

# Determining the Relationship Between Development Pattern and the Costs of Public Services in the Mountain West

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Project Director Meeting  
Prosperity for Small and Medium-Sized Farms and Rural Communities Programs

February 21 – 22, 2013

10:30 AM

Panel #1 Rural Development

Holiday Inn Capitol

550 C. Street,

Washington, DC 20024



United States Department of Agriculture  
National Institute of Food and Agriculture

UNIVERSITY  
OF WYOMING

# Today's Agenda

- **Rationale and Objectives**
- **Prior Research**
- **Data for historical land-use modeling**
- **The state of data for econometric modeling**
- **Outcomes**
- **Timeline for finishing/Next Steps**



# Rationale

## **USDA Goals:**

Priority in U.S. Agriculture 6. Agriculture Economics and Rural Communities (AE&RC)

## **The Situation:**

Most local governments do not know the cost of development decisions and do not know if their land use plan is fiscally sustainable .

## **Rationale:**

Economic efficiencies may improve if governments can be made aware of the relationship between the built environment and costs of service provision.

Rural Communities benefit from Agriculture; protecting agricultural lands secures agriculture and associated environmental amenities and in turn supports economic robustness of rural communities

## **Research Opportunities:**

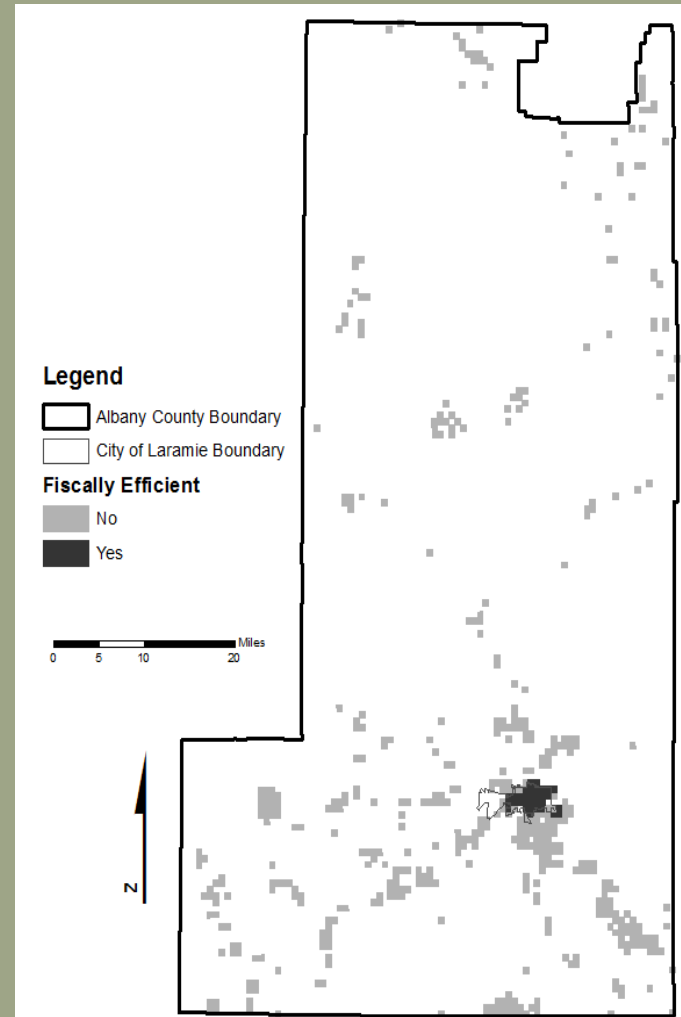
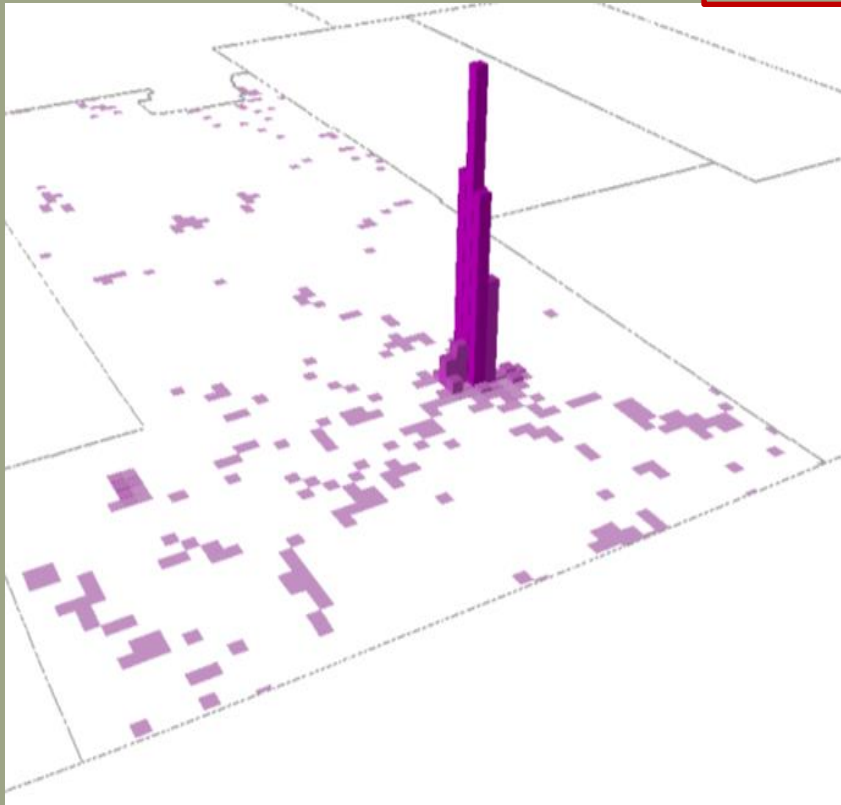
Protect Agricultural Lands by Indicating Fiscally Efficient (and inefficient) areas for development

