Preparing Colorado for a Resilient Future

February 24, 2016
Meeting Overview

- Welcome & Introductions
- Overview of Resiliency Planning
- Colorado Resiliency Framework
- Planning for Hazards: Land Use Solutions for Colorado
- Integrating Hazards and Resilience into Local Planning
- Discussion
Today’s Panel: See Packet for Bios

- Andrew Rumbach, Assistant Professor, University of Colorado Denver

- Iain Hyde, Deputy Director, Colorado Resiliency and Recovery Office

- Anne Miller, AICP, Senior Planner, Colorado Department of Local Affairs

- Dale Case, AICP, Land Use Director, Boulder County
Resilience

A (Very) Brief Overview
What is Resilience? Two Metaphors

- **Resilio**: leap or spring back; rebound
  - Households, communities or systems ‘bounce back’ after a shock or stress
  - Implies that we want to return to previous state - is that a good thing?

- Resilience akin to health and well-being
  - Everyday activities like eating well and exercising make our bodies more able to handle unexpected illnesses and injuries
  - The benefits of a community being in ‘shape’ are not always obvious, until disaster strikes
‘Acts of God’ $\rightarrow$ Hazards to Defend Against $\rightarrow$ Prepare & Respond $\rightarrow$ Mitigation & Vulnerability Reduction
Uncertainty and the Origins of Resilience

Atmospheric CO$_2$ at Mauna Loa Observatory

Scripps Institution of Oceanography
NOAA Earth System Research Laboratory

[Graph showing CO$_2$ levels from 1960 to 2010]

Financial crisis
Crash of 200

Disbelief, and a punter reaches...
The goal of resilience is for communities to anticipate, withstand and recover quickly from shocks and stresses, with minimal outside assistance.
Why Resilience?

- From negatives to positives
  - Disaster risk reduction, vulnerability, hazard mitigation > community resilience

- Recognizes complexity and interconnectedness of natural and human systems

- Shifts planning away from ‘one time’ events and towards a recognition of hazards as ongoing and routine features of environmental systems
  - Incorporate disaster planning and management into everyday actions and plans

- Accepts uncertainty as part of planning
Characteristics of Resilient Communities

- **Anticipate** shocks and stresses and take meaningful actions to address them, i.e. they assess risk
- Build **redundancy** into core human and infrastructural systems to prevent catastrophic failures
- Promote **diversity** by continually seeking to include a wide range of “publics” in decision making processes
- Work to remain **flexible** to adapt to unexpected shocks and inevitable change
- Build excess **capacity** to marshal during times of disaster
- Create meaningful feedback loops from experience to policy and practice, i.e. they never stop **learning**
Emerging Questions About Resilience

- Resilience of what? for whom?
- Is resilience a process? An outcome? Both?
- Resilience at what scale?
- How do we measure / assess / monitor resilience?
- Who is responsible?
Thank You!

Andy Rumbach

Assistant Professor of Planning and Design at University of Colorado Denver

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State Resiliency & Recovery Efforts
What is Resiliency?

“The ability of communities to rebound and positively adapt to or thrive amidst changing conditions or challenges -- including disasters and changes in climate -- and maintain quality of life, healthy growth, economic vitality, durable systems and conservation of resources for present and future generations.”

- Colorado Resiliency Working Group
Resiliency Considerations

Quality of life

- Colorado consistently ranks as one of the best places to live in the US

Healthy growth

- Colorado is expected to increase by 2.7 million by 2040; how do we effectively manage this growth?

Durable systems

- Systems and services are able to withstand high levels of pressure and stress and continue to function, including during natural hazards and economic shocks

Conservation of resources

- Critical resources that impact public health, economic output, healthy ecosystems, and quality of life are protected assets

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<th>Jurisdiction</th>
<th>2010 Census</th>
<th>Estimated 2013</th>
<th>Estimated 2020</th>
<th>Estimated 2040</th>
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<td>5,924,692</td>
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<td>52,360</td>
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*Source: Colorado Department of Local Affairs Demography Office
## Colorado Disaster History

