NFRPA Technical session

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Colorado State University
Knowledge to Go Places

Natural Resource Ecology Laboratory

Road map

- General observations
- SAP methods and layers
- Ideas for testing model
  - Against existing stewardship areas
  - Sensitivity analysis

General observations

- Offer constructive critique, observations and ideas – fully realizing there are a range of other considerations
- Well-defined threats & resources (and therefore data layers), but less guidance on methods to produce them (a good thing!)
- Binary/categorical mapping – why not more gradient/continuous based?
- Why ignore space/process?
- Identify key data limitations and strive to improve
- How to measure success?

SAP methodology

- Threats
  - Wildfire
  - Insects/pests
  - Development
- Resource Potential
  - Wetlands
  - Forest patches
  - Forested lands
  - Riparian corridors
  - Rare & imperiled (T&E)
  - Proximity to publicly protected lands
  - Slopes
  - Public water supply areas
  - Analysis mask
  - Private forest mask

Slopes

- Surrogate for: ?
  - CO: where mechanical harvesting is possible (0-50%)
  - MA: 15-30%
  - MO: 5-40% (<5 is agland, >40 no skidder)
- Why binary? Why not continuous function where steeper is harder
- Why not accessibility from major roads?

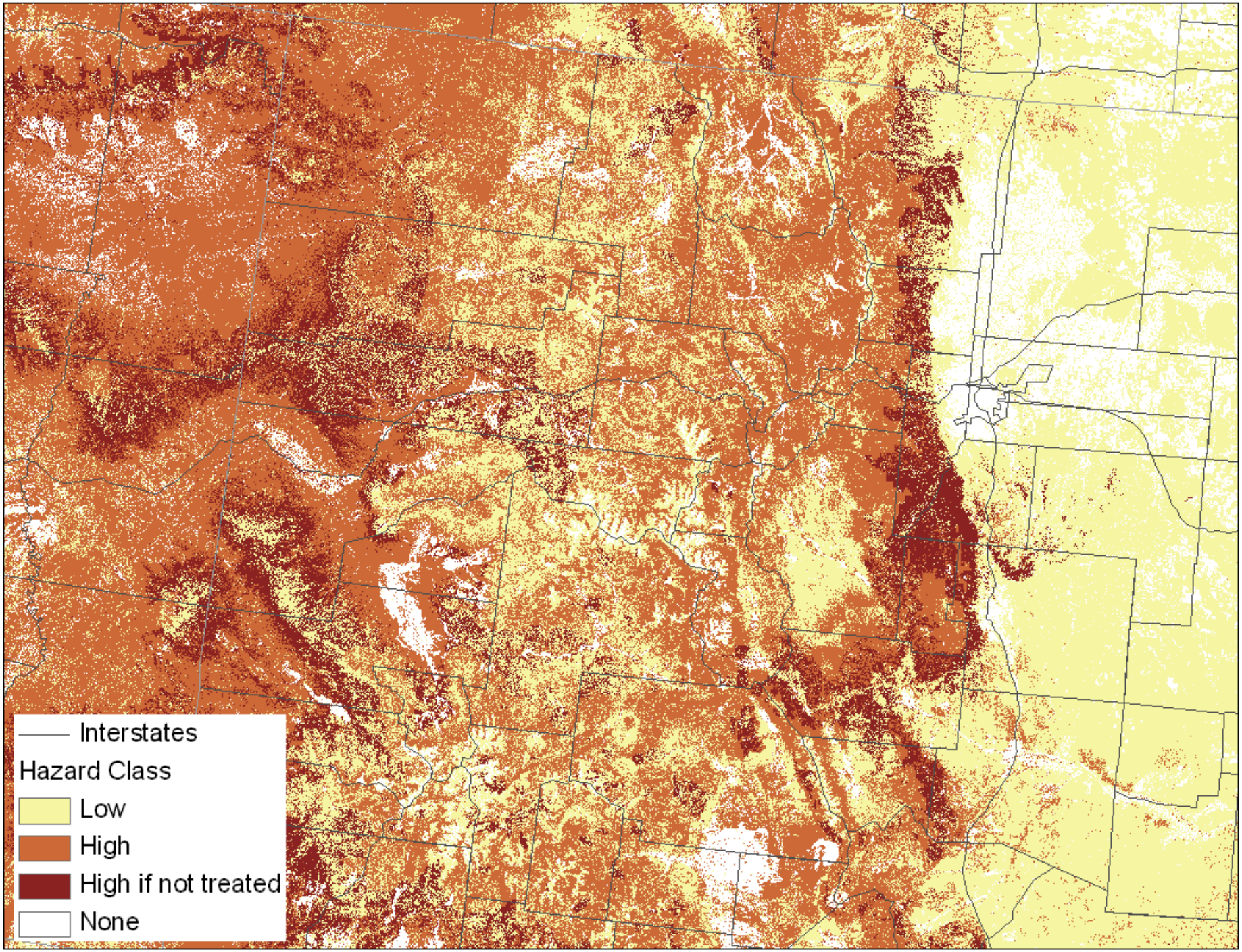
Wildfire risk

- Clarify if forest only, or do other values (e.g., houses, wildlife habitat, water, included) need to be accounted for?
- Need to differentiate forest ecosystem types (high/low hazard, mitigation from restoration)
- Combined with