Evaluation of development with regard to environmental attributes.

# Objectives

1. To examine data in Colorado, Montana and Wyoming in order to determine which county datasets contain the necessary attributes for spatially explicit fiscal modeling of local government services.
2. To examine local government time series expenditure data and associated time series level of service measures in Colorado, Montana and Wyoming for county government services that may have a spatial component to the cost of service provision.
3. To investigate the availability of spatially attributed panel data that capture environmental characteristics (e.g. prime agricultural lands, big game species habitat, wildland urban interface).

# Prior/Current Research

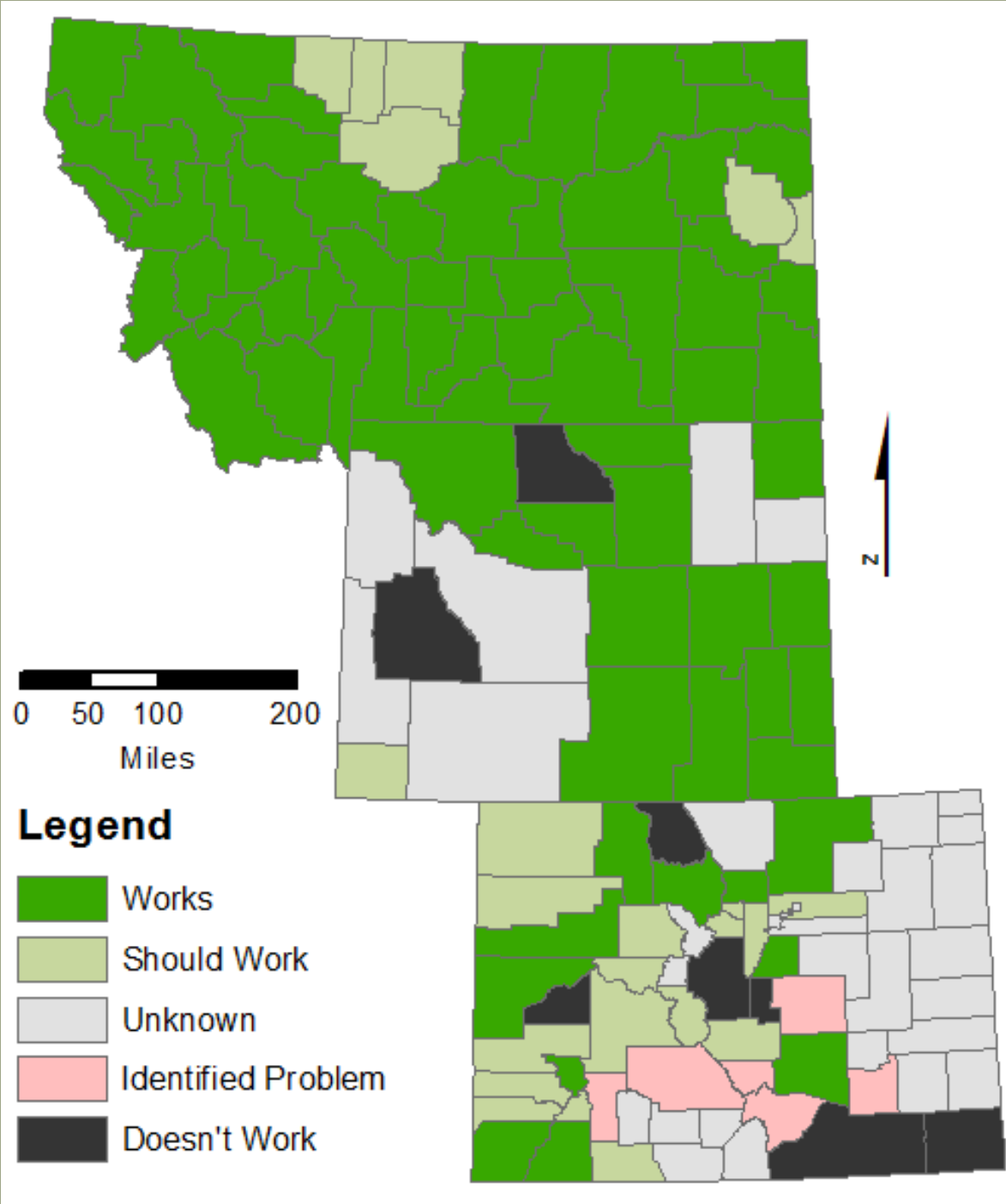
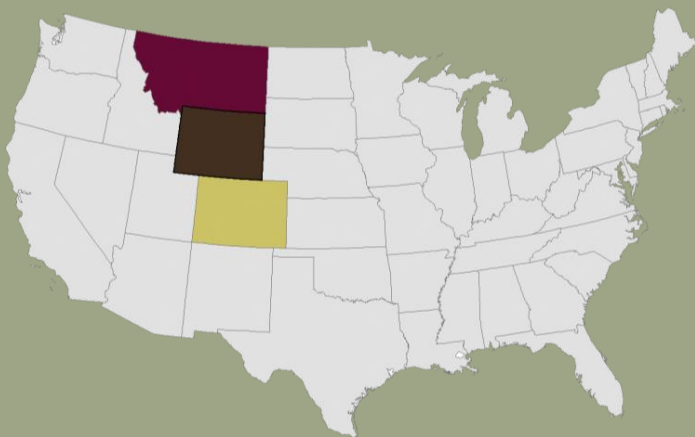


Lieske S.N., McLeod D.M., Coupal R. and Srivastava S. 2012. 'Determining the relationship between urban form and the costs of public services.' *Environment and Planning B* 39(1).

