

Chapter 7

Plan Preparation

Determining the Need for a State Plan

In order to determine the need for a state landslide hazard mitigation plan, individual states must first assess the vulnerability of their present and future population to the hazard.

Vulnerability is the susceptibility or exposure to injury or loss from a hazard. People, structures, community infrastructure systems (transportation, water supply, communications, and electricity), and social systems are all potentially vulnerable.

An assessment of statewide vulnerability to geologic hazards is a product of the technical assessment of the problem, based on scientific studies and investigations, and an assessment of capabilities, in the public and private sectors, to respond to and mitigate the hazards and potential impacts identified. Before resources are invested in hazard mitigation measures, the social and economic costs and impacts associated with landsliding need to be determined and put into perspective.

The next step in recognizing the overall vulnerability of the state to the landslide hazard is the identification of specific communities, areas, and facilities at risk. The existence and effectiveness of local programs and systems for mitigating landslide problems in communities experiencing actual or potential impacts must then be determined.

Although landslides can potentially affect entire regions or states, the hazards themselves are local problems first, and local governments remain on the "front lines" of the battle to reduce losses.

Landslide loss reduction in the United States is primarily a local responsibility. While the federal government plays a key role in research, in the development of mapping techniques, and in landslide management on federal lands, the reduction of landslide losses

through land use management and the application of building and grading codes is essentially a function of local government (Sangrey and Bernstein, 1985, p. 9).

The purpose of a state landslide hazard mitigation plan is to encourage and support local mitigation efforts and address serious landslide problems, beyond local capability, that threaten lives and property and have potential regional or statewide implications. Strategies and projects developed in the planning process are therefore based on an assessment of what can be accomplished locally and the level of supplemental assistance that will be required to lessen the problem. State and federal assistance picks up where local efforts stop; generally local resources must first be exhausted.

A key element in the planning process and a major recommendation of this guidebook is the establishment of a permanent state organization, representing the various levels and responsibilities of government, to focus the attention of state government on natural hazard mitigation issues.

Federal Disaster Relief and Emergency Assistance Act (Section 409)

In presidentially-declared disasters, the preparation of a state plan that identifies and evaluates hazard mitigation opportunities is mandated by Section 409 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (Public Law 93-288, as amended) as a condition of receiving federal disaster assistance. This requirement was originally enacted in 1974 under Section 406 of the Disaster Relief Act to encourage identification, evaluation, and mitigation of hazards at the state and local government levels. The requirements of Section 409 are triggered by a major disaster or emergency declared by the President and apply to all types of declared emergencies and disas-

ters. A hazard mitigation clause is incorporated into the FEMA/State agreement for disaster assistance, thereby establishing the identification of hazards and the evaluation of hazard mitigation opportunities as a condition for receiving federal assistance.

The Federal Emergency Management Agency (FEMA) is responsible for administering the Section 409 requirements and has prepared implementing regulations (44 CFR 206, Subpart M) that specify federal, state, and local responsibilities under Section 409. Under the regulations, a state hazard mitigation coordinator is designated by a governor's authorized representative to prepare a hazard mitigation plan and to ensure its implementation. States may establish a group of individuals from state and local agencies to assist in preparing the "409 plan," which must be completed and submitted to FEMA within 180 days after the presidential declaration.

With the passage of the Stafford Act in 1988, a hazard mitigation funding program was authorized for the first time under Section 404 of the Act. This mitigation-measures funding program provides up to 50 percent federal funding for activities identified under Section 404, thus making preparation of a good hazard mitigation plan more important than ever before. The identification of mitigation opportunities under this program follows the evaluation of natural hazards under Section 409. Total federal funds available under Section 404 are limited to 10 percent of the permanent restorative work funded under FEMA's Public Assistance Program. Implementation regulations for Section 404 can also be found in 44 CFR 206, Subpart M.

In state-declared disasters, some states require the development of local hazard mitigation plans as an eligibility requirement of state emergency relief.