	Federal Register			
Class	**description**	**definition**	**Our definition**	**Other definitions**
Interface (WUI)	Clear line of demarcation between structures & fuels	>1 structure per 0.3 ac (>3 units/ac *or* >250 people/mi^2	>1 unit per 2.4 ac (based on 250 people/mi$^{2)}$ *and* >25 ac patch	>1 unit per 40 ac & <50% wildland vegetation (Stewart et al. 2003)
Intermix (WIX)	Structures scattered throughout, fuels continuous	1 unit per 0.3 to 40 ac	1 unit per 2.4 to 40 ac *and* % of WIX using 100 m treatment;	>1 unit per 40 ac & >50% wildland vegetation (Stewart et al. 2003)
Occluded	Structures abut "island" of fuels, often in city,	<1,000 acres	-	-
Community fire planning zone	0.5-2.0 mi from boundary of at-risk community		0.5, 1.0, 2.0 mi from WUI; 1 ha cells	1.5 mi buffer from WUI; blocks are units
Wildland vegetation	?	Forest & shrublands	Forest types from FUELMAN, location from NLCD, filtered	FUELMAN (1 km; Schmidt et al. 2002) NLCD (30 m; Radeloff et al. 2004)

Forest vegetation types

NLCD Cover type	*FUELMAN Vegetation Type**	*Km²*	*% US*
Water		1,925	5.05%
Dev. Low resl		82,083	1.02%
Dev. High res		21,041	0.26%
Dev. Comm..		45,462	0.56%
Transitional		166,781	2.07%
Forest – Coniferous or Mixed	White/red/j pine	106,564	1.32%
	E. spruce-fir	61,062	0.76%
	Longl. pine	104,047	1.29%
	Loblolly pine	352,732	4.38%
	Ponderosa Pine	208,266	2.59%
	Douglas-fir	124,956	1.55%
	Larch	9,787	0.12%
	W. White Pine	9,094	0.11%
	Lodgepole Pine	107,453	1.33%
	Heml. S. Spruce	8,072	0.10%
	Fir – Spruce	79,719	0.99%
	Redwood	15,127	0.19%
	P-Juniper	157,536	1.96%
	Oak-pine	120,638	1.50%
Forest - Deciduous	Oak-hickory	439,203	5.45%
	Oak-cypress	45,756	0.57%
	Elm As Cotton.	30,783	0.38%
	Mpl-Bch-Brch	182,110	2.26%
	Aspen-Birch	83,507	1.04%
	W. Hardwoods	30,025	0.37%
	Juniper – Pinyon	14,848	0.18%
Shrubland	Juniper Steppe	467	0.01%
	Mesquite bosques	568,588	7.06%
	Sagebrush	83,948	1.04%
	Chaparral	306,872	3.81%
	SW shrub steppe	441,221	5.48%
	Desert shrub	14,848	0.18%
	Annual (CA))	72,092	0.89%
Grassland	Mountain	104,733	1.30%
	Plains	701,698	8.71%
	Prairie	155,534	1.93%
	Desert	112,563	1.40%
	Texas savanna	40,473	0.50%
	Alpine tundra	42,391	0.53%
Wetl. Wdy		221,272	2.75%
Wet.Herb.		98,360.7	1.22%