<table>
<thead>
<tr>
<th>Disaster</th>
<th>Communities Impacted</th>
<th>Disaster Impacts</th>
</tr>
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<tbody>
<tr>
<td>1965 Floods</td>
<td>Colorado Front Range (South Platte and Arkansas basins)</td>
<td>21 lives lost; $540M damages (1965 dollars); resulted in construction of Chatfield and Bear Creek reservoirs</td>
</tr>
<tr>
<td>Big Thompson Flood (1976)</td>
<td>Primarily Larimer County between Estes Park and Loveland</td>
<td>8 inches of rain in a one hour period; 145 lives lost; 418 houses destroyed.</td>
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<tr>
<td>2002 Drought and Wildfires</td>
<td>Statewide. Major fires included Hayman, Coal Seam, Missionary Ridge and others</td>
<td>Hayman fire burned 137k acres; Missionary Ridge 70k acres; Chronic debris flow and post-wildfire floods</td>
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<tr>
<td>2012-2013 Fires</td>
<td>Statewide. Large fires in Larimer, El Paso, Fremont counties and the San Luis Valley</td>
<td>More than 1100 homes destroyed, $1.2B in insurance claims</td>
</tr>
<tr>
<td>2013 floods</td>
<td>24 counties impacted</td>
<td>10 lives lost; 1800 homes destroyed, $3.9B in damages</td>
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Vulnerability To Shocks and Stresses

**Shocks** cause significant immediate damage, injuries and deaths or result in sudden changes to a community. They can include:

- **Natural hazards**, such as wildfires, flooding or winter storms.
  - Is drought a shock or stress? Both?

- **Human-caused hazards** such as hazardous materials spills, acts of violence/terrorism.

**Stresses** are chronic conditions that magnify vulnerability and make it harder to recover from shocks, such as:

- **Economic** or **social** stresses, like high unemployment, affordable housing shortage, aging infrastructure or lack of social cohesion.

- **Environmental** stresses, such as, changing climate conditions, poor water quality or forest health.
Why Prioritize Resiliency?

- History tells us Colorado is not immune to disasters; they will happen again
- Conditions are changing
- Population is growing
- We want to preserve and enhance our way of life
- Federal policy moving towards the need for more state and local pre-disaster action
The Resiliency ROI

Wildfire mitigation saves Cedar Heights neighborhood and 187 homes in Colorado Springs during Waldo Canyon Fire in 2012

Longmont Left Hand Creek channel improvements; $5.4 million in investment pre-flood, $22 million in estimated losses avoided during 2013; 3.91 ROI.

National Institute of Building Sciences report:

For every $1 invested in mitigation, $4 return in future losses avoided. Resiliency expands notion of ROI to economic, environmental, social benefits.

Local, state and FEMA partnerships to update hydrology and hazard maps; communities utilizing up-to-date risk information in recovery/reconstruction efforts
What Have We Accomplished So Far?

- Colorado Resiliency Framework and Annual Operating Plan
- Pilot local resiliency strategy plans
- Resiliency built into recovery grant programs
Colorado Resiliency Framework

- Result of 2-year partnership across state, 150+ stakeholders from state, federal, local government and non-governmental organizations

- Governor adopted the Framework May 28th, 2015

- Establishes a vision and definition of resilience for the State of Colorado

- Seeks to empower a culture of resilience in Colorado communities

- Identifies guiding principles

- Outlines specific and concrete strategies
Resiliency Sectors and Partners

COLORADO Department of Transportation
Region 4

COLORADO Resiliency & Recovery Office
Governor John W. Hickenlooper

COLORADO Department of Local Affairs

FEMA

COLORADO Division of Homeland Security & Emergency Management
Department of Public Safety

COLORADO Environment & Natural Resources

COLORADO Department of Natural Resources

COLORADO Energy Office

COLORADO Resiliency & Recovery Office
Governor John W. Hickenlooper

COLORADO Department of Human Services

COLORADO Office of Economic Development & International Trade

COLORADO Office of Economic Development & International Trade

COLORADO U.S. Department of Transportation
Federal Highway Administration

COLORADO Department of Public Health & Environment
Framework Annual Operating Plan

- Developed and implemented each year
- Includes projects from all six Framework sectors for 2016
- Will be available on www.coloradounited.com in coming weeks
- Annual resiliency report at the end of each year

Sector Project Descriptions

Community

Sector Snapshot
A resilient community is one in which community members are involved and have the necessary information and available tools to make resilient decisions. The Community Sector integrates the concerns of risk management, preparedness and smart growth into land use planning and community engagement in order to build state and local capabilities and resources that facilitate holistic pre- and post-disaster recovery planning, effective implementation, and community resiliency and sustainability.

