Natural Working Lands

Colorado Resiliency Office's
Climate Adaptations and Futures Webinar Series
September 01, 2021
12 P.M. - 1 P.M.

COLORADO
Resiliency Office
Department of Local Affairs

Welcome –
Climate Adaptations & Futures Webinar Series

Today marks the 10th webinar in the monthly Climate series!

Recordings of all webinars are available here:
https://www.coresiliency.com/trainings-and-events

Please use the chat to communicate any questions or comments to all attendees.

Please use the Q&A to ask any questions to the panelists only.

Your microphone is on mute.

This webinar is being recorded and will be posted on the Colorado Resiliency Office's Website:
https://www.coresiliency.com/trainings-and-events

Moderator

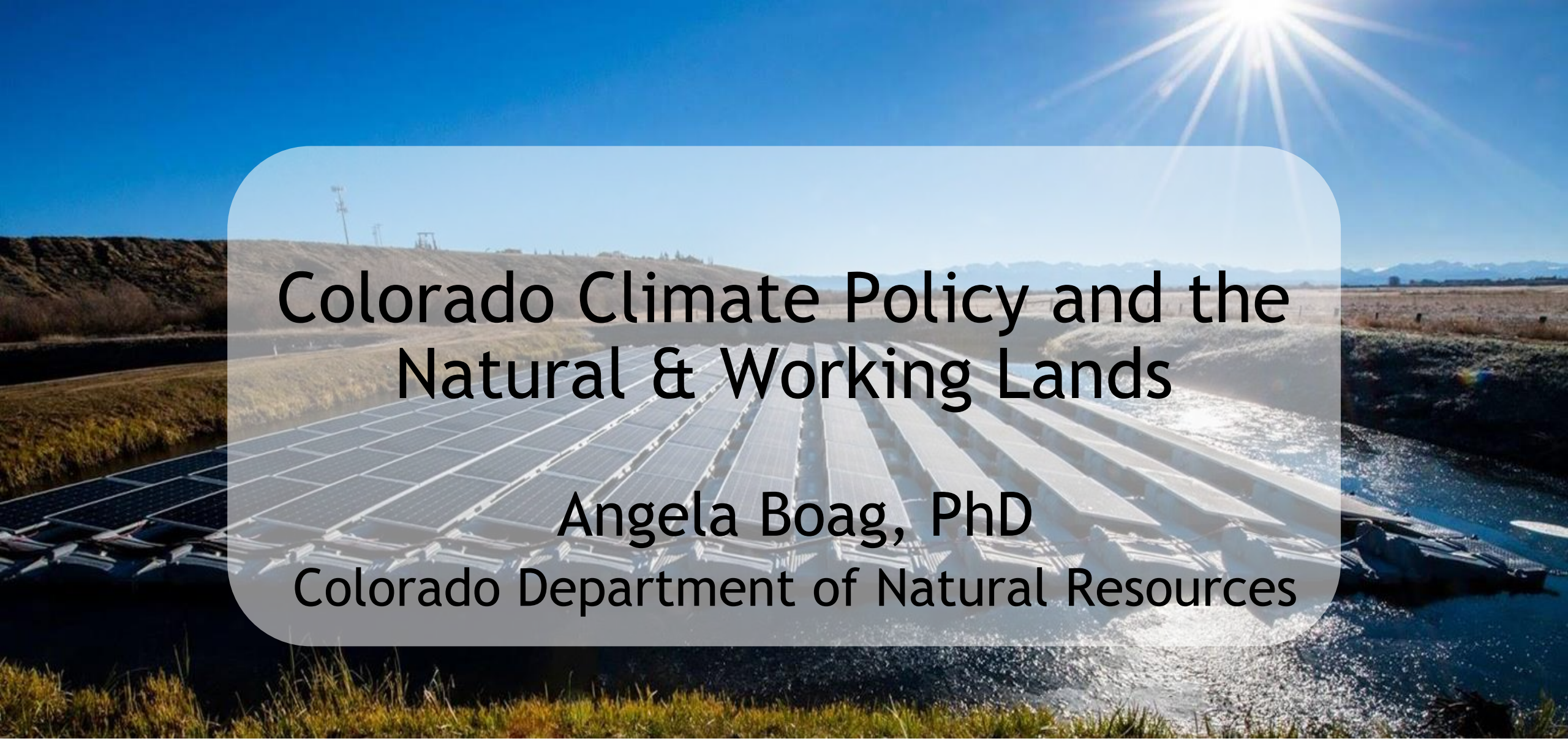
Angela Boag
Assistant Director for Climate, Forest Health and Energy
Colorado Department of Natural Resources

Panelists

Chris Menges
Sustainability Programs Administrator
City of Aspen

Erin Glen
GIS Analyst
World Resources Institute

Tim Sullivan
Natural Climate Solutions, Director
Yampa Valley Sustainability Council



Colorado Climate Policy and the Natural & Working Lands

Angela Boag, PhD

Colorado Department of Natural Resources

COLORADO
Department of Agriculture

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Department of
Natural Resources

Natural and Working Lands - Key Terms

- Natural and Working Lands (NWL) include forests, farms, rangelands, grasslands, urban greenspace and wetlands, and their potential emission sources (e.g. wildfire emissions) and carbon sinks (e.g. forests and grasslands absorbing CO_2)
- Natural Climate Solutions (NCS): conservation, restoration and improved land management actions that increase carbon storage or avoid greenhouse gas emissions in landscapes
- NWLs have the potential to sequester a proportion of Colorado's emissions, but this varies widely by land potential, season, and year due to wildfires, forest insects and disease, drought, etc.
- **The mission of the Colorado Natural and Working Lands (NWL) Task Force is to promote voluntary reduction of greenhouse gas emissions, and restore, protect and enhance carbon sequestration across all natural and working lands in Colorado**

Colorado's Major Climate Legislation

(HB19-1261 - Targets) (HB21-1266 - Targets/Equity) (SB 19-096 - Inventory) (HB21-1181 - Soil Health Program) (HB21-1242 - ADCRO)

- Establish greenhouse gas inventory with 2005 baseline
- Reduce GHG emissions 26% by 2025, 50% by 2030, and 90% by 2050
- Develop rules and policies to reduce GHG emissions
- Creates regulatory path for electric utilities to meet 80% GHG reduction by 2030
- Requires annual tracking and reporting through CDPHE

Colorado's Major Climate Legislation

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Establish gree

Reduce GHG

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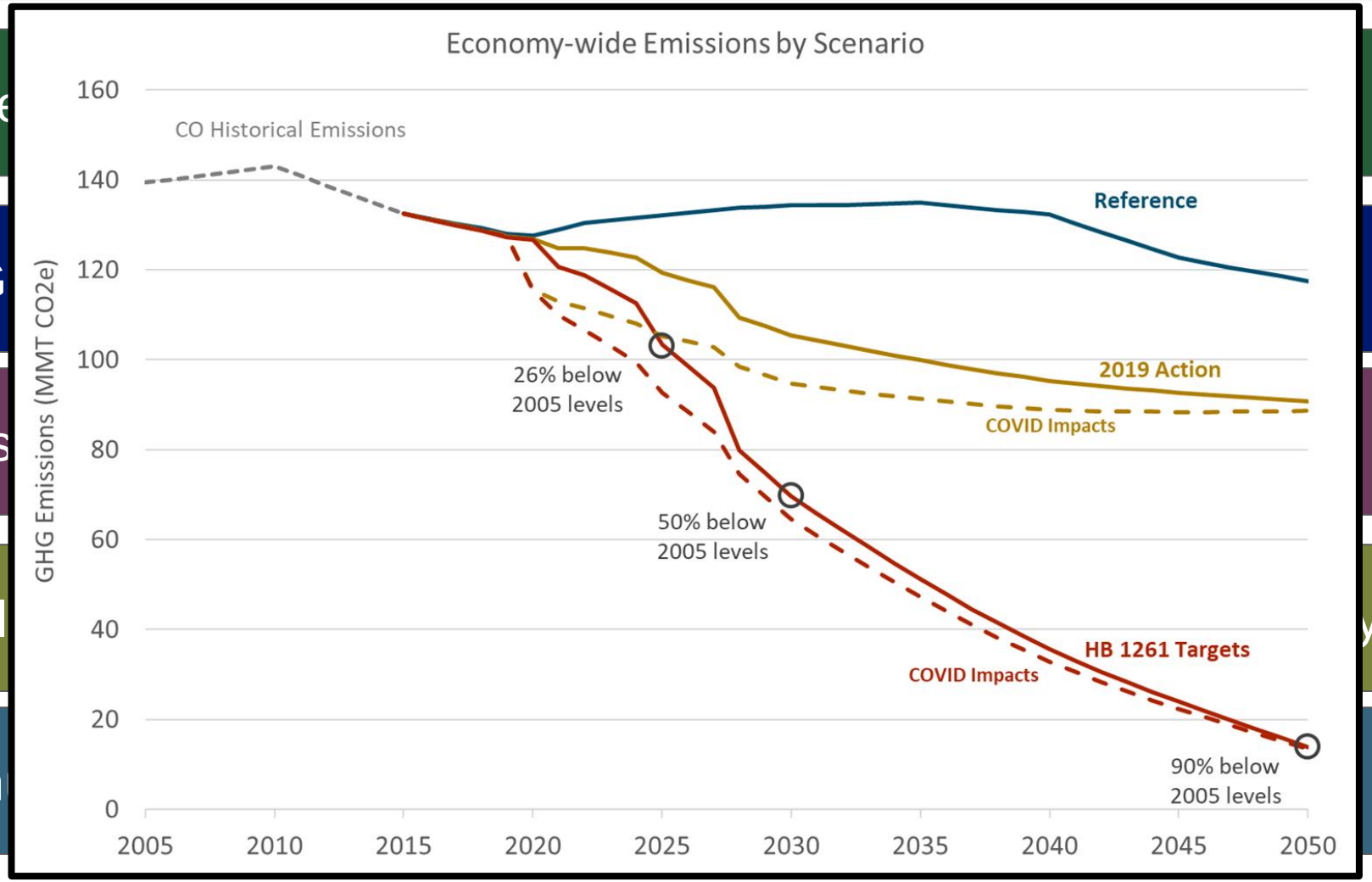

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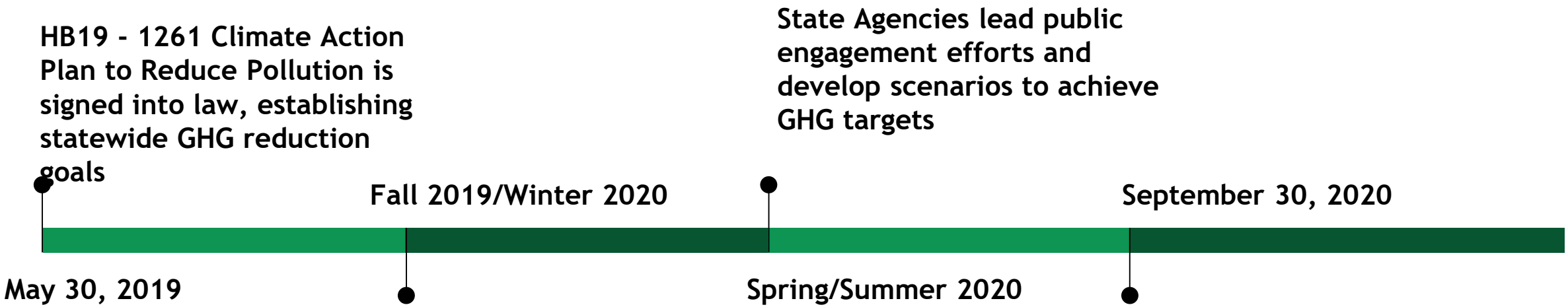
COLORADO Department of Agriculture

