

ECOLOGICAL MID-CYCLE REVIEW SUBCOMMITTEE**Conference Call Summary****Tuesday, May 8, 2007****12:00 noon – 2:00 p.m. Eastern Time****Welcome***Dr. Jim Clark, ExxonMobil Corporation, Subcommittee Chair*

Dr. Jim Clark, Chair of the Ecological Mid-Cycle Review Subcommittee, welcomed the Subcommittee members to the conference call and thanked them for participating in this review. He stated that during this call the Subcommittee would hear presentations on the progress made on Long-Term Goals (LTGs) 2 and 3, and the strategy for the new Ecological Program. Also during the call, there would be time to discuss progress on the draft report and plans for the face-to-face meeting to be held May 23, 2007, in Newport, Rhode Island. He then asked Ms. Heather Drumm to cover the administrative procedures for the call.

Administrative Procedures*Ms. Heather Drumm, U.S. Environmental Protection Agency (EPA), Office of Research and Development (ORD), Designated Federal Officer (DFO)*

Before covering the administrative procedures, Ms. Drumm extended her thanks to the Subcommittee members for their efforts in conducting this mid-cycle review. Because she had reviewed the Federal Advisory Committee Act (FACA) procedures in detail during previous conference calls, Ms. Drumm only addressed some of the more important administrative procedures. She explained that the Board of Scientific Counselors (BOSC) is a Federal Advisory Committee that provides independent peer review for the U.S. Environmental Protection Agency's (EPA) Office of Research and Development (ORD), and as such is subject to the rules and requirements of FACA. The Ecological Mid-Cycle Review Subcommittee, as a subcommittee of the BOSC, is subject to FACA as well. As the Designated Federal Officer (DFO) for the Subcommittee, Ms. Drumm serves as the liaison between the Subcommittee and ORD. The purpose of this mid-cycle review is to gauge the progress that has been made and the changes that have been implemented since the BOSC reviewed the program 2 years ago, and to obtain advice on future directions for the program. For this mid-cycle review, the Subcommittee was provided a list of charge questions by the BOSC Executive Committee; these questions were designed to obtain feedback from the program staff on both management and scientific issues. Ms. Drumm noted that the draft charge was revised following the April conference call and was distributed to the Subcommittee prior to this call.

This is the third conference call of the Ecological Mid-Cycle Review Subcommittee. An administrative conference call was held on April 12, 2007, during which the FACA rules were

explained to the Subcommittee members. The second conference call was held on April 26, 2007. This call was open to the public and included an overview of the materials distributed to the Subcommittee and a presentation on LTG 1. The face-to-face review meeting will be held on May 23, 2007, in Newport, Rhode Island. The Subcommittee will prepare a draft report that addresses the charge questions and this report will be submitted to the BOSC Executive Committee for review. The Executive Committee will revise the report as it deems appropriate and submit it to ORD. The rights of decision making on how to respond to the review reside with EPA, and program implementation is the responsibility of the Agency.

Ms. Drumm stated that it is her responsibility as the DFO to ensure that the Subcommittee's conference calls and meetings comply with all FACA rules. All meetings and conference calls involving substantive issues, whether in person, by phone, or by e-mail, that include one-half or more of the Subcommittee members must be open to the public and a notice must be placed in the *Federal Register* at least 15 days prior to the call or meeting. Issues that are preparatory or administrative in nature are exempt from this requirement. The Subcommittee Chair and DFO must be present at all conference calls and meetings. The information for this conference call was entered into the federal docket management system (<http://www.regulation.gov>).

During this conference call, items will be discussed according to the agenda, and a summary of the call will be made available to the public after certification by the Subcommittee Chair. The Chair must certify the summary within 90 days of the call or meeting. The summary then will be posted on the BOSC Web Site (<http://www.epa.gov/osp/bosc>). All advisory committee documents also are made available to the public.

Ms. Drumm has worked with EPA officials to ensure that all appropriate ethics regulations have been satisfied; each Subcommittee member has filed a confidential disclosure form and completed the required ethics training. Because notes were being taken by a contractor, Ms. Drumm asked speakers to identify themselves when making a comment. She then covered some logistical items related to the upcoming face-to-face meeting. Subcommittee members will soon receive their travel itineraries for the meeting. She asked that Subcommittee members notify her if they need to change their itineraries. Ms. Drumm reminded members that she will need receipts for any expenses that exceed \$75. It is a 45-minute drive from the airport to the hotel in Newport. She will send everyone driving directions to the hotel for those who plan to rent a car. The meeting ends at 3:00 p.m. and Ms. Drumm will collect the travel vouchers and receipts at that time.

Ms. Drumm asked if the members had received the package with supplemental materials that was sent by Federal Express. Dr. Giesy said he had just received the package; Dr. Sue Thompson said that she had not been to her office so she did not know if the package had arrived. Dr. Robert (Gene) Turner indicated that he had not received his package. Ms. Drumm stated that the package contains some materials and a draft agenda for the May 23 meeting. A contractor will be present at the meeting to provide logistical support and to take notes. Anyone at the meeting who requires the assistance of the contractor should notify Ms. Drumm. Dr. Turner said that he did not have a ticket yet because he was trying to save the government some money, possibly \$500-1,000. Ms. Drumm responded that she will look into the matter and get back to him.

Ms. Drumm reported that no requests for public comment were submitted prior to the call, but the agenda allows time for public comment from 1:25 p.m. to 1:30 p.m. She will call for public comments at that time and each comment should be limited to 3 minutes.

