

# The Malheur State-and-Transition Model: An Ecological Modeling Approach to Strategic Habitat Conservation

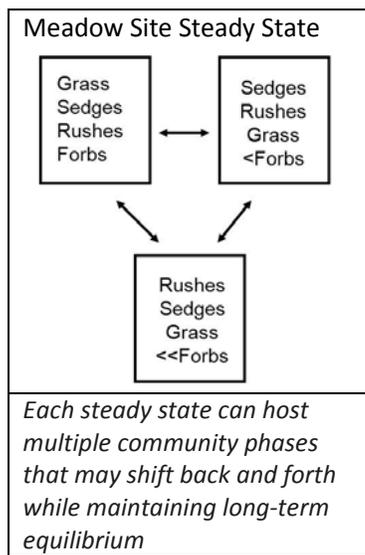
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The successful implementation of Strategic Habitat Conservation (SHC) supports the development of innovative approaches to conceptual ecological modeling that is implemented through the collaboration of multiple partners at a landscape-scale...with a new emphasis on use of surrogate species. Malheur National Wildlife Refuge (NWR) is in the process of creating a model for its various habitat types to evaluate habitat on an acre-acre scale and set realistic and sustainable population goals. The effort was motivated by the alarming rate of loss of high quality wet meadows to encroaching common cattail and reed canary grass over the past 30 years. A diversity of agencies and NGOs worked together during the Refuge's collaborative Comprehensive Conservation



Malheur NWR's wet meadows host the largest breeding population of bobolink west of the Great Plains.

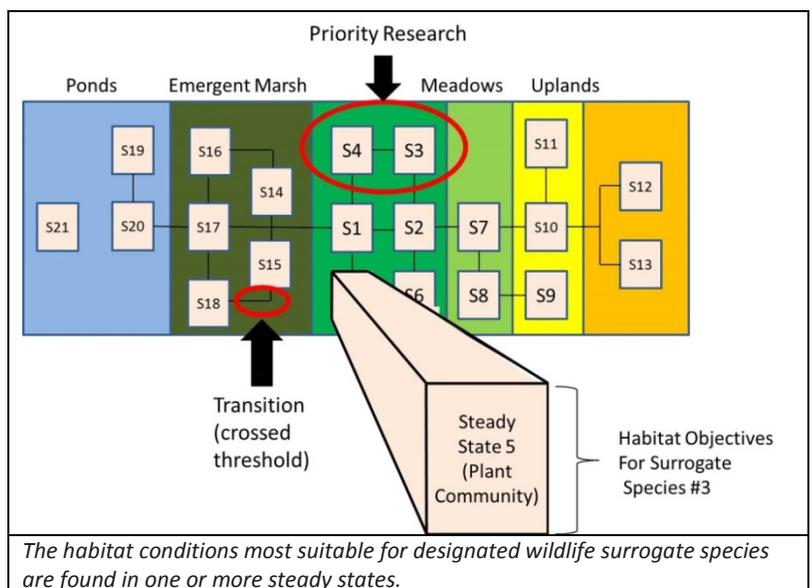
Photo credit: Jess Wenick/USFWS



Plan (CCP) process, forming the Malheur NWR Ecology Work Group, a collaborative body of ecologists from The Wetlands Conservancy, Oregon Heritage Program, Oregon State University, Agricultural Research Service, Ducks Unlimited, and Oregon Department of Fish and Wildlife. These collaborative efforts resulted in the

creation of the Malheur NWR State-and Transition Model (STM) that utilizes Adaptive Management to understand the decline in habitat quality and health of the Refuge's wet meadows as well as possible strategies to attain wildlife objective goals and targets. The STM briefly describes various habitat types (plant communities) along a hydrological gradient and discusses the conditions that likely cause transitions to other plant assemblages. These transitions are referred to as thresholds. The STM also strives to provide a summary of: 1) The challenges facing the management of Malheur's habitat types 2) Available information relating to relationships between species/guilds within and between plant assemblages 3) Existing information gaps in the scientific knowledge base that need to be addressed in further understanding the functionality of these habitat types and 4) Possible strategies for obtaining this critical information.

The STM consists of various steady states with associated phases and thresholds that can be crossed with corresponding transitions that shift one state to another across hydrological gradients (wetlands) or soil types (uplands). Within a steady state individual plant species may cover more or less of the area, depending on changes in water availability, fire, and other disturbance, but long-term equilibrium is maintained. Each assemblage of species, or plant community, is considered a community phase. There can be multiple plant communities and associations within a steady state. As long as the dynamic response to climate, management, etc. does not alter the ability to shift between various community phases, the integrity of the "state" is maintained. It is possible for conditions to change beyond the site's ability to cope within its existing community phases. This happens when stress from disturbance (e.g. substantial irrigation changes, increased fire, new noxious weeds) occurs on the site. By linking defined steady states within and between habitat types, the STM begins to take form. The Refuge and Ecology Work Group will use the information to identify which states play a critical role in providing habitat for identified focal/surrogate species, optimal areas where research should take place, and the areas at highest risk of crossing a threshold.



