



Photo: Town of Estes Park

COLORADO FLUVIAL HAZARD ZONE PROGRAM OVERVIEW

Flood-related hazards caused by stream channel movement and the erosion and deposition of sediment within a stream corridor have not traditionally been factored into floodplain management leaving a legacy of costly damage from flooding in Colorado. Since 1978, approximately 50% of all National Flood Insurance Program claims in Colorado have come from properties located outside of regulatory floodplains. Many of these property loss claims are the result of hazards created by fluvial geomorphic processes such as erosion, sediment deposition and channel avulsion.

The Colorado Fluvial Hazard Zone (FHZ) Program, developed by the Colorado Water Conservation Board (CWCB), is a significant step forward in illuminating these hazards and provides a resource to floodplain managers, planners, engineers, river scientists, and communities to identify, map, and plan for the hazards associated with dynamic river processes. The Colorado FHZ Program represents a new strategy in adaptively managing stream corridors, preparing for and mitigating flood impacts, and making informed land use decisions based on an awareness of fluvial processes.

“Our communities are interested in understanding risk with the changing landscapes in our watersheds, whether it be development, fire, or aridification. The FHZ program has provided a tool and resource for our members to use when making informed decisions around the management of our watersheds.”

-Morgan Lynch
Chair, Colorado Association of
Stormwater and Floodplain Managers

The Fluvial Hazard Zone (FHZ) is the area a stream has occupied in recent history, may occupy, or may physically influence as it stores and transports water, sediment, and debris.



Colorado FHZ Program Development

In the aftermath of the devastating floods of 2013, The Colorado Water Conservation Board developed the Colorado Fluvial Hazard Zone Program to help communities better identify, map, and plan for the flood hazards associated with erosion, sediment deposition, and other dynamic river processes. The effort began by reviewing existing riverine erosion mapping programs for their technical and governance applicability in the State of Colorado, an initiative that was aided by the ASFPM Riverine Erosion White Paper. Between 2015 and 2019 technical and scientific studies, community resource development, mapping protocol development, and pilot mapping on approximately 450 miles of stream was completed. These products were peer reviewed by experts from across the United States.

The Public Review Draft of the Fluvial Hazard Zone Mapping Protocol was released in January of 2020 for public comment and the Colorado Fluvial Hazard Zone Mapping Protocol Version 1.0—along with a Model Zoning Ordinance, Stream Corridor Easement guidance, and Quickstart Guide for Planners—was released in August of 2020. To view these documents, please visit ColoradoFHZ.com.

The CWCB Fluvial Hazard Zone Program was developed in partnership with the Colorado Geologic Survey, the Colorado Department of Local Affairs, the US Bureau of Reclamation, the Mile High Flood District, Watershed Science and Design, and Round River Design. The Program was awarded the 2021 Tom Lee State Award for Excellence in Floodplain Management by the Association of State Floodplain Managers.



Photo: The Denver Post



Photo: Town of Estes Park

“The 2013 floods perfectly illustrated the inherent shortcomings of static floodplain maps during certain events. The creation and implementation of the FHZ program goes a long way to increasing resilience in dynamic stream systems. I’m certain lives will be saved and infrastructure will be protected when land use managers adopt this important tool.”

—Kevin Houck
Chief, Watershed and Flood Protection
Colorado Water Conservation Board

The Colorado FHZ Program’s goal is to prevent future flood damages while restoring and protecting functional floodplains and stream systems.



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Colorado FHZ Program Components

The Colorado FHZ Program provides support to communities throughout the state of Colorado in the following ways:

Technical



The Program has developed a technical mapping protocol and GIS tools that support the FHZ delineation and map making process. The scientific studies that support the mapping protocol are detailed in numerous appendices to the protocol and are currently being written for formal publication. To date, approximately 700 miles of streams throughout the state of Colorado have had a Fluvial Hazard Zone delineated. The State also provides technical experts to review maps and support communities wishing to develop FHZ maps.

Community Support



The Program has developed resources including a guide for planners, floodplain managers, and local officials that describes the numerous ways that an FHZ map can be used or applied. A model ordinance for the development of a Fluvial Hazard Overlay District was created in cooperation with planning experts at the Colorado Department of Local Affairs so that interested communities can create zoning and development standards in areas where fluvial hazards exist. The Colorado Water Conservation Board also provides cost-sharing grants to support FHZ development in local communities.

Education and Outreach



The Program has had a large focus on education since 2014 with webinars, workshops, presentations, and a soon to be produced online video training series in partnership with the Colorado Watershed Assembly. When in-person technical trainings are allowed to resume they will address the need for increased capacity and skills related to mapping and planning amongst river scientists, engineers, floodplain managers, and others throughout the state of Colorado.

“The Fluvial Hazard Zone Program provides critical resources for planners and local communities to understand and visualize their risk and mitigate flooding impacts. As a municipality, there is often a resistance or hesitance to change, however, we’re grateful to have the information to be confident that our planning efforts and development regulations are making our residents as safe as possible and our stream corridors as healthy as they can be.”