Referring to the revised charge to the Subcommittee, Dr. Clark stated that only charge question #3 had been revised. This question was changed to focus on the proposed strategy for the program rather than the outdated Multi-Year Plan (MYP). Dr. Linthurst will be making a presentation on the proposed strategy during today's conference call. He asked if there were any questions regarding the revised charge. No questions were posed.

Dr. Clark reminded the Subcommittee members that leads had been assigned for each charge question. Subcommittee members should provide their comments to the lead for each question prior to the May 23rd meeting; at the face-to-face meeting, the designated Subcommittee member will summarize the members' comments and lead the discussion on that question. In addition, the lead will be responsible for drafting the section of the report that addresses his/her question. After receiving the supplemental materials, Dr. Clark thinks that the Subcommittee members will have enough information to address each of the charge questions. He said that one of the goals of today's call was to ensure that the Subcommittee members understand the context of the materials they have received for the mid-cycle review. He asked if there were any questions about the path forward. There were no questions.

Dr. Clark indicated that he was only available to participant on the call until 12:30 p.m. Therefore, he asked Dr. John Giesy, Vice-Chair of the Ecological Mid-Cycle Review Subcommittee, to chair the remainder of the conference call, and Dr. Giesy agreed.

Dr. Giesy apologized for missing some of the April conference call. He explained that, in addition to serving on this Subcommittee, he is a member of the BOSC Executive Committee. Dr. Giesy then asked Dr. Deborah Mangis to proceed with her presentation.

Ecological Research Program BOSC Review: Progress on LTG 2

Dr. Deborah Mangis, EPA, ORD

Dr. Mangis reminded the Subcommittee of LTG 2: "By 2010, states and tribes apply improved tools and methods to protect and restore their valued ecological resources." The key research questions for LTG 2 are:

- ✧ How can states and tribes best assess the condition of their ecological resources?
- ✧ What are the causes of degraded and undesirable conditions?
- ✧ How will the condition of ecological resources change in the future and in response to management actions?
- ✧ Which management practices are most successful for the protection and restoration of ecosystems?

Dr. Mangis summarized the LTG 2 BOSC comments that were addressed during the April conference call by Dr. Kevin Summers. These included:

- ✧ Improved integration across LTGs and with outside investigators (Tiger teams/ERP/MYP).
- ✧ Increased international collaboration.
- ✧ Increased stakeholder involvement (MYP development).
- ✧ Increased post-research communications (being built into new MYP, fact sheets, Web sites, outreach, etc.).

Dr. Mangis then addressed the progress made in response to the following BOSC comment on performance: “Performance measures of the ERP’s planning process and measures for demonstrating progress toward overall program goals do not appear to be strictly established, although they can be extracted from the body of research.” In 2005, ERP worked with the Office of Management and Budget (OMB) to set four performance measures/metrics, two of which apply to LTG 2. Dr. Mangis referred to the first of these measures as “diagnostic tools.” States, tribes, and relevant EPA offices have improved their ability to determine causes of ecological degradation through the application of ORD causal diagnosis tools and methods, resulting in positive environmental outcomes. The second measure was referred to as “restoration tools and methods.” States, tribes, and relevant EPA offices have improved their ability to protect and restore ecological condition and services through the application of ORD environmental restoration and services tools and methods, resulting in positive environmental outcomes.

Dr. Mangis focused her update for LTG 2 on some recently completed work: (1) Landscape Scale Classification and Condition Indicators, (2) Next Generation of Condition Indicators, (3) Diagnostic Decision Support Tools, and (4) ecosystem restoration.

To illustrate how the program has addressed the research question regarding how states and tribes can best assess the condition of their ecological resources, Dr. Mangis described some of the landscape tools that have been developed by the program. In 2001, the National Land Cover Database (NLCD) was released, which was based on the 1992 remote sensing data. This database forms the basis for all of the landscape tools developed under LTG 2. The land cover database was used to develop tools for the Environmental Monitoring and Assessment Program (EMAP), which are being used by the states. It also served as the basis for ORD’s water quality research program and for the Office of Water’s BASINS database. In 2005, the final report on the land cover mapping methods for the Southwest Regional Gap Analysis (SWGAP) project was released. This project was the first formal GAP project designed at a regional, multi-state scale. The project area comprised the southwestern states of Arizona, Colorado, Nevada, New Mexico and Utah. Since the report’s release, Nevada has used land cover data to organize and present the State Wildlife Action Plan (SWAP). New Mexico, Colorado, and Nevada have used the land cover data for state wildlife conservation strategies. Nevada also has used the SWGAP data to support opinions under the Endangered Species Act.

The program partnered with local, state, and regional scientists to assess the ecological vulnerability of the Lower Mississippi River and the White River, and analyze the impact of ecosystem change on water quality. The program supported development of the 2006 National Landscape Atlas, which allows planners and researchers to include metrics in their analyses. The update of the 2001 National Land Cover Data (NLCD) will be released in 2007. In 2006, the Great Lakes Landscape Ecology Metric Browser was released. The browser is designed to present some key ecological metrics to the Great Lakes Basin public and research communities at a landscape scale. This tool has been used to reduce the cost of monitoring in the Great Lakes Basin. The program partnered with numerous Great Lakes organizations on this effort. In 2006, the data from the Albemarle-Pamlico Estuary System Change Detection effort were released. Change areas were delineated using the National Aeronautics and Space Administration's (NASA) Moderate Resolution Imaging Spectrometer (MODIS) Normalized Difference Vegetation Index (NDVI) 16-day composite 250 meter data product. The program is considering integrating these data with the NLCD. For this effort, the program partnered with the North Carolina Department of Environmental Resources. Data from the NLCD are used in the Regional Vulnerability Assessment (ReVA), specifically the 2004 Mid-Atlantic Assessment and assessment of future conditions, the Sustainable Environment for Quality of Life (SEQL) project, and the Phase I HAPS (under LTG 3).

