability of assessors to communicate the significance of the loss of species, changes in community structure, and other endpoints. In addition, it involves the lack of standards for acceptability like those in human health assessment, the plethora of assessment methods employed, and difficulties in conveying variability and uncertainty. Currently there is no guidance for communicating ecological risks. An RAF panel is studying this issue but will need the support of Agency management to develop a standard for effectively communicating ecological findings.

### ***2.3 Incorporate Ecosystem Services and Benefits in Assessments***

Quantification of ecosystem services and other benefits of ecosystems is still a developing research program at EPA. The outcome from this research is potentially transformational for environmental science and decision-making. Ecosystem services can be used to describe potential outcomes of environmental management decisions in terms that can be more effectively communicated to decision-makers and the public. An RAF technical panel is addressing this issue and expects to produce case studies and guidance on how to relate ecological endpoints to ecosystem services. This information will be used to update the guidance on use of Generic Ecological Assessment Endpoints.

### ***2.4 Strengthen Science Policies that Promote Agency-Wide Ecological Protection Goals***

There is little consensus in the Agency about goals for protection of the nonhuman environment or the importance of ecological effects. In addition, important and well-developed ecological science principles (e.g., systems analysis, landscape ecology, ecosystem services, and adaptive management) are unfamiliar and have not been systematically integrated into the Agency's science policy framework. If the Agency is to successfully incorporate ecology, it must consider ways to elevate representation and influence of ecological scientists as senior science advisors in its programs, regions, and intra-Agency science policy development and coordinating bodies. The RAF is raising this issue as one that was important to ecological assessors and asks the STPC to consider how it can be constructively addressed.

### 2.5 *Incorporate Adaptive Management as a Formal Science Policy for EPA*

Adaptive management is a process that determines the outcomes of actions and uses that information to improve assessments that inform decisions, thereby improving the efficacy of those decisions. Adaptive management has not been adopted as a policy at EPA. However, it is conceptually well developed and has been widely adopted in numerous federal and state agencies charged with ecological, fisheries, and wildlife management. The RAF recommends the development of adaptive management for testing and revising risk management actions.

### 2.6 *Develop Weight of Evidence as an option for inference in Ecological Assessments*

Although ecological assessments often involve multiple lines of evidence, there is no guidance on how to weigh those lines of evidence to make inferences. The SAB identified a need for guidance, case studies, and standards of practice for weighing multiple lines of evidence to support decision-making. The weight of evidence should be used during problem formulation, data analysis and interpretation, and should be fully documented during the risk characterization. The RAF recommends development of guidance on the use of weight of evidence.

## 3.0 **Specific Issues and Technical Practices**

### **ACTION PLAN TABLE – TECHNICAL PRACTICE INITIATIVES**

	<b>ACTION</b>	<b>OUTCOME</b>
1	Training and access to information for Ecological Assessment (some of these activities have been initiated by the RAF)	Improved capacity of risk assessors and improved quality of risk assessments.
2	Quality assurance and data quality objectives for ecological assessment	Formalize ecological assessment standards
3	Guidance on how to address multiple stressors	Provide guidance for the conduct of assessments with multiple stressors
4	Receptor-specific & Stressor-specific guidance	Guidance for common receptor- and stressor-specific assessments
5	Life-cycle analysis for product safety evaluations	Guidance for the assessment of new chemicals and other products using this approach could improve the quality of assessments and decisions.
6	Uncertainty characterization and communication	Provide necessary guidance for characterizing uncertainty and preparing risk communication information
7	State-of-science, best practices reports, exemplary case studies & success stories	Provide timely information on best practices to risk assessors

Although Colloquium participants emphasized broad transformative science policy needs for ecological assessment, the RAF understands that its foregoing recommendations are visionary and will require significant time and effort to accomplish. The call for transformative thinking regarding ecological assessment is not intended to diminish the need for incremental improvements in specific ecological assessment applications. Many of the issues are of longstanding concern in ecological assessment. The following list will be prioritized and incorporated into the RAF EOC work-plan in the coming years.

- *Training and access to information for Ecological Assessment* (some of these activities have been initiated by the RAF)
- *Quality assurance and data quality objectives for ecological assessment*
- *Multiple stressors*
- *Receptor-specific & Stressor-specific guidance*
- *Life-cycle analysis for product safety evaluations*
- *Uncertainty characterization and communication*
- *State-of-science, best practices reports, exemplary case studies & success stories*