-Sam Miller, Engineer, City of Aurora



Colorado FHZ: Identifying Risk & Opportunity

FHZ maps are an important tool to help stakeholders understand the inherent risk, and the opportunity, that exists on land that has been, and will someday again, be shaped by water and sediment moving through the landscape. FHZ maps help residents, businesses, and local governments understand hazards and make informed decisions about personal safety and evacuations, protection of critical infrastructure and financial assets, and plan for emergencies.

FHZ maps and the supporting documentation also provide a framework for communities, planners, and designers to identify opportunities to develop and implement mitigation measures which can range from avoidance through proactive development planning to civil works projects that focus on sediment storage and energy dissipation. Furthermore, as stream corridors are environmentally and economically important areas, FHZ maps can also help to prioritize opportunities for land for conservation and support maintenance of fluvial hazard compatible land uses, such as recreation and agriculture.



"Fluvial Hazard Zone maps can show us areas of *risk* and *opportunity* at the same time. Opportunities for community protection and enhancement of environmental and recreational attributes increase tremendously when we map and recognize the FHZ."

-Chris Sturm
Watershed Program Director
Colorado Water Conservation Board

Photo: City of Longmont

"Communities across Colorado face a variety of challenges from the sudden impacts of wildfire and flood to mounting pressures from growth to the everyday strain from things like tight capacity. The FHZ Program provides communities with critical tools that meet them where they are. The user-friendly design and variety of tools makes progress on risk mitigation both accessible for outreach and engagement and achievable for staff and local officials. Always looking to broaden impact, the Program was also purposefully integrated into other state hazard mitigation resources so that communities are more likely to come across complementary mitigation tools and strategies and therefore more likely to take action with multiple benefits for the natural systems across the state and the human communities that live among them."

-KC McPerson, Senior Planner, Colorado Department of Local Affairs



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Example Colorado Fluvial Hazard Zone Maps and Applications

Sand Creek Fluvial Hazard Zone Mapping and Mitigation Plan

Mile High Flood District and City of Aurora

In 2020, a Fluvial Hazard Zone delineation was completed for the Mile High Flood District on approximately nine miles of Sand Creek, a highly dynamic stream that runs through sand bluffs on the Colorado Plains. The area was primarily undeveloped at the time of the study; however, the corridor was developing quickly, and the City and Flood District were in need of a tool that would identify the erosion and sedimentation hazards of the stream and help them steer development into less hazardous locations.

An online StoryMap with the Sand Creek FHZ Mapping and Mitigation Plan can be found here: tinyurl.com/1xsb9v04

“The Sand Creek FHZ has been incredibly helpful as we review new development along the creek corridor. The FHZ gives us another way of communicating risk and analyzing improvements with developers. Without it, we wouldn’t be nearly as effective in preserving and protecting Sand Creek and the communities in our district.”

-Mark Schutte, Project Engineer,
Mile High Flood District



Middle Colorado River Fluvial Hazard Zone Mapping

Middle Colorado River Watershed Council through Garfield and Mesa Counties

The Middle Colorado Watershed Council is developing FHZ maps for approximately 75 miles of the Colorado River. This reach is experiencing rapid development within a narrow valley bottom and a conversion of land use within the floodplain. The goal of this mapping effort is to identify hazardous areas within the floodplain that also coincide with important habitat and recreational amenities and prioritize conservation and restoration efforts.

“We were pleased to have the newly minted FHZ delineation protocol available while we were developing the Middle Colorado Integrated Water Management Plan. With this tool in hand, the plan is to introduce our FHZ mapping to the local governments within the watershed as a mechanism to further protections for environmental and recreation resources”

-Laurie Rink, Project Manager,
Middle Colorado River Watershed Council



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Colorado FHZ: Supporting Natural & Beneficial Functions

Using FHZ maps and the management tools provided by this Program, including the new Stream Corridor Easement Guide, conservation and recreation organizations can identify and protect the lands where the societal benefit of limiting human exposure to fluvial geomorphic hazards is enhanced by the environmental benefits of unconstrained, dynamic rivers.

FHZ maps identify the land where fluvial geomorphic processes create shifting mosaics of highly productive habitat for riparian, aquatic and terrestrial species. These stream corridors provide diverse, dynamic, and complex habitats that are among the most important to protecting biodiversity in Colorado. This diversity of habitat creates recreational opportunities for wildlife viewing, fishing, foraging, and hunting, as well as opportunities for trail and path networks for recreation and alternative transportation. Natural floodplains also provide opportunities to protect and improve water quality, facilitate groundwater recharge and provide carbon storage.