COLORADO Department of Transportation

COLORADO Department of Natural Resources

Colorado Greenhouse Gas Roadmap Timeline



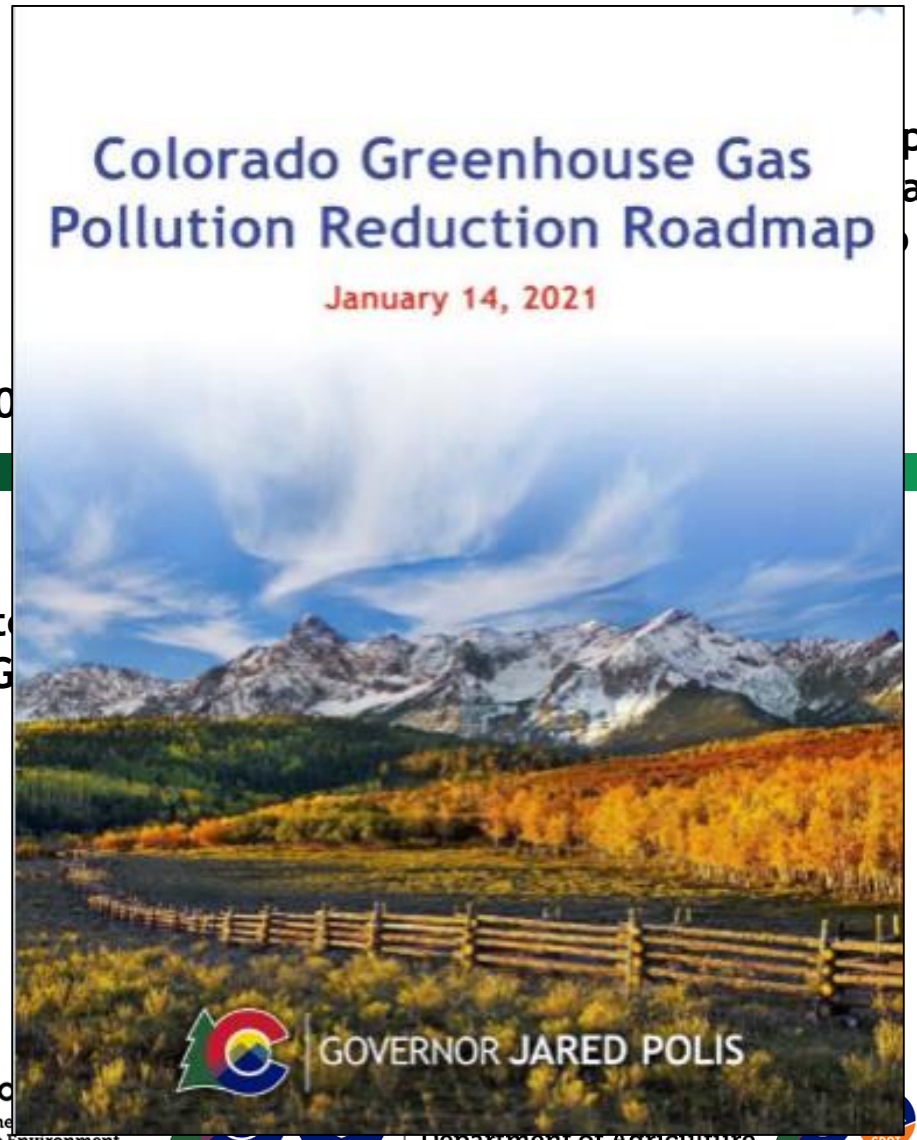
Colorado Greenhouse Gas Roadmap Timeline

HB19 - 1261 Climate Action Plan to Reduce Pollution is signed into law, establishing statewide GHG reduction goals

May 30, 2019

Fall 20

Stat
GHG



public
and
achieve

September 30, 2020

Final GHG Roadmap delivered to CO Air Quality Control Commission

- **GHG Scenario Modeling**
- **Scenario Inputs, Results, and Models**
- **Greenhouse Gas Emissions Roadmap**

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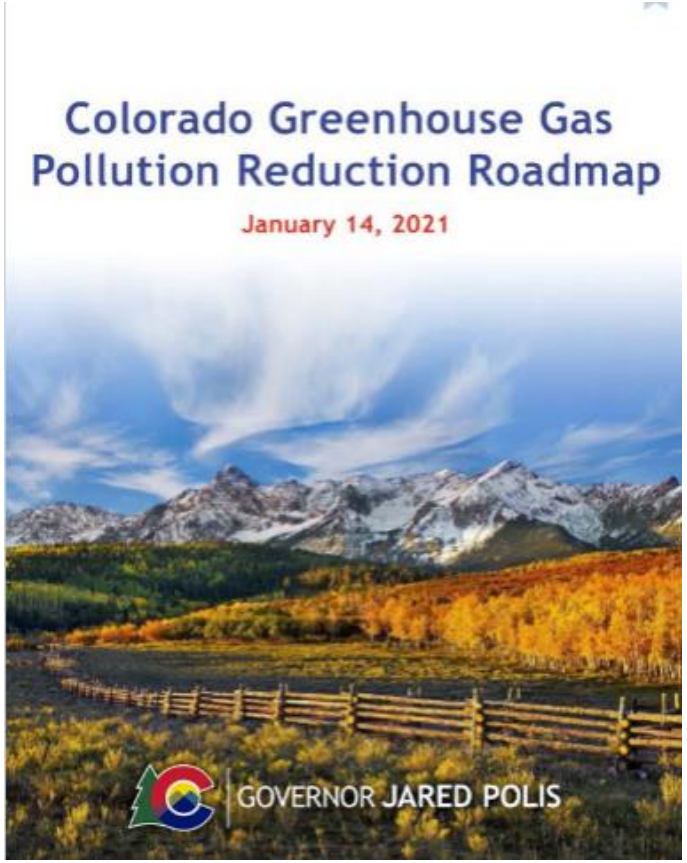
Near Term Actions: Natural and Working Lands

- Develop a refined NWL emissions inventory and NWL Strategic Plan with stakeholder feedback
- Voluntary/incentive-based approaches
- Improve soil function and carbon sequestration through regenerative farming practices
- Support voluntary participation in such efforts as Field to Market, Soil Health Partnership and Precision Agriculture programs
- 2030: Agricultural soil emissions reduced by 1 MMT CO_2eq



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CITY OF ASPEN

Land-based carbon & Natural Climate Solutions in the Roaring Fork Watershed

9/1/21

What the presentation will cover

- What we've done and why
- Our research and process findings
  - Quantitative
  - Implications and recommendations (stakeholder driven, informed by data)
- Where we are now
- Where we might be going

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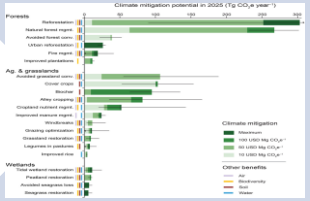
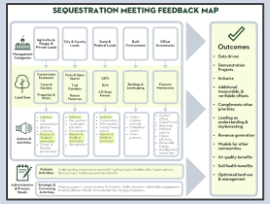
Process summary: Why

Kickoff Meeting (Feb 2020)

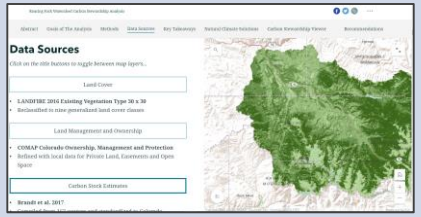


‘Feedback Map’ (Mar 2020)



‘Subgroup lead’ meetings (April - Dec 2020)

Analysis, mapping (April ‘20 – ‘21)



Stakeholder meeting (April 2021)

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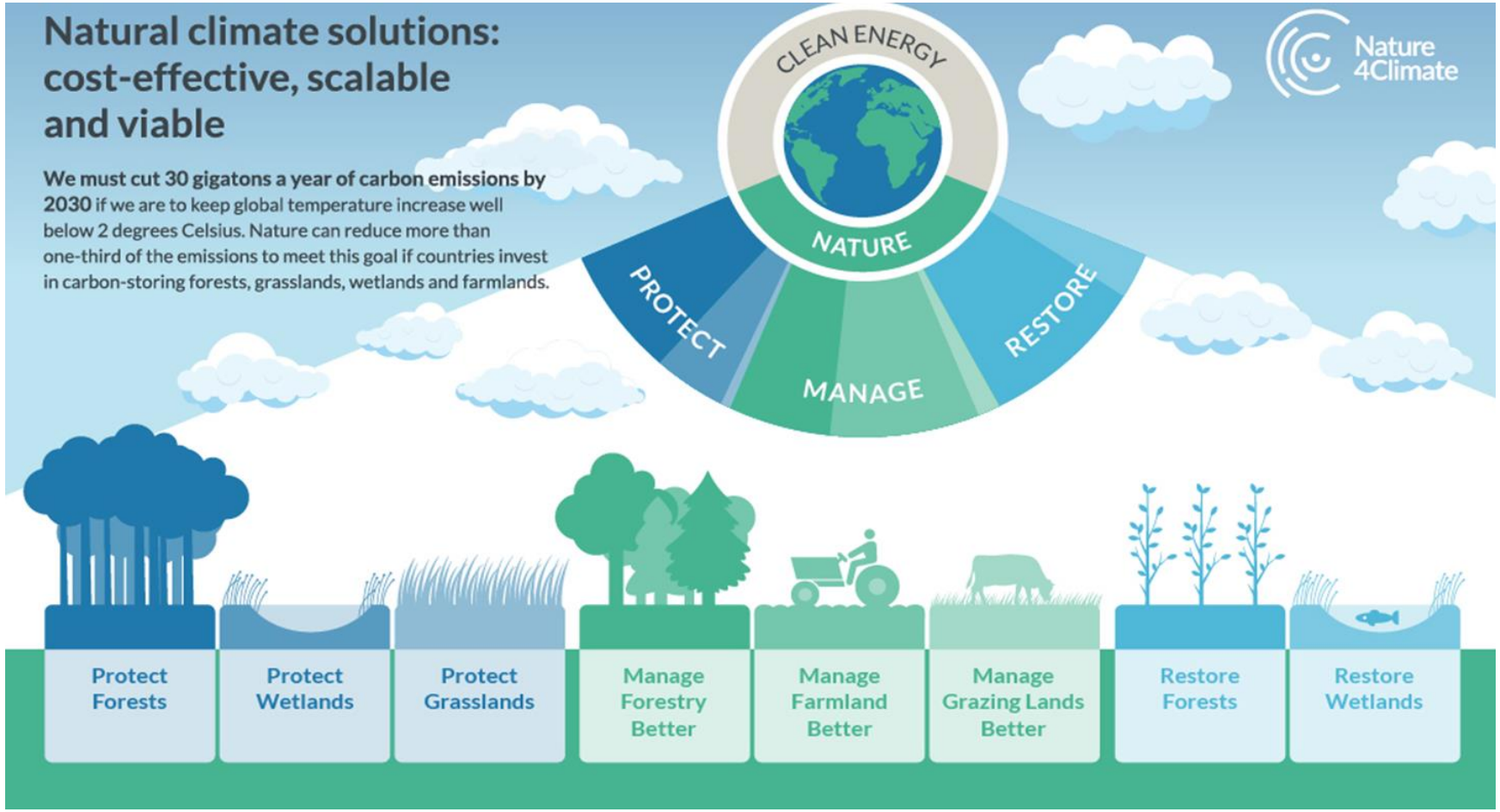
Kickoff Meeting

Kickoff Meeting (Feb 2020)



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Feedback Map

‘Feedback Map’ (Mar 2020)

