

**U.S. Environmental Protection Agency
Advisory Council on Clean Air Compliance Analysis
Ecological Effects Subcommittee**

March 9 - 10, 2010

SAB Conference Center
1025 F Street, NW, Washington, D.C. 20004

Minutes of the Meeting

Attendees:

EES Members: Ivan Fernandez (Chair), Elizabeth Boyer (By Telephone), Charles Driscoll, Chistine Goodale, Keith Harrison, Allan Legge, Stephen Polasky, Ralph Stahl (By Telephone)

Council Members: Jim Hammitt (Council Chair)

SAB Staff Office: Stephanie Sanzone, Vanessa Vu

Other EPA Staff: Jim DeMocker, Brian Heninger

Other: Molly Davis, Inside Washington Publishers; Maura Flight, IEc; Jim Neumann, IEc (By Telephone)

Purpose:

The EES, supplemented with additional members from the Council and CASAC Ozone Panel (see Roster¹), met to review ecological effects assessments prepared for the Second Section 812 Prospective Analysis of the Costs and Benefits of the Clean Air Act Amendments of 1990.

Meeting Materials:

All materials discussed at the meeting are available on the Council Web site, <http://www.epa.gov/advisorycouncilcaa>, at the [March 9-10, 2010 EES Meeting](#) page.

Summary of Discussions:

The meeting was announced in the Federal Register² and proceeded according to the meeting agenda³, as revised. **Stephanie Sanzone**, Designated Federal Officer for the Ecological Effects Subcommittee (EES), convened the meeting and noted that the EES operates in accordance with the Federal Advisory Committee Act. This means that meetings are announced and open to the public, meeting minutes are prepared, and all materials prepared for or by the EES are available to the public. She also noted that subcommittee members are in compliance with ethics and conflict of interest rules that apply to them as Special Government Employees. **Dr. Vu**, Director for the SAB Staff Office, welcomed panel members and thanked Dr. Fernandez for agreeing to serve as Chair of the EES. She also acknowledged Dr. Driscoll for his previous service as EES Chair. **Dr. Fernandez** reviewed the agenda and the Charge to the EES⁴, and stated his goal of developing a draft EES report before leaving the meeting.

The following is a summary of the issues discussed and conclusions reached during the meeting.

A. Overview of Ecological Effects Studies for the Second Prospective Study

Jim DeMocker, Senior Policy Analyst with EPA's Office of Air and Radiation and head of the 812 Project Team, summarized the approach taken to the Second Section 812 Prospective Study, including a focus on comprehensive analysis, review by outside experts, and continued improvement to methodologies (Presentation Slides⁵). He noted that the 812 study compares scenarios for future air quality with and without the Clean Air Act Amendments (CAAA). Scenarios without CAAA hold regulatory requirements fixed to 1990, but allow for population and economic growth. Scenarios with CAAA include Unidentified Local Controls to achieve modeled emission reductions at levels required to comply with NAAQS. Where it is not possible to do national analysis of important endpoints, the team developed regional case studies. DeMocker noted that the Project Team intends to include estimates of ozone benefits to crops and timber, and benefits to the Adirondacks region, in the Primary Benefit results for the Second Prospective Report.

Several members noted the absence of discussion of uncertainties in the ecological documents, and stressed the importance of considering the cascading uncertainties in the multiple analyses that are required to develop final benefit estimates. Mr. DeMocker agreed to provide excerpts from the separate documents on uncertainty. He noted that changes in methodologies and models make it difficult to assess whether uncertainties have been reduced from the previous prospective study. EES members urged the Project Team to compare model projections where possible with empirical data to "ground-truth" the simulations.

On the morning of March 10, **Mr. DeMocker** provided copies of information requested by the EES on uncertainties associated with the ecological assessments. The materials^{6,7,8} were excerpts from the draft stand-alone report on uncertainty prepared for the 812 Study.