Dr. Mangis presented a timeline for the Next Generation of Condition Indicators. She noted that some efforts are yielding results in the short-term but others will take much longer.

The program partnered with the Canadian Department of Fisheries and Oceans; Regions 3, 4, 5, 7, 8, 9, and 10; Twenty Nine Palms Indian Nation; the States of New Mexico and California; the U.S. Fish and Wildlife Service (USFWS); and the U.S. Geological Survey (USGS) on a project involving endocrine disrupting chemicals (EDCs). ORD developed a vitellogenin assay that was used in a lake study that was the first to show an impact of EDCs on wild fish viability. An article on this research has been accepted for publication in the *Proceedings of the National Academy of Sciences* (April 2007). This research was leveraged with the EDC MYP.

The DNA Barcoding and Great Lakes Invasive Species Study developed new methods for species identification and enumeration. The methods were applied to ballast water and recipient waters and enabled the differentiation of species. The program partnered with the Canadian Barcode of Life Network for this project and leveraged resources from EPA's Advanced Monitoring Initiative in a partnership with the Smithsonian. An EMAP design was used to evaluate invasive species in the Duluth Harbor. Using the DNA barcoding technique, the invasive quagga mussel was found for the first time. The monitoring and detection design allows for improved advanced monitoring. In collaboration with others in ORD, the program was involved in using a genetic algorithm for rule-set production (GARP) model to assess new invaders and predict invasibility.

Developing the next generation of indicators is the focus of the Estuarine and Great Lakes (EaGLe) Coastal Indicators Project. EPA and NASA jointly funded five EaGLe Centers (total funding \$31 million) from 2002 to 2005. Sixty-five indicators have been identified and the habitats and ecosystems that can be monitored have been expanded. Thirteen clients from California to North Carolina are using the indicators, and the Centers have reported their

research in 251 publications (articles, books, and proceedings). There was collaboration with ORD for the Great Lakes Environmental Indicators (GLEI) Project. There were 5 directors, 29 principal investigators (PIs), 58 co-PIs, 42 collaborators, and approximately 75 technicians involved in the Centers' research. In addition, 200 undergraduate, 38 Master's, 31 and doctoral students supported the Centers' efforts, along with 22 post-doctoral researchers.

The five EaGLE Centers are:

- ✧ Atlantic Coast Environmental Indicators Consortium—focuses on cross-system, automated, and remotely-sensed indicators.
- ✧ Atlantic Slope Consortium (ASC)—focuses on indicators that link the health of upstream watersheds with that of the downstream estuaries.
- ✧ Consortium for Estuarine Ecoindicator Research for the Gulf of Mexico (CEER-GOM)—focuses on indicators of sublethal hypoxia and the nutrient enrichment that causes this hypoxia.
- ✧ Great Lakes Environmental Indicators Project (GLEI)—focuses on the integration of biological, spatial, and temporal scales, and the development of stress-response relationships.
- ✧ Pacific Estuarine Ecosystem Indicator Research Consortium (PEEIR)—focuses on developing contaminant and pathogen indicators using plants, birds, and invertebrates.

To illustrate how the program has addressed the research question regarding the causes of degraded and undesirable conditions, Dr. Mangis described several projects, including CADDIS (Causal Analysis/Diagnosis Decision Information System), the Science To Achieve Results (STAR) grants focused on national aquatic ecosystem classifications and reference conditions, and the STAR grants on watershed classification systems for diagnosis of biological impairment in watersheds.

CADDIS I, released in 2006, is a Web-based diagnostic system for stressor identification for use by states, regions, and tribes to determine causes of stream reach impairment. It is based on EPA's stressor identification process, which is a formal method for identifying causes of impairments in aquatic systems and watersheds. CADDIS has been used by the Mississippi Department of Environment Quality (DEQ) to support more than 750 court-ordered Total Maximum Daily Loads (TMDLs). It also was used to determine the cause of fish kills and intersex in the Potomac River systems. With regard to outreach, EPA has provided training for states and tribes on the use of CADDIS. An upgraded version of CADDIS (i.e., CADDIS II) is expected to be released in fall 2007.

The purpose of the STAR national aquatic ecosystem classifications and reference conditions grants is to develop classification frameworks to establish reference conditions for the following types of aquatic systems: wetlands, large rivers, ephemeral systems, reservoirs, lakes, streams, estuaries, near-shore coastal environments, and coral reef communities. Four grants were awarded in 2001 and funded through 2006 for a total of \$4.2 million. From 2005 to 2007, the

grantees reported their research results in 30 journal publications, 8 proceedings, and 19 presentations, and there are 21 manuscripts in preparation. Some of the highlights of these grants include: (1) the results have been used for EPA tiered aquatic life designations; (2) Great Lakes coastal wetlands coordinated with GLEI covering four wetlands classes, reference conditions; (3) for western streams, new methods were developed that incorporate stream flow (these will be reported in an article to appear in the *Proceedings of the National Academy of Sciences*); and (4) classifying reservoirs in agricultural dominated landscapes.

