Living with Wildfire in the San Luis Valley
Methods and Data Sources, September 2018

Background

This document provides methods and data sources for the interactive map and website Living with Wildfire in the San Luis Valley.

In 2017, the San Luis Valley was accepted into Community Planning Assistance for Wildfire, a program of Headwaters Economics that provides land use planning, risk assessments, training, and custom research to communities to help better plan the wildland-urban interface. As a part of the program, stakeholders in the San Luis Valley identified the need for improved mapping tools to better define their wildland-urban interface, to identify areas of highest wildlife hazard from a land use and development perspective, and to communicate wildfire threats to the community.

To meet this need, Headwaters Economics partnered with Gage Cartographics and SLV GIS to develop geospatial data and an interactive web map, Living with Wildfire in the San Luis Valley. The purpose of the interactive web map is to help share information about wildfire history in the San Luis Valley, the connections between home development and wildfire risk, the linkages between watershed health and wildfire, and share resources for homeowners, residents, and visitors.

Methods and Data Sources

For this analysis, the San Luis Valley is defined by the boundaries of Alamosa, Conejos, Costilla, Mineral, Rio Grande, and Saguache counties of Colorado. The wildland-urban interface analysis also includes portions of Hinsdale and San Juan counties.

Watersheds

Watershed boundaries are based on the U.S. Geological Survey Watershed Boundary Dataset.[1] The Rio Grande Headwaters (HUC4) watershed makes up the majority of the San Luis Valley. Small portions of the Gunnison, San Juan, and Upper Canadian HUC4 watersheds are also in the San Luis Valley, but this analysis focused solely on the Rio Grande Headwaters HUC4.

Data for watershed importance are from the U.S. Forest Service dataset, From the Forests to Faucets: Drinking Water and Forests in the U.S., which models the importance of watersheds for surface drinking water.[2] The model incorporates data about water supply (volume), downstream water demand (consumption), and water quality based on natural processes and landscape protection. Watersheds are shown in a normalized (0-100) score of importance, with 100 representing the greatest importance.

Housing Trends and Growth Rates

A local GIS authority (SLV GIS) provided data about structures on each parcel and year built, which was mapped and plotted to view overall trends. Figure 1 shows new structures built each year since 1847.

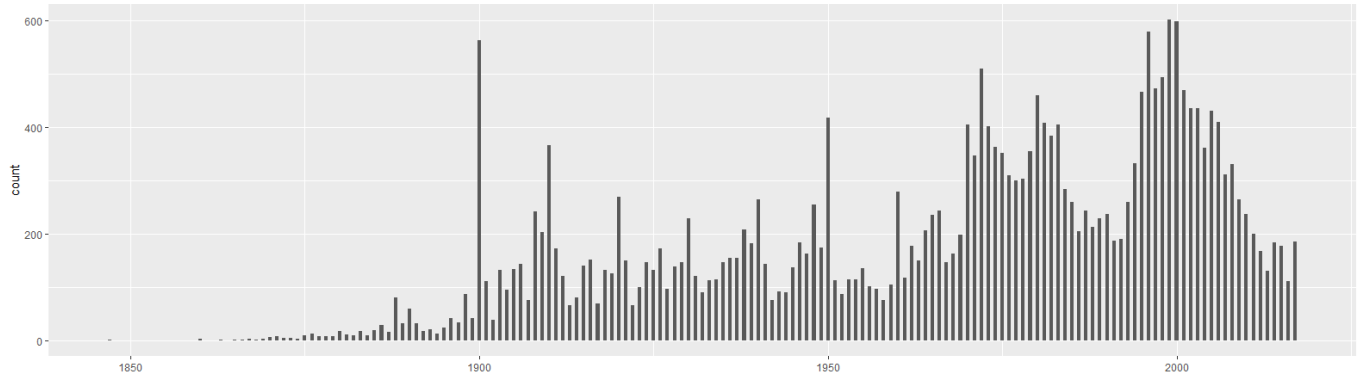

Figure 1: Structures built in the San Luis Valley each year, from 1867 through 2016. The large spike in 1900 is likely due to a change in record-keeping procedures.

Wildfire History and Risk

Polygons of recent fires and data about wildfire risk are from Colorado Wildfire Risk Assessment Portal (CO-WRAP).[3] Polygons of wildfire history were available from 2000 through 2018.