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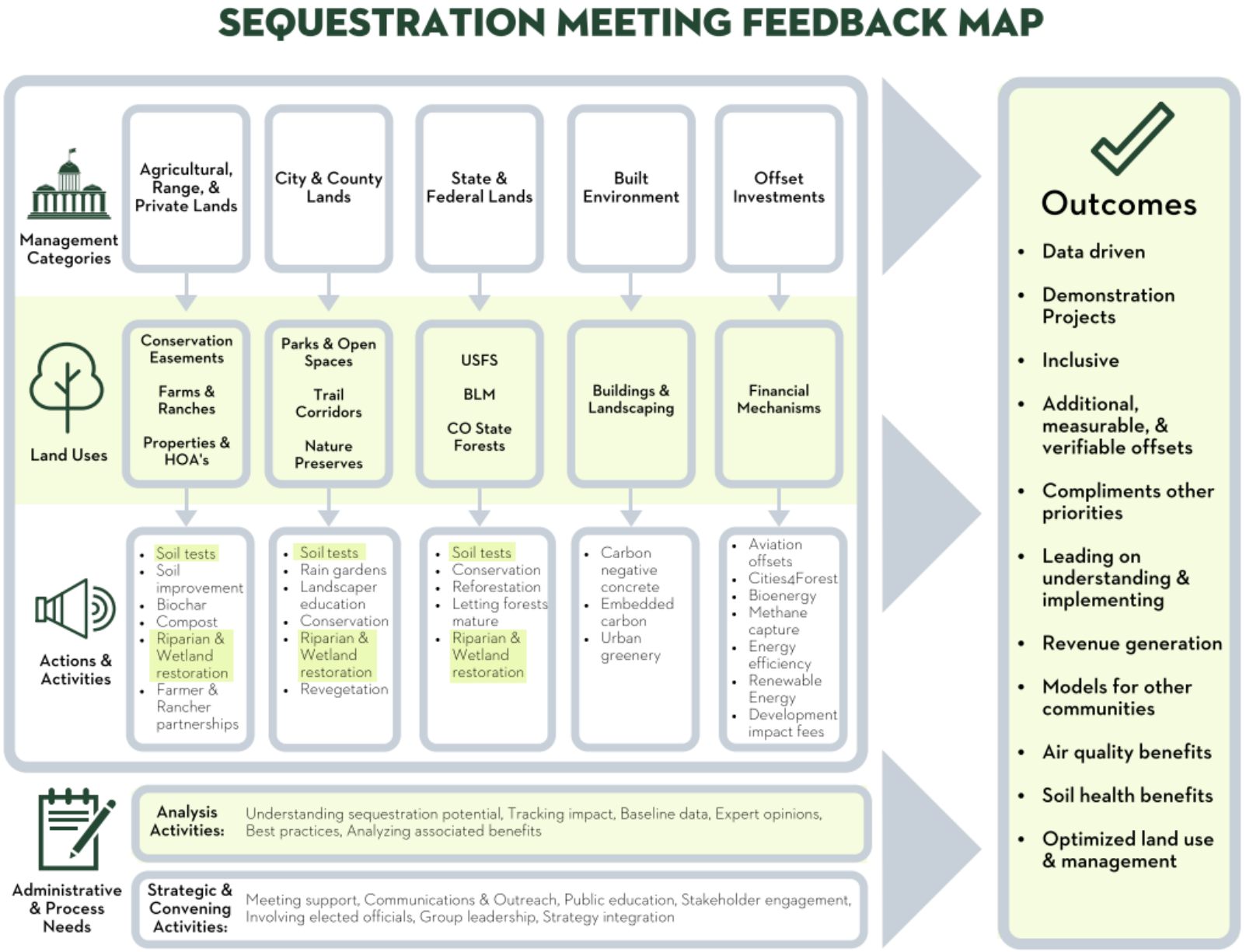
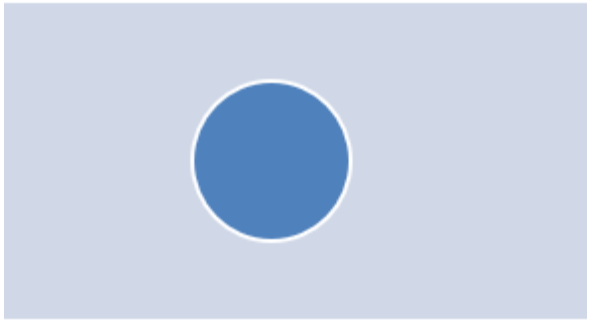
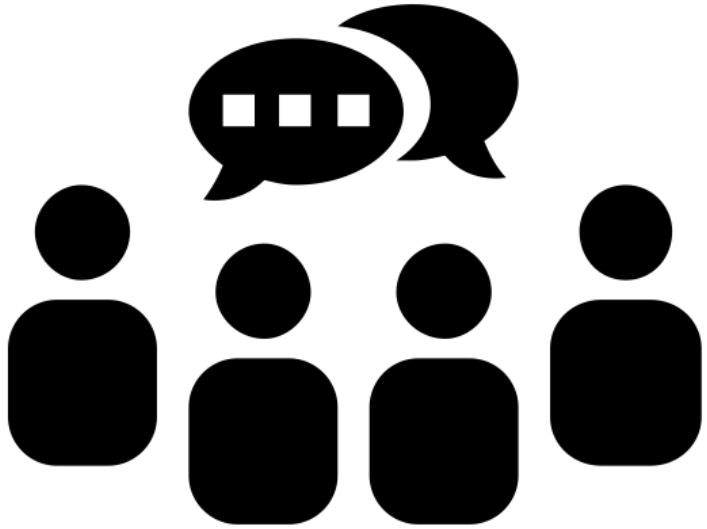


Subgroup Leads

'Subgroup lead' meetings (April - Dec 2020)





Subgroup Leads	
Federal and State Lands	
Adam McCurdy	ACES
Juli Slivka	Wilderness Workshop
County and City Lands	
Derrick Wyle	NRCS
Paul Holsinger	Pitkin County
Michael Tunte	City of Aspen
Agricultural and Private Lands	
Eden Vardy	Farm Collaborative
Suzanne Stephens	AVLT
Offsets	
Mona Newton	CORE

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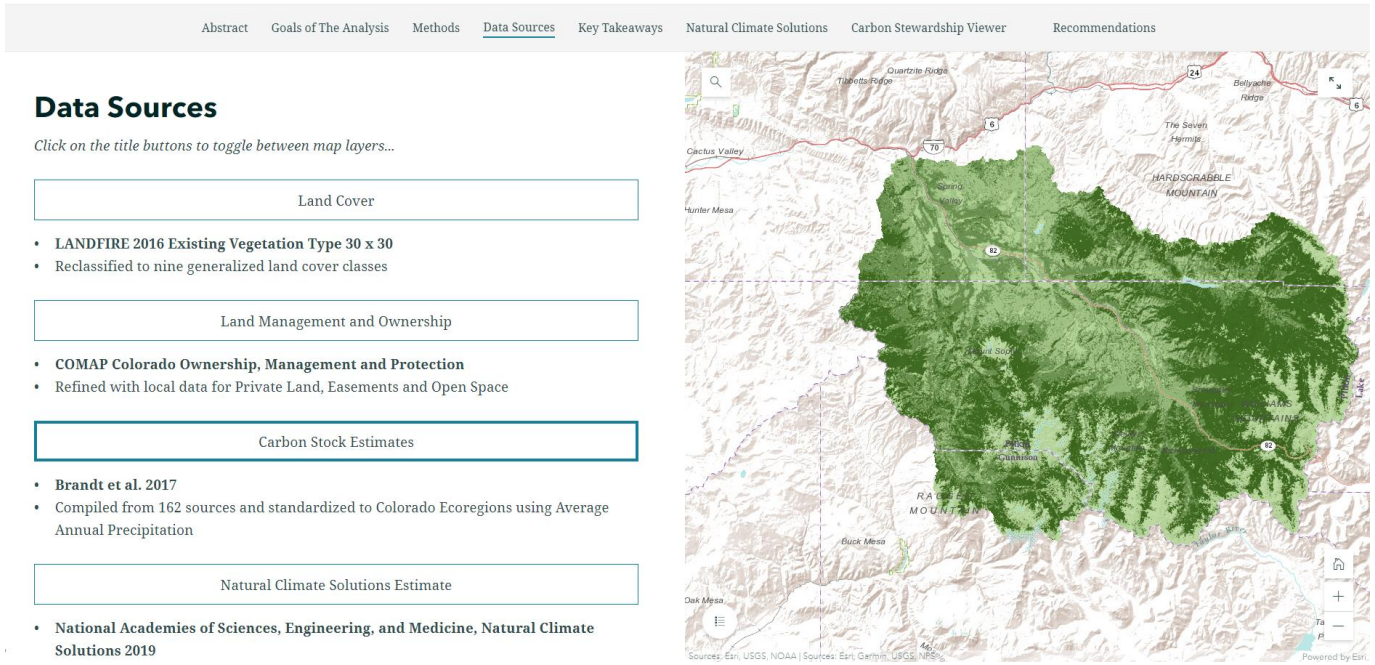
Process summary

Analysis & mapping

(April ‘20 - present)



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Recap: Where we've been

Stakeholder meeting

(April 2021)

(nitiwa/iStock)

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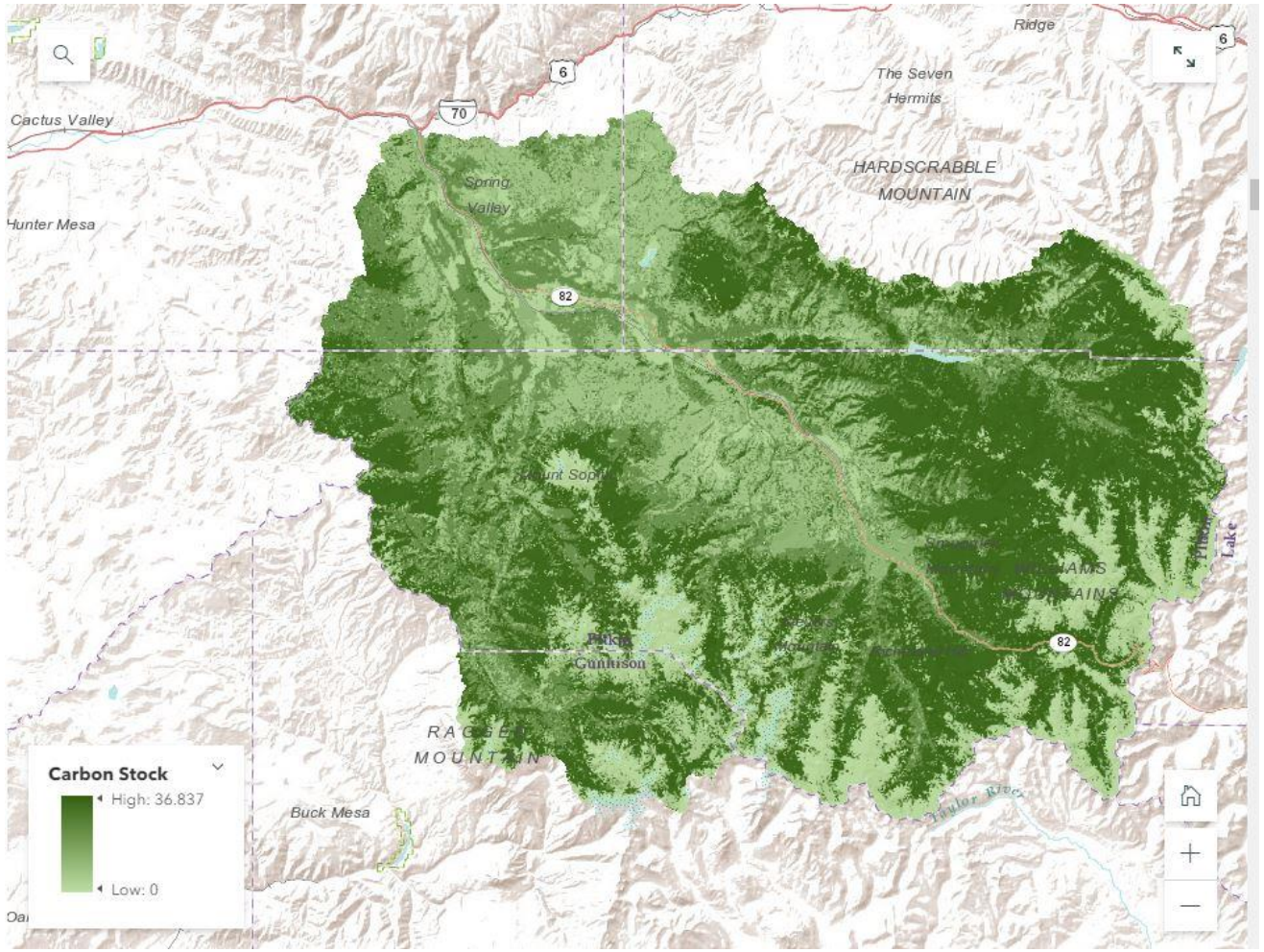
Research Overview