The purpose of the STAR watershed classification systems for diagnosis of biological impairment in watersheds grants was to develop regional watershed classifications to diagnose impairment and identify restoration opportunities. Nine grants were awarded in 2003 with total funding of \$7.5 million. From 2005 to 2007, the grantees reported their results in 36 journal publications, 19 proceedings, and 45 presentations, and 24 manuscripts are in preparation. The grants also were supported by eight Master's and seven doctoral students. Dr. Mangis provided an example of the outcomes from this research. The ecological classification of rivers in Illinois, Michigan, and Wisconsin led to a new Michigan law that limits water withdrawals according to scientific standards developed using the River tool. Statewide stream classification and tiered reference ranges have been established for selected ecological attributes for all river segments in Michigan, Wisconsin, and Illinois. The clients for these grants include the Illinois Department of Natural Resources (DNR), Illinois EPA, Illinois Natural Areas Program, Michigan DNR, Michigan DEQ, Michigan Natural Features Inventory, Wisconsin DNR, and USGS.

To illustrate how the program has addressed the research question regarding identifying the management practices that are most successful for the protection and restoration of ecosystems, Dr. Mangis described several projects, including the Minebank Run Stream Restoration Project and the Delaware Project.

The Minebank Run Stream Restoration Project was conducted from 2001 to 2006 and it involved evaluation of stream restoration effectiveness to improve ecosystem function and water quality in an urban watershed. The evaluation indicated that restoration significantly improves denitrification (>2 times), and the beneficial ground water/surface water interactions enhance nitrogen removal. The project identified effective restoration techniques that can be employed as water quality best management practices (BMPs). The partners for this project included USGS, Institute of Ecosystem Studies, Baltimore County Department of Environmental Protection (DEP) and Resource Management, and University of Maryland-Appalachian Laboratory.

The Delaware Project, conducted from 2003 to 2007, involved evaluating the effectiveness of restored wetlands for the treatment of agricultural runoff (including nitrogen). Meanders were used to restore wetlands and rough grading was used to promote diversity in plant and animal communities. The partners for the project included Delaware Department of Natural Resources and Environmental Quality (DNREC), EPA Region 3, and USFWS.

Dr. Mangis closed with some conclusions. Her presentation described some of the 2005 to 2007 outcomes of ORD's research on tools and methods for diagnosis of condition and restoration of ecological issues. It is evident that ORD produces high quality tools and methods that are used by states and tribes to protect their resources (diagnosis and restoration). All of these ORD

capabilities developed in addressing issues of condition, diagnosis, and restoration will be used by the program as it transitions to ecosystem services to map, quantify, model, and predict ecosystem services and their benefits and impacts on human populations.

Dr. Giesy thanked Dr. Mangis for her presentation and asked if there were any questions. When there were no questions, he asked Dr. Goodman to begin her presentation.

Ecological Research Program BOSC Review: Progress on LTG 3

Dr. Iris Goodman, EPA, ORD

Dr. Goodman reminded the Subcommittee of LTG 3: “By 2010, decision-makers apply tools that enable them to make informed, proactive management decisions that consider a range of choices and alternative outcomes, including effects on ecosystem services.” The key research questions are: (1) What forecasting tools can be developed to evaluate scenarios of future stressors and their associated ecological and social outcomes? (2) How can forecasting tools incorporate information about the production of ecosystem services? and (3) What tools can be developed to enable decision-makers to evaluate trade-offs among alternative management strategies and to better manage for sustained ecosystem services?

Dr. Goodman identified the four categories of ecosystem services defined in the Millennium Ecosystem Assessment (2003). The categories include: (1) provisioning services (e.g., fresh water, fiber, food, fuel, genetic resources), (2) regulating services (e.g., regulate floods, droughts, land degradation, climate, and air quality), (3) supporting services (e.g., soil formation, nutrient cycling, primary production), and (4) cultural services (e.g., recreational, educational, and spiritual non-material benefits).

The research portfolio for conserving ecosystem services includes:

- ✧ Forecasting regional vulnerabilities and management scenarios (1999-2008). Funding of ~\$1 million/year, four studies completed from 2005-2007.
- ✧ Developing regional-scale stressor response models for environmental decision-making (2003-2007). Total funding of \$5.6 million for seven studies; annual funding of ~\$1.4 million/year.
- ✧ Models to assess the effects of air pollutants on ecosystems (2002-2007). Funding of ~\$1 million/year, seven studies conducted from 2005-2007.
- ✧ Understanding ecological thresholds in aquatic systems through retrospective analysis (2005-2008). Total funding of \$3.3 million for 11 studies; annual funding of ~\$0.8 million/year.
- ✧ New tools for conserving ecosystem services (2005-2009). Total funding of \$1.5 million for four studies; annual funding of ~\$0.4 million/year.
- ✧ Biodiversity and Human Health: an interdisciplinary approach (2007-2011). Total funding of \$2 million for three to four studies; annual funding of ~\$0.5 million/year.

- ✧ Enhancing ecosystem services from agricultural lands (2007-2011). Total funding of \$1.5 million for three studies; annual funding of ~\$0.38 million/year.

Dr. Goodman mentioned the SEQL project as an example of the program's research on forecasting regional vulnerability to stressors. The outputs/outcomes of this project include a Web-based decision support toolkit with alternative development scenarios projected out to 2030. Decision-makers representing more than 100 local jurisdictions in the region are using the toolkit to evaluate trade-offs associated with land use alternatives. The partners on this project include: EPA Office of Air Quality Planning and Standards (OAQPS), Centralina Council of Governments, Catawba Council of Governments, North Carolina Department of Environment and Natural Resources, South Carolina Department of Health and Environmental Control, University of North Carolina-Charlotte, Duke University, University of Maryland, and Tennessee Valley Authority (TVA).

