



**Project Title: QUANTIFYING AND MODELING THE RISK OF DISTURBANCE TO ECOSYSTEMS CAUSED BY INVASIVE SPECIES**

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**Collaborators:** US Geological Survey, Oklahoma State University

**Introduction to the problem:** Invasive species are biological pollutants that threaten ecosystem health. Identifying the mechanisms of invasion and developing predictive models of invasion will be critical to developing risk management strategies for limiting the economic and environmental damage caused by invaders.

**Background:** Eastern redcedar (*Juniperus virginiana*), a prolific evergreen tree and its associated vertebrate seed dispersers will be used as a model invader-disperser system. Limiting factors of invasion (growth and seed dispersal; upper left figure) will be studied through manipulative field experiments conducted at Oklahoma State University's Cross Timbers Experimental Range Research Site. Researchers from OSU will collaborate to complete research tasks.

**Objectives:** A) Investigate the mechanisms of invasion by *Juniperus virginiana*. B) Quantify the susceptibility of ecosystems to invasion. C) Develop predictive models of invasion probability based on empirical data

**Approach:** The effects of local plant diversity and soil characteristics on *J. virginiana* survival and growth (measures of invasion ability) will be examined in a field experiment where *J. virginiana* seedlings will be planted in three distinct ecosystem types, old field, deciduous forest, juniper forest (figure at upper right). Seedling growth and survival will be analyzed in relation to adjacent plant species and soil type and chemistry. *J. virginiana* dispersal limits will be studied by monitoring seed consumers (below left) and their rates of consumption at *J. virginiana* trees fenced to exclude small mammals and deer. A greenhouse experiment will be conducted to determine the effects of both nitrate nitrogen and ammonium nitrogen on seedling growth. Models of ecosystem susceptibility to *J. virginiana* invasion will be developed using empirical data collected in this study and projecting onto existing geographical data bases on vegetation type, soil type, animal distributions, and nitrogen deposition in the US (figure at lower right).

**Accomplishments to date (Feb 2003):** Completed all field work on plant diversity, soil characteristics, and seed consumption. Completed lab analysis of soils. Presented papers and posters at 3 national meetings. Greenhouse study is underway.

**Near future tasks:** Continue greenhouse experiment on nitrogen effects on growth. Complete reports for field and lab work portions of study. Develop predictive models of invasion.

**Goals:** A) Arrive at a better understanding of the mechanisms of ecosystem invasibility, B) develop unique field techniques, C) identify vulnerable stages of invader life history, and D) develop predictive models of invasibility applicable to other species and useful to land managers responsible for addressing invasive species problems.