B. Literature Review and National Deposition Maps

Ms. Maura Flight, Industrial Economics (IEc) and project lead for the ecological benefits work, provided an overview of the draft ecological report (Presentation Slides⁹). She referenced earlier reviews by the Council and EES, wherein the Council had agreed that it was not realistic to develop a national quantitative assessment of ecological benefits from the CAAA. The recommended approach for the Second Prospective Study was to include a qualitative discussion of ecological effects, and use case studies to explore quantification of benefits for limited cases. For the regional example, the Project Team gave highest priority to the Adirondacks because of the clear case for injury from air pollutants and availability of data for a case study. The national estimate focuses on ozone and effects on timber and agricultural crops. In response to a recommendation from the EES, the draft report also maps the distribution of emissions reductions and sensitive ecosystems.

Dr. Legge was Lead Discussant for the literature review and mapping chapters. During the discussion, EES members made the following points:

Literature Review:

- The review is not comprehensive and although it relied on review papers, it lacked some important current references. Important recent papers should be added, and the review should refer to the Integrated Science Assessment prepared for the Secondary NAAQS review.

- The literature review should not be just a “review of the reviews” because the authors may not have captured the essential issues, and the review will be out of date.
- The literature review offers a place to discuss the complexity of the ecological issues, e.g., multiple pollutants, multiple endpoints, changing climate. For example, the review should discuss the relationship between sulfate and the methylation of mercury. The review misses important linkages by not discussing climate and carbon issues.
- The review does not include ecological valuation literature that might help bridge the gap between studies on ecological effects and market/nonmarket valuation.
- The discussion of nitrogen might be organized using the nitrogen cascade, discussing nitrogen loading, and deposition processes. Experimental acidic deposition research seems under-represented. The discussion should express more clearly the relationship between acidic deposition and nitrogen deposition, and the importance of upstream loading to downstream systems.

Air Pollutant Maps:

- Maps should not report combined mass of nitrogen and sulfur components because the effects differ depending on the compounds. An acidic metric, or acid equivalents, would be more useful and appropriate.
- Estimates of total nitrogen deposition are ecologically relevant, but the document should be clear that CAAA controls are for NO_x, not ammonia.
- Uncertainties introduced by using eVNA to interpolate between ozone monitors should be discussed (density of monitors is higher in the eastern U.S. than in the west).

C. Adirondacks Case Study: Recreational Fishing

Ms. Flight provided an overview of the methodology for estimating benefits of the CAAA to recreational fishing in the Adirondacks region. The study linked MAGIC model forecasts of acid neutralizing capacity (ANC) values for a set of lakes to an existing random utility model (RUM). Of the 44 lakes calibrated in MAGIC, the analysis was limited to 35 lakes that also overlapped the economics model. The Project Team interpolated ANC values from the 35 lakes to the full suite of lakes within the Adirondacks that were within the same size range, and the results also were extrapolated to lakes within New York State (omitting New York City). Three ANC thresholds were used to classify lakes as either “fishable” or “impaired” (nonfishable). The difference in number of lakes was the input to the RUM and used to estimate the benefits.

Mr. Harrison was Lead Discussant for the recreational fishing chapter. During the discussion, EES members made the following points:

- More information is needed on how MAGIC was applied, how the model was parameterized for these lakes, and how deposition inputs from CMAQ compared to measured atmospheric deposition values.
- The selection of lakes on the basis of size and elevation may introduce some bias in the results. The lake variables used when extrapolating were not well correlated with ANC. The extrapolation to lakes outside the Adirondack region is especially problematic.
- The relationship between acidification and fishing quality is not binary, all-or-nothing. It would be preferable to consider some underlying loss function. A term like “fishing-impaired” might be useful to convey this concept.

- If the binary choice model is all that is available, consider how this might be effecting the results (e.g., over or underestimating the benefits) and flag this as an important research area.
- The RUM is dated (1989 telephone survey) and only looks at day trips, excluding overnight trips or fishers from outside the state or from New York City.
- Results should be compared to other studies of the value of recreational fishing in the region. Is demand for fishing relatively constant over time in the region (e.g., look at trends in purchase of fishing licenses)?
- Be clear that the case study results cannot be used to develop a national benefit estimate.