- Baseline estimation of 2016 carbon stocks
- Analysis of land cover change and change in carbon flux
- Breakdown of carbon stocks / flux by:
  - Land Cover
  - Land Management
  - Protection Status
- Investigation of key NCS opportunities
- Prioritization of future research

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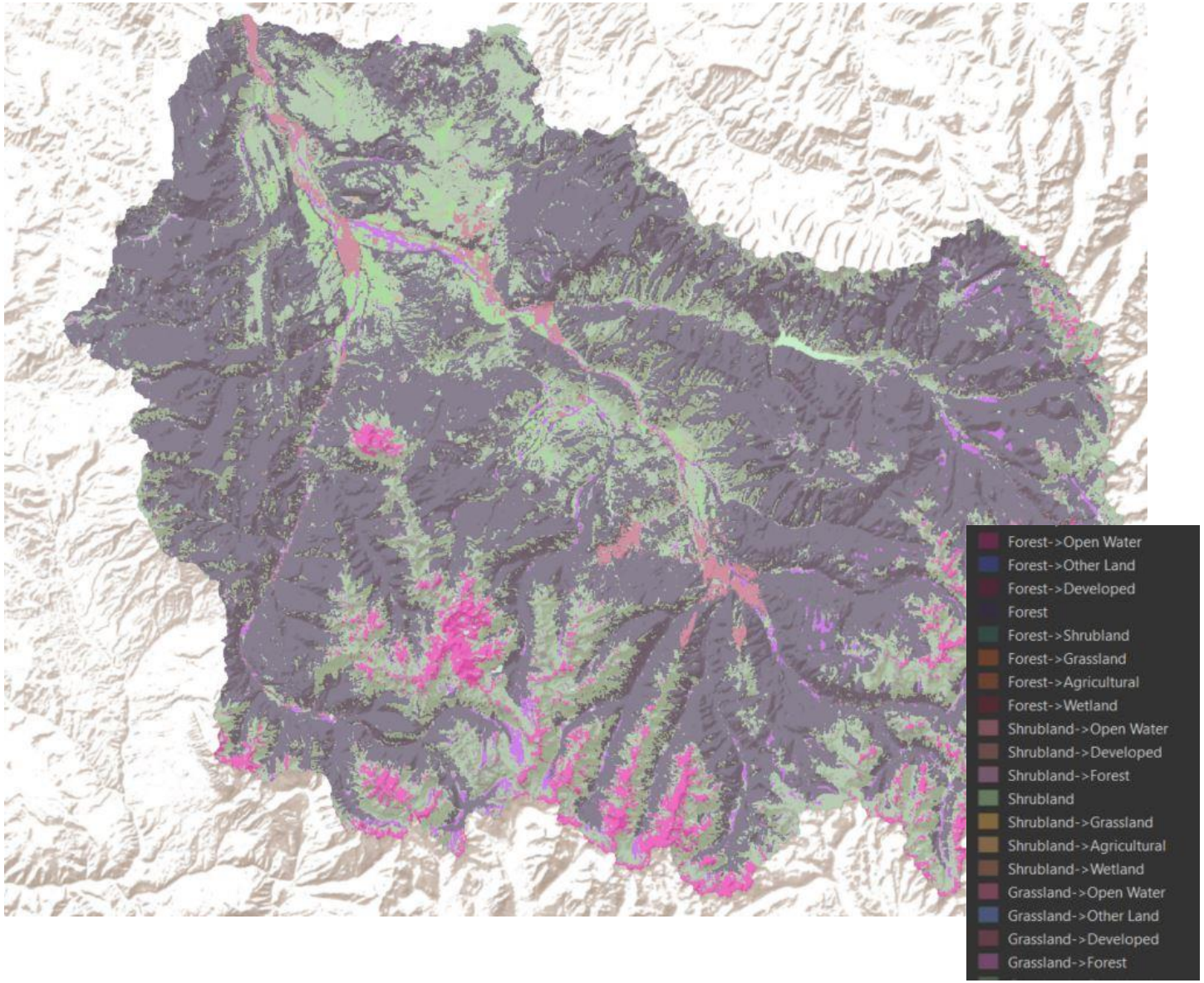
Land Cover Change

Used **NLCD 30 m Resolution Land Cover Data** to identify change in LC from **2006 – 2016**

Applied **carbon flux estimates from literature** to estimate how change in land cover has **affected change in flux**

Projected **future change** in land cover flux from 2016 to 2026 **assuming linear change trajectory**



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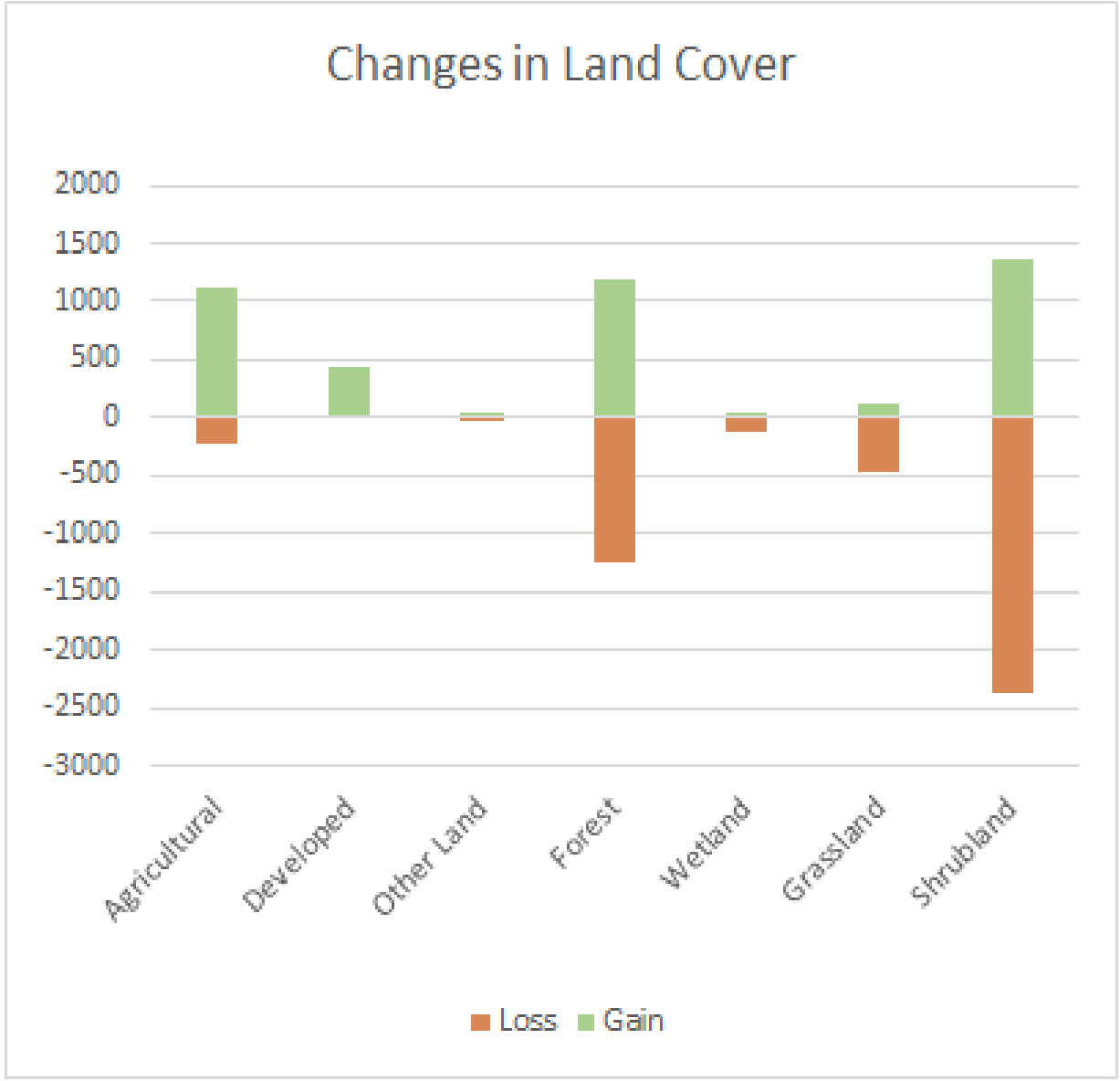
Land Cover Change

Greatest changes = **gain** and **loss** of **shrubland** and **forest**, **gain** in **agricultural lands**

Greatest **net** changes = **gain** in **agricultural** / **developed** lands, **loss** in **shrublands**

Critical difference in **gain** / **loss** vs. **NET**

Change by Land Cover Class as a Percentage of 2006			
Land Cover	**% Loss**	**% Gain**	**% Net**
Agricultural	-2%	8%	6%
Developed	0%	3%	3%
Other Land	0%	0%	0%
Forest	0%	0%	0%
Wetland	-1%	0%	0%
Grassland	-1%	0%	-1%
Shrubland	-1%	1%	0%

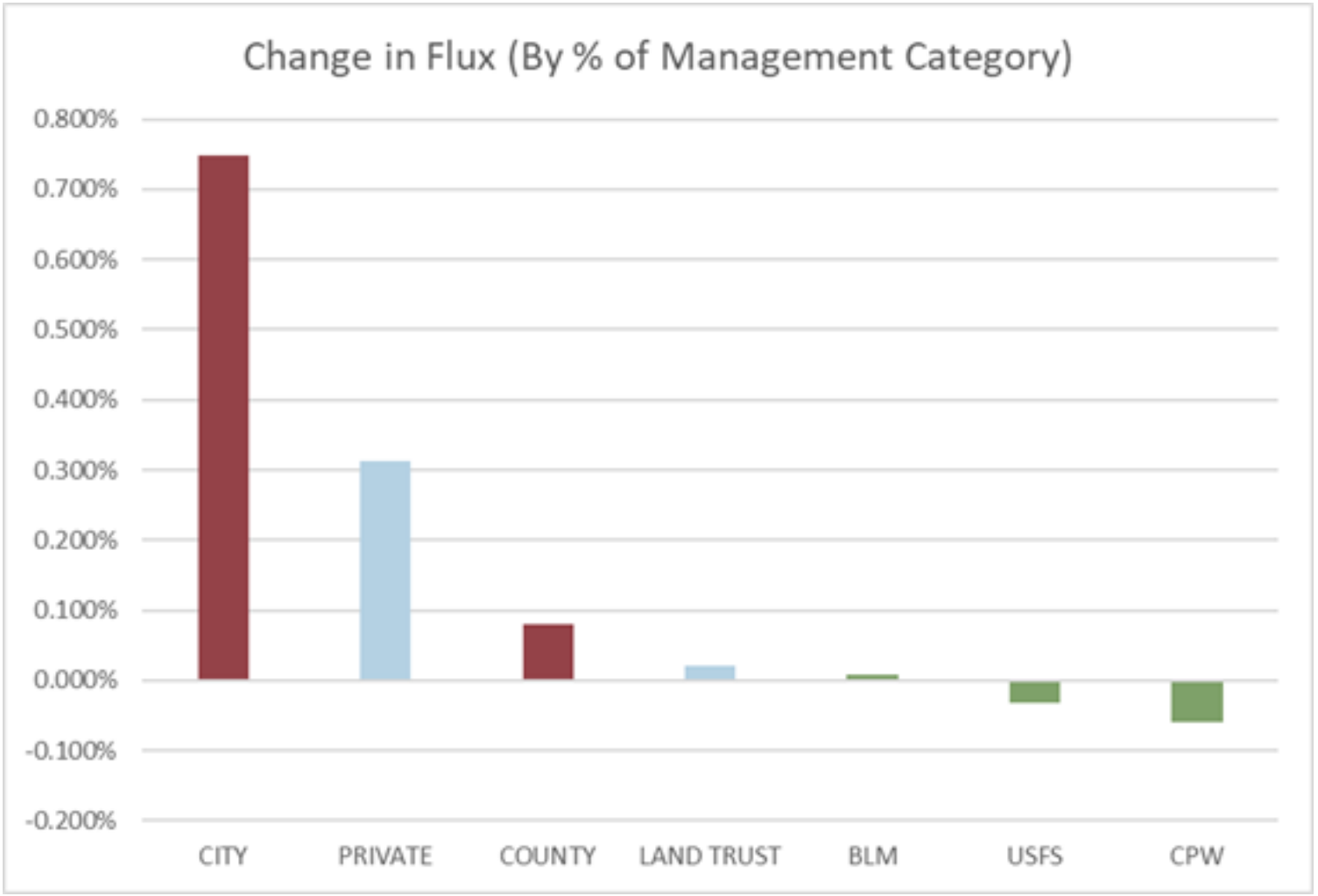


Change in Flux by Manager

City Lands showed the **highest % increase** in sequestration

State and Federal Lands (BLM, USFS, CPW) showed the **highest % losses** in sequestration

