

PLANNING FOR FLUVIAL HAZARDS



QUICK START GUIDE



Damage to structures located outside of FEMA floodplains has been a common occurrence due to fluvially-induced erosion and sedimentation across the state of Colorado. The Fluvial Hazard Zone (FHZ) is defined as the area a stream has occupied in recent history, may occupy, or may physically influence as it stores and transports water, sediment, and debris. Planning for fluvial hazards is an essential component of stream corridor management and the mitigation of risks associated with future floods.

This Quick Start Guide lists some proactive actions and best practices a community can implement in conjunction with Fluvial Hazard Zone mapping to reduce threats to life and property from fluvial hazards in their stream corridors.

Photo: St. Vrain Creek, Lyons, CO

COMMUNITY PLANNING, LAND USE, & DEVELOPMENT

Incorporate Fluvial Hazard Concepts into Community Plans

A **comprehensive plan (or master plan)** is an important tool for consolidating and articulating a community's various policies that relate to planning, land use, and development. FHZ mapping should be incorporated into the comprehensive plan, similar to floodplains and geologic hazards, and add to the base of information from which zoning and development policies are derived.

Local hazard mitigation plans are used to identify, assess, and reduce the impact of disasters. Therefore, this plan should incorporate an assessment of a community's susceptibility to fluvial hazards via FHZ mapping. Local hazard mitigation plans should also seek to identify mitigation opportunities (such as asset relocation), or social measures (such as education or insurance), in order to help safeguard life, property, and the economic vitality of communities.

Similarly, **pre-disaster recovery plans** identify specific actions aimed at minimizing the impact and cost of recovery. Pre-disaster recovery planning should incorporate the areas of known susceptibility to fluvial hazards (i.e., FHZ maps) and promote recovery actions that are commensurate with long-term risk reduction (e.g., asset relocation, property buyouts, floodplain reconnections, etc.)

Emergency response planning should utilize FHZ maps when planning for evacuation routes and evacuation centers, as well as to assess the viability of proposed emergency response facilities (e.g., fire and police stations, medical facilities, critical transportation infrastructure, etc.) should a flood event occur.

Wildfire planning should incorporate considerations of fluvial hazards both before and after a wildfire has occurred. FHZ delineations can identify areas that are vulnerable to flooding and sedimentation that occur after a wildfire, thereby directing the deployment of resources after a fire into watersheds that have the most at-risk assets downstream. In wildfire susceptible areas, the FHZ mapping process can help direct stakeholders toward conservation and rehabilitation of areas critical for the storage of sediment and debris (e.g., areas upstream of vulnerable communities and/or water storage facilities).

Parks and open space plans provide a systematic approach for communities to identify and conserve lands for the public good as well as for critical habitat for wildlife. Fluvial Hazard Zones may be useful to further identify parcels suitable for conservation as open space for biodiversity protection and/or recreation opportunities for nearby communities.

Many lands adjacent to streams are currently being used for agriculture and grazing. Generally, these land uses are considered compatible for areas within the FHZ. Mapping the FHZ and incorporating the boundaries into community plans can help to prioritize the maintenance and **conservation of existing agricultural land uses and practices** in stream corridors.

Capital improvements plans (both for local governments and private infrastructure) should consider the FHZ. Using the FHZ as guidance, a community can improve the design and placement of community assets, thereby reducing the susceptibility of these investments to fluvial hazards, reducing maintenance obligations, as well as reducing the transfer or redirection of fluvial hazards onto nearby properties or infrastructure. Additionally, investing in green infrastructure, such as through the conservation and rehabilitation of floodplains identified by the FHZ, minimizes the need for long-term public investment in channel management and maintenance activities necessary to protect infrastructure.

The largest single source of flood losses, both in terms of cost and number of people affected, is damage to transportation infrastructure which puts public health and safety at risk when access to homes, emergency services, and businesses are unavailable due to failed roadways and crossings. Incorporation of fluvial hazards into downtown plans, **drainage and stormwater master plans, infrastructure and transportation planning** (particularly location and design of crossings), **stream corridor resilience plans, integrated water resource plans, and/or stream management plans** will be beneficial to communities seeking to take the first step in planning for fluvial hazards.

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

For more information, examples and FAQs about Fluvial Hazard Zone mapping please visit:
www.ColoradoFHZ.com

COMMUNITY PLANNING, LAND USE, & DEVELOPMENT (CONT.)