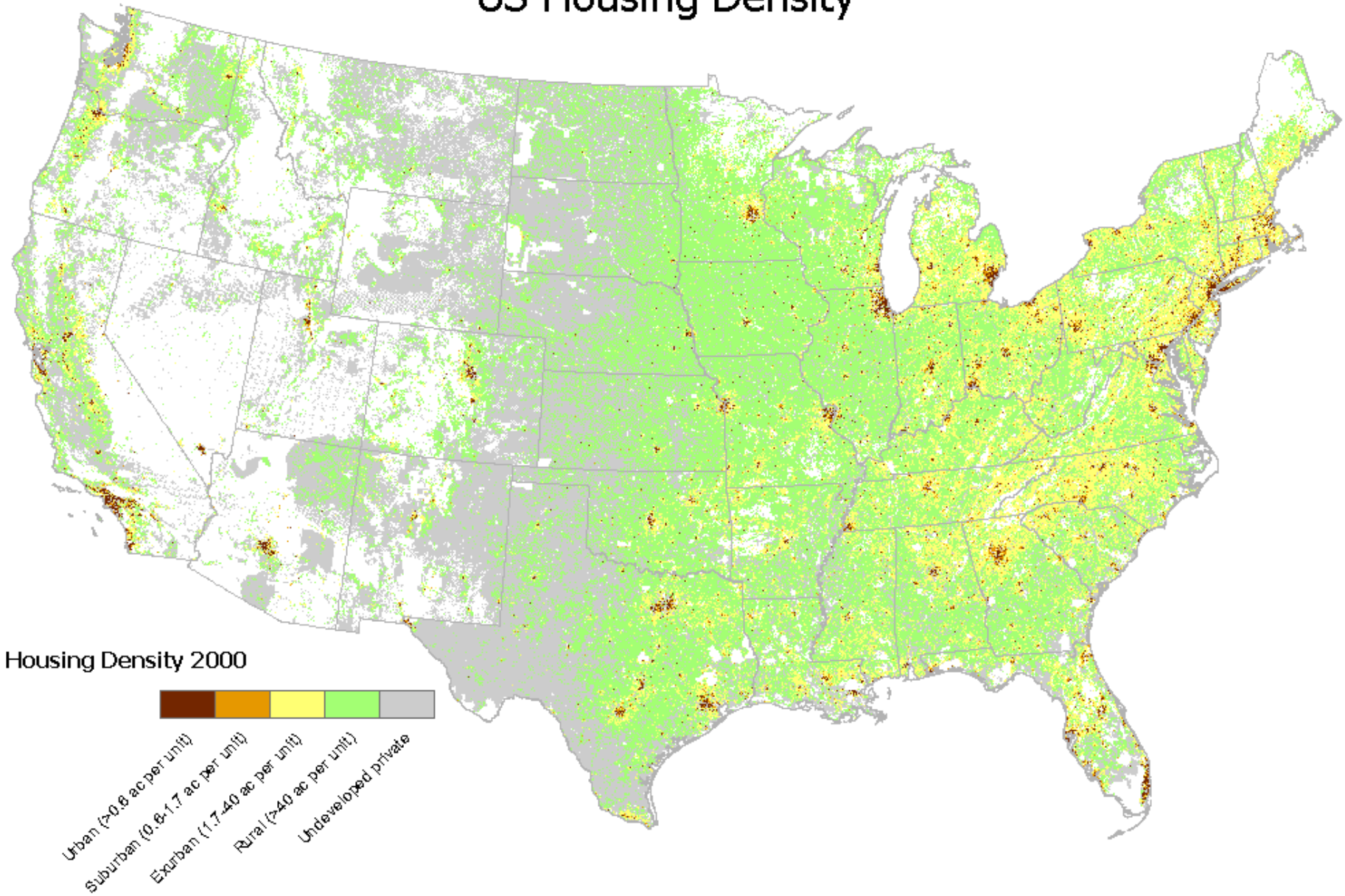

Interstates
Hazard Class
Low
High
High if not treated
None

Insects/pests (disease)

Development

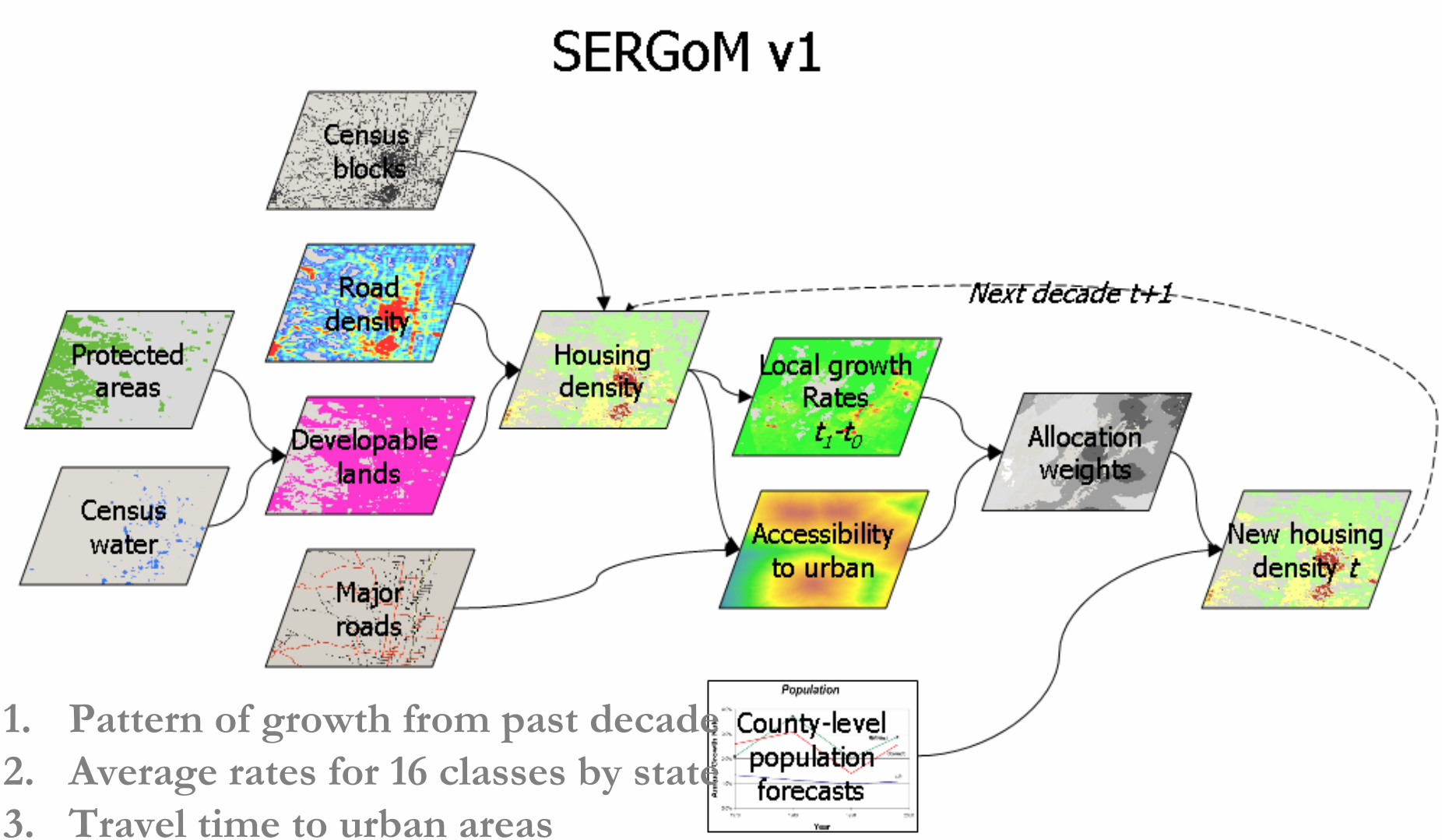
- Nationally consistent data → Census Bureau housing density (block-group, blocks)
- Why not blocks? 40x more than block-groups
- Remove undeveloped/undevelopable land (public, private conserved, water, etc.)