Projects focused on developing regional-scale stressor-response models for environmental decision-making include: (1) Individual-based Fish Models in the South Fork Eel River Watershed, California; (2) Development of a Watershed Vulnerability Model for Midwestern Regions; (3) Modeling Human Activities and Factors in the Great Lakes Region; (4) Eutrophication Response Models for Coastal Marine Systems; (5) Modeling of Indicator Interactions in Chesapeake Bay Embayments; and (6) Modeling Stress Responses in the Apalachicola Bay Ecosystem.

The program is developing air quality models for mercury. The models were used to forecast reductions in mercury deposition to freshwater systems of the eastern United States in 2010, 2015, and 2020. The results were used to establish Clean Air Act reductions in mercury emissions to reduce the number of fish advisories and to protect ecosystem and human health. The results also supported the 2005 Clean Air Mercury Rule (CAMR). The program partnered with other ORD fish/water modelers to assess the time frame to meet advisories in different watersheds (10-50 years). The results from five case studies showed that most freshwater systems will achieve 90 percent of the benefits of CAMR reductions in mercury emissions within 2-3 decades; some systems may respond faster (5-10 years). Watershed dominated systems will likely take 50 years or more to respond. The partners for this project included the National Oceanic and Atmospheric Administration (NOAA) and EPA's Office of Air and Radiation (OAR). The model framework included four components: (1) source receptor (air modeling: *HYSPLIT/CMAQ*), (2) aquatic fate and transport (*MCM/WASP*), (3) bioaccumulation (*BASS/EcoFate*), and (4) human exposure (*MENTOR Modeling System*).

Some progress highlights for assessing the effects of air pollutants on ecosystems include:

- ✧ Article on CMAQ model is in "top 1% of cited articles."
- ✧ Outreach to scientific community including Web accessibility (<http://www.epa.gov/asmdnerl/Multimedia/WatershedDepositionTool.html>).

- ✧ Model results and methods used by clients: Chesapeake Bay Program Office, Florida DEP, Tampa Bay National Estuary Program, EPA's OAR, and EPA Region 4.
- ✧ Partnerships with EPA's OAQPS, EPA Region 4 Air Toxics Section, The Nature Conservancy, Southeastern Regional Gap Analysis Program, TVA, and USFWS.

Program efforts focused on understanding ecological thresholds in aquatic systems include:

- ✧ Gallatin River, Montana—stressors: land cover/land use change; thresholds: nitrogen saturation via spatially distributed nitrogen concentration.
- ✧ Wisconsin Lakes—stressors: climate, agricultural practices, land cover change; thresholds: phosphorus transport and cycling.
- ✧ Long Island Sound and New England Estuaries—stressors: climate change, anthropogenic stress, land use; thresholds: state changes reflecting biodiversity and resistance to invasive species.
- ✧ Colorado Streams (79 streams)—stressors: metal contamination; thresholds: macroinvertebrates, fish population.
- ✧ Great Plains Rivers and Streams—stressors: human hydrological changes, thresholds: streamflow connectivity and aquatic habitat.
- ✧ Mid-Atlantic Coastal Marshes—stressors: sedimentation, land cover change; thresholds: invasion by *Phragmites australis*.
- ✧ Narragansett Bay—stressors: climate change and anthropogenic stressors; thresholds: phytoplankton, zooplankton, grazers.
- ✧ Coastal California Rivers—stressors: climate variability, human change to hydrology; thresholds: adequate streamflows for salmon and macroinvertebrates.
- ✧ Florida Everglades—stressors: anthropogenic changes in nutrient loading and hydrology; thresholds: nutrients and hydrology.

Dr. Goodman presented a diagram of a conceptual model showing pollutant flows and economic effects. Some highlights of the research on understanding ecological thresholds in aquatic systems through retrospective analysis include: (1) 10 peer-reviewed journal publications from studies that began in late 2005; (2) one highly cited paper on ecological thresholds published in *Ecosystems*; (3) outreach to the scientific community (18 presentations at conferences); (4) outreach to EPA programs and regions (Progress Review Workshop to be held in June 2007); (5) diverse clients (local land managers, lake associations, vineyard owners); and (6) exploring partnerships with resource managers and social scientists.

Projects to develop new tools for conserving ecosystem services, which began in 2005 and 2006, include:

- ✧ Decision support tools—managing rivers to meet both human and ecological needs in New England (new 2005).
- ✧ Restoring multiple ecosystem functions for the Willamette River, Oregon (new 2005).
- ✧ Ecological sustainability in rapidly urbanizing watersheds—Montgomery County, Maryland (new 2005).
- ✧ Cumulative effects of habitat alteration on ecosystem services: Pacific Northwest, Gulf of Mexico, Atlantic Coast estuaries (new 2006).

With regard to envisioning new ecosystem service “production functions,” Dr. Goodman stated that the conventional view is that one goal must be sacrificed to get more of another. The improved decision support tool shows promise for “expanding production” and better meeting both goals.

Progress highlights on new tools for assessing and conserving ecosystem services include:

- ✧ Peer reviewed journal articles.
- ✧ Outreach to scientific community and policy makers: special briefing to the Office of Science and Technology Policy, two STAR progress reviews in collaboration with EPA Office of Water, Smart Growth, and EPA’s 2006 Stewardship Initiative.
- ✧ Model developed in collaboration with clients: Oregon DEQ, EPA Region 10, Willamette industry, Willamette watershed council, private water suppliers in New England Region, Connecticut DEP, Maryland DNR, Montgomery County DEP, private consultants, The Nature Conservancy, and real estate developers.
- ✧ Partnerships: USGS and U.S. Army Corps of Engineers.

According to an article published by program researchers in *Nature* in 2004, infectious diseases appear to be emerging and re-emerging at a faster rate.

