Interactions among Biodiversity and Socioeconomics in the Greater Yellowstone Ecosystem

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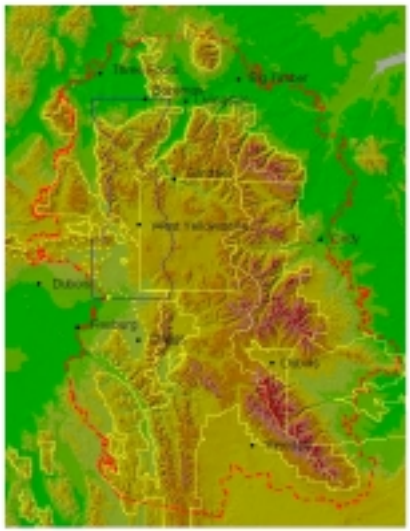
http://www.homepage.montana.edu/~hansen/hansen/lab/index.html



Greater Yellowstone Ecosystem

Questions:

- **How fast and why are humans expanding into semi-natural landscapes?**
- **Does ecosystem quality contribute to economic performance?**
- **Is human growth influencing biodiversity in nature reserves?**

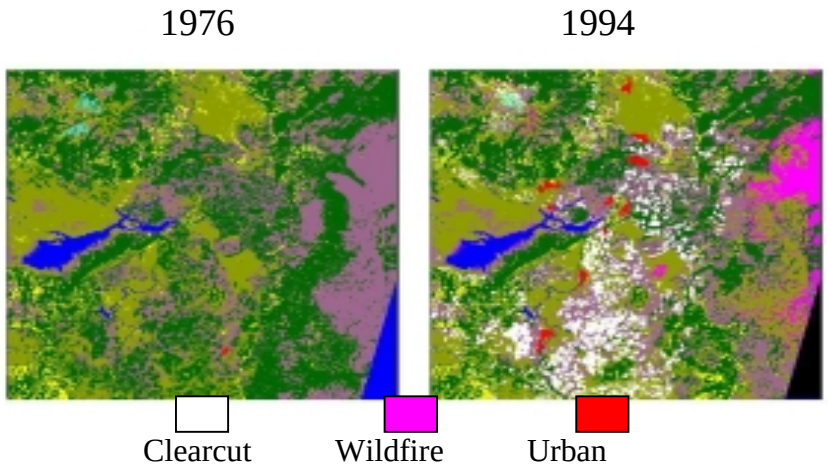
Objectives:

- **1. Quantify changes in biophysical gradients, biodiversity, and land use and socioeconomic factors across the GYE from 1972-1997.**
- **2. Test hypotheses on interactions among biophysical gradients, biodiversity, and socioeconomic patterns.**
- **3. Assess current and future risk to ecological hot spots and potential for restoration.**
- **4. Develop and implement an approach to monitor ecological and human interactions.**
- **5. Communicate results to stakeholders.**

Results

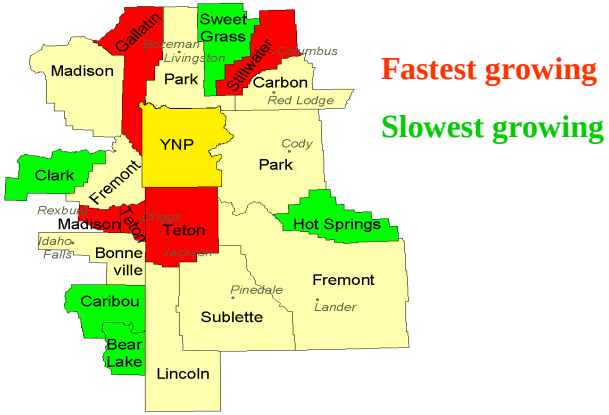
Obj 1. Quantify 25-Year History of GYE

- Cover maps from LandSat done for 1976, 1985, 1994 with 65-87% accuracy.
- Conifer decreased by fire, logging; increased by conifer encroachment.
- Urban expanded at expense of Agriculture.
- Human density increased dramatically.