US Housing Density



Data source: US Census Bureau 2000 block-groups and blocks.
Created by David Theobald, Colorado State University. 17 June 2004.

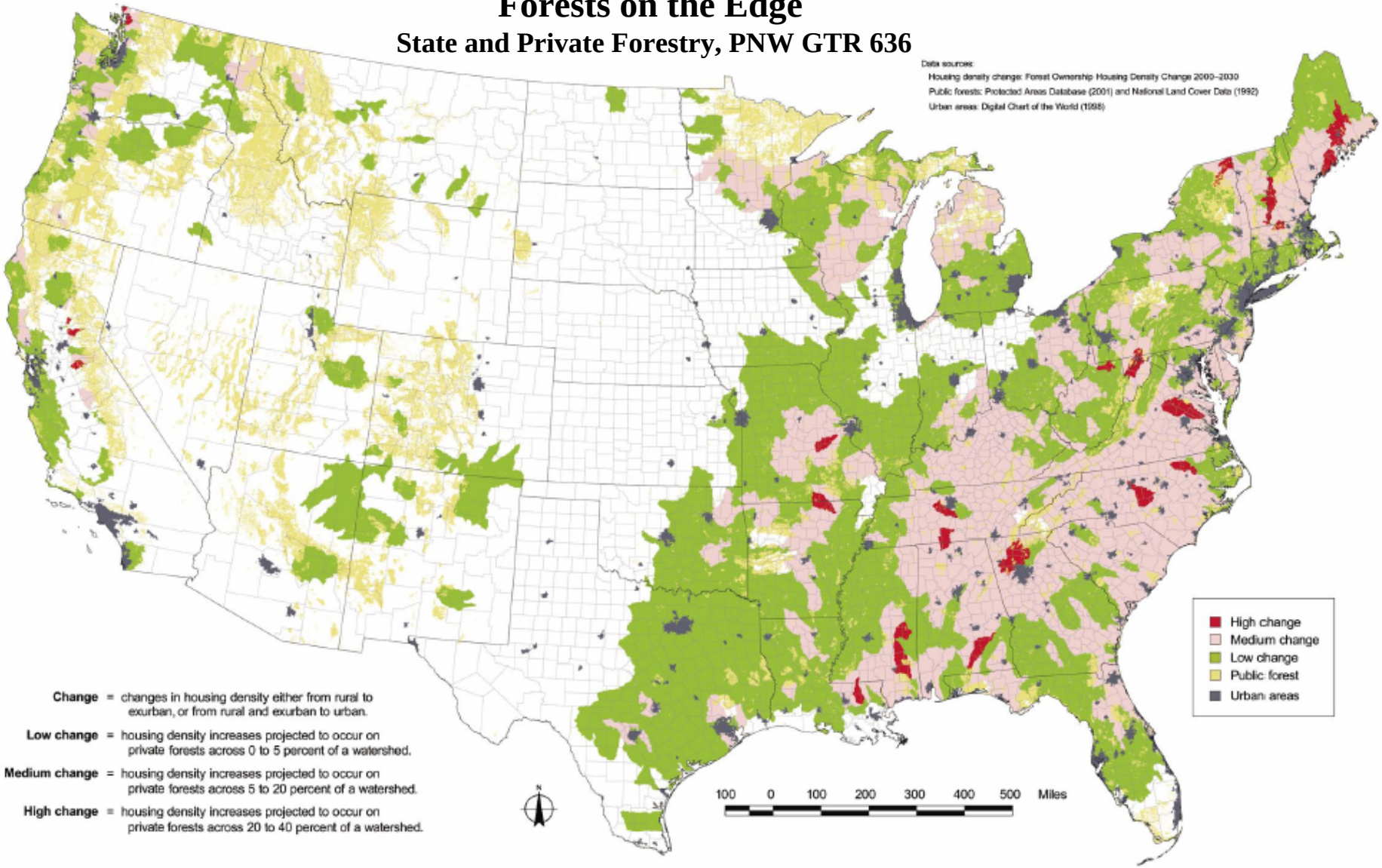
Forecast housing density



1. Pattern of growth from past decade
2. Average rates for 16 classes by state
3. Travel time to urban areas

Forests on the Edge

State and Private Forestry, PNW GTR 636



Change = changes in housing density either from rural to exurban, or from rural and exurban to urban.