Incentivize Development Outside of Fluvial Hazard Zones

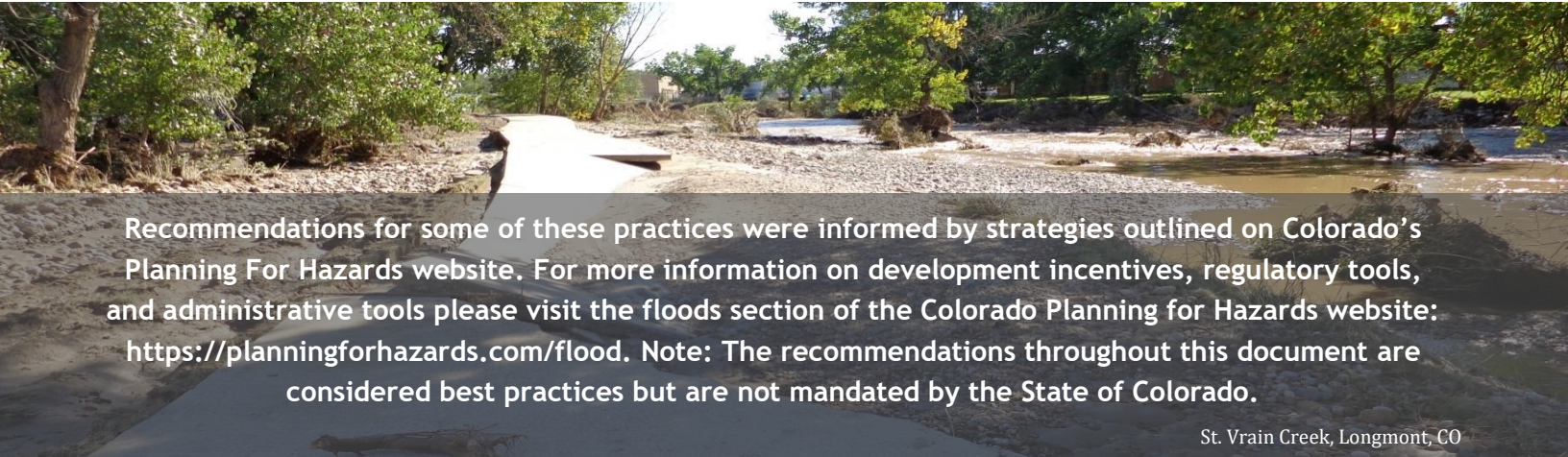
Development agreements may utilize FHZ maps to inform decisions that are mutually beneficial to both the local government and the developer. Examples include agreements to site homes and critical infrastructure out of the mapped hazard areas (including Fluvial Hazard Zones) in exchange for incentives such as cost-sharing new stormwater/flood mitigation infrastructure or cost-sharing recreational facilities in the development. In some instances, variances to local code may be used. For example, **density bonuses** allow greater density to be built on a site than would otherwise be allowed through underlying zoning. Density bonuses are often granted as an incentive to encourage preferred types of development activity, such as locating all structures outside of a mapped FHZ.

Cluster subdivisions and planned unit developments (PUDs) land development tools used by communities to protect open space or environmentally sensitive lands, including hazard-prone lands. Clustering development simply means grouping or directing new development to less sensitive areas within a subdivision or larger planned development, away from more sensitive areas such as open space, steep slopes, floodplains, or a mapped Fluvial Hazard Zone.

A **transfer of development rights (TDR)** program allows additional density where the community wants to grow in exchange for preservation of sensitive areas, such as mapped FHZs, that the community wants to protect from future development. This tool requires an adopted plan that clearly identifies areas the community desires to preserve or protect from development such as the FHZ (“sending areas”) and areas where growth and development are encouraged (“receiving areas”).

A **conservation easement** is a specific type of voluntary legal restriction placed on land to protect sensitive landscapes such as active connected floodplains, riparian corridors and the wetlands created by natural channel processes. An easement limits the ability to use or develop the land in some specific way, while still allowing the property owner to reside on and use the land, sell it, or pass it on to heirs. Similarly, a **stream corridor easement** is used to minimize detrimental channel training or flood control interventions by transferring that right/responsibility to a party that has a vested interest in protecting a natural stream corridor. Easements placed upstream of a more densely developed historic settlement, for example, may prevent further development thereby allowing for critical sediment deposition and channel movement during a flood, an investment that might pay for itself many times over in reducing downstream property damage. Easements generally involve partnership with a land trust.