The Planning Team

States undertaking plan development should first consider assembling a state planning team to manage the research and writing of the plan. The planning team could be in the form of a working group, directed by state representatives and supported by representatives of local

government, the private sector, and academia. Typically, the group would gather, interpret, and assemble the technical information that forms the basic structure of the landslide hazard mitigation plan.

The interagency efforts of post-disaster hazard mitigation teams in presidentially-declared disasters have demonstrated that such working groups representing a broad range of state and federal agencies can successfully develop a host of innovative and cost-effective mitigation ideas.

The planning team should include individuals knowledgeable about geology, engineering, emergency management, and community development and planning. Depending on the nature of landslide problems, the team might also include individuals involved in natural resources management, highway construction and maintenance, state and regional planning, and others as conditions warrant.

The responsibilities of individual team members would include researching and writing those sections of the plan that relate to their area of expertise. Team members would also participate in meetings with planners, emergency managers, policy makers, and elected officials in local and state government and, to the extent possible, seek the input and participation of private industry, professional and volunteer organizations, and interested citizens. An initial analysis of existing mitigation plans and emergency management capabilities in landslide-impacted jurisdictions will enable the planning team to identify the most serious problems and to develop projects that build on efforts already in progress. This assessment of local landslide conditions and local capabilities to deal with them should identify a wide variety of practicable mitigation solutions. This will facilitate the coordination of state support and the identification of unmet local needs that can be presented for possible state action.

Local jurisdictions impacted by landslides should be encouraged to form their own local planning teams—composed of decision makers, planners, emergency managers, engineers, geologists, and officials from law enforcement, fire safety, and emergency medical services—to formulate local plans and mitigation strategies.

The Planning Process

The planning process recommended for the development of a landslide hazard mitigation plan follows a series of steps that are basic to mitigation planning:

- (1) analysis of the types of landslide hazards in the state and a general assessment of the vulnerability of people and property to the state's landslide hazards;
- (2) identification of specific areas of the state where landslides have the most serious or immediate potential impacts and a detailed analysis of their vulnerabilities;
- (3) translation and transfer of technical information on hazards and vulnerabilities to users such as decision makers, community planners, and emergency management officials;
- (4) assessment of resources and mitigation programs available in the public and private sectors to deal with the identified potential impacts;
- (5) determination of local capability shortfalls and unmet needs in order to apply technical and financial assistance where it can best contribute to the reduction of future losses;
- (6) formulation of goals and objectives for state and local landslide hazard mitigation plans, and the development of cost-effective mitigation projects that address identified vulnerabilities;
- (7) establishment of a permanent state hazard mitigation system to prioritize and promote mitigation goals and objectives and to secure and direct funding for implementation;
- (8) periodic evaluation and modification of the plan and planning process.

Step 1—Hazard Analysis

A complete hazard analysis is the result of the identification of the state's landslide hazard areas, the identification of the most vulnerable locations, and the assessment of potential impacts on people and property in vulnerable areas. Where possible, the hazard analysis should provide planners with information about

hazard location, description, frequency, history, existing impacts, potential impacts, and, to the extent possible, probability of occurrence.

The use of land-use maps in conjunction with detailed maps exhibiting the extent and severity of landslide hazards in an area helps officials to determine vulnerability to landslides, mitigation priorities, and the most appropriate mitigation measures.

Appropriate land use management, effective building and grading codes, the use of well-designed engineering techniques for landslide control and stabilization, the timely issuance of emergency warnings, and the availability of landslide insurance can significantly reduce the catastrophic effects of landslides. All of these approaches require, as a starting point, the identification of areas where landslides are either statistically likely or immediately imminent, and the representation of these hazardous locations on maps (Committee on Ground Failure Hazards, 1985, p. 2).

The planning team should assemble existing mapped landslide susceptibility data that portray the distribution of various types of landslides and the likelihood of their occurrence. The team will need maps sufficiently detailed to determine the character, location, and magnitude of landslide problems.