Low change = housing density increases projected to occur on private forests across 0 to 5 percent of a watershed.

Medium change = housing density increases projected to occur on private forests across 5 to 20 percent of a watershed.

High change = housing density increases projected to occur on private forests across 20 to 40 percent of a watershed.

SERGoM parameters

1. weighting values can be adjusted as a function of distance away (travel time) from urban cores
   - Urban area (<5 minutes) carrying capacity, zoning
   - Exurban areas (~30-60 minutes) – increased fuel prices, more “new ruralism” amenity migration

2. Assumptions about households, particularly household size (number of people living in a single housing unit) – smaller or larger family sizes
3. Housing density class ranges (e.g., 10-40 acre exurban vs. ~2-10 ac exurban in the east
4. Amount of developable land changing over time from conservation (protected lands, easements, etc.)
5. Population growth rates – low, best, high; migration assumptions (EPA ICLUS project)
6. Other land cover types (e.g., commercial/industrial

Development “pressure”

- MA: Increased by 20 units per mi^2
- CO: HD 2030-2000 > 0.0, then 1.0 weight
- Why does it have to be change?
  - Look at Forest on the Edge:
  - at about suburban, exurban in 2000?

Forest patches

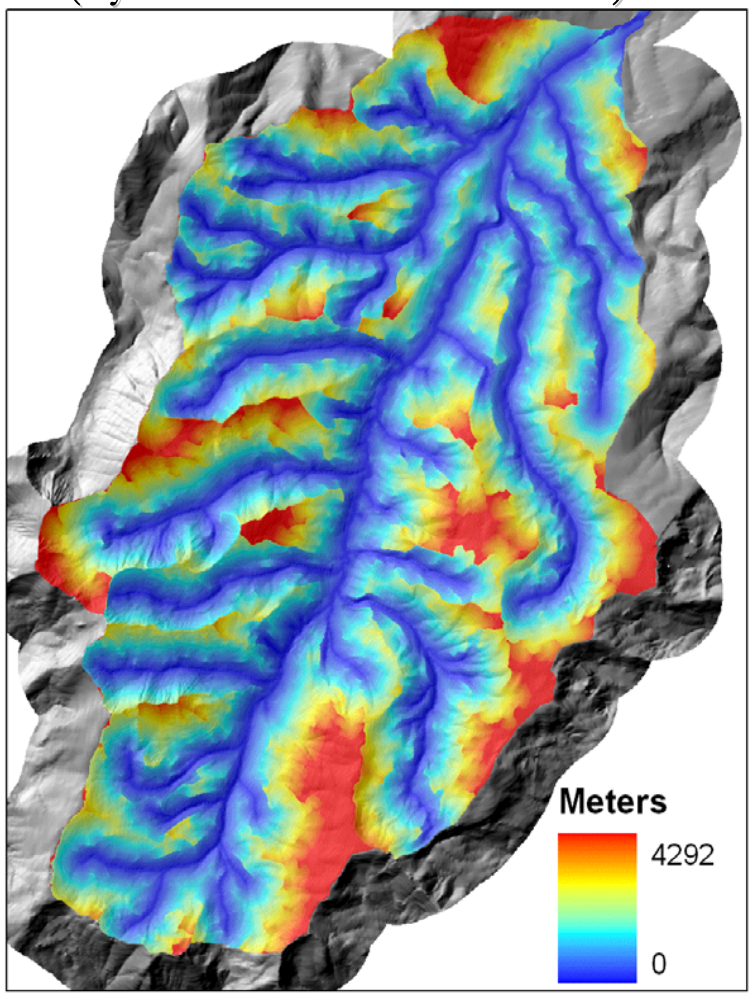
- NLCD – 41, 42, 43, 51, 91
- Assumption that you want to reduce large patches (CO)
- Why 1000 acres – why not continuous weighting?
- 100’ buffer on roads – what type of roads?
- Is 30 m distance enough to break process that “connects” a patch?
- Recognize forest types?

