Organisms-to-Ecosystems Working Group
Second Meeting Agenda

Sunday, April 3, 2016
Working group members arrive.

Monday, April 4, 2016
8:00 – 9:00 Breakfast

9:00 – 12:00 Revisit Objective from Meeting 1, assess progress, and develop a plan for completing. See below for Objective summary. Agree on model chemicals and exposure scenarios (pesticide; EDC). Discuss opportunities for future funding.

12:00 – 13:00 Lunch

13:00 – 13:45 Brief presentation and Q&A on ecosystem services as a decision-making tool: An EPA perspective by Randy Bruins.

14:00 - 17:00 Work/write in small groups or individually to continue drafting the ET&C FOCUS manuscript.

17:00 NIMBioS Group Photo and Reception

Tuesday, April 5, 2016
8:00 – 9:00 Breakfast

9:00 – 12:00 Reconvene to discuss the conceptual and mathematical models developed for the two case studies. As a group, identify the major data gaps and suggest methods for filling them.

12:00 – 13:00 Lunch

13:00 – 17:00 Work in small groups or individually to make progress on tasks identified at the end of the morning's session.

Wednesday, April 6, 2016
8:00 – 9:00 Breakfast

9:00 – 12:00 Split into two groups to focus on developing ecological production functions for the two case studies. By the end of the morning, have a list of questions/tasks to discuss during afternoon hike.

12:00 – 18:00 Box lunch and hiking in Great Smoky Mountains National Park

Thursday, April 7, 2016
8:00 – 9:00 Breakfast

9:00 – 12:00 Report back on questions/tasks assigned the previous afternoon. Work in small groups or individually on model analyses, data gathering, and/or writing.

12:00 – 13:00 Lunch

13:00 – 15:00 Final session; assess progress achieved; develop plan for completing Meeting 2 Objectives; agree on next steps to be taken and deadlines to prepare for Meeting 3.

Friday, April 8, 2016
Working group members depart.

Reminder of Our First Two Objectives:
Objective 1(November 2015): *Develop a general conceptual model that can mechanistically and quantitatively link ecosystem services valued by the public to underlying ecosystem processes and the attributes of the species or groups of species contributing to those processes. To ensure a smooth interface with the molecules-to-organisms WG, we will consider daphnids and rainbow trout as key drivers of the ecosystem services that we model to demonstrate proof of concept. We will translate the conceptual models into mathematical terms, determining the data needed to parameterize and test each model.*

The first step will be to identify the key ecosystem functions that contribute to ecosystem services for which each of these taxa are drivers (e.g., biomass production, nutrient processing). We have chosen daphnids and trout as case study species because there is a wealth of data on these species at different levels of biological organization and because they are standard test species used in ecological risk assessment. The conceptual models will articulate all of the entities, state variables, and key processes that relate responses in our representative taxa to ecosystem-level responses. The models will be designed to predict impacts of chemicals (and other stressors) on ecosystem service delivery from information on individual-level effects in ecologically realistic scenarios; they will explicitly incorporate nonlinearities and feedback in the systems.

Once the conceptual models are construed, they will be converted to mathematical models using physiologically structured population models (PSPMs); de Roos and Persson 2013) and simulation modeling (i.e., individual-based models (IBMs); Grimm and Railsback 2005) to capture the dynamics of our focal species. By building on these well-established approaches that link individuals-to-populations, we will go on to develop entirely new ecological production functions that capture how changes in the population dynamics of our focal species alter ecosystem function, which can then be related to the delivery of ecosystem services. The aim will be to develop process-based and probabilistic models that can be parameterized with a combination of standard toxicity test data and ecological/life history data from the literature. That said, an important output of Objective 1 will be to clearly identify data requirements with perspectives on what modeling or extrapolation tools might be useful in the absence of a full data set for parameterization.

Objective 2 (April 2016): *Conduct preliminary tests of submodel forecasts, identify data gaps, conduct sensitivity analyses, and refine the models as necessary.*

Ultimately, we seek to develop models and a modeling framework that can be used to predict effects of chemical stressors on the delivery of ecosystem services. A key challenge the group will address is evaluating model performance at higher levels of biological organization or with regard to the functions supporting ecosystem services. At these levels, available data are fewer and the systems far more complex; we expect that applying principles of control theory will become pivotal when predicting potential feedback in data-sparse systems. Throughout the model evaluation phase, but especially with regard to evaluating model forecasts of higher-level responses, we will adopt an evaluation strategy based on the concept of model *evaludation* (Augusiak et al., 2014) which is defined as a fusion of 'evaluation' and 'validation' and describes the entire process of assessing a model's quality and reliability. The group will identify evaludation approaches and metrics considered suitable for deciding when a model's performance is satisfactory.