Land acquisition can be an effective way for a community to protect a critical area, such as an area where significant sediment and debris deposition or channel adjustment is expected to occur upstream or downstream of urbanized reaches. For the purposes of this document, the term “land acquisition” refers to the acquisition of private land by the government (local, state, or federal) or by a conservation organization (land trust, NGO, or other) in fee simple (i.e., through purchase or donation).



Recommendations for some of these practices were informed by strategies outlined on Colorado’s Planning For Hazards website. For more information on development incentives, regulatory tools, and administrative tools please visit the floods section of the Colorado Planning for Hazards website: <https://planningforhazards.com/flood>. Note: The recommendations throughout this document are considered best practices but are not mandated by the State of Colorado.

St. Vrain Creek, Longmont, CO

COMMUNITY PLANNING, LAND USE, & DEVELOPMENT (CONT.)

Adopt Regulatory Tools for Fluvial Hazard Zones

Overlay zoning applies an additional layer of standards to all areas within a defined boundary, regardless of the underlying base zoning. The primary benefit of overlay zoning is that it applies a unique set of standards to a specified area without having to amend all other relevant sections of the zoning code. Other benefits include: providing additional protection for defined hazard areas without negotiating development applications on a case-by-case basis; allowing existing zoning regulations to be superseded or complemented to solve a known problem; and implementing comprehensive plan policies and strategies for the betterment of the community.

Comprehensive recovery ordinances typically establish the framework for a variety of post-disaster tasks such as: stream channel and debris management; stabilization of damaged buildings; identification of other life/safety risks; repair of damaged infrastructure; and mitigation options and funding to rebuild to different standards or to potentially relocate certain uses. The FHZ may be used to help identify a boundary within which these activities are regulated.

Community Rating System (CRS) is a voluntary, incentive-based program that recognizes, encourages, and rewards local floodplain management activities that exceed the minimum standards of the National Flood Insurance Program (NFIP). As part of a comprehensive flood risk management program, regulation of Fluvial Hazard Zones may result in lower flood insurance premiums for residents in the participating community. For more information on the potential for CRS credits, please see Appendix A, Section 5.0 of the Colorado Fluvial Hazard Zone Delineation Protocol. CRS is administered by FEMA.

CWCB Incentives and Support for Local FHZ Programs and Mapping

CWCB is committed to assisting communities that wish to map and acknowledge FHZs through the following actions:

- Providing **technical and regulatory advisory assistance** to communities that wish to map and manage FHZs.
- Allowing FHZ mapping and programs to be considered for **competitively awarded grant funding** with a 1:1 match requirement via the [Colorado Watershed Restoration Grant Program](#).
- Providing resources to and partnering with organizations and local agencies that are implementing Stream Corridor Easements.

ENHANCE LOCAL ADMINISTRATION & PROCEDURES

Development application submittal requirements are the materials that must be submitted to a local government to initiate the development review process. In the instance of a development application within a Fluvial Hazard Zone, a local community may request or mandate that the application be reviewed by the Colorado Geological Survey or other non-affiliated third-party consultant with the technical knowledge to assess fluvial hazards. Doing so may not only mitigate risks to the new development but may also help to limit the transfer of hazards to adjacent or downstream areas that might arise when the development is proposing to alter and/or armor the stream. Communities should also review their development review process to ensure all relevant stakeholders are consulted at the correct step of the process. Generally, involving stakeholders early in the process (as opposed to later-stage public comment periods) is recommended.

A **post-disaster moratorium** on repairing or rebuilding structures either located within a Fluvial Hazard Zone and/or damaged by fluvial processes may be used to temporarily restrict building activity following a major disaster. The main benefits of enacting a post-disaster moratorium include: allowing a community to pause or slow down the permitting and rebuilding process to help ensure appropriate post-disaster rebuilding; ensuring that community goals for recovery and redevelopment are being met; and allowing for necessary mitigation, code changes, and/or policy changes to be fully evaluated and/or implemented before rebuilding takes place.



Streams become hazardous when public infrastructure, houses, businesses, and other investments are placed in locations where fluvial processes naturally occur.