Public drinking water supply

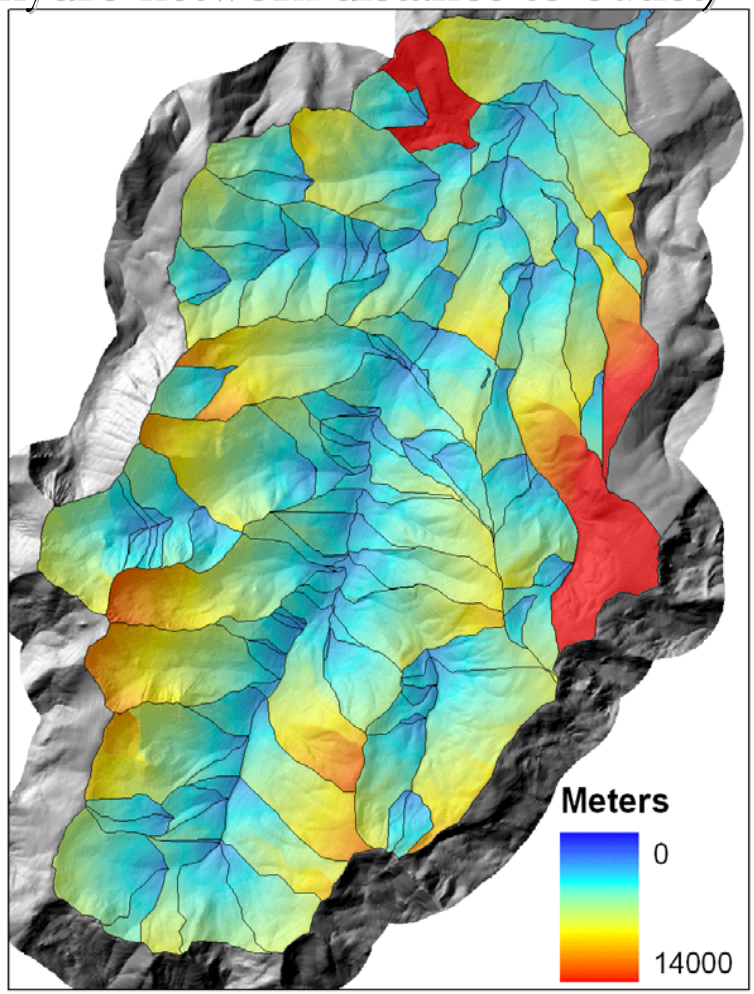
- Why entire watershed equal?
- How about distance upstream (along stream, uphill)

Within RCA hydro-weighting

Overland flow
(hydro distance to stream)



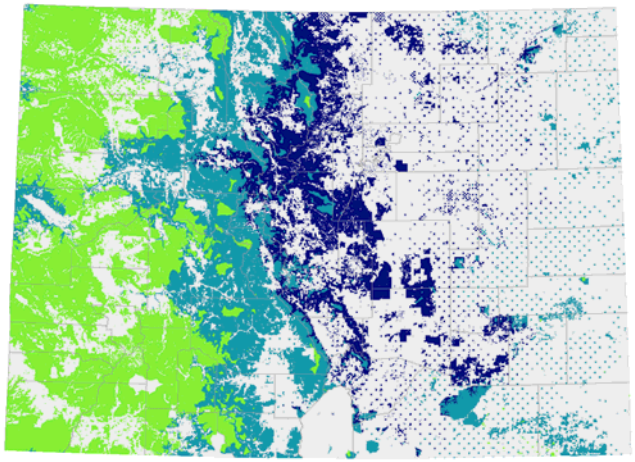
Instream flow
(hydro network distance to outlet)



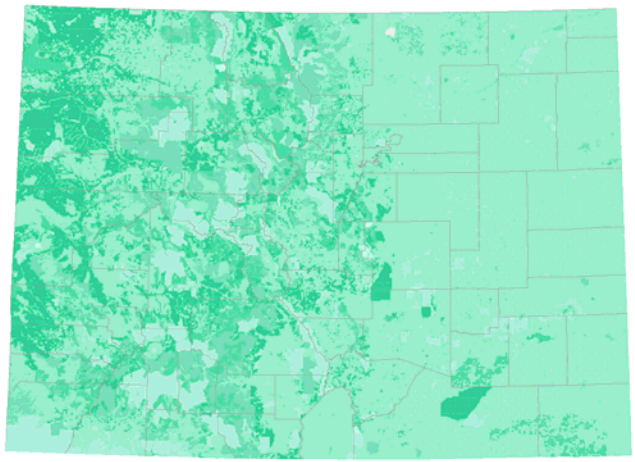
Proximity to public lands

- Why public lands? Recognize different public land uses as well as private conservation
- Why a buffer distance (1/4, ½ mile)? Why not continuous?