Project Profiles
1. Local Government Financial Resilience Education

Financial stability is critical for creating a resilient community. This project will provide education and guidance to local governments on how to plan for financial resilience, including planning for revenue disruption. Being prepared for revenue impacts and disruption is critical for local governments because it impacts the services and amenities they provide to their communities (particularly vulnerable populations), including potable water, sanitation, transportation, health services, education, infrastructure, etc.

Lead Agency
Colorado Department of Local Affairs

Supporting Agencies
Colorado Municipal League, Colorado Counties, Inc., Special District Association, Universities
Pilot Local Resiliency Plans

- Three pilot county-wide plans in highly flood/fire impacted counties:
  - Boulder
  - Larimer
  - El Paso

- Evaluate existing conditions, shocks and stresses across sectors

- Identify broad range of strategies

- State Framework model/guide for local plans
What Can Communities Do?

Understand

- Educate yourselves and staff about what resiliency is and why it matters
- Develop partnerships – across sectors and across jurisdictions
- Engage networks, neighborhoods and community members and build social capital

Source: Urban Drainage and Flood Control District
What Can Communities Do?

Plan

- **Build a team** to coordinate activities across sectors; partner with private sector non-profits
- **Establish a vision** for resilience in your community
- **Thoroughly study your current and future risk**; understand hazards in the context of stresses
- **Develop a local resiliency plan**
- **Integrate risk and resiliency** into local plans and policies

Source: Colorado Springs Fire Department
What Can Communities Do?

Act

- Invest in resiliency practices; build resiliency criteria into budgeting process (i.e., capital improvements)
- Integrate resiliency into design standards and practices (housing, infrastructure, watersheds)
- Implement resiliency projects that achieve multiple benefits (i.e., infrastructure protection, economic development and water quality)
- Dedicate staff to resiliency efforts
What Could DRCOG Potentially Do?

- Facilitate or participate in development of a regional resiliency framework to align with Metro Vision 2040

- Continue to integrate resiliency concepts into future Metro Vision updates and other regional planning efforts
  - Already aligns with many principles, including open space protection, GhG reduction, regional housing needs, etc.

- Fantastic DRCOG data, analysis and GIS work provides a foundation to study how risk to metro communities will change over time in the region
  - Population growth, changing climate conditions, interface of urbanization and flood risk, growth in Wildland Urban Interface etc.
  - Partner with Urban Drainage and Flood Control District (UDFCD) or other organizations?
Questions?

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DRCOG – Metro Vision Idea Exchange
February 24, 2016
Overview

- Why planning for hazards is important to Colorado
- Approaches to planning for hazards
- Overview of the planning for hazards guide
- Moving forward – next steps
Why Planning for Hazards is Important to Colorado
Why Colorado?

- The population is growing
- We are no stranger to hazards (and they are increasing in frequency and severity)
- Many communities face hazards
  - Riparian areas (floodways)
  - Forested areas (wildland-urban interface)
  - Ridgelines with (great views/steep slopes)
State Resiliency Framework

- **Colorado Resiliency Framework 2015**
- A “call to action” for Colorado communities
- This guide identified as an action
Approaches to Planning for Hazards
Approaches to Consider

Avoidance

*The most effective way to protect development from hazards is simply to prohibit development in known hazard areas.*

But that’s not always possible.........
Approaches to Consider

- Prevent development in hazardous areas
- Direct future growth to safer areas
- Strengthen existing development in hazardous areas
Consider Community Context

- Size and geographic location
- Technical, administrative, and financial capacity
- Community goals and political will
Consider the Interrelatedness of Hazards

For example:

- Drought → Fire
- Lightning → Fire
- Fire → Flooding
- Fire → Debris Flow
- Flooding → Soil Hazards
Consider Climate Change