Fish Creek, Estes Park, CO

PROMOTE ACTIONS TO MITIGATE HAZARDS

Communities can choose to adopt **No Adverse Impact standards (NAI)**, a management approach recommended by the Association of State Floodplain Managers (ASFPM) for local government, state, and federal floodplain management to help control spiraling flood and erosion losses, and avoid new development that increases flood risks. This approach aims to ensure the action of any entity (public or private) does not adversely impact the rights of other property owners. An adverse impact can be measured by an increase in flood stages, flood velocity, flows, the potential for erosion and sedimentation, degradation of water quality, or increased cost of public services. The FHZ, or a combination of the FHZ and FEMA floodplain (whichever is larger), could be used as the area to which a community would apply their no NAI standards. For more information on No Adverse Impact see: <https://www.floods.org/asfpm-nai-no-adverse-impact-floodplain-mgmt>

Identify **critical areas for fluvial hazard mitigation** through consultation with FHZ map developers in order to identify where areas of significant channel adjustment associated with erosion and/or aggradation of sediment and debris are likely to occur during a flood event or after a wildfire and areas where mitigation for previous land use decisions could be undertaken. Identifying these areas and then targeting them for protection through one of the numerous aforementioned tools and/or rehabilitation and infrastructure upgrades is an excellent strategy for mitigating damage in downstream reaches.

Provide **opportunities for relocation or buyouts**. Hazard mitigation enables individuals and communities to recover more quickly after a disaster. Mitigation also lessens the financial impact to individuals and to the local, state, and federal government. Federal, state, and local partners should evaluate the feasibility of completing one of the following fluvial hazard mitigation activities:

Home relocation moves structures from their current location to another location on the property that is out of the Fluvial Hazard Zone, if another buildable location is available.

Buyout involves complete removal of the home, outbuildings, and infrastructure (septic and utilities) and restoration of the land. After the property is bought, it is no longer developable. The property does not always become public land. Private land trusts or other nonprofits can have their own buyout programs.

For examples of how some of these best practices are implemented throughout Colorado please see:
www.ColoradoFHZ.com

CREATE OPPORTUNITIES TO INFORM RESIDENTS OF EXISTING HAZARDS

Provide the FHZ as an informational layer on NFIP maps. When NFIP maps are updated, it may be beneficial for a community to request that an FHZ delineation be placed on the FEMA map as an informational layer. Community staff and developers are generally accustomed to looking at NFIP and NFHL maps. Incorporating the FHZ as an informational layer on this accepted tool can further promote understanding and awareness of fluvial hazards as well as self-directed responsible decision making.

Incorporate FHZs into utility connections and septic permit reviews. Water and sewer are often the first issues someone investigates when determining how and if to develop a lot. At this initial stage, communities can request that applicants review applicable FHZ maps and assess if the proposed site plan can be altered to reduce investment in hazardous areas.

Encourage the purchase of flood insurance for residents in the FHZ. Most residents base flood insurance purchases on their home's inclusion in a mapped and regulated floodplain. FHZ maps may illuminate existing risks from flooding that are not accounted for on these traditional floodplain maps. Communities can encourage residents whose properties are mapped in the FHZ to purchase flood insurance so that they are properly insured.

Incorporate fluvial hazard information onto community websites. Many communities have an informational page on their websites that discusses flood hazards and floodplain development permits. It is recommended that a community also include information on this page about fluvial hazards, FHZ maps, and actions that can be taken to mitigate fluvial hazards.

Incorporate fluvial hazard concepts into all levels of education. Fluvial hazards and the physics that create them, combined with the social and ecological connections that are inherent in defining them, provide an excellent multi-disciplinary opportunity for education, critical thinking, and discussion. An example lesson plan has been developed for a week-long program on hazards in stream systems that addresses the science standard of *“mapping the history of natural hazards in a region and understanding related geological forces”*.

Partner with local watershed organizations to promote the benefits of planning for natural stream channel adjustment. Local watershed groups have invested stakeholders and strong partnerships that add robustness to the public engagement process, may be able to leverage grant money, and should already be promoting fluvial processes for the multi-benefits of watershed health. Combining efforts in a multi-stakeholder partnership to map, protect, and/or regulate stream corridors may prove to be the most powerful strategy for attaining long-term risk reduction and ecosystem function. Other ideas for collaboration with local watershed organizations include installing signs in stream-adjacent public spaces, staffing information booths at community events such as farmer's markets and cultural festivals, and posting information at community-oriented buildings and gathering spaces.



Fluvial Hazard Zone mapping is a component of the Colorado Hazard Mapping Program (CHAMP) run by the Colorado Water Conservation Board in partnership with the Colorado Geological Survey, the Colorado Department of Local Affairs, and local governments. The CHAMP program is working toward effective long-term flood hazard reduction in Colorado through the development of the Fluvial Hazard Zone mapping program, debris flow hazard assessments, and traditional floodplain mapping.

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St. Vrain Creek, Longmont, CO