NFWF proposal

Creating a decision support tool for open pine ecosystems throughout the range of longleaf pine.

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Background

The first generation decision support tool for the open pine (longleaf) ecosystems in the East Gulf Coastal Plain Joint Venture (EGCP JV) is nearly completed (Figure 1). The model for this tool relies upon an objective-driven approach firmly anchored in principles of conservation biology and landscape ecology, and it directly incorporates the elements of biological planning and conservation design expressed in strategic habitat conservation. As such it relies upon priority species selected based on the concept of umbrella species. Since the tool was developed for a Joint Venture it utilizes population goals for migratory birds based on objectives stepped down from those developed by Partners in Flight, a multi-agency working group dedicated to bird conservation. The EGCP JV methodology translates population goals directly into habitat objectives using estimates of density and dispersal distance and using the concepts of minimum viable population size and core area requirements. This approach also identifies potential habitat and the location of putative source populations for priority species using peer-reviewed habitat relationship models modified from the Southeast Regional Gap Analysis Project (SEGAP). The result is a model that prioritizes the entire landscape based on density and proximity of sites that meet the objectives of suitability for restoration, ability to use prescribed fire as a management tool, likelihood of long-term conservation, probability of colonization, and contribution to source populations of umbrella species.

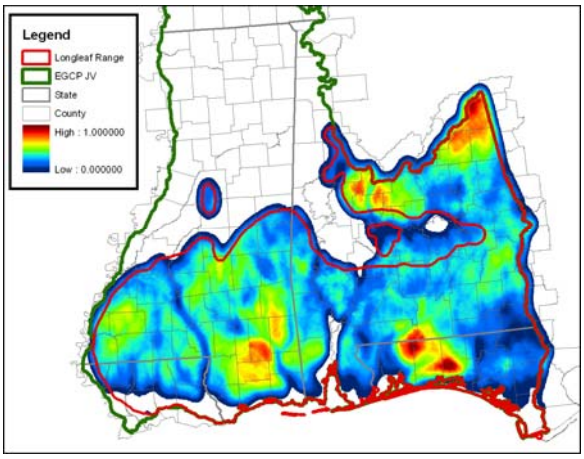

Figure 1. Draft map of conservation priorities for open pine systems in the EGCP JV area.

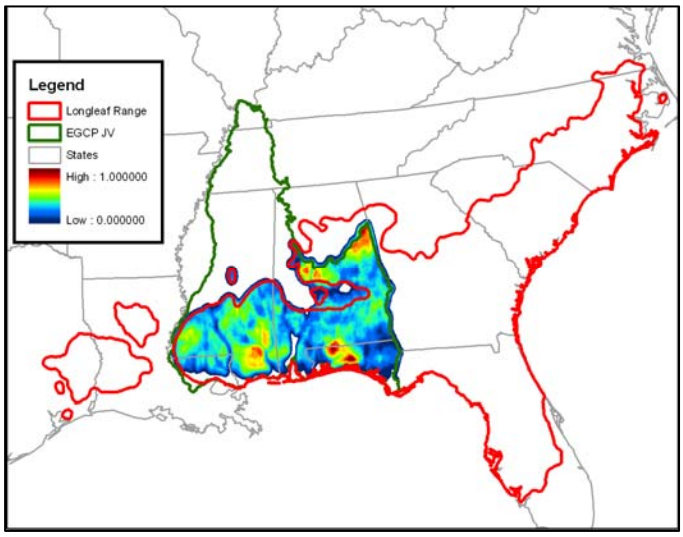

Figure 2. The scope of the proposed project, the historic range of longleaf pine (*Pinus palustris*)(Little 1996), and the scope of the ECGP JV open pine decision support tool.

Similar to the EGCP JV longleaf decision support tool, this project largely relies upon existing, publically available data. Although all of the data used in the EGCP JV are not available for the western portions of the range, suitable data are available to develop a planning tool based on a spatial model that could be rapidly updated as better information becomes available. This type of iterative approach is integral to the concepts of structure decision making and strategic habitat conservation.

Justification

The longleaf pine ecosystem once covered nearly 90 million acres in the Southeastern U.S. Yet this important habitat has undergone drastic declines. Alteration of natural fire regimes and widespread conversion to systems dominated by loblolly and slash pine has drastically altered much of the original longleaf pine habitats. The East Gulf Coastal Plain represents only 27% of the historic range of longleaf pine (Fig. 2), leaving much of the area once included in the historic range of longleaf outside of existing conservation decision support tools.

In recent years the conservation community across the Southeastern U.S. has made the restoration of longleaf habitats a key priority. Despite the widespread recognition and support, conservation of longleaf pine systems has largely been opportunistic due to limited capacity to determine where conservation might best be directed in support of specific conservation objectives.

[I need some verbage here regarding the significance of this to the other JVs and planning efforts].

Conservation of longleaf and other open pine ecosystems is important to ensuring the long-term sustainability of a variety of species of concern including red-cockaded woodpeckers, indigo snake, black-pine snake, gopher tortoise and green pitcher plant to Bachman's sparrow, brown-headed nuthatch and eastern kingsnake.

Decision support tools that integrate the elements of biological planning and conservation design are an integral part of strategic habitat conservation. This tool will contribute to

large-scale planning efforts throughout the range of longleaf in the southeastern coastal plain from Texas to North Carolina because it will allow the prioritization of conservation delivery projects related to open pine ecosystems throughout the region.

Objectives

1. Identify and obtain the available spatial data for the development of an open pine decision support tool for the historical range of longleaf pine.

2. Identify priority species of birds, mammals, reptiles, and amphibians associated with the open pine system using the framework of structured decision making.