A new STAR solicitation to support the ORD Initiative on Biodiversity and Health closed in April 2007. There is approximately \$2 million to fund four studies. The partners and collaborators for this initiative include: Yale Center for EcoEpidemiology, Institute of Ecosystem Studies, Asia-Pacific Institute of Tropical Medicine and Infectious Diseases, University of Illinois Earth & Society Initiative in Disease Emergence & Ecosystem Health, NOAA, NASA Ames Research Center, Smithsonian Institution, World Federation of Public Health Associations, American Public Health Association, World Health Organization, and World Conservation Union.

Dr. Goodman also described the conceptual foundation for a new STAR grant focused on enhancing multiple ecosystem services from agricultural lands.

In the last few slides of her presentation, Dr. Goodman presented the program's responses to the BOSC findings from the 2005 program review. In BOSC finding #6, the Subcommittee suggested that the research plan for LTG 3 include specific programs and projects with specific deliverables and timelines such that, in the future, progress can be tracked and the quality, efficiency, and impact of the program elements can be evaluated. Furthermore the BOSC should review the MYP when it is developed. The program responded by creating an Agency-wide workgroup in 2005 to develop a research prospectus on ecosystem services. The definitions of major research products were refined, and the ORD niche for research on ecosystem services was identified and refined.

In BOSC finding #7, the Subcommittee stated that "LTG 3 requires better integration with, and articulation of, outcomes at the local levels. This is essential to achieving EPA's mandate, but the Agency must be aware of the dangers of asking a good research organization to take on responsibilities that it is not structured to accomplish. Responsibilities for communication and dissemination of results certainly rest with the ERP, but other elements of EPA also have responsibility for client and stakeholder communication. It is important to recognize that ORD has a primary research mission. There is a danger in assigning other priorities to ORD because the research mission may be compromised. The time and talents of ORD's research scientists need to be focused on the research mission. At the same time, careful tracking of outcomes is essential to ensure that research conducted by the ERP is appropriate and that it addresses customer priorities." The program responded by defining goals and outcomes at local to federal levels of governance, and identifying roles for private sector and voluntary practices. New approaches for tracking and communicating outcomes are being developed.

In BOSC finding #8, the Subcommittee recommended that "some form of extramural cooperation be re-established to leverage resources and continue to provide flexibility in the research program." The program has leveraged, to the maximum extent possible, existing STAR grant funds to support research on conserving ecosystem services. In addition, the program initiated a solicitation with \$1.5 million in new STAR eco funds for FY 2006. For FY 2002-2004, total STAR investments in LTG 3 were ~\$10 million. For FY 2006, total STAR investments in LTG 3 were ~\$3.5 million.

In concluding her presentation, Dr. Goodman described how ecological research can help EPA achieve its mission:

- ✧ Create geo-spatial products that describe ecosystem services and potential new ecosystem service production functions.
- ✧ Develop ways to envision alternative combinations of services and to assess trade-offs.
- ✧ Develop methods to restore ecosystem services through restoring ecological structures and/or functions.

- ✧ Identify, quantify, and predict ecological “tipping points” that threaten loss of services.
- ✧ Provide information to catalyze innovations in policies and the private sector.

Dr. Giesy called for questions and there were none. He stated that as a member of the Subcommittee that reviewed the program in 2005, he was gratified to see the significant progress that has been made. He then asked Dr. Linthurst to proceed with his presentation on the new strategy.

Expanding LTG 3 as the Focus of the Future Ecological Research Program (ERP)

Dr. Rick Linthurst, National Program Director for Ecology, EPA, ORD

Dr. Linthurst thanked his colleagues for updating the Subcommittee on the progress that has been made since the 2005 program review. He stated that the Subcommittee members had or would soon receive a copy of the draft strategy for the ERP.

In the 2005 program review, the BOSC stated that “LTG 3 is a highly relevant activity that is central to EPA’s mandate of improving environmental quality and protecting and restoring the health of the nation’s ecosystems. ORD and particularly the ERP are uniquely suited and positioned to address these issues. The key findings of the Millennium Ecosystem Assessment, “Living Beyond Our Means: Natural Assets and Human Well-Being,” were that (1) everyone in the world depends on nature and ecosystem services to provide the conditions for a decent, healthy, and secure life; and (2) even today’s technology and knowledge can reduce considerably the human impact on ecosystems. They are unlikely to be deployed fully, however, until ecosystem services cease to be perceived as free and limitless, and their full value is taken into account. Simply put, the program’s role is to integrate the science to understand the ecosystem structure and function and what that means for ecosystem services. This will involve predicting future scenarios and coupling them with monetary and nonmonetary valuation and well being quantification. The program will accomplish this in stages with different partners. The ability to forecast alternative futures for ecosystem services will lead to better solutions.

The mission statement for the evolving ERP is to advance a more comprehensive theory and practice for quantifying ecosystem services and their relationship to human health and well being. The vision is to transform the way we understand and respond to environmental issues by making clear the ways in which our choices affect the type, quality, and magnitude of the services we receive from ecosystems—such as clean air, clean water, productive soils, and generation of food and fiber. The program’s overarching goal will be: “Decision-makers regularly apply information and methods developed by ORD’s ERP to make proactive policy and management decisions that ensure human well-being by conserving and enhancing ecosystem services over time and at multiple scales.

Many Millennium Assessment research frontiers are listed under basic theory, scale, monitoring and data needs, policy assessment, and economic instruments and valuation. The ERP has the expertise to address a number of them but key among them is “Landscape level quantification of economic values of entire bundle of ecosystem services under alternative management regimes.”