D. Adirondacks Case Study: Timber

Ms. Flight provided an overview of the Adirondack Timber Case Study, which evaluates the effects of acidic deposition using MAGIC to estimate changes in percent base saturation of soils under the with and without-CAAA scenarios. Although changes in soil acidity are assumed to alter forest growth, specific CR functions were not available for Adirondack tree species. A timber industry profile, including the value of sawmill timber and pulp/chip wood, was developed to give a sense of the resource at risk. The greatest benefits of the CAAA are projected for sugar maple/beech/birch forest types.

Dr. Goodale was Lead Discussant for the Adirondacks timber chapter. During the discussion, EES members made the following points:

- If CR functions are not available, it might be possible to develop a species-sensitivity approach to assess potential effects for Adirondack species.
- The case study looks at differences in modeled soil base saturation between the with- and without-CAAA scenarios, but the science suggests there is a threshold for effects so absolute values also will be important.
- There is no demonstrated simple correlation between soil base saturation and forest response (growth).
- A broader focus on high value forest communities (e.g., Old Growth forest in the Adirondacks) would suggest larger benefits than just focusing on the yield of particular species.
- The study does not consider the fertilizing effects of nitrogen in acidic deposition.
- The study reports timber sales revenue, but doesn't subtract harvesting costs to reveal profit.
- Simulated values for soil base saturation should be compared to measured data, which often show there is considerable variability even within a small geographic area.
- Discuss results from some of the longer term experimental studies (e.g., nitrogen addition studies) to get growth and yield estimates relative to base saturation.
- It might be useful to focus the analysis on sugar maple because it is sensitive to base saturation and accounts for much of the harvested timber in the case study area.
- The case study is limited to acidification impacts on forest growth, ignoring changes in carbon allocation, responses to decreased ozone, and nitrogen fertilization effects.

E. Agriculture and Forestry Benefits from Reduced Ozone

Ms. Flight noted that the EES was being asked to evaluate the relative yield losses, not the valuation of these changes in yield. In general, the results show yield losses for scenarios without

the CAAA. The economic analysis is in process, using the FASOM model, and results will be provided to the Council. In response to an EES member's question, Ms. Flight confirmed that FASOM allows optimization using changes in crop mixtures, and changes between crop and forest cover.

Dr. Polasky was Lead Discussant for the ozone benefits chapter. During the discussion, EES members made the following points:

- The chapter relies on old CR functions that were based on experiments with open-top chambers and pots. Some of the experiments used cultivars that no longer represent those used in commercial agriculture and forestry. These caveats should be discussed in the chapter or in the literature review.
- Explain why the analysis uses metrics such as W126 rather than the current NAAQS. Make sure that tables have sufficient explanation of column titles and units. Make sure the text adequately explains why the tables are included. What was the rationale for using relative yield losses?
- Discuss why the forest responses are so large? Why are these forests so sensitive?
- When FASOM results are presented, the report should discuss the likelihood that land owners do not always optimize their profits, because of landowner objectives, given incomplete information, because of the role of subsidies, and other factors.

F. Validity and Utility of the Overall Approach

On the afternoon of the first day and the morning of the second day, **Dr. Fernandez** led Subcommittee discussion moving towards consensus conclusions and messages to include in the EES report. He noted the tension between a set of ecological analyses that were narrow in scope and defensible versus broader assessments that might require extrapolating beyond what is well supported by data. He acknowledged the importance and value of painting a picture of the many ecological benefits from the CAAA. Given the timeframe of the 812 study, observed data are now available that could be compared with model projections to “ground truth” the scenarios. This would enhance the understanding of the validity of the results.