- Colorado Climate Plan (2015) suggests that Colorado temperatures will increase another 2.5 to 5 degrees Fahrenheit by 2050
  - Longer and more severe droughts
  - Faster and earlier snowmelt
  - More frequent periods of extreme heat
Planning for Hazards – A Collaborative Approach

- Land use planners
- Emergency managers
- Elected and appointed officials
- Public works officials
- Citizens
- Community advocates
- Business owners
- Developers
Overview of the Planning for Hazards Guide
Outline:

- Introduction and Summary
- Planning Framework
- Hazard Identification and Risk Assessment
- Planning Tools and Strategies
- Moving Forward
- Appendix – Hazards in Colorado
The Hazards Lineup

- Avalanche
- Drought
- Earthquake
- Extreme Heat
- Flood
- Hazardous Material Release
- Landslide, Mud/Debris Flow, and Rockfall
- Severe Winter Storm
- Soil Hazards
- Wildfire
- Wind Hazards
Planning Tool Profiles - Categories

- Addressing hazards in plans and policies
- Strengthening incentives
- Protecting sensitive areas
- Improving site development standards
- Improving buildings and infrastructure
- Enhancing administration and procedures
Planning Tool Profiles – The Lineup

- Integrating Risk Reduction into Comprehensive Plans
- Climate Plan
- Community Wildfire Protection Plan (CWPP)
- Hazard Mitigation Plan
- Parks and Open Space Plan
- Pre-Disaster Planning
- Community Rating System
- Development Agreements
- Transfer of Development Rights
- Density Bonuses
- 1041 Regulations
- Cluster Subdivisions
- Land Acquisition
- Overlay Zoning
- Stream Buffers and Setbacks
- Low-Impact Development and Stormwater Management BMPs
- Site-Specific Assessments
- Subdivision and Site Layout Standards
- Use-Specific Standards
- Building Code
- Critical Infrastructure Protection
- WUI Code
- Application Submittal Requirements
- Post-Disaster Building Moratorium
What’s in the Tool Profiles?

Subdivision and Site Design Standards

Hazards Addressed

- Flood
- Landslide
- Stormwater
- Rockfall
- Seismic

How It Works

Subdivision and site design standards are used by communities to regulate how parcels of land are divided into developable lots, and how those lots are subsequently designed and laid out through the development process. Subdivision typically includes the creation of a sketch plan (showing basic lot layout and provisions for public infrastructure), and subsequent creation of a more detailed preliminary plat (indicating building footprints and specific measurements), and then culminating in a final plat that creates the new lots. Abbreviated procedures are typically established for minor subdivisions that involve the creation of just a handful of lots.

Site design standards are related and define the basic parameters for development on individual lots, including maximum or minimum lot size, how buildings are situated on a lot, traffic and circulation patterns, pedestrian connectivity, preservation of open areas, and avoidance of hazardous areas.

Communities increasingly consider hazard mitigation when adopting site layout standards. For example, applicants are required to avoid mapped hazard areas (like floodplains) in new development or to develop strategies to mitigate the hazard risk.

Implementation

As communities grow, they should identify where new growth should be concentrated through long-range planning mechanisms, such as the comprehensive planning process. There can be pressure to locate new development in areas that are known to be at risk from hazards. Communities must balance competing interests when reviewing proposed development. For example, the need for additional workforce housing in a community should be balanced against the desire to protect natural areas, view corridors, and natural hazard areas, as well as the safety and welfare of future inhabitants of the development. Communities are challenged with keeping development out of harm’s way while allowing individuals to develop land consistent with stated policies. Communities can often find middle ground through subdivision standards that allow for new subdivisions to be approved when they meet conditions to mitigate hazards, such as water cisterns for wildfire protection, slope stabilization for landslide and rockfall, and keeping buildable lots out of the floodplain. Additional incentives and regulations can be explored such as cluster subdivisions, density bonuses, and Transfer of Development Rights (TDRs), each of which are good tools for promoting avoidance of hazards. Each of these are discussed in separate planning tool profiles.

According to APA’s Zoning Practice Issue on Safe Growth Audits (Godschalk, 2009), communities should ask themselves the following questions related to their subdivision regulations:

1. Do the subdivision regulations restrict the subdivision of land within or adjacent to natural hazard areas?
2. Do the regulations provide for conservation subdivisions or cluster subdivisions in order to conserve environmental resources?
3. Do the regulations allow density transfers where hazard areas exist?