The program needs to be able to develop a rationale as to why one management option is better than another.

Dr. Linthurst stated that all ecosystems have services to offer and all respond differently to change. He then presented trajectories of landscape change in the Willamette Basin from pre-EuroAmerican settlement to 2050. This provides a visual picture of various future scenarios that allows decision-makers to visualize the effects. Next, Dr. Linthurst presented a diagram of relative ecosystem services within an ecosystem district that showed scaling and aggregation under alternative management scenarios. It also illustrated the net value of services for the various options. A subgoal of the program is to develop a decision support platform and tools (information/models/mechanisms) to help local, watershed, state, regional, and national managers make environmental management choices based on gains and losses of ecosystem services. The program already has developed many tools (e.g., ReVA environmental decision toolkit) and the challenge now is to figure out the best ways of presenting that information.

Public Comments

Ms. Drumm interrupted Dr. Linthurst's presentation to call for public comment. When no comments were offered, Dr. Linthurst resumed his presentation.

Expanding LTG 3 as the Focus of the Future ERP (Continued)

Dr. Linthurst then described the foundation of the MYP for the future program. He presented a logic model of the future program that identified the resources, research activities, outputs, outreach and transfer, partners, and outcomes (institutional, management, and environmental). The products will include measures and dynamic maps, predictive models and management options, and a decision support platform and tools.

The three subgoals designed to achieve the program's new overarching goal, identified as LTG 1, LTG 2, and LTG 3, are:

- ✧ LTG 1: Quantify and delineate changes on ecosystem services.
 - Locate, characterize, measure, monitor, and map services.
- ✧ LTG 2: Define ecosystem services' response to management decisions.
 - Model ecosystem service response to current conditions/stressors, forecast changes and restore/enhance ecosystem services.
- ✧ LTG 3: Transfer findings to managers.
 - Decision support platform and tools
 - Valuation and human well-being quantification.

Dr. Linthurst then described the relationship of the old LTGs to the new LTGs. EMAP will wind down; it has a great history and has been adopted by EPA and others. The ERP will continue to work with those who are collecting EMAP data to ensure it is done correctly and to facilitate that the program's access to the data.

The program will take a three-prong approach: (1) pollutant driven ecosystem services research (how does a regulated pollutant affect, positively and/or negatively, the collection/bundle of ecosystem services?), (2) ecosystem driven ecosystem services research (how does the collection/bundle of ecosystem services provided by a single ecosystem type change under alternative management options?), and (3) place driven ecosystem services research (how do the collection/bundle of ecosystem services for all ecosystems within an ecosystem district change under alternative management options/drivers?). Dr. Linthurst then showed the “ecosystem molecule,” which has been used to depict the program and its three-prong approach. He then stated that the idea is to impose “big picture” changes—such as climate change, nitrogen change, and biofuels—on the decisions and look for similarities and differences.

Dr. Linthurst concluded his presentation with some summary remarks. Ecosystems services was selected as the future focus of the ERP based on advice from both within the Agency and outside EPA. ORD is one of many organizations with unique qualifications and needs and it can combine efforts with other agencies working on these issues. ORD can provide the fundamental science but to move the program beyond that will require partners (economics and human well being).

Dr. Giesy thanked Dr. Linthurst and asked if there were any questions. Dr. Turner asked how the program will measure the various alternative choices. How will the balance between intramural and extramural research be determined? There are strategic choices to be made. Has the program developed metrics to determine if it is on the right track? Dr. Linthurst replied that the program is in the process of updating the MYP based on this proposed strategy. Each group (wetlands, nitrogen, place-based) will identify what needs to be done to accomplish the goals. The program will determine what expertise is not available within EPA, and then will seek partners to obtain the needed expertise. Dr. Turner did not think the response really addressed whether the research will be done internally or externally. Will the program add staff to gain the needed expertise? Have you developed metrics to evaluate implementation of the new vision? Dr. Linthurst responded that no metrics have been developed but they are in the early stages of planning and metrics should be a consideration.

Subcommittee Discussion

Dr. John Giesy, University of Saskatchewan, Subcommittee Vice Chair

Dr. Giesy said that there has been no progress on the report but individual Subcommittee members have been assigned to take the lead on the different charge questions. He asked that the members write down any questions that arise as they review the materials so that they can be addressed at the face-to-face meeting. Subcommittee members also should write down any critical points that they want to discuss at the May meeting.

Ms. Drumm mentioned that, because this is a mid-cycle review, the Subcommittee will have only 6 hours at the face-to-face meeting; therefore, the members should maximize the use of their time by being prepared.

Dr. Giesy asked if there were any questions about assignments or the charge questions. Dr. Thompson asked when the draft of the proposed strategy would be sent to the Subcommittee members. Ms. Drumm stated that the draft strategy was in the supplemental materials that were delivered by Federal Express.

Ms. Drumm said that she will be sending an e-mail to the Subcommittee members that contains travel information for the upcoming face-to-face meeting. Dr. Giesy asked that any additional items for him be sent to Michigan rather than his Canadian address.

Dr. Giesy asked if there were any additional questions or comments. When none were offered, he adjourned the conference call at 1:45 p.m.

Action Items

- ✧ Ms. Drumm will send an e-mail to the Subcommittee members with their travel itineraries, directions from the airport to the hotel, and other logistical information.
- ✧ Subcommittee members should notify Ms. Drumm if changes are needed in their travel itineraries. Ms. Drumm will look into the issue regarding Dr. Turner's airline ticket.
- ✧ Subcommittee members should review the materials and prepare a list of questions and key issues for discussion at the May 23, 2007 meeting.
- ✧ Subcommittee members should send their comments to the assigned leads for each charge question prior to the May 23, 2007 meeting. The leads should be prepared to lead the discussion for each charge question and summarize the members' comments.