Private Lands showed the **highest overall increase** in sequestration



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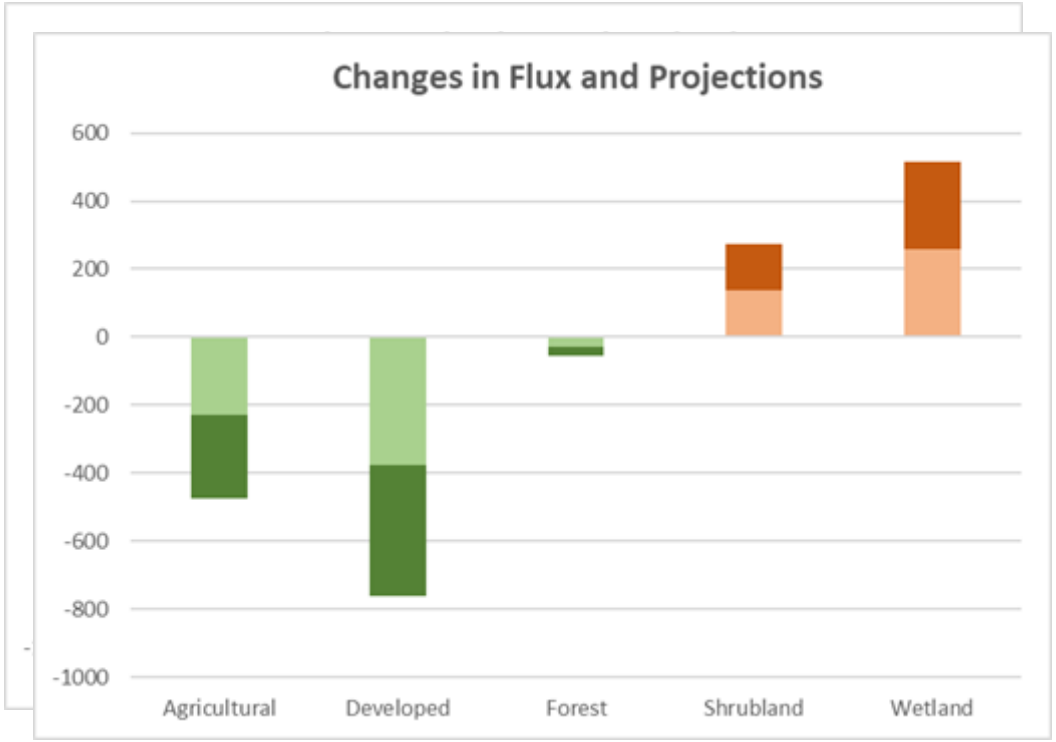
Change in Flux

Based on land cover alone, we see an **increase** in overall **carbon sequestered** over each period

Consistent with findings of overall Colorado trends*

*These same models predict a reversal (**reduction in sequestration** beginning around **2030**)

These estimates **do not account** for the **emissions** caused by the actual land change process



Percent Change in Overall Flux	
2006 - 2016	0.0573%
2016 - 2026	0.0635%

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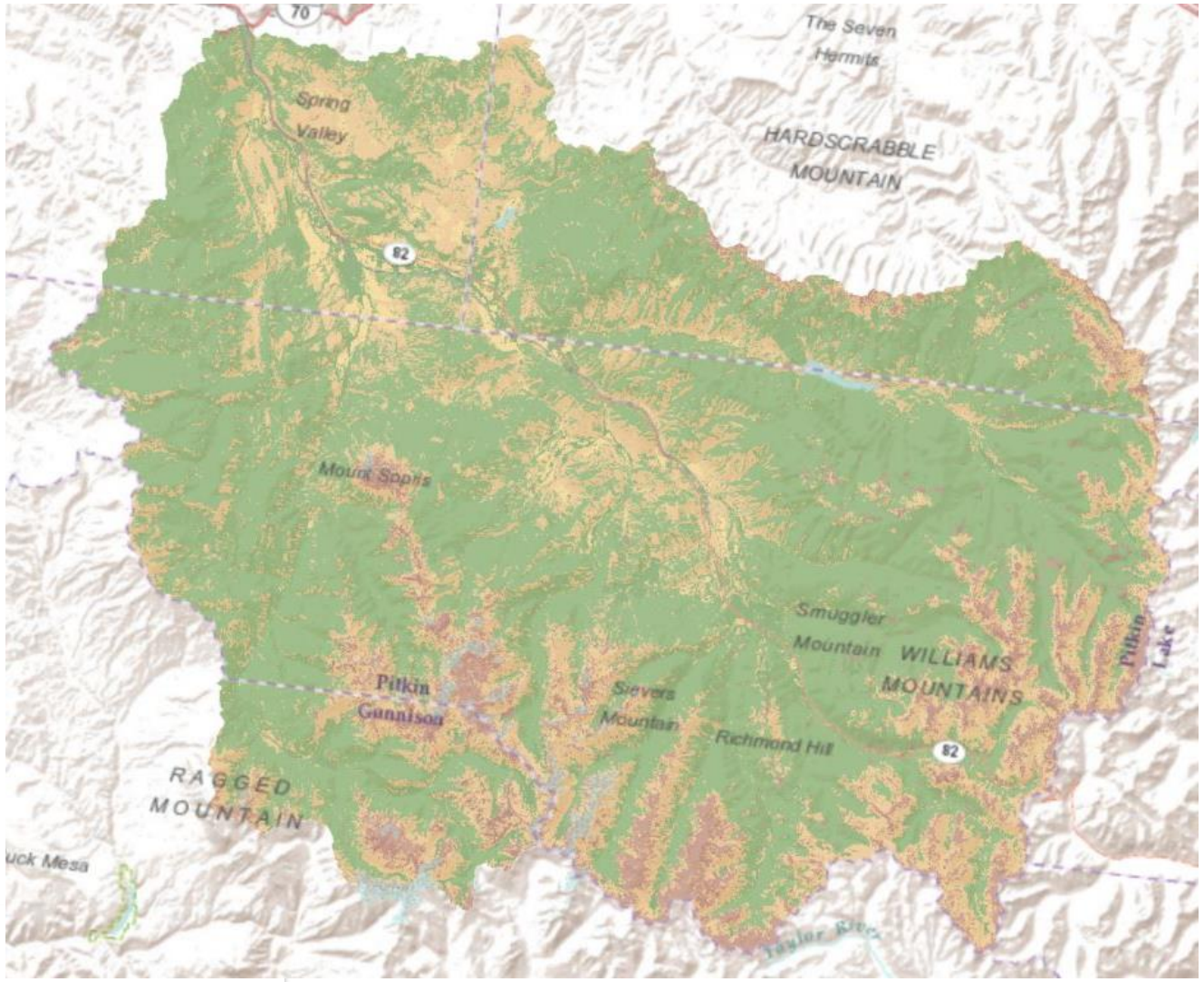
Brant et al. 2017*

Considerations on Flux



Land Cover Change Drivers

These estimates assume linear change based on 2006 – 2016 and do not account for …

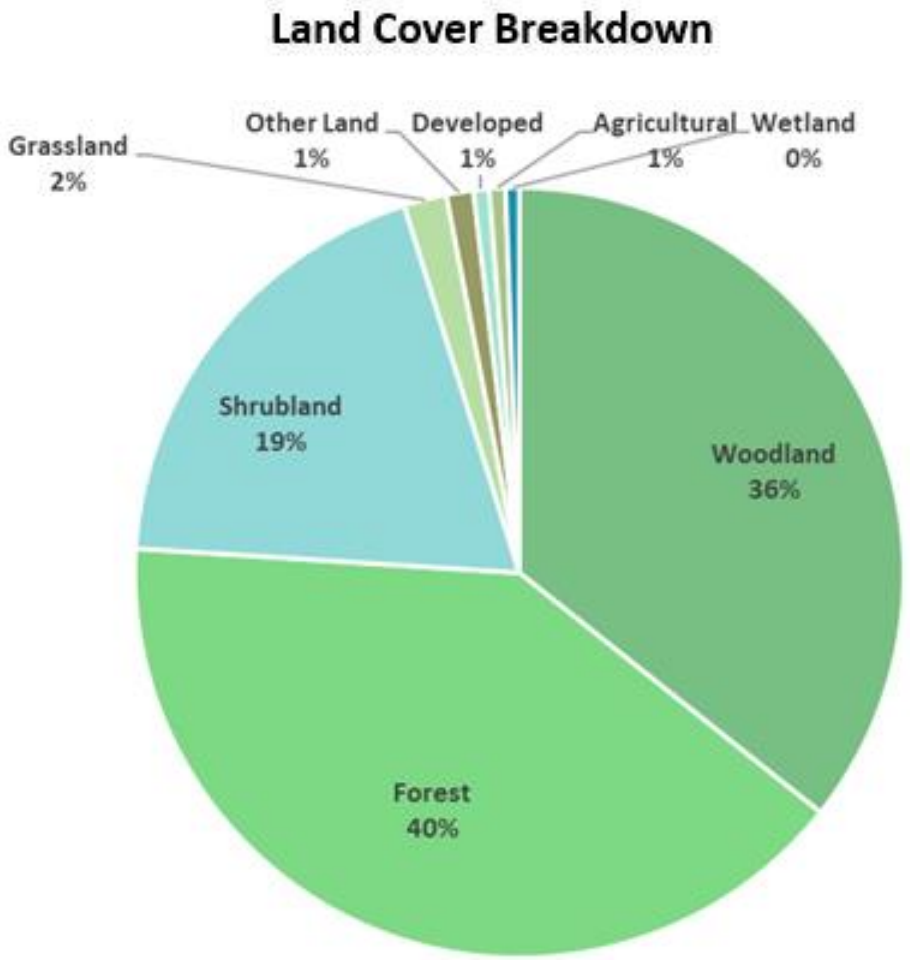
Recent wildfires (Lake Christine)