As with zoning codes, adoption of subdivision ordinances or site layout standards requires approval by the governing body (City Council, Board of Trustees, or County Commissioners).

Where It’s Been Done

Pagosa Springs adopted sensitive area protection standards for subdivisions and for redevelopment of existing areas in its Land Use and Development Code (2015). The standards generally address the following issues:

- Slopes: Slopes greater than 30 percent, or are otherwise unstable or subject to hazards, are not allowed to be platted or developed for residential uses without mitigation controls in place.
- Natural Features: Subdivisions or development shall protect waterways, vegetation, and rocks and other natural features or vistas.
- Areas of Special Flood Hazard: Mapped flood hazard areas identify areas where subdivisions shall not be approved without evidence that it is not in a flood hazard or meets other flood damage protection regulations to the satisfaction of the floodplain administrator.
- Geologic Hazard Areas: Subdivisions and site plans must meet mitigation conditions prior to approval in mapped geologic hazard areas in the Town as the information becomes available, including provisions to prevent danger to human life or property.
- Wildfire Hazard Areas: Applicants for subdivisions or other development must provide evidence from a professional forester that the proposal meets several conditions, including adequate roads for emergency services and criteria for wildfire areas published by the Colorado State Forest Service.
- Perimeter Fencing: Limits the height to protect migration of elk and deer.
- Riparian Setbacks: To promote and preserve the quality of the river ecology, aesthetic, and recreation.

In addition to these standards, approval criteria for major subdivisions also address areas that may involve soil or topographical conditions that present hazards.
What’s in the Tool Profiles?

KEY FACTS

Administrative capacity: Experienced planner with city or county attorney to write ordinance. Skilled planners to administer program and track implementation.

Mapping: Technical mapping of sending and receiving areas is typically required.

Regulatory requirements: Land use regulations. Also, an intergovernmental agreement (IGA) typically is used if the TDR program is administered as a joint initiative between multiple jurisdictions.

Maintenance: Yes, requires extensive on-going tracking mechanism for TDRs.

Adoption required: Yes, the requirements and conditions for TDRs must be specified in the local land use regulations.


Associated costs: Extensive staff time. TDRs will require outside consulting for land value expertise and dedicated staff for long-term maintenance of the program.

EXAMPLES

Boulder County Land Use Code: bouldercounty.org/doc/landuse/laudearticle06.pdf Section 6-700

City of Fruita Land Use Code: fruta.org/sites/default/files/fileattachments/community_development/page/242/17.09.pdf Chapter 17.09 TDR

Mesa County Land Development Code: mesacounty.us/planning/land-development-code.aspx Section 5.8

Transferable Density Credits

Pitkin County Land Use Code: pitkincounty.com/DocumentCenter/View/5888 Section 6-70

Routt County PDR program: www.co.routt.co.us/DocumentCenter/View/16

Summit County TDR program: co.summit.co.us/index.aspx?NID=187

King County, Washington TDR bank: kingcounty.gov/environment/stewardship/sustainable-building/transfer-development-rights/bank.aspx

FOR MORE INFORMATION

elionassociates.com/pdfs/duarksan.tdrless.pdf
## Model Code Language

- Integrating Risk Reduction into Comprehensive Plans
- Climate Plan
- Community Wildfire Protection Plan (CWPP)
- Hazard Mitigation Plan
- Parks and Open Space Plan
- Pre-Disaster Planning
- Community Rating System
- Development Agreements
- Transfer of Development Rights
- Density Bonuses
- 1041 Regulations
- Cluster Subdivisions
- Land Acquisition
  - Overlay Zoning
  - Stream Buffers and Setbacks
  - Low-Impact Development and Stormwater Management BMPs
- Site-Specific Assessments
  - Subdivision and Site Layout Standards
  - Use-Specific Standards
- Building Code
- Critical Infrastructure Protection
- WUI Code
- Application Submittal Requirements
- Post-Disaster Building Moratorium
Model Code Language

- Language to be tailored for local governments (in blue)
- Based on several best practices throughout Colorado and the nation
- Includes commentary for further explanation (in margin)
Case Study – Cluster Subdivisions

Applicability

A. Cluster subdivisions are permitted in the [name of district(s)] zoning districts.

B. Clustering of lots is required in the following:
   1. New subdivisions in the [name of district(s)] zoning districts.
   2. New subdivisions in a wildfire hazard area of [insert range of severity level of mapped wildfire hazard areas].