# Objective 1: Data for historical land-use modeling

1. Parcel boundaries (GIS layer)
2. Parcel ID number (attribute)
3. Land-use designation (often tax code classification)(attribute)
4. Year of construction (attribute)
5. Building Value; the assessed valuation of structures in dollars (attribute)
6. Land Value; the assessed valuation of land in dollars (attribute)
7. Assessed valuation (attribute)
8. Tax District (GIS layer or attribute)

Objective 1  
Outcomes:  
Data for  
Historical  
Land-Use Change  
Modeling  
(as of 4 Feb. 2013)



0 50 100 200  
Miles

- Legend**
- Works
  - Should Work
  - Unknown
  - Identified Problem
  - Doesn't Work

## Objective 2: Time Series Expenditure Data and Level of Service Measures

Wyoming is the only state that compiles county level budget/expenditure, socioeconomic data, and crime data at the state level.

Data for Colorado and Montana is kept at the county-level, and is generally more problematic.

Issues associated with the data include:

Data gaps – (FBI, Colorado and Boulder County are unreported in the uniform crime reporting system).

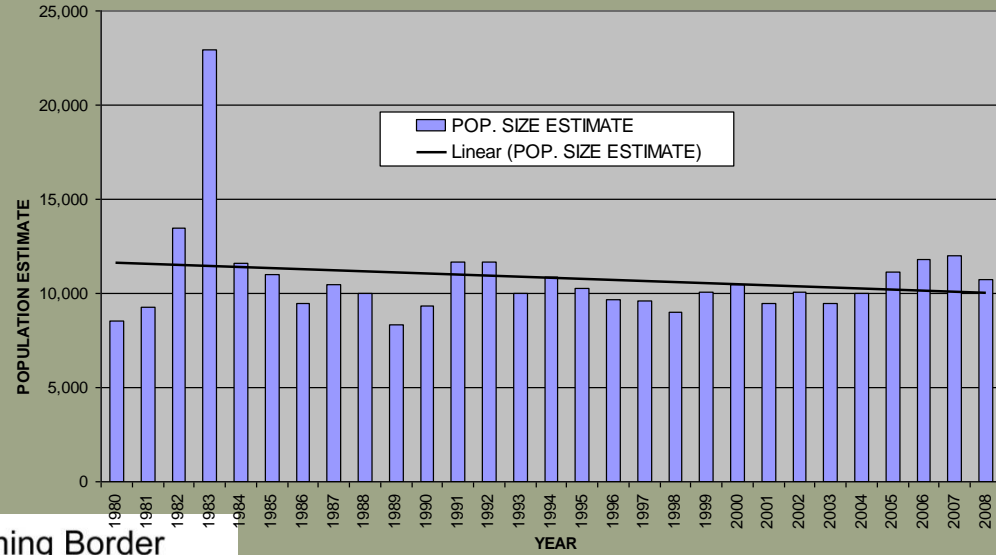
Inconsistent collection methods

Discrepancies between data reported in multiple locations

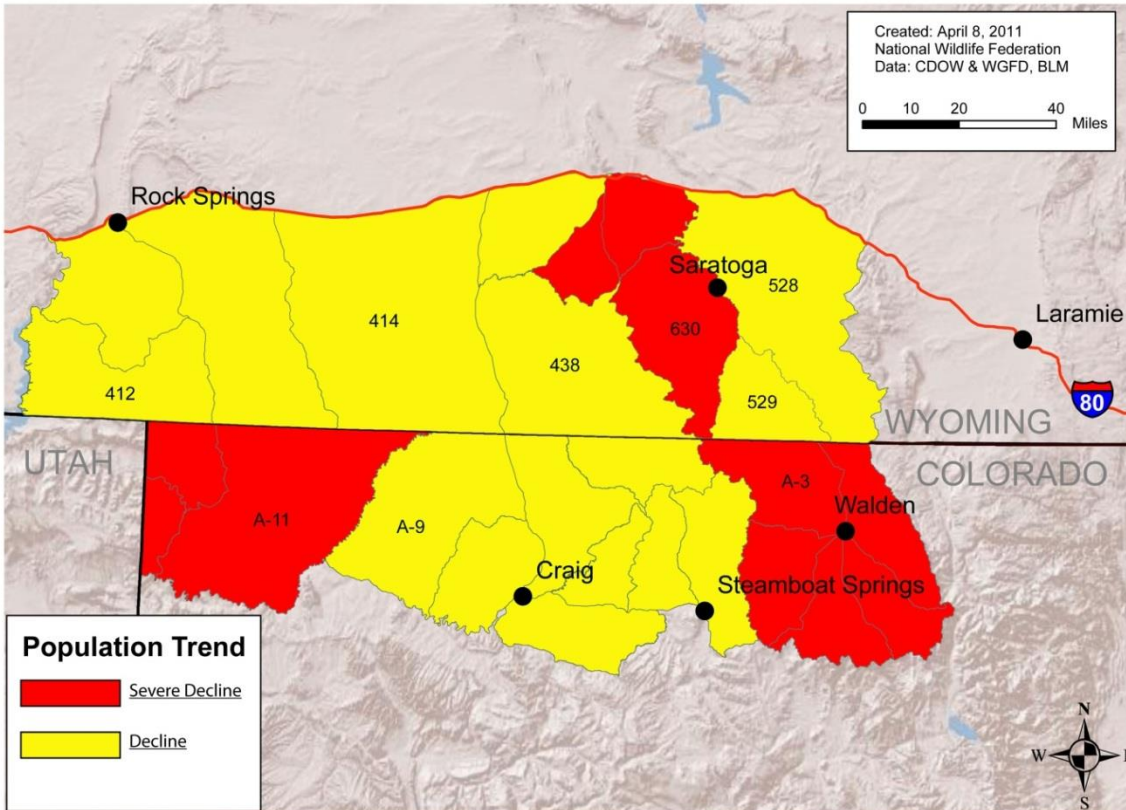
Inconsistent time frames--we have data for our years of interest for some things



# Objective 3: Time-series Environmental Data



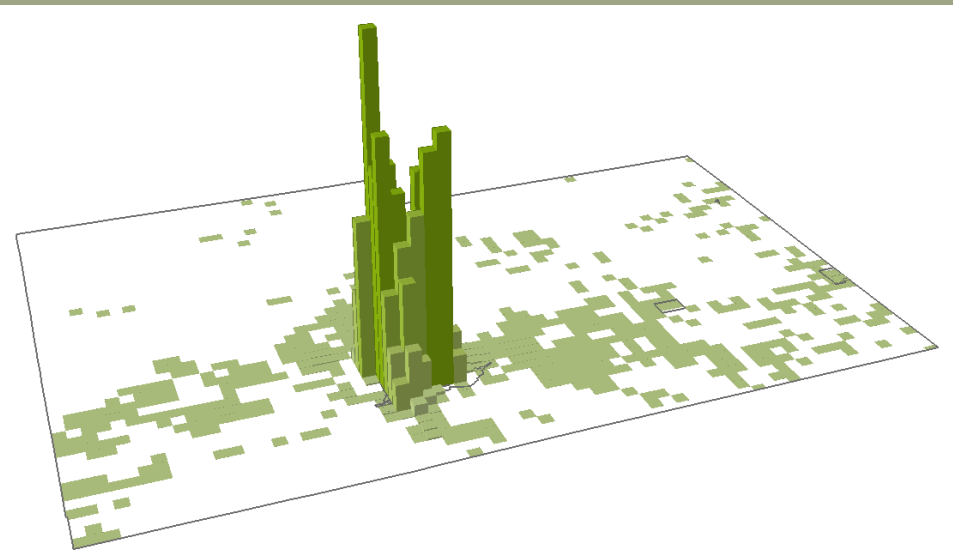
Pronghorn Population Trends along the Colorado-Wyoming Border