3. Map the density of suitable sites for the restoration of open pine ecosystems based on land form, land use, and range limits.

4. Define population objectives for priority species based on existing conservation plans and policies, current status, and minimum viable population sizes.

5. Map the relative ability for land managers to use fire for the maintenance of open pine ecosystems based on the density of urban and developed lands.

6. Use the density of conservation lands to determine where the potential exists for long-term conservation and maintenance of open pine systems.

7. Use the density of potential habitat for priority species to identify where connectivity and patch size can be increased to improve the viability of existing populations and create new source populations.

8. Use density of putative source populations to determine where restored areas area likely to be colonized by priority species.

9. Develop a spatially explicit map of open pine systems conservation priority based on combined densities of suitable sites, sites that can be managed with fire, lands managed for long-term conservation, potential habitat, and putative source populations.

10. Develop a geospatial database suitable for tracking progress towards restoration goals.

Approach

- We will make extensive use of 30m resolution geospatial data developed by SEGAP and NLCD. Although these represent land use – land cover in 1999-2001, they are the most current regional-scale geospatial data available.

- Starting with the current list of priority species for the EGCP JV we will identify additional non-avian umbrella species based on a review of state and federal conservation planning and policy documents. This information will be used to expand the EGCP JV list and determine the habitat criteria and conservation objectives they represent (Table 1). This table will be reviewed by regional experts and revised accordingly.

- We will define population objectives for priority species based on existing conservation plans and policies, current status, and minimum viable population sizes scaled down to the range of longleaf based on proportionate density and distribution where appropriate.

- Extensive literature review and expert opinion was used to determine the habitat requirements for many of the potential priority species for SEGAP. We will obtain and review the habitat relationship models and maps of potential habitat for the umbrella species. Where necessary these models will be revised. If the suite of umbrella species includes vertebrates for which animal distribution models do not exist in the SEGAP database, we will conduct literature review and develop animal distribution models as necessary.

Conservation Design & Decision Tool Development

- Conservation design involves determining the habitat objectives and suitable areas for meeting them within the scope of the planning area. Because we define conservation priority based on the proximity to and the extent of areas meeting our conservation objectives, and density represents an aggregate measure of proximity and extent, we propose to use kernel density estimators to map conservation priority area based on the above-state objectives for the entire range of longleaf pine. When priorities are expected to accurately reflect the density of locations meeting the desired criteria we use an “optimal” kernel size. When proximity is expected to reflect important spatial relationships, e.g., dispersal distance of animals or smoke, we will use kernel sizes based on valued derived from the appropriate literature.

- Although soils and climatic data have been proposed as criteria for mapping the suitability of sites for longleaf restoration. Precise digital data will not currently available for the entire range of longleaf for at least several years. Therefore, we will use landform models derived from National Elevation Data using topographic relative moisture index to mask low-lying areas and urban sites within the range of longleaf to determine where potential sites for restoration occur. When mapping the density of suitable sites and the density of potential habitat we will use a normal kernel with an optimal bivariate kernel size determined based on the normal scaling rule.

- Since fire is the preferred means of maintaining the structure and diversity of open pine systems, and urban and developed areas represent the greatest impediment to the use of fire as a management tool, we will use urban and

developed areas within the range of longleaf extracted from NLCD data to map their extent. When mapping the density of sites where fire can not be readily used, we will use a kernel size based on expert knowledge and typical smoke dispersal patterns and distances.

- Public lands and private lands in permanent conservation easement represent the best opportunities to maintain, conserve, and restore wildlife habitat into perpetuity. We will use the geospatial stewardship data developed for SEGAP to indicate their distribution and extent. While proximity to public lands is generally considered important, the distance at which that importance become negligible is unclear. However, it is clear that connectivity of conservation lands is important, so additional research is needed to determine appropriate kernel size.

- We will use the density of potential habitat for priority species based on predictions from SEGAP and models we develop to identify where connectivity and patch size can be increased to improve the viability of existing populations and create new source populations. When mapping the density of potential habitat we will use an optimal kernel size.

- We will use the density of contiguous patches of potential habitat for each priority species that are large enough to support viable populations. Since colonization by priority species is an important consideration for conservation we will use dispersal distances for priority species based on literature review or allometric equations as the kernel size in these analyses.

- Because the habitat requirements of each priority species will be different, we will develop a spatially explicit map of open pine systems for each species. Conservation priority will be based on combined densities of suitable sites, sites that can be managed with fire, lands managed for long-term conservation, potential habitat, and putative source populations. The density values will be combined based on simple algorithms based on limiting and compensatory parameters. For example, in the EGCP JV, density of suitable sites and the density of sites where the use of fire was limited were assumed to limit the ability of potential restoration sites to contribute to ecosystem function, while density of public lands, density of potential habitat, and the density of putative subpopulations were assumed to be compensatory. That is, low density of sites meeting one or more criteria could be offset by higher densities of the others. We will use a similar approach to create a priority map based on these relationships for the entire range of longleaf pine.

- The conservation priorities mapped for each species will then be combined to develop range-wide priorities for conservation, restoration, and management of longleaf systems that incorporates the needs of all of the priority species as has been done for the EGCP JV (Figure 1).

- One of the greatest needs in the current data available for this effort is a geodatabase that describes recent restoration efforts. Therefore, we are currently

unable to incorporate recent efforts in our prioritization scheme. We will develop a database suitable for tracking the location, extent, and other relevant data by partner agencies for incorporation in future modeling efforts.

Expected Benefits

- Development of a range-wide list of umbrella species and their habitat requirements in open-pine systems

- Development and dissemination of a GIS containing available spatial data required for range-wide conservation planning

- A greater level of coordination in the conservation and restoration of longleaf pine habitats across the historic range