Based on local expert input, wildfire risk was approximated from the variable "Fire Intensity Scale (FIS)," which quantifies potential fire intensity based on high to extreme weather conditions, fuels, and topography. CO-WRAP categorized intensity into five classes. For the San Luis Valley analysis, the highest two classes were combined, as shown in Table 1.

Table 1: Crosswalk of Risk Classifications

CO-WRAP Class	SLV Class
0 (Non-Burnable)	Non-burnable
1 (Lowest Intensity)	Minimal Risk
2	Low Risk
3	Moderate Risk
4	High Risk
5 (Highest Intensity)	

FIS data from CO-WRAP is modeled at 30-meter resolution. This scale is accurate enough to generalize trends in the San Luis Valley but is not appropriate for site-specific local conditions. The resulting raster layer was smoothed using a focal statistical analysis with a 6x circular window. This removed noise in the data and simplified for display in the web browser.

To calculate housing growth trends in each risk class, zonal statistics were calculated for the majority value in each parcel. This approximated the overall risk value for the majority of cells in each parcel. Table 2 shows running totals of the number of homes in each risk class by decade.

Table 2: Total Number of Homes in Each Risk Category By Decade				
	Minimal Risk	Low Risk	Moderate Risk	High Risk
1850	0	1	0	0
1860	0	2	1	0
1870	0	15	2	0
1880	6	81	5	0
1890	26	290	14	1
1900	127	835	69	1
1910	279	1,849	88	3
1920	462	2,665	112	6
1930	629	3,577	155	13
1940	759	4,628	201	25
1950	935	5,704	264	48
1960	1,064	6,513	344	58
1970	1,215	7,904	435	71
1980	1,495	10,468	746	103
1990	1,679	12,332	1,042	147
2000	1,918	15,091	1,566	239
2010	2,116	17,509	2,150	326
2016	2,237	18,281	2,260	348

Land Cover Vegetation Classes

To help explain the risk found across different vegetation types in the San Luis Valley, maps of vegetation type were included with information about wildfires in each type. Vegetation data are from the Colorado Wildfire Risk Assessment Portal (CO-WRAP)[3]. Vegetation types were grouped into simplified classes based on how they would burn, resulting in a reclassified raster of burnable types. For the web map, the raster dataset was converted to polygons. Table 3 shows the original values and final grouped values.

Table 3: Crosswalk of Land Cover Vegetation Classes	
Generalized Class	CO-WRAP Class
Cottonwood Bosque	introduced riparian
	riparian
Mixed Conifer	aspen
	lodgepole pine
	mixed conifer
	ponderosa pine
	spruce fir
Pinon-Juniper	pinon juniper
Shrub Steppe	grassland
	oak shrubland
	shrubland
n/a	agriculture
	open water
	urban
	non-burnable

Wildland-Urban Interface (WUI)

Wildland-Urban Interface (WUI) is included as a layer in the Map Explorer portion of Living with Wildfire in the San Luis Valley. WUI definitions are derived from the Federal Register,[4] as adapted by Radeloff et al.[5] and further refined by the U.S. Forest Service's Rocky Mountain Research Station through the Community Planning Assistance for Wildfire program.

WUI classes are based on an analysis of vegetation and structure density to characterize where structures are in or near burnable vegetation. WUI is categorized into two classes: interface and intermix. Interface are areas where housing is close to or abuts contiguous wildland vegetation. Intermix are areas where housing and wildland vegetation intermingle. Vegetation data are from CO-WRAP[3] (as described above) and structure density was derived from a combination of address points and parcels categorized as "improved" for the six-county area and portions of Hinsdale and San Juan counties, as provided by SLV GIS. To simplify the display, the resulting raster layer was smoothed using a focal statistical analysis with a 6x circular window. Technical criteria for interface and intermix are as follows:

- Interface: areas with at least 1 structure per 40 acres and ≤50% wildland vegetation and within 1.5 miles of an area with >75% wildland vegetation; and

- Intermix: areas with >0 structures per 40 acres and >50% wildland vegetation.

Land cover types classified as non-burnable include agriculture, water, and non-burnable.

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About Headwaters Economics

Headwaters Economics is an independent, nonprofit research group whose mission is to improve community development and land management decisions. https://headwaterseconomics.org/

References

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