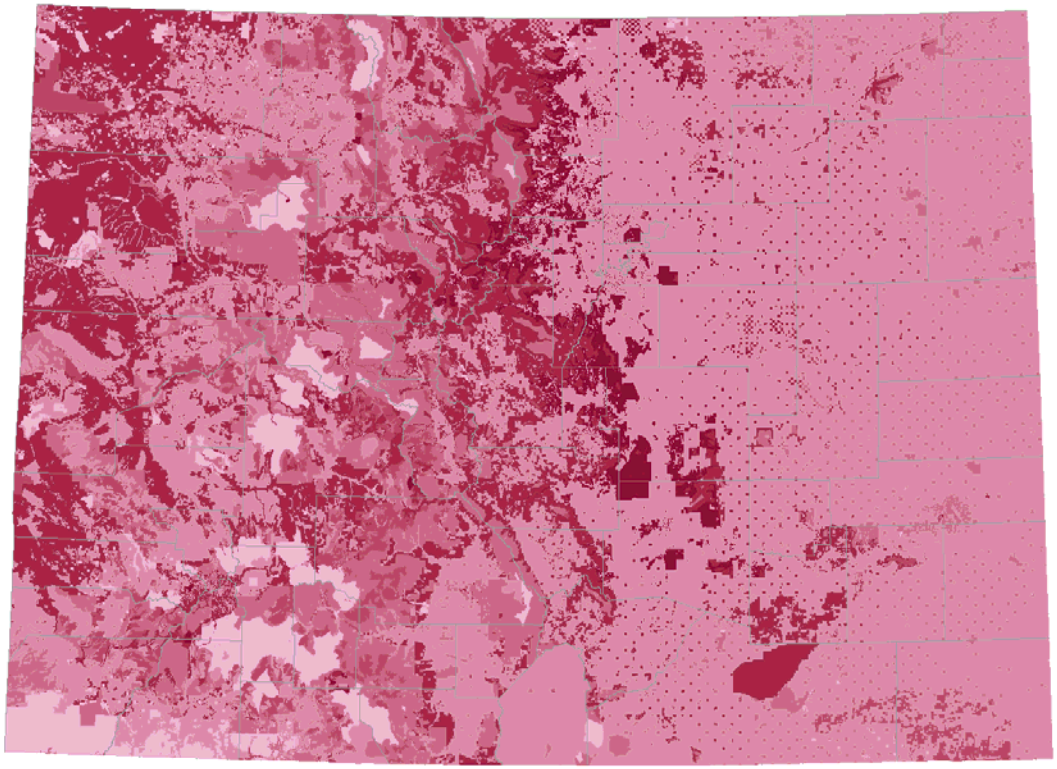
Recreation/tourism



Accessibility



Managed Uses



Composite

Wetlands

- Binary
- What about distance upstream from?

Riparian zones

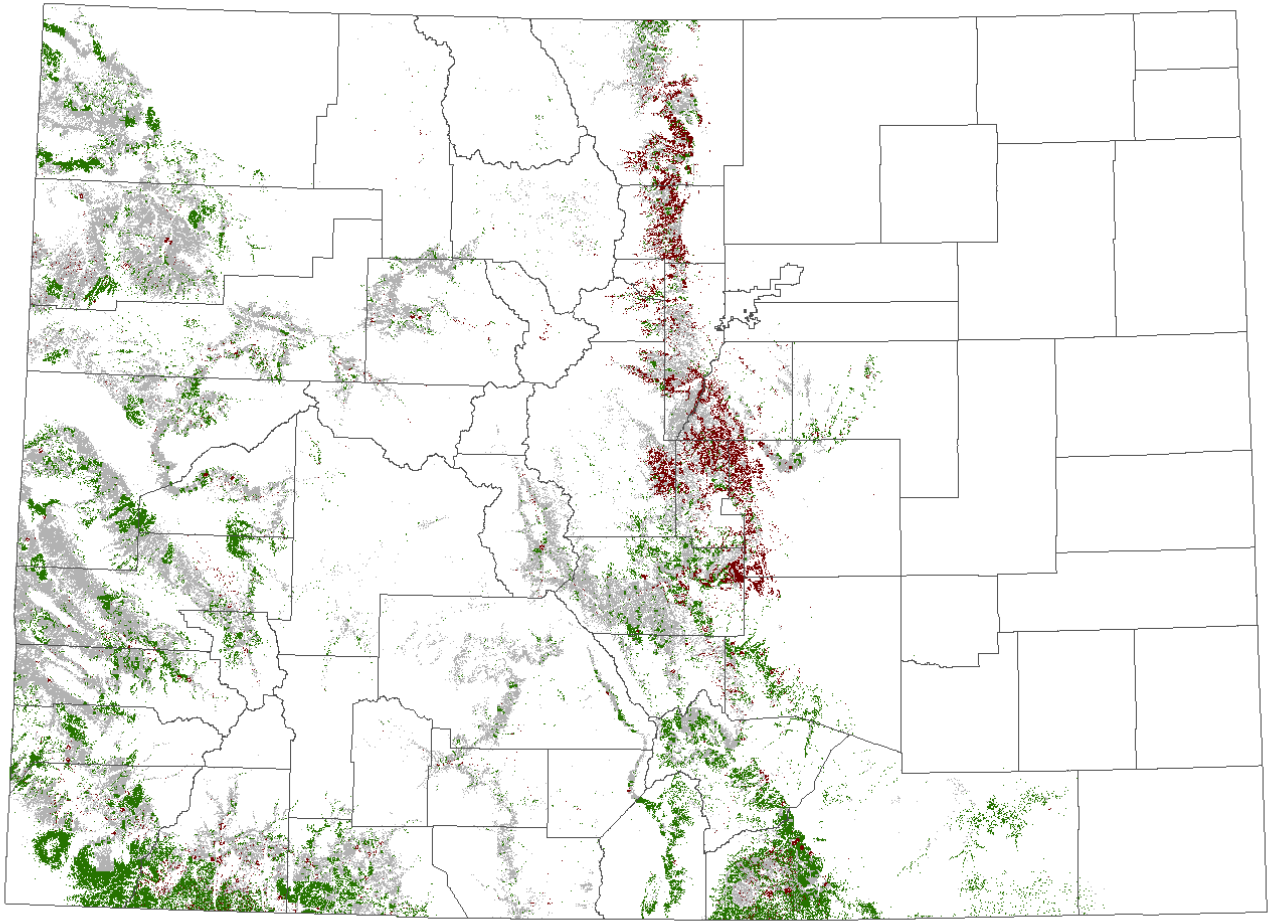
- Buffering 300’ streams (1:24k, or 1:100k)
- By stream order?
- Potential riparian zone – look at channel geomorphology (example from Ouray County)

Testing

- Check against existing stewardship lands
- Generate average or cumulative frequency distribution of values of existing vs. all others – do they rank high in the model?