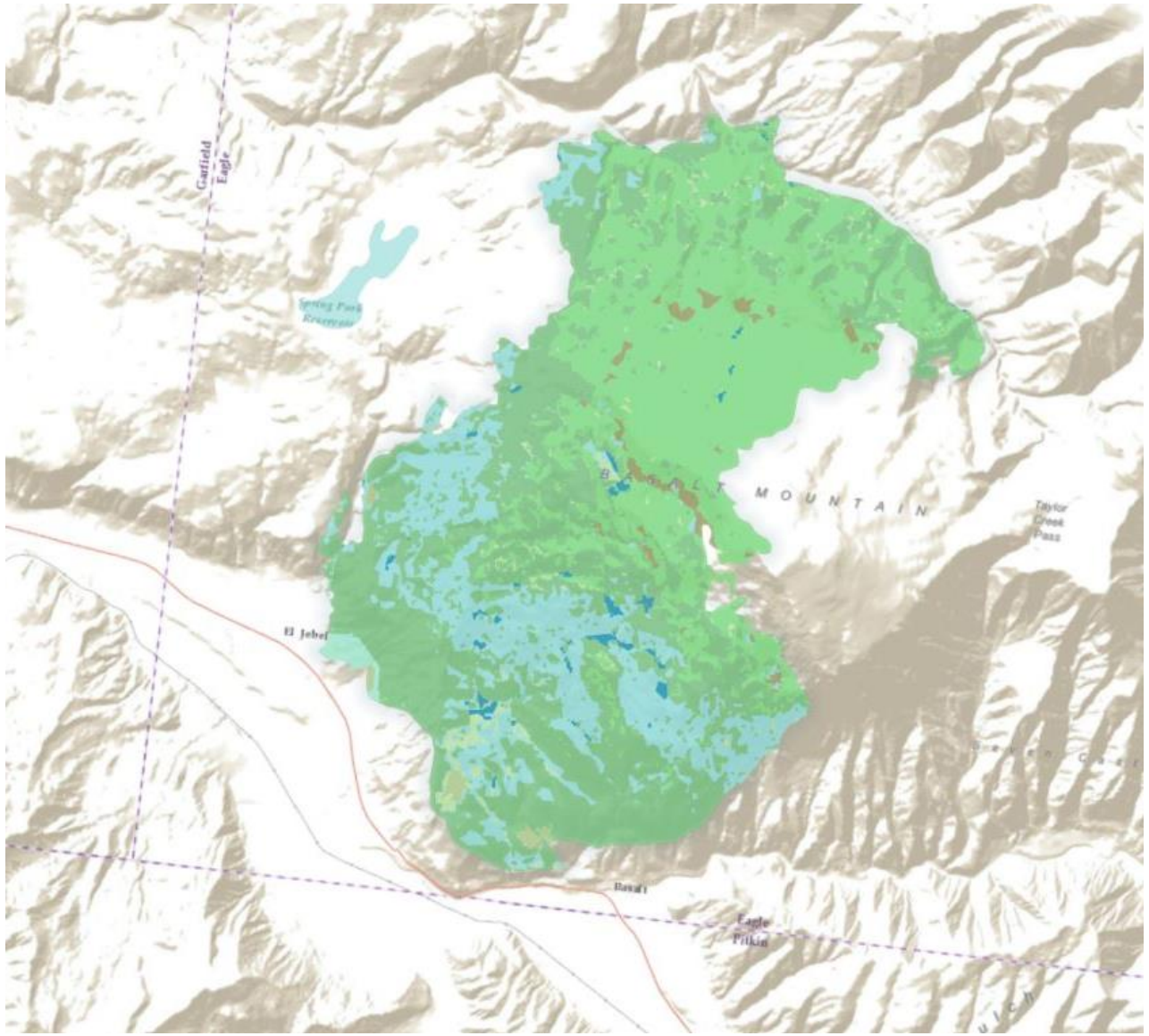
Ecological succession due to climatic shift

Increased development pressures

Disturbance or degradation from drought, insects, disease

Lake Christine Example





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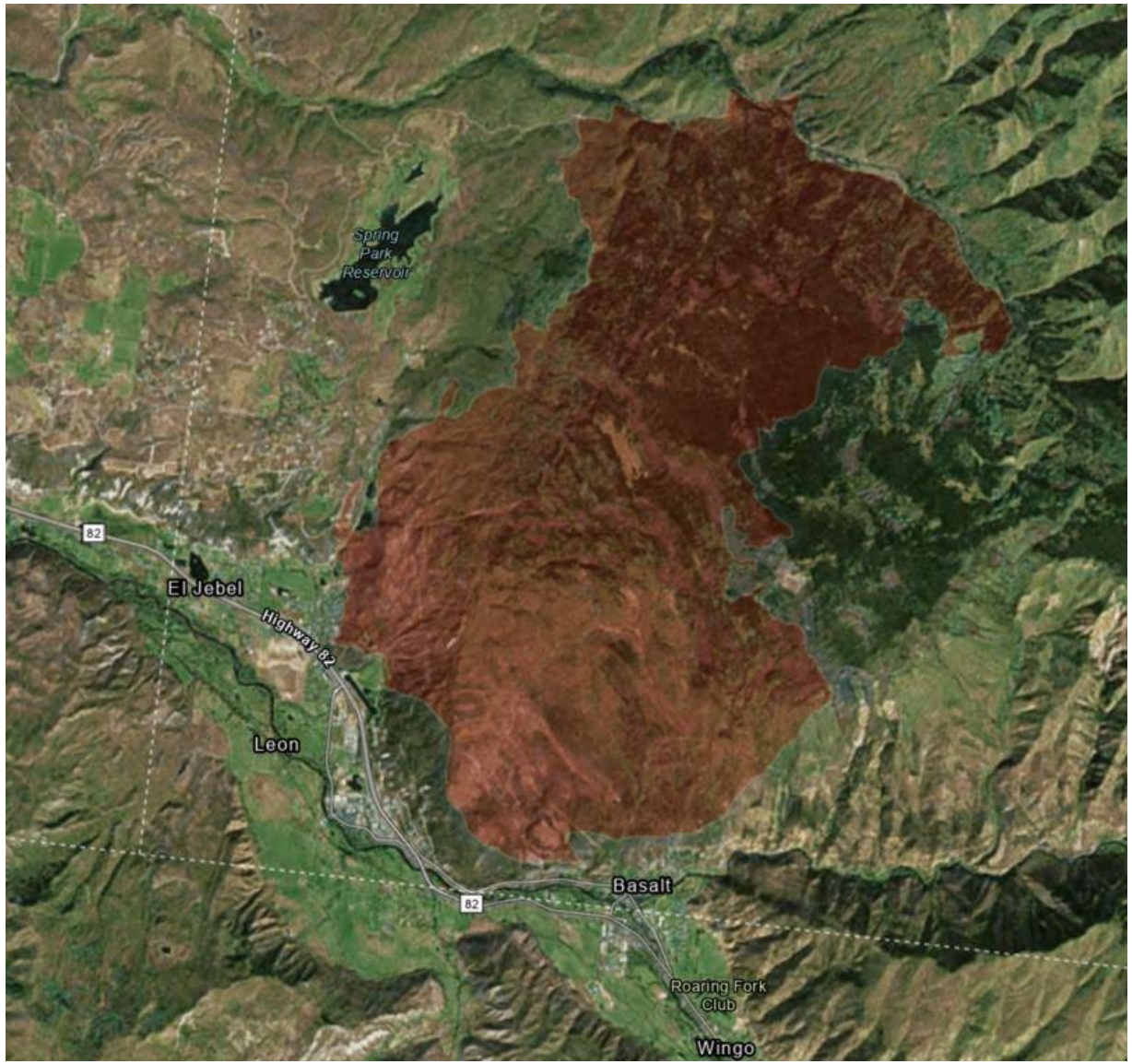
Lake Christine Example

12,500 Acres burned in Lake Christine Fire

9,500 Acres of Forest and Woodland

Calculations assumed a 50% reduction in **long term recovery** of Forest and Woodland classes

Estimated Reduction in Sequestration:	**3,270 MT Carbon**
Estimated % Reduction in Sequestration:	**-43%**
As % Of Watershed Total:	**-1%**
EST Emissions from Forest + Woodlands	**51,703 MT Carbon**



Coffman Ranch Example

THE ASPEN TIMES | ASPEN TIMES WEEKLY Snowmass Sun
Serving Aspen and Snowmass Village, CO

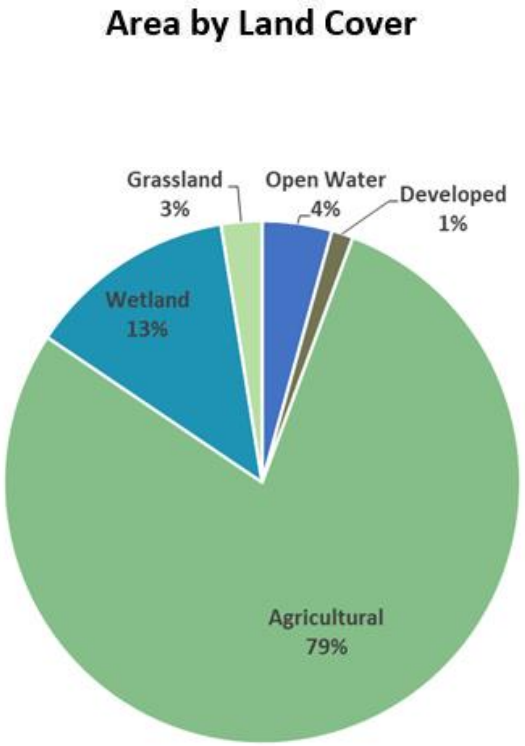
Carbondale-area ranch spared from the real estate feeding

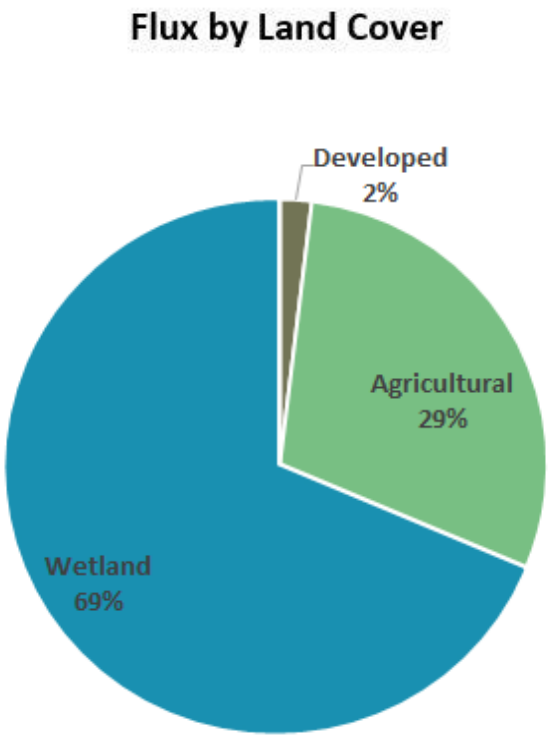
Diversity of land cover and use provides **unique opportunity** for **Natural Climate Solutions monitoring**