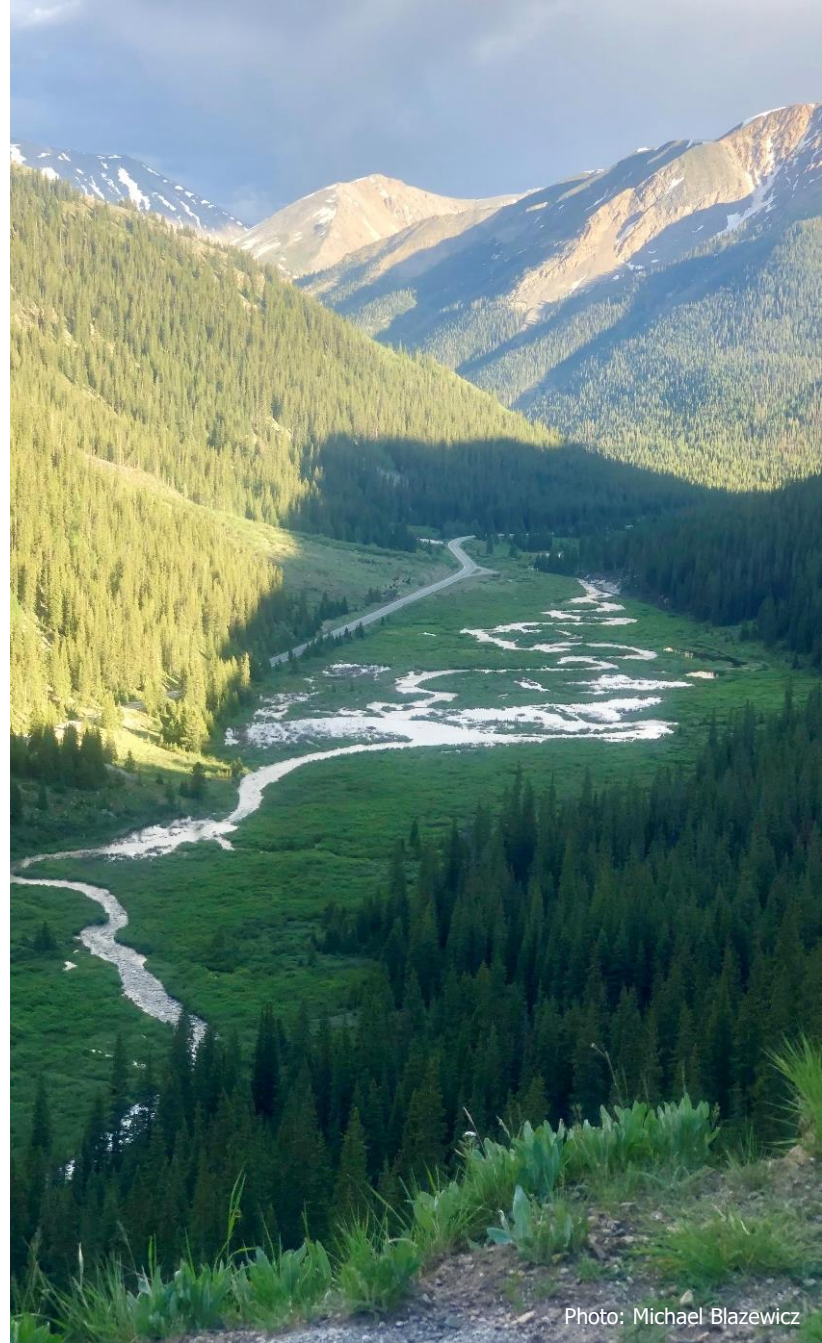


Photo: Michael Blazewicz

“The FHZ protocol, if used by planners to manage development within the FHZ, will also realize enormous benefit to the health of Colorado’s river ecosystems. Ecosystem services that may also be protected or enhanced include flood mitigation/attenuation, nutrient cycling and retention, late season flow augmentation, and recreation.”

-Peter Skidmore, Colorado River Program
Walton Family Foundation



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Photo: Fourmile Fire District

FHZ & Wildfire Planning and Response

In recent years communities across Colorado have experienced large and intense wildfires, and the FHZ Program provides valuable resources for planners and local leaders to make informed land use decisions that address post-wildfire flooding hazards, helping reduce impacts to floodplains and other natural environments, as well as the built environment. After a wildfire, FHZ maps can be quickly and cost-effectively created to delineate areas vulnerable to sediment and debris impacts spurred by rainfall over the burn scar. Mapping these post-fire hazards may allow downstream residents to prepare by preemptively moving vehicles, storage units, and other items to safer locations and to develop evacuation plans. Additionally, before a wildfire, communities can use FHZ maps to identify locations where sediment mitigation may be necessary to protect critical infrastructure. Furthermore, conserved floodplains and stream corridors, such as those identified by the FHZ Program, are thought to provide natural fire breaks, potentially aiding a community's firefighting effort during a wildfire.

WANT TO KNOW MORE?

All the fact sheet, documents, and resources mentioned here, along with FAQs and other additional information can be found on our website:

[COLORADOFHZ.COM](https://coloradofhz.com)