PARTICIPANTS LIST

Subcommittee Members

James R. Clark, Ph.D., Chair

ExxonMobil Research and Engineering
Company
Environmental, Safety, Civil & Marine Division
3225 Gallows Road, Room 3A009
Fairfax, VA 22037
Phone: 703-846-3565
Fax: 703-846-6001
E-mail: jim.r.clark@exxonmobil.com

John P. Giesy, Ph.D.

Professor & Canada Research Chair in
Environmental Toxicology
Department of Veterinary Biomedical Sciences
University of Saskatchewan
44 Campus Drive
Saskatoon SK S7N 5B3
Phone: 306-966-7441
Fax: 306-931-1664
E-mail: jgiesy@aol.com

Sue Thompson, Ph.D.

Director, 3 Rivers Ecological Research Center
Pennsylvania Fish and Boat Commission
16 Terminal Way
Pittsburgh, PA 15219
Phone: 412-381-1297
Fax: 412-481-1019
E-mail: suethomps@state.pa.us

Robert Eugene Turner, Ph.D.

Coastal Ecology Institute
School of the Coast and Environment
1209 Energy Coast and Environment Building
Louisiana State University
Baton Rouge, Louisiana 70803
Phone: 225-578-6454
Fax: 225-578-6326
E-mail: eeturne@lsu.edu

Designated Federal Officer

Heather Drumm

U.S. Environmental Protection Agency
Office of Research and Development
Office of Science Policy
Mail Code: 8104R
1200 Pennsylvania Avenue, NW
Washington, DC 20460
Phone: 202-564-8239
E-mail: drumm.heather@epa.gov

EPA Participants

Tom Barnwell, Ph.D.

Office of Research and Development
National Center for Environmental Research
Mail Code: 8701F
1200 Pennsylvania Avenue, NW
Washington, DC 20460
Phone: 202-343-9862
E-mail: barnwell.thomas@epa.gov

Iris Goodman, Ph.D.

Office of Research and Development
National Center for Environmental Research
Mail Code: 8701F
1200 Pennsylvania Avenue, NW
Washington, DC 20460
Phone: 202-343-9854
E-mail: goodman.iris@epa.gov

Phillip Juengst

U.S. Environmental Protection Agency
Office of Research and Development
Office of Resources Management
Administration
Mail Code: 8102R
1200 Pennsylvania Avenue, NW
Washington, DC 20460
Phone: 202-564-2645
E-mail: juengst.phillip@epa.gov

Rick Linthurst, Ph.D.

U.S. Environmental Protection Agency
Office of Research and Development
Mail Code: N283-01
Research Triangle Park, NC 27711
Phone: 919-541-4909
E-mail: linthurst.rick@epa.gov

Deborah Mangis, Ph.D.

U.S. Environmental Protection Agency
Office of Research and Development
Mail Code: D305-01
Research Triangle Park, NC 27711
Phone: 919-541-3086
E-mail: mangis.deborah@epa.gov

Suzanne Marcy

U.S. Environmental Protection Agency
Office of Research and Development
National Center for Environmental Assessment
Ariel Rios Building
1200 Pennsylvania Avenue, NW
Mail Code: 8623N
Washington, DC 20460
Phone: 202-564-3248
E-mail: marcy.suzanne@epa.gov

Mike McDonald, Ph.D.

U.S. Environmental Protection Agency
Office of Research and Development
Mail Code: B343-06
Research Triangle Park, NC 27711
Phone: 919-541-7973
E-mail: mcdonald.michael@epa.gov

Mike Slimak, Ph.D.

U.S. Environmental Protection Agency
Office of Research and Development
National Center for Environmental Assessment
Ariel Rios Building
1200 Pennsylvania Avenue, NW
Mail Code: 8601N
Washington, DC 20460
Phone: 202-564-3324
E-mail: slimak.michael@epa.gov

Kevin Summers, Ph.D.

U.S. Environmental Protection Agency
Office of Research and Development
National Health and Environmental Effects
Research Laboratory
Gulf Ecology Division
Sabine Island Drive
Gulf Breeze, FL 32561-5299
Phone: 850-934-9244
E-mail: summers.kevin@epa.gov

Contractor Support

Beverly Campbell

The Scientific Consulting Group, Inc.
656 Quince Orchard Road, Suite 210
Gaithersburg, MD 20878
Phone: 301-670-4990
E-mail: bcampbell@scgcorp.com



ECOLOGICAL MID-CYCLE SUBCOMMITTEE

AGENDA

May 8, 2007

12:00 pm – 2:00 pm Eastern Time

Participation by Teleconference Only

866-299-3188

code: 2025648239#

12:00-12:10 pm	Welcome - Roll Call - Overview of Agenda	Dr. Jim Clark, Subcommittee Chair
12:10-12:15 pm	Administrative Procedures	Heather Drumm Subcommittee DFO
12:15-12:35 pm	Goal 2 Progress	Dr. Deborah Mangis Office of Research and Development
12:35-12:55 pm	Goal 3 Progress	Dr. Iris Goodman Office of Research and Development
12:55-1:30 pm	Strategy for the new Ecological Program	Dr. Rick Linthurst Office of Research and Development
1:30-1:35 pm	Public Comment	
1:35-2:00 pm	Subcommittee Discussion - Report Progress - Preparation for face-to-face meeting	Dr. Jim Clark, Subcommittee Chair
2:00 pm	Adjourn	