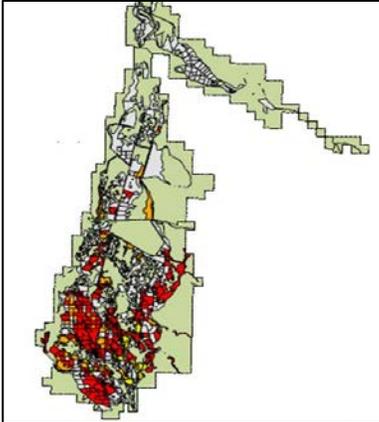
# Applying the STM to the Steps within SHC

## Biological Planning

One of the biggest challenges in applying SHC is the acre-acre evaluation of potential vs. actual habitat to support a species' population. The STM can provide a meaningful tool to support finer scale habitat and species needs integration. The bobolink, a focal species of considerable importance on Malheur, will be used as a theoretical surrogate species for demonstration purposes.



*Bobolink at Malheur National Wildlife Refuge.*  
Photo credit: Barbara Wheeler/USFWS volunteer



*Red polygons indicate habitat conditions meeting bobolink objectives.*

## Conservation Design

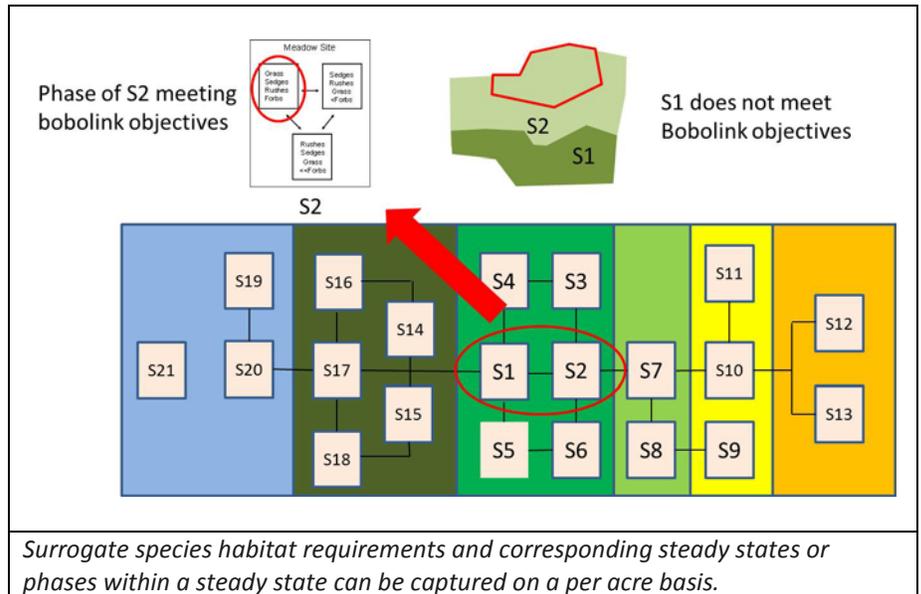
The combining of geospatial data and biological information are used to capture present and potential conditions on-the-ground. Wildlife surveys, research, and habitat mapping have identified preferred areas and plant species that play critical roles in the reproductive cycle of bobolinks on the Refuge. The identification of the steady state condition for bobolink habitat as well as the phases of that state that best meet this species' needs will better support identifying the total number of acres of bobolink habitat available and any opportunities to enhance or create the habitat in other areas. In the figure to the left the red polygons represent habitat found in steady state 2 (S2). Because bobolink require a high percentage of certain perennial forbs that provide seeds and associated invertebrates, a particular phase of S2 offers the best habitat conditions for this species (indicated by the red polygon within S2 in the diagram below). S1 has the potential of providing adequate habitat to meet bobolink objectives, but active management would be required to transition these sites into the community capable of hosting associated forbs.

## Conservation Delivery

Implementation of the plan involves strategically seeking to influence surrogate species and habitats across the landscape. By understanding the transition between S1 and S2 through obtaining all relevant scientific information and using research to fill in knowledge gaps, adaptive management can be used to transition more acres from S1 to S2 as well as increase the number of acres that are expressing phase 1.

## Monitoring and Adaptive Management

Outcome-based monitoring would reveal whether the suite of tools used were effective in obtaining the goal of x number of available acres meeting bobolink objectives.



## Research

Through the collective efforts of the Malheur NWR Ecology Work Group opportunities are created to collected data and develop models on both public and private lands. It will also support the development of a collaborative larger landscape implementation strategy that identifies and offers greater opportunities and long-term success at conserving and enhancing surrogate species habitat acreage needs.