Obj 2. Test hypotheses on Causes and Consequences

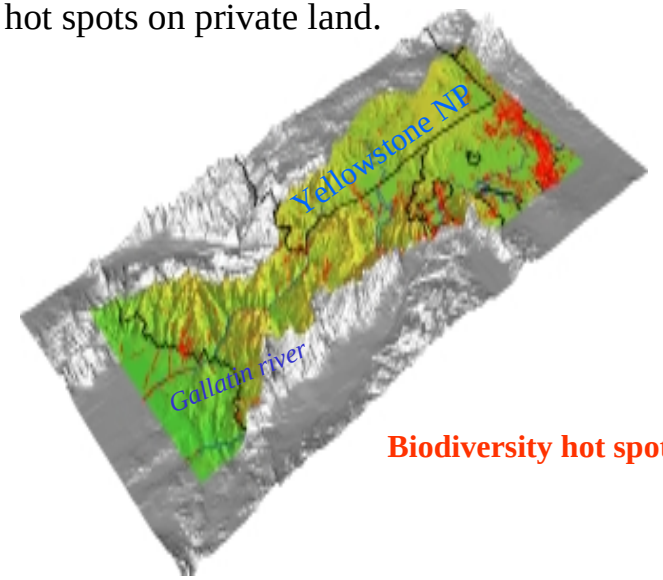
- Human population growth and economic expansion is associated with ecosystem quality.



Fastest growing

Slowest growing

- Abiotic factors cause biodiversity to be concentrated in small hot spots on private land.



Biodiversity hot spots

Results

Obj 2. Test hypotheses on Causes and Consequences

- Intense land use is concentrated near biodiversity hot spots.

- Intense use of private lands increases probability of extinction of native species, even in nature reserves.

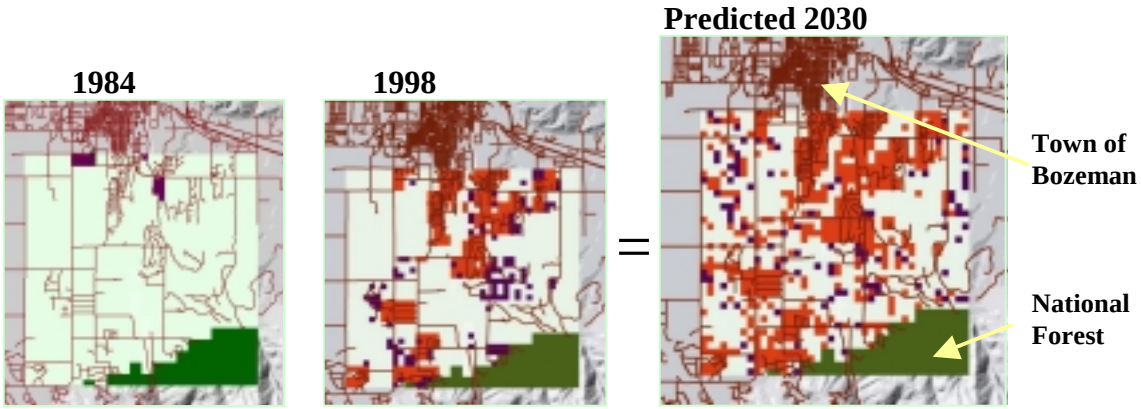
Habitat	Nest Succ.	# Female Fledglings	Pop Growth Rate
AS (low land use)	39%	1.5	1.10
CW (high land use)	22%	1.4	0.90

Obj 3. Assess Risk to Biodiversity

- Dynamic Habitat and Population Analyses was developed as a new method of risk assessment.

Obj 4. Outreach

- Provide tools and knowledge to stakeholders.



Markov land use model predicts continued urban expansion in the future

Conclusions

- **GYE is changing rapidly in land cover, human population size, and economics.**
- **The quality of the ecosystem appears to be contributing to population growth, home location, and economic expansion.**
- **Because abiotic gradients structure both biodiversity and humans, intense land use is concentrated in locations critical to native species.**
- **Development in private lands strongly influences native species in YNP.**
- **Innovative management is needed to sustain both the ecosystem and the human communities dependent upon it.**

Publications

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