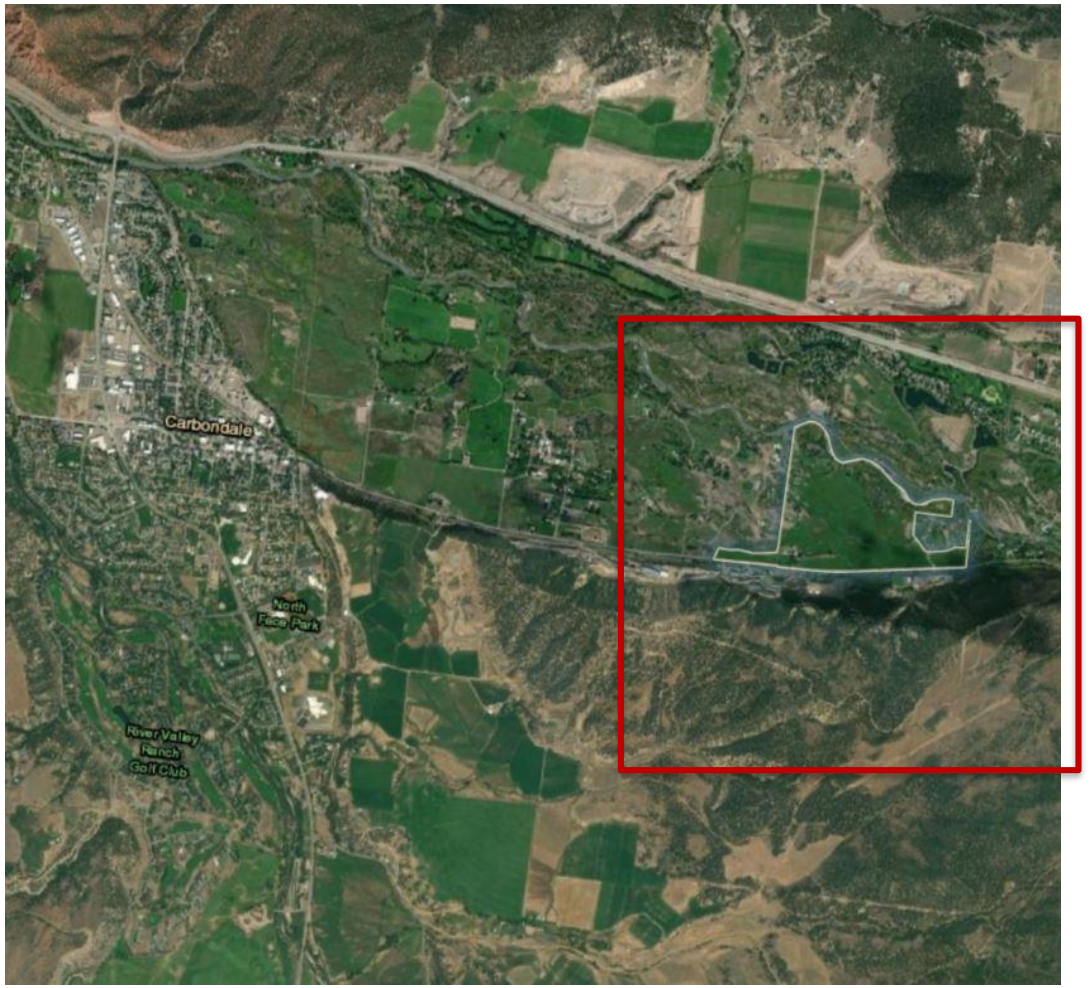
Plans to implement soil improvement, regenerative agriculture, wetland restoration, and more in combination **with carbon content soil sampling**

Potential to make available as a site for University field **study of climate change, carbon storage and more**

Coffman Ranch Example







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Coffman Ranch Example

Potential Natural Climate Solutions Strategies:

Restore Degraded Riparian Areas by Planting Woody Plants	
Potential Flux / Acre Change:	**0.2 MT**
Replace Synthetic N Fertilizer with Compost (CN ratio 25) on Irrigated Croplands	
Potential Flux / Acre Change:	**0.01 MT**
Seeding Forages to Improve Rangeland Condition	
Potential Flux / Acre Change:	**0.05 MT**

Estimated Flux:	**-98.87 MT Carbon**
Estimated % Annual Enhancement:	**2%**
Estimated Annual Flux with NCS:	**-101.01 MT Carbon**

68% of Estimated Enhancement from Wetland Restoration

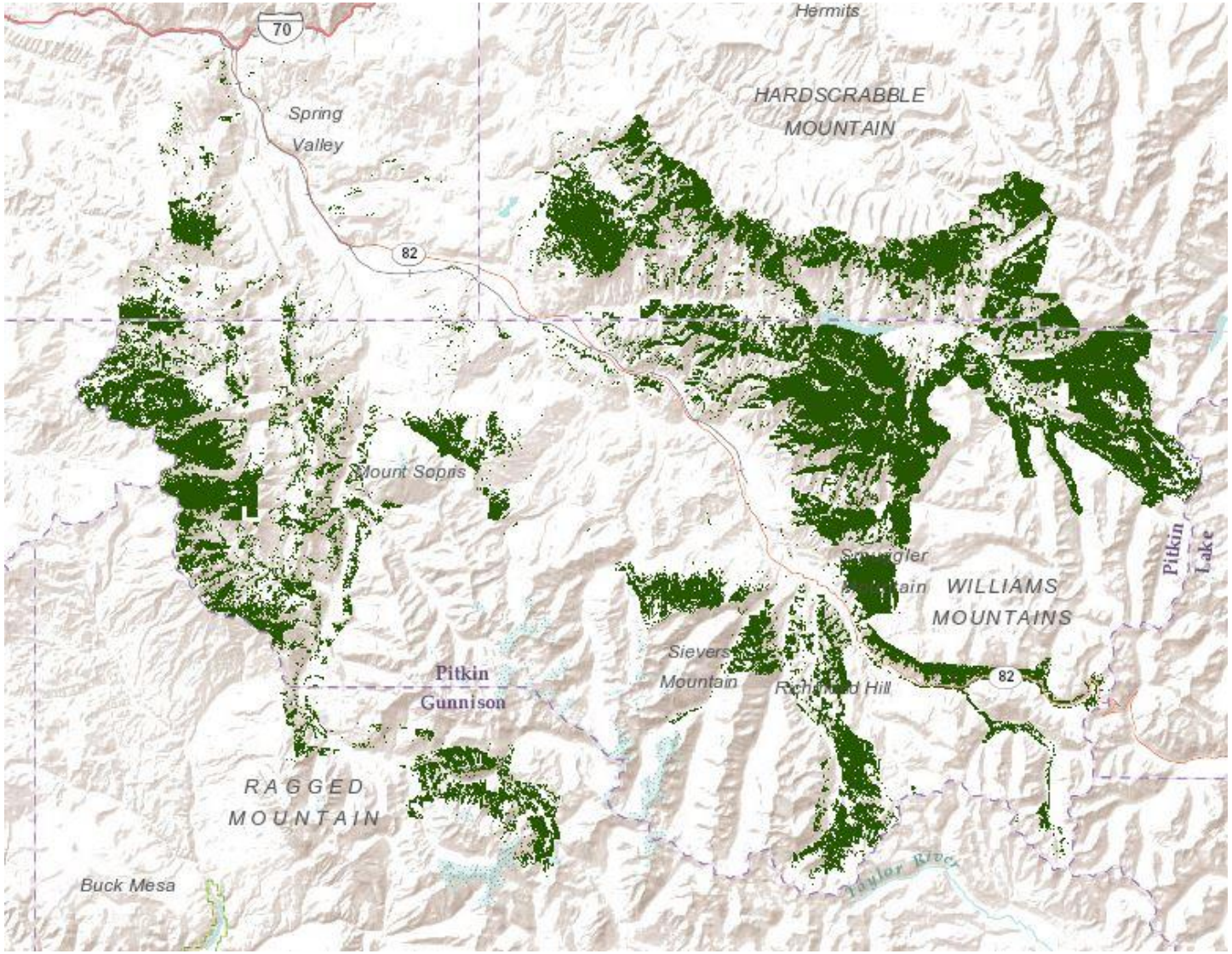
NCS Analysis

Considered **5 NCS Practices** at 3 theoretical scales of implementation

Used **COMET** as source for **agricultural** and **wetland** estimates

Forest estimates taken from **NAS, 2019**

NCS Agricultural Practice	MT C / ACRE / YEAR
Replace Synthetic N Fertilizer with Compost (CN ratio 25) on Irrigated Croplands	0.14
Conversion of Annual Cropland to a Farm Woodlot	27.5
Seeding Forages to Improve Rangeland Condition	0.5
Improved Forest Management	3.45 - 6.18
Restore Degraded Riparian Areas by Planting Woody Plants	2.97



NCS Analysis

When implemented at scale over a 10-year period…

Improved Forest Management has the potential to increase carbon stocks on **Public Multi-Use** forest lands by **20%** *(7% of overall)*

Switching from **synthetic fertilizer** to **compost** has the potential to increase carbon stocks on Private Agricultural Lands by **3%**

Wetland restoration on 25% of watershed wetlands could increase carbon stocks by **4%**

Key Takeaways:
Insights, Implications and Recommendations

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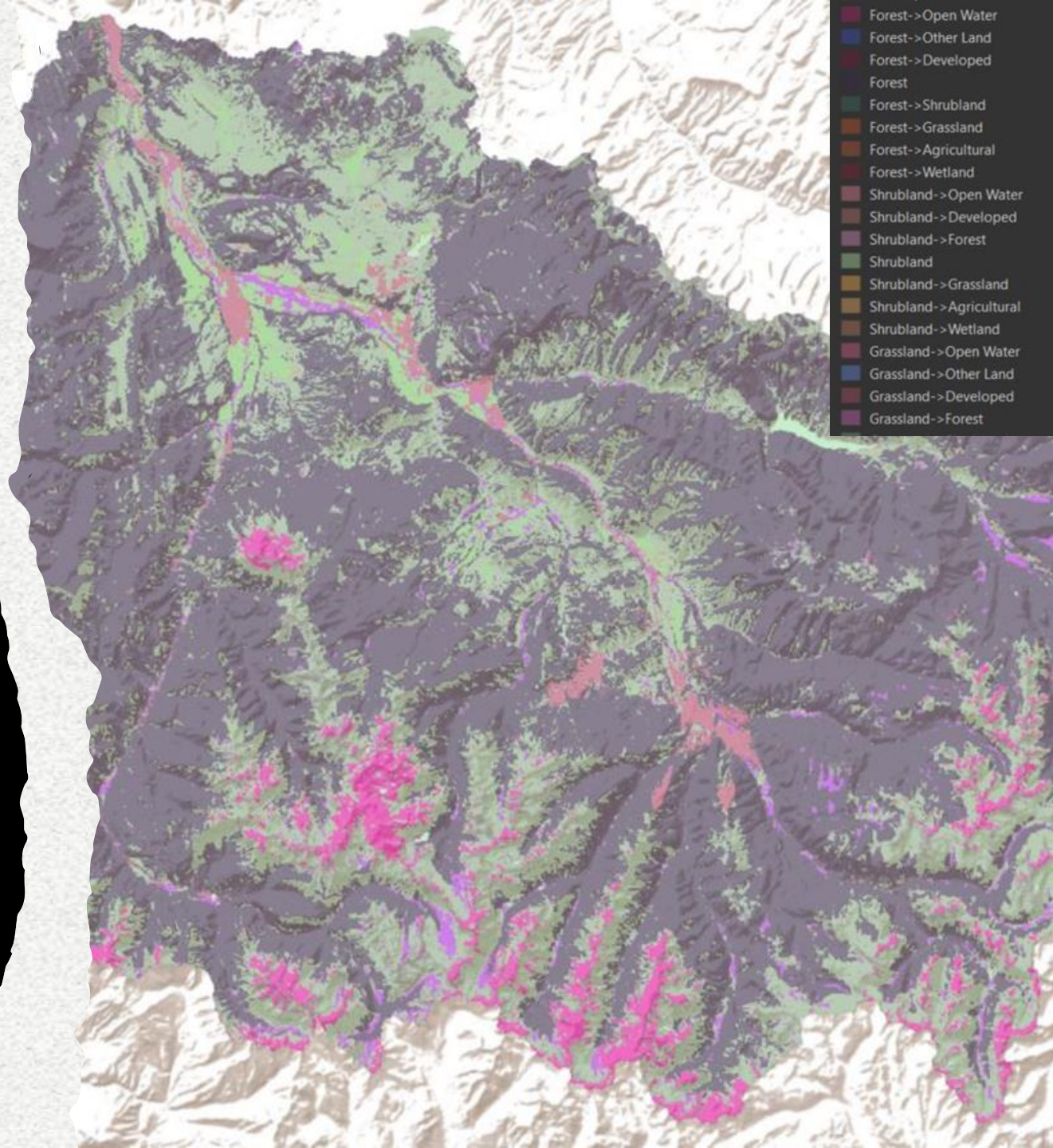
- **Most CDRs occur in forests and woodland on Federal and State Lands.**
- **Policy Priority: Protect intact ecosystems, prevent land conversion, improve management, and mitigate stand-replacing fire.**

Most Land Conversion:

- Shrubland to Cropland
- Deciduous to Mixed Forest
- Pasture to Cropland

Policy Objectives:

- Prioritize and support sequestration, healthy soils, water stewardship, other related benefits.
- Ongoing evaluation and implementation.
- Knowledge sharing, scalability and impact.