**Applicability:** Cluster subdivision can either be mandatory or optional. Many communities limit the districts where clustering benefits can be achieved (such as low-density residential or agricultural districts). For mapped hazard areas, communities can require clustering in certain instances (e.g., high to extreme wildfire hazard rating). Mapping can be tied to the comprehensive plan or hazard mitigation plan.
# Case Study – Cluster Subdivisions

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<td><strong>Big City</strong></td>
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<td>San Miguel County</td>
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Appendix – Hazards in Colorado

- Expanded information related to the hazards profiled in the guide. Each hazard includes:
  - Description of the hazard
  - Hazard risk in Colorado
  - Related hazards
  - Available data sources
  - Summary of applicable planning tools and strategies
www.planningforhazards.com

Purpose of the Guide
Learn how the Hazard Mitigation Guide can help your community address risks and integrate hazard mitigation into policies, regulations, and standards.

Intro
This guide provides detailed, Colorado-specific information about how to assess a community’s risk level to hazards and how to implement several land use planning tools and strategies for reducing a community’s risk.

Read the Guide
To explore this guide or specific chapters in the traditional format, Page-by-Page from start to finish, look for the purple Table of Contents on the top right and the previous/next buttons on the bottom of each page.
Goals of the Website

- Accommodate different user experiences
- Offer user-friendly interface
- Make it easy to access information from the printed guide
- Bring the document to life through enriched media
- Maintain it over time
“Jim’s Scenario”

Interested in wildfire, Jim has some burning questions…

- How does wildfire impact Colorado communities?
- What types of planning tools can address wildfire?
- What other hazards can be addressed with the same planning tool?
- Is there model code language for that planning tool?
Wildfire

Description

The Colorado Natural Hazards Mitigation Plan defines a wildfire as an unplanned, unwanted wildland fire, including unauthorized human-caused fires, escaped wildland fire use events, escaped prescribed fire projects, and all other wildland fires where the objective is to put the fire out[36]. Wildland fire occurs when vegetation, or “fuel,” such as grass, leaf litter, trees, or shrubs, is exposed to an ignition source and the conditions for combustion are met, resulting in fire growth and spread through adjacent vegetation.

Wildland fires are either ignited by lightning or by some consequence of human activity. In Colorado, lightning accounts for only 17 percent of wildfires, with human ignitions accounting for the remainder[37]. Human causes vary and can include escaped debris pile burning, campfires, fireworks, construction sparks, downed transmission lines, and arson.

Wildland fires can occur during any time of year. Although there are frequent references to a “fire season,” ignitions are a result of the ability of fuels to support combustion. In addition to an ignition source, the fuel type, amount of fuel, distribution pattern, and moisture content—coupled with weather and topography—will determine the conditions for combustion and resulting fire behavior. Fire behavior “outputs” include intensity,
Overlay zoning is used by communities to apply area-specific standards and/or conditions to ancillary zoning districts (such as residential or mixed-use) that determine the types of uses permitted, the dimensional requirements, and sometimes additional district-specific standards. An overlay district (or overlay zone) is an additional layer of standards that apply to all areas within a defined overlay boundary, regardless of the underlying base zoning district. For example, an area with single-family homes that is zoned R-1 might also be within a hillside overlay zone. In this example, the permitted uses might allow construction of a single-family home according to the R-1 standards.
Moving Forward/Next Steps
Next Steps

- Website goes live in March
  - Sign up for updates here: www.planningforhazards.com
- Attend a training
  - RMLUI Conference, March 10, etc.
  - Webinar in April
- Have a need for training/technical assistance?
  - Contact anne.miller@state.co.us
- Send best practices to andrew.rumbach@ucdenver.edu
Questions & Discussion

- What are the most effective ways to educate and engage communities through Colorado?
- What resources and information do communities need to be successful?
THANK YOU!

Questions? Please contact Anne Miller: anne.miller@state.co.us