

ECOLOGY OF FESCUE GRASSLANDS IN GLACIER NATIONAL PARK

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Fescue grasslands are small, but ecologically significant, habitat types in several drainages within Glacier Park. An up-to-date, systematic study of the plant and animal communities of these grasslands is needed to assess factors which may potentially impact these habitats, including invasion of exotic vegetation, fire suppression, and human development (e.g. sewage line and road construction).

Objectives

This project has four primary objectives:

- 1) Identify potential factors determining the distribution of fescue grasslands;
- 2) Describe plant and vertebrate communities inhabiting fescue grasslands;
- 3) Identify factors that are potentially disruptive to the natural integrity of fescue grasslands; and
- 4) Develop a management model that includes hypotheses to be tested by management actions.

Information regarding these objectives will help provide a foundation for assessing the present status of the park's fescue grasslands and for formulating management objectives. This is a two year project. Field work for the first season (1989) has been completed and data analysis is in progress.

Methods

Glacier National Park's Geographical Information System will be used to determine the 1) general elevation and slope limits of fescue grasslands, 2) coverage of these grasslands within specific drainages, and 3) the proportion of xeric, mesic, and edge vegetation within these grasslands. Size-specific

mortality comparisons of trees in burned versus unburned ecotone areas in the North Fork grasslands will be used to assess the role of fire in preventing tree encroachment on grasslands.

In each of 11 grassland study sites, the presence of all vascular plant species, excluding Carex spp., is determined in 25-50 quadrats (0.1 m²) placed along a 100 m transect. Species frequencies and mean quadrat species richness will be estimated for each site. Sample sites are adjacent to improved roads (4), along unimproved roads (4), and along back country trails (3).

In 6 other sites, each of which is approximately 21 ha in size, the size of vertebrate populations will be estimated using a 400 m trap line of Sherman live traps (small mammals), the "consecutive flush" method (birds), burrow densities in 10 x 100 belt transects (ground squirrels and badgers), surface coverage of elk pellets, and a limited number of pitfall traps (amphibians and reptiles). Trapping will be repeated twice each summer.

Three human-related disturbance factors will be considered: (1) impact of transportation routes (improved road, unimproved road, and back country trails), (2) fire, and (3) underground utility line construction. The impact of each of these factors on fescue grasslands will be assessed using plant community composition parameters (native species richness, exotic species richness). A fourth factor to be examined will be the impact of common timothy (Phleum pratense), a widely distributed grassland exotic in the park, on native plant species richness, small mammal density, vesper sparrow (Pooecetes gramineus) density, Columbian ground squirrel (Spermophilus columbianus) density, and elk (Cervus canadensis) usage. Plant and animal data will be collected using the above techniques.

Preliminary Results

Field observations and GIS Landsat data indicate that fescue grassland vegetation occurs on sites below 1620 m (5320 feet). Extensive fescue grasslands occur on both eastern and western slopes of the Continental Divide. Fescue grassland coverage ranged from 0.3 % to 3.2% in the drainage systems examined.

Observations in the Red Bench fire burn indicate that tree mortality in the burned grassland ecotone is significantly greater than in unburned ecotone areas in all tree size

classes. In the burned areas, mortality of the smallest size class trees (< 1.99 cm DBH) was highest and nearly 100%. These results suggest that, at least in the North Fork area of the park, fire suppression is detrimental to the long term persistence of fescue grasslands.

Idaho fescue (Festuca idahoensis) and/or rough fescue (F. scabrella) were among the three most common grasses in all study sites. Other common nonfescue grasses occurring in one or more sites included Richardson's stipa (Stipa richardsonii), oatgrass (Danthonia intermedia), junegrass (Koeleria cristata), wheatgrass (Agropyron caninum), and common timothy (Phleum pratense).

One or more exotic species occurred within 100m of roads/trails in 9 of the 11 sites. This suggests that no large fescue grassland areas exist in the park which are completely free of exotic vegetation.

Quadrat species richness varied significantly between sites, and ranged from 5.6-11.4 species/quadrat/site. In terms of quadrat species richness, the two most floristically diverse sites were located in the Two Dog Flats and Belly River areas. Sites in the Big Prairie region were among the least diverse.

Six bird species were observed within grassland vegetation, though vesper sparrows (Pooecetes gramineus), chipping sparrows (Spizella passerina), and possibly robins (Turdus migratorius) were the only resident species. Three species of small mammals were trapped (Peromyscus maniculatus, Zapus princeps, Microtus pennsylvanicus), with P. maniculatus being by far the most commonly trapped species. Surprisingly, no small mammals were trapped in one site during either of the two trapping periods. Animal survey results suggest that small mammal and vesper sparrow densities may be higher in sites with higher plant species richness.

Burrow densities ranged from 3.1-12.2 and 0.0-0.9 per 0.2 ha for Columbian ground squirrels (Spermophilus columbianus) and badgers (Taxidea taxus), respectively. Elk pellets were found in all six study sites, with the highest surface coverage in the St. Mary valley sites.

Distribution patterns of exotic species varied significantly between transportation route types. Not surprisingly, exotic species richness was higher in improved roadside areas than along unimproved roadside areas. Road construction and maintenance is more extensive for improved roads, undoubtedly assisting exotic seed dispersal into the park and also

creating substrate disturbance conditions favoring establishment of exotic species.

However, the study sites adjacent to roads and trails showed unexpected patterns. Exotic species richness was lowest in sites adjacent to improved roads and highest in the back country trail sites. It seems possible that the surprisingly high occurrence of exotics in the back country sites may be a relic of the park's earlier horse concession. The most common back country exotic was common timothy, which park records indicate was seeded by the former horse concessioner in the 1920's in at least one area--possibly the Belly River area, where two of the three back country sites were located--to "improve the range."

Comparison of species richness in the site burned during the 1988 Red Bench fire showed no significant pre-fire/post-fire differences in either native species richness or exotic species richness. Long term effects of this fire on species richness patterns may occur, but no short term effect was detected.

Additional Field Work

Primary field objectives for the second year of this investigation will be to: (1) re-survey vertebrate communities in the animal study sites in order to assess yearly population variability, (2) compare plant and vertebrate communities in grassland areas with high timothy cover to those in areas with low timothy cover, and (3) assess the impact of underground utility lines on plant community composition.