Results (forest zones)

Ecological systems[1]	***Mean HMF (SD)***
Upper montane (spruce-fir)	0.329 (0.159)
Mid-montane (Douglas fir, Lodgepole pine)	0.428 (0.192)
Lower montane (Ponderosa pine, Pinyon-Juniper)	0.405 (0.203)
Aspen	0.313 (0.135)



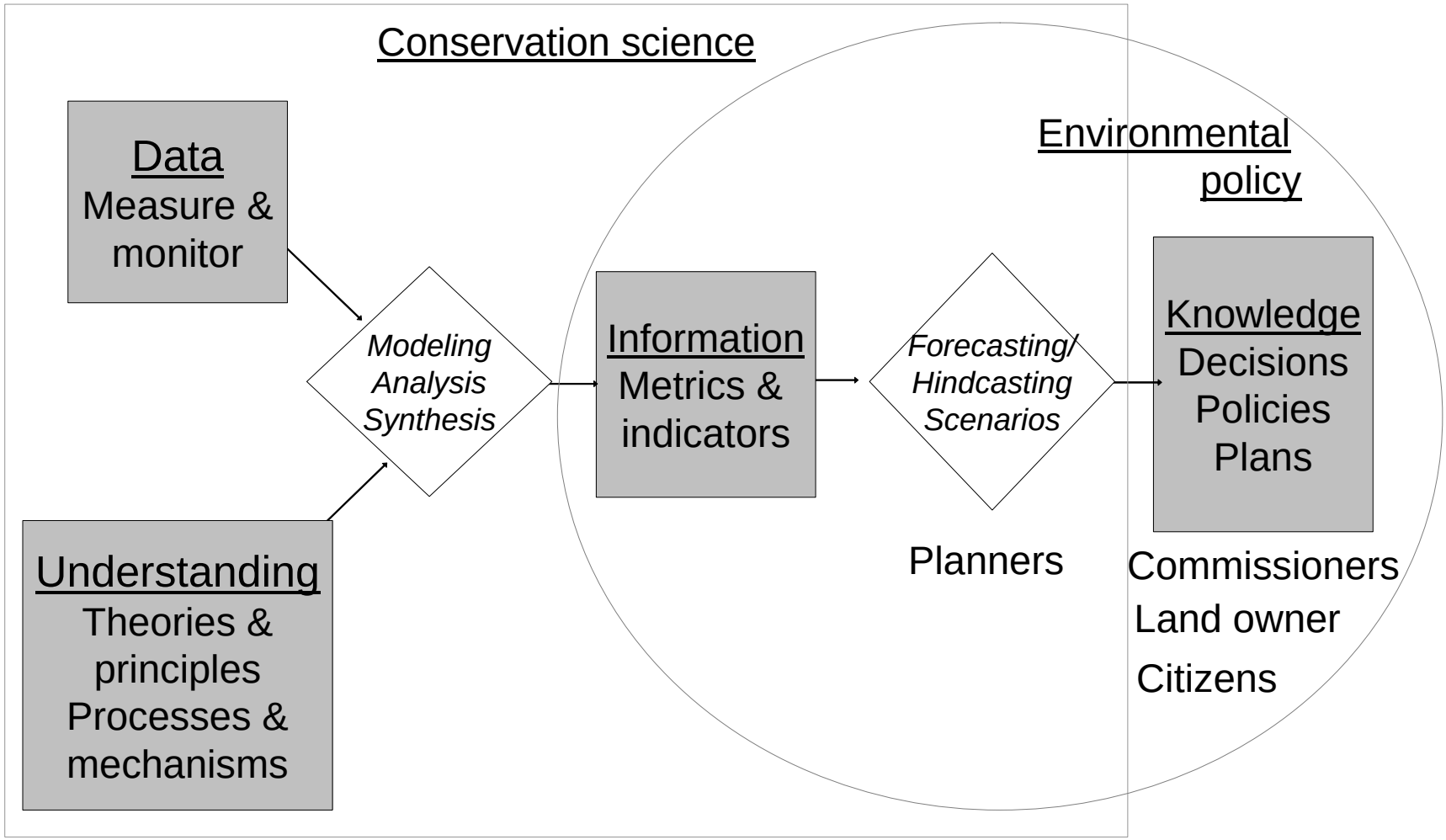
Statewide: 0.392 (SD=0.231)

Sensitivity analysis

- A lot of colinearity… test for it
- Private lands are about 30-40% of weights, figure in other layers as well

Refinements

- 1. stewardship/protected lands
- 2. topographically-enhanced analysis (accessibility, upstream, etc.)


Conservation science
Data
Measure & monitor
Understanding
Theories & principles
Processes & mechanisms
Modeling
Analysis
Synthesis
Information
Metrics & indicators
Forecasting/
Hindcasting
Scenarios
Environmental policy
Knowledge
Decisions
Policies
Plans
Planners
Commissioners
Land owner
Citizens