- County and City Lands: relatively small but very important
- Quantification could make sense at scale
  - prompts questions about rationale and policy application
- Policy Recommendation: develop best-practice guides that can be used in decision-making.

Outcomes and Next Steps

Stakeholder meeting

(April 2021)

AGRICULTURAL & PRIVATE LANDS

Further Research Interests & Questions	Tools or steps to implement NCS	Further policy & program ideas	Ideas on how to move forward
• Evaluate potential gains in soil carbon relative to the types of agriculture and grazing that is most prominent (and possible) in the RFV. • Compare modeled estimates to on-the ground measurements. While this can be labor intensive, it may be worth looking to a CSU/Colorado Collaborative for Healthy Soils initiative that is developing • Be sure to include grasslands in carbon sequestration potential (note: they are included in the current analysis).	• Implementation of recently passed HB21-1181: Agricultural Soil Health Program • Develop financial incentives for landowners to implement NCS. • Leverage known Natural Resources Conservation Service soil health practices to help identify implementable activities related to ecosystem services.	• Create a regenerative philanthropy financial model that incentivizes landowners to transition agricultural lands. • Develop mechanisms to educate and finance the transition to NCS. Part of this could be monetizing sequestration even if it is on a small scale. • Follow previous sequestration projects to determine mechanisms for landowners to shift towards conservation. • Incentivize regenerative practices by focusing on avoided loss of agricultural lands.	• Establish a common understanding of tools to help working lands and private landowners. • Collaborate with community groups and local conservation districts that are ready to implement change. • Examine investment opportunities in programs which involve multiple landowners. • Build momentum by hosting summits and conferences, while also partnering with existing ones.

Additional Information: Savory Institute data on grazing benefits, CSU development of measurement reliability as part of the Colorado Collaborative for healthy soils, tools for working lands/private landowners (NRCS)

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Established Initiative: UDI

URBAN DRAWDOWN INITIATIVE

RESOURCES NEWS & UPDATES FRAMEWORK ABOUT

A FRAMEWORK FOR URBAN DRAWDOWN PLANNING:

FIVE PATHWAYS FOR CITIES TO LEAD ON CARBON DRAWDOWN

Questions and Discussion

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Natural Climate Solutions in the Yampa Valley

CRO **Climate Change Series: Natural Working Lands**

September 1, 2021

Tim Sullivan

Natural Climate Solutions , Director, YVSC

YVSC Natural Climate Solutions Overview

YAMPA VALLEY SUSTAINABILITY COUNCIL

What are Natural Climate Solutions:

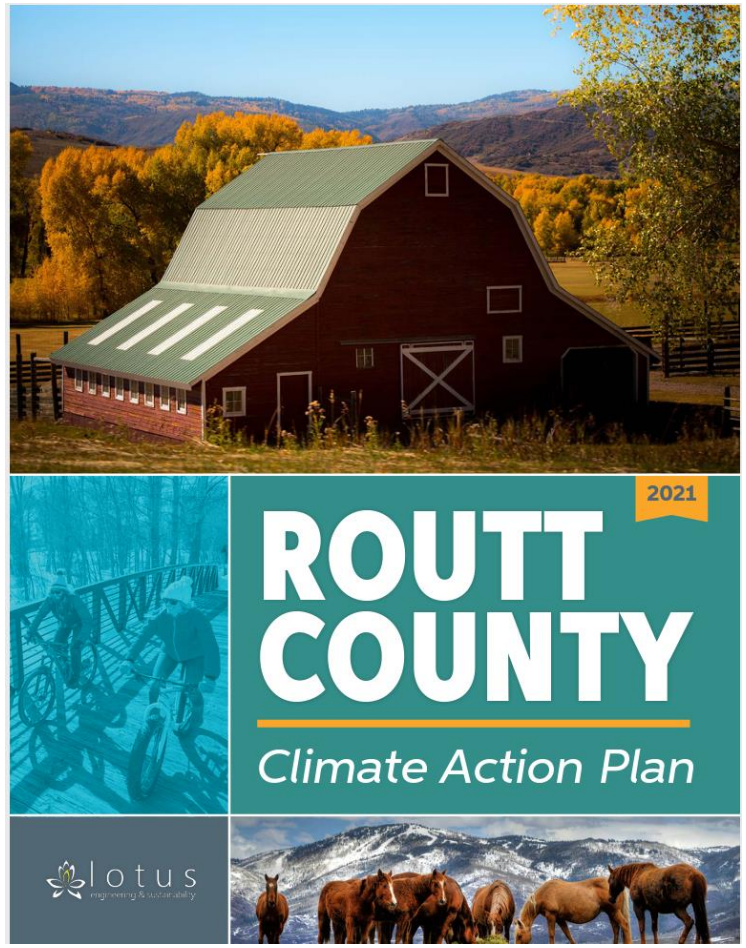
- PROTECT intact ecosystems
- RESTORE native ecosystems
- IMPROVE practices on working lands

With Carbon Sequestration and Climate Resilience as Goals

Program Goal: Invest in land and water conservation and restoration that can help reduce greenhouse gas emissions and build resilience to the impacts of climate change.

Role of YVSC:

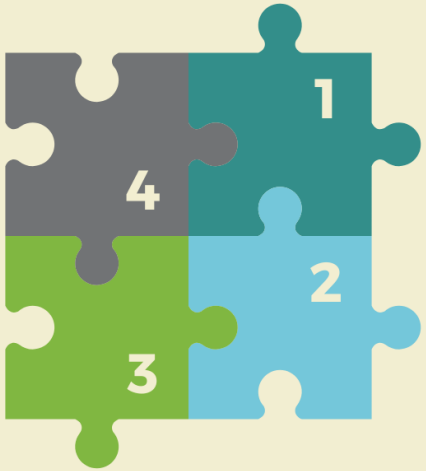
- Identify best opportunities for natural climate solutions in Routt County; across ecosystem types and land ownerships
- Work with partners to design and implement projects
- Build sustainable funding sources and capacity for implementation



Land Use Sector

Promote compact development patterns to achieve more sustainable development and preserve natural land use types.

Promote water conservation measures and reduce energy consumed in water production, distribution, and waste water treatment.



Promote land management practices that increase carbon sequestration and storage.

Increase and support cross-boundary efforts to conserve and maintain natural lands and efforts to promote resiliency on the landscape within the County.

YAMPA VALLEY SUSTAINABILITY COUNCIL

Routt County Climate Action Plan—Land Use Sector Actions

LUS1. Promote land management practices (e.g. reforestation, restoration, conservation, natural climate solutions) that increase carbon sequestration and storage across forests, wetlands and ag/rangelands and preserve carbon sinks, especially forests and wetlands, and designate future land uses to maximize carbon sequestration.	LUS1 A1: Implement specific natural climate solutions for wetlands and riparian corridors within the County.
	LUS1 A2: Work to implement specific natural climate solutions for croplands and rangelands within the County.
	LUS1 A3: Protect and enhance wetlands and riparian corridors.
	LUS1 A4: Work to implement specific natural climate solutions for forests within the County.
	LUS1 A5: Integrate green infrastructure concepts and improvements that promote carbon mitigation.
LUS2. Increase and support cross-boundary efforts to conserve and maintain natural lands and to promote resiliency across the landscape within the County.	LUS2 A1: Protect natural resources that promote carbon mitigation.
	LUS2 A2: Create a public-private partnership to expand forest treatments and to re-introduce healthy fire into the landscape and promote resiliency across the County's landscapes.
	LUS2 A3: Expand the acquisition of open spaces and the use of conservation easements to preserve natural landscapes and the County's agricultural heritage.
LUS3: Promote water conservation measures and reduce energy consumed in water production, distribution, and waste water treatment.	LUS3 A1: Enhance regional water and energy conservation.
	LUS3 A2: Improve water and waste water infrastructure to reduce water and energy use using nature based solutions.
LUS4: Promote compact development patterns to achieve more sustainable development and preserve natural land use types.	LUS4 A1: Enhance policies, guidelines, and incentives for Smart Growth and compact development.
	LUS4 A2: Update development and zoning codes to implement compact development goals and policies.

CAP Land Use Opportunities

YAMPA VALLEY SUSTAINABILITY COUNCIL

Natural climate solution	Description
avoided conversion of natural lands	reducing rates of land conversion for anthropogenic uses to avoid carbon emissions;
reduced wildfire severity	using forest management practices such as thinning and prescribed burns to reduce fuel loading in forests and managing rangelands to reduce fire risk. Increased wood utilization from thinned forests (biochar, other products).
post-wildfire and other disturbance reforestation	planting trees in areas that have burned under high-severity wildfires or are understocked due to beetles, blowdown, etc. to improve carbon stocks.
riparian restoration	establishing forest cover along riverbanks and stream banks
agroforestry	planting trees and hedgerows along agricultural field boundaries to provide windbreaks and increase soil carbon sequestration
improved grazing management	Changes in grazing practices to increase soil carbon—unclear benefit in NW Colorado grazing systems. Soil amendments. Manure management.
wetland restoration	restoring wetlands to avoid emissions from drained soils and increase carbon stocks

Climate Change and River Health: an Example of a Natural Climate Solution

Yampa River Health Assessment

Appendix-B-Yampa-River-Health-Assessment-Report.pdf - Adobe Acrobat Reader DC (32-bit)

Home Tools Appendix-B-Yampa... × Sign In

Upper Yampa River, Above Town Segment

River Health Assessment

Reach Condition: A B C D F

Stressor Contribution: None Low Moderate High Extreme

Causes of Impairment (Estimated Contribution of Stressors)

3.1 (3380 ft)	3.2 (4270 ft)	3.3 (2380 ft)	Grade	Attribute	Unknown source(s)	Surface water diversions	Dam/reservoir operations	Watershed scale land use activities	Hillslope and channel erosion	Irrigation return flows/ urban runoff	Urbanization	Riparian land cover conversion	Aggregate mining	Roads/bridges	Levees/ channelization	Bank/channel armoring	Channel structures (dams/wiers)	Woody material recruitment/removal	Exotic plant species/weeds	Exotic aquatic species
			A	Flow Regime																
			B	Sediment Regime																
			C-	Water Quality																
			C	Landscape																
			D	Floodplain Connectivity																
			C	Riparian Condition																
			B	Organic Material																
			B-	Morphology																
			D+	Stability																
			C+	Physical Structure																
			B-	Trophic Structure																
			C+	River Health																

YVSC Natural Climate Solutions
Yampa River Forest Restoration Project

YAMPA VALLEY SUSTAINABILITY COUNCIL

- Partnership with YVSC, COSS, and CSFS emerging from Yampa Stream Management Plan and YVSC ReTree since 2019
- Critical need to increase shade to address water temperature increases—natural infrastructure solution is to increase canopy cover in reaches of the Yampa that have degraded riparian condition
- Improves habitat and increases carbon sequestration—both a climate adaptation and mitigation project
- One acre of newly planted cottonwood forest can sequester approximately 200 tonnes of CO2e in 30 years
- Significant impact on river condition or carbon sequestration will require sustained engagement across land ownership and geographies.
- Community Volunteer Engagement—more than 200 people in past two years for ReTree planting day

YVSC Natural Climate Solutions

YAMPA VALLEY SUSTAINABILITY COUNCIL

Key Takeaways for NCS in Local Climate Action

- NCS can achieve both climate mitigation and climate adaptation
- NCS provides non-climate co-benefits (e.g. wildlife, recreation, water quality)
- NCS has a place in both urban and rural settings (and can work across those settings)
- NCS can promote community engagement (e.g. tree planting, restoration).
- NCS actions can be fully in the purview of local governments.

Q & A

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Upcoming Webinars

Stay tuned for future webinars from the Colorado Resiliency Office!

To see announcements, sign up for the newsletter at www.coresiliency.com/newsletter or view future events at www.coresiliency.com/trainings-and-events.

This webinar recording and presentation will be posted on the Colorado Resiliency Office's Website: https://www.coresiliency.com/trainings-and-events

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