# Objective 3 (cont.)

- Additional Community Service Issues: Land Use Planning and Fire
- Wildland Urban Interface
- Land Use Choices by Counties
- Fire Suppression Costs borne by Federal Agencies
- Residential Development and Increasing Costs of Fire Suppression
- Fire Management = USFS/BLM Ecosystem Management

# Outcomes: Research And Education



**Allocation Fn:**  $LE_{EXP}$  = dependent variable

|                       | (1a)<br>1M Grid<br>b/(se) | (1b)<br>1K Grid<br>b/(se) |
|-----------------------|---------------------------|---------------------------|
| Res                   | -27.424***<br>(3.99)      | -6.778***<br>(1.99)       |
| Res <sup>2</sup>      | 3.015***<br>(0.39)        | 0.522***<br>(0.11)        |
| RuralPop              | 0.001***<br>(0.00)        | 0.000<br>(0.00)           |
| officers              | 0.052**<br>(0.02)         | 0.063**<br>(0.02)         |
| officers <sup>2</sup> | -0.000*<br>(0.00)         | -0.000**<br>(0.00)        |
| t                     | -0.517**<br>(0.16)        | -0.131<br>(0.21)          |
| constant              | 52.342***<br>(9.43)       | 17.131**<br>(5.66)        |
| R-sqr                 | 0.9086                    | 0.8751                    |

**Production Fn:** PSI = dependent variable

|              |                    |                    |
|--------------|--------------------|--------------------|
| PLE Lag1     | 7.299**<br>(2.69)  | 7.217**<br>(2.70)  |
| PCWageSalary | 0.002<br>(0.00)    | 0.002<br>(0.00)    |
| t            | -0.464<br>(0.54)   | -0.524<br>(0.54)   |
| constant     | -20.801<br>(19.09) | -23.804<br>(19.19) |
| R-sqr        | 0.6845             | 0.6853             |

# Outcomes: Research, Education and Extension

## Research

- Lieske S.N., McLeod D.M., Scofield A.M. and Coupal, R.H. 2013.(In Development). Modeling Costs of Public Service Provision.
- Lieske S.N. and Gribb, W.J. 2012. 'Modeling high-resolution spatiotemporal land-use data.' *Applied Geography* 35(1-2), 283-291.
- Lieske S.N. and Gribb W.J. 2011. Cadaster-based temporal land use modeling with Python. The Association of Collegiate Schools of Planning 52<sup>nd</sup> Annual Conference.
- Lieske S.N., McLeod D.M. and Scofield A.M. 2011. *Determining fiscally efficient locations for public service provision*. 58th Annual North American Meetings of the Regional Science Association International and Second Conference of the Regional Science Association of the Americas.

## Education

- Scofield, A. (In Development) The Relationship Between Development in the Wildland Urban Interface and Federal Wildland Fire Suppression Costs. Thesis (M.S) University of Wyoming. Laramie.

## Extension

- Lieske S.N., Coupal R.H., Hamerlinck J.D., McLeod D.M., Scofield, A.M. (Accepted) 'Planning support system enabled spatially explicit local government fiscal modeling' in *Planning Support Systems for Sustainable Urban Development* (Edited Volume) Springer Academic Publishers.

# Timeline

We extended seed grant through July 2013 are applying for a standard AFRI Foundational Program grant in May 2013.

For More Information:

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## **Data Partnerships**

Numerous Municipal and County Governments

Wyoming Department of Revenue

Wyoming Division of Economic Analysis

Wyoming Wildlife Federation

## **Research Partnerships**

The Nature Conservancy

USDA Regional Research Committee Member

W-2133 Benefits and Costs of Public and Private Lands Mgmt.

## **Universities:**

Colorado State University

Idaho State University

Montana State University

University of Colorado

University of Montana

University of Wyoming