ACES 2014 Morning Workshop 8
December 8, 2014 | 8:00am-11:30am

Title: ***Modeling Species Banking at a Landscape-Scale***

Description:

Given increased interest in tradable credits for biodiversity and the importance of landscape-scale processes for protecting small and declining populations, this workshop will help to span the gap between science and application. Conservation or species banking is still dominated by crediting systems that establish the equivalency of habitat trades based on habitat area and quality (i.e., Fox and Nino-Murcia 2005). While estimating tradable credits based on habitat area and quality may minimize transaction costs and facilitate the creation of markets, tradable credit systems have been heavily criticized by the conservation community for not achieving sustainability goals (Walker et al. 2009). Adjacency of habitat to other land cover types, estimated as habitat connectivity, can have a large impact on population viability for some species (Lindenmayer and Fisher 2007). Conservation banking policies were intended to ameliorate the effects that habitat fragmentation on these at-risk populations (USFWS 2003). Several studies have been published describing how landscape models can be used to provide incentives to defragment habitat (Bruggeman et al. 2005, 2009; Hartig and Drechsler 2009), but this academic research has rarely made contributions in real landscapes.

Workshop Objective:

The objectives for this three hour workshop are to 1) highlight how landscape-scale processes can affect the conservation value of a habitat patch; 2) describe different modeling approaches for estimating the benefits of conservation banking at a landscape scale; and 3) to provide free software to estimate tradable credits for at-risk species at a landscape-scale. This workshop will highlight approaches for increasing the scientific rigor applied to tradable credit systems through the use of landscape-scale projection models, rather than an acre/quality approach. The discussion will be motivated by describing interactions between species natural history traits and landscape patterns. Ignoring these interactions could lead to gross over- or under-estimation of habitat patch conservation value. We will describe how patch-occupancy [metapopulation] modeling (Hanski and Gaggiotti 2004), matrix population models for subdivided species (Caswell 2001), and individual-based modeling (Grimm et al. 2005) can be used to capture the influence of landscape-scale dynamics on patch-conservation value.

Technical Information:

Note: All workshop participants must provide their own Windows PC laptop in order to participate in this workshop.

As a way to subsidize transaction costs associated with applying landscape-scale analysis of species banking, we will provide free software that integrates GIS technology with matrix population projection models. The software is designed to estimate the number of credits that result from alternative bank placement and the number of credits exchanged to offset a take occurring elsewhere. The software is

designed for Windows PCs and does not require any existing GIS or data analysis software. The software will be provided on a thumb drive and workshop participants will have to bring their own laptop. The software will run from the thumb drive and does not need to be installed on the PC. The participants will be able to interact with parameters used to describe landscape processes and gain a better understanding of how models can be used within a policy setting. We will describe how the variation in habitat quality and dispersal probabilities over space can be applied within the software. The software will also include the influence of habitat restoration on subdivided populations.

This workshop represents an important step for increasing the ecological realism of species banking, by recognizing that conservation value is not only dependent on habitat quality and acreage of a bank. The hope is that by providing a review of ecological theory and methods, non-profits, conservation bankers and regulators will gain a deeper understanding of the systems they manage. Further, by providing software it will allow both private and public practitioners to begin "gaming" with their systems to understand the benefits of landscape-scale approaches, and the dangers of ignoring such dynamics.

Agenda:

40 min Characterizing a landscape-perspective for tradable credits

- What is a landscape perspective?
- When is a landscape perspective appropriate?
- How do aspects of natural history relate to tradable credits?
- How are source/sink dynamics germane?
- How can different dispersal behaviors be represented?
- Modeling techniques: metapopulation models, matrix population models, and individually-based, spatially explicit population models
- Questions & discussion

50 min Applying Individual-based Models to species banking for the Red-cockaded Woodpecker

- How habitat defragmentation credits can be estimated using population genetic theory
- How the value of trades can be evaluated using counterfactual evidence
- Questions & discussion

30 min Break – 9:30-10:00am

90 min Work with open source software: Martix-LEA

- Gain experience with modeling techniques for spatially structured populations
- ***Please bring your PC laptop.*** A thumb drive will be provided that contains software to perform GIS and spatial modeling of populations. Your computer need not have any GIS software installed prior to the workshop – it will be on the thumb drive. The software may not work on Mac, but you can follow along with facilitators and/or choose a partner

- Using a hypothetical species, we will work through a hypothetical trading scenario that incorporates landscape-scale processes and analyzes source-sink dynamics
- Discussion / Lessons Learned

Qualifications of Organizer:

Doug Bruggeman, Ph.D., Ecological Services and Markets, Inc., 8 Bay St., Asheville, NC 28801. dougbrugg@gmail.com, esmarkets.com, (828)505-3578

Dr. Doug Bruggeman will lead the workshop and will be supported by a GIS software technician to be determined at a later time. He is the President and founder of Ecological Services and Markets, Inc., a research and development consulting firm started in 2009 focusing on landscape-scale model development and tradable credit systems for biodiversity. Doug Bruggeman finished his Ph.D. in Fisheries and Wildlife and Ecology, Evolutionary Biology, and Behavior at Michigan State University in 2005. Dr. Bruggeman focused his dissertation work on developing landscape scale accounting systems for biodiversity markets. He did his post-doctoral work at the Helmholtz Centre for Environmental Research in Leipzig, Germany and focused on the application of uncertainty analysis and high performance computing to IB-SEPMs. Dr. Bruggeman also led the application of the landscape scale approaches to tradable credit systems within an Adaptive Management framework for Programmatic Biological Opinions. Dr. Bruggeman has published three peer-reviewed papers on tradable credit systems and has been an invited speaker on biodiversity markets in Germany, Australia, and throughout the U.S.