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Using Species Life History Traits to Design Landscape-Scale Reserve Networks

Environmental Issue

•Habitat reserves are a key component of biodiversity conservation.

-Species loss is occurring at a rate comparable with the five mass extinctions of geologic history.
-Habitat loss, which results in a fragmented landscape, is one of the primary threats to species. This loss is mitigated by the establishment of reserves.

•Reserve systems provide networks of natural habitat to support species within a matrix of developed/disturbed areas.

-Conservation of native vegetation in reserves is a primary goal, as this provides the habitat structure and nutritive basis on which all other species depend.
-Life history characters of plants, such as dispersal strategies, dormancy, longevity of individuals, and clonal propagation, evolved in a natural environment. Consequently, species may vary in their ability to persist in a fragmented environment.

•Understanding the interaction between life history traits and persistence in fragmented habitat is essential for successful planning.

-Expanding our knowledge of these interactions will allow the development of predictive models to inform planning and management decisions.

Scientific Approach

Hypothesis: There is a direct correlation between life history strategies and plant species persistence within fragmented habitat.
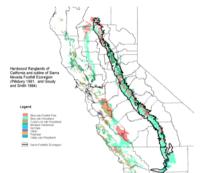
Research Plan:

•Examine the distribution and abundance of plants in a landscape with varying levels of fragmentation.

-Field surveys will be conducted in the Sierra Nevada foothills.
-A minimum of 60 common and rare species will be selected and classified according to life history strategies.
-Habitat areas will be classified according to size, isolation, and habitat quality.

•Develop predictive models.

-Models will explore the interaction between habitat patch arrangement and persistence of plants with various survival and reproductive strategies.

•Test model predictions using empirical data.

-The influence of life history and habitat variables on species persistence will be assessed through statistical analyses.
-Comparison of these analyses with model predictions will allow for an evaluation of the success potential of different reserve design strategies.

Hardwood Rangelands of California and outline of Sierra Nevada Foothill Ecoregion (Pillsbury 1991, and Goudy and Smith 1994)

Legend
Blue oak-Foothill Pine
Blue oak Woodland
Coast Live oak Woodland
Montane Hardwood
No Data
Other
Potential
Valley oak Woodland
Sierra Foothills Ecoregion

Typical scene in the Sierra Nevada foothills in Mariposa County, California, U.S.A.

The Sierra Nevada foothills ecoregion in California is an ideal study system due to the variety of plant species and the presence of habitats ranging from pristine to highly fragmented.

Impact

•Sierra Nevada foothills ecoregion

-Information gained from this study will provide planners and land managers with quantitative methods for the development of a reserve network in the Sierra Nevada foothills that will effectively maintain populations of plant species.

Other ecosystems

-Habitat fragmentation is a global problem, and species conservation is at the forefront of environmental concern.
-This study will provide an important conservation tool to reserve planners worldwide, allowing improved quantitative predictions of long-term species persistence in fragmented systems.