Subcommittee members made the following summary comments on the ecological effects reports:

- The ozone modeling and the recreational fishing model seemed to be useful, and the timber example was the least useful for the purpose of estimating benefits from CAAA.
- The study authors should include a discussion of information needs for a subsequent study, including identification of ecological endpoints that are suitable for valuation.
- The report should relate nitrogen deposition and acidic deposition, and discuss the interrelationships (e.g., critical loads contributing to acidity and critical loads for nitrogen).
- The report should clearly indicate the uncertainties in the analyses. The materials provided do not highlight the large uncertainties beyond emissions, and there is no discussions of uncertainties in the ecological chapter section itself (only the last page of tables in Appendix C).
- Developing a small set of analyses that are “close to the lamp post” raises the question as to whether the effects quantified are the big ones; i.e., what percent of potential benefits are being captured by the ecological chapters?

G. Report Drafting and Review

On Day 2 of the meeting, the Subcommittee held a writing session, during which members developed draft language for the EES advisory letter. Members were instructed to provide general comments, as well as responses to the charge questions. The proposed format for the report was according to chapters in the review document, rather than strictly according to the charge questions. Dr. Fernandez requested that draft text be emailed to Ms. Sanzone to be incorporated into a composite draft. The draft report¹⁰ was shared with the Subcommittee in the afternoon, after which the Subcommittee discussed additions and clarifications.

During review of the draft EES report, the following issues were agreed to:

- There has been a lot of progress over the past 10 years, but it will always be difficult to attach dollar values to specific ecological benefits. The 812 report should recommend research to address data gaps. As assessments evolve, e.g. to include carbon dioxide/climate change effects, it will be important to do integrated ecological benefits assessment.
- For benefits that are not quantified, point out the nature of expected benefits to ecological receptors and relate these to endpoints that are relevant to people.
- Be careful when presenting local case study estimates of benefits alongside national estimates (i.e., be clear they are not comparable).
- Consider integrating the 2 Adirondack case studies.
- Emphasize the need to compare modeling results with field observations.
- Describe an overarching framework for the ecological analyses; the study is a Cost-Benefit Study, but shares some aspects of an ecological risk assessment.
- EES should point out limitations of the recreational fishing survey data, but recognize that better data may not be available.

H. Next Steps

The DFO agreed to work with the Chair to edit and format the draft EES text and send out the revised version to the EES for review. If members identified issues with the draft requiring additional deliberation, a follow-up teleconference call could be scheduled.

The DFO adjourned the meeting at 3:30 pm.

Respectfully Submitted:

/signed/

Stephanie Sanzone
Designated Federal Officer

Certified as Accurate:

/signed/

Dr. Ivan J. Fernandez, Chair
Ecological Effects Subcommittee
Advisory Council on Clean Air
Compliance Analysis

Materials Cited

The following cited materials are available on the Council Web site, <http://www.epa.gov/advisorycouncilcaa>, at the [March 9-10, 2010 EES Meeting](#) page:

¹ Ecological Effects Subcommittee Roster, March 9-10, 2010

² Federal Register Notice Announcing the Meeting, Vol 75 Number 36 Pages 8338-8339

³ Final Agenda, Ecological Effects Subcommittee of the Advisory Council on Clean Air Compliance Analysis, March 9-10, 2010

⁴ Charge to the Ecological Effects Subcommittee

⁵ Presentation by Jim DeMocker on Section 812 Second Prospective Study: Background, Status, and Emissions/Air Quality Foundation for Ecological Benefits, March 9, 2010

⁶ *Chapter 3: Emissions and Air Quality Modeling Uncertainty* (excerpt from the draft stand-alone report on uncertainty to accompany the 812 Prospective Study, February 2010)

⁷ *Appendix B: Uncertainty Analysis of the Integrated Air Quality Modeling System* (excerpt from the draft stand-alone report on uncertainty to accompany the 812 Prospective Study, February 2010)

⁸ *Appendix C: Qualitative Uncertainty Summary Tables for Second Section 812 Prospective Analysis of the Clean Air Act* (excerpt from the draft stand-alone report on uncertainty to accompany the 812 Prospective Study, November 2009).

⁹ Presentation by Maura Flight on Second Prospective Ecological Benefits Analysis of the Clean Air Act Amendments: EES Briefing on January 2010 Draft Report, March 9, 2010

¹⁰ EES Draft Report (dated March 10, 2010) to Assist Deliberations