Step 2—Identification of Impacted Sites

Once the nature and distribution of the hazard and the vulnerability to landsliding of various communities, areas, and facilities has been determined, site-specific evaluations of the potential impacts of landsliding should be performed. Based on the hazard analysis, those sites determined to present the greatest threat to lives and property should be subject to further site analysis and mitigation planning.

Impact is the effect of a hazard event on people, buildings, and the infrastructure. The impacts of landsliding range from the inconvenience of debris cleanup to the life-threatening failure of a landslide-formed dam. The simultaneous or sequential occurrence of other hazards such as flooding or earthquakes with landsliding can produce effects that are greater or qualitatively different from those produced by landsliding alone.

Step 3—Technical Information Transfer

As discussed in Chapter 5, individuals or groups often do not take mitigative actions because they do not understand the significance of the threat, what to do to reduce it, or lack information and training on how to do it. Therefore, once landslide hazard information has been gathered, it must be communicated to planners, policy makers, emergency response personnel, and the public. Maps are one of the best methods of transferring such information. Landslide information can be used in the development, review, and approval of land-use plans, community development plans, emergency management plans, and hazard mitigation plans. In order for landslide information to be more widely incorporated into community planning and planning for landslide mitigation, the technical staff that produces the information must tailor it so that it is understandable and usable by the various parties involved in the development process. Producers of information should also ensure that potential users are aware of available data, as well as research planned or in progress. Conversely, nontechnical users of landslide information should take steps to improve their skills in interpreting and applying the information.

The difficulty of translating technical information for nontechnical users highlights the importance of retaining the services of qualified technical experts throughout the planning process. According to Fleming and Taylor (1980, p. 4), "solutions to the technical problems are only a part of the process of achieving landslide hazard reduction. The political problem of transferring the information into a governmental system to reduce hazards and damages is perhaps more formidable than the technical one."

Step 4—Capability Assessment

Capability assessment is a determination of public, private, and volunteer resources in a community that are available to support emergency management and hazard mitigation activities designed to reduce losses from a particular hazard. Resources include not only equipment, supplies, and materials, but, more importantly, people, expertise, plans, programs,

and cooperative agreements with other jurisdictions and private industry. Private companies have a vested interest in the mitigation process because private losses often exceed public losses in natural disasters, and also because private firms may receive insurance benefits (lower premiums, reduced liability) for a demonstrated commitment to reducing future losses.

The assessment of local capabilities should identify the most vulnerable elements of the community, the current level of mitigation activity, the status of emergency management planning, and opportunities for state and federal mitigation assistance.

The checklist provided in Table 7 can assist local jurisdictions in preparing plans for landslide hazard mitigation and emergency management as well as assisting state planning teams in assessing local mitigation efforts.

Table 7. Types of information that should be considered in an assessment of a community's landslide hazards and capabilities (modified from Weber et al., 1983).

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- A. Maps
 - 1. Base map
 - 2. Landslide inventories
 - 3. Landslide susceptibility maps
 - 4. Landslide hazard maps
 - B. Physical (Geologic) Information
 - 1. Scope (boundaries of areas subject to landslides)
 - 2. Frequency (historical occurrences by date, location, description, and impacts)
 - a. Reports
 - b. Newspaper articles
 - c. Eyewitness accounts
 - 3. Hazard characteristics
 - a. Predictability
 - b. Potential speed of occurrence
 - c. Potential impact forces
 - d. Magnitude
 - e. Worst-case scenario
 - C. Social (Human) Information
 - 1. Land Use
 - a. Existing (map)
 - b. Future (map)
 - c. Zoning (map)

Table 7. Continued

<ul style="list-style-type: none"> 2. Population at risk <ul style="list-style-type: none"> a. Number of people/total dwelling units b. Variability (difference in day/night populations) 3. Property at risk (infrastructure) <ul style="list-style-type: none"> a. Use/function b. Assessed value 4. Economic activity at risk (commercial, industrial, tourism) <ul style="list-style-type: none"> a. Employment b. Gross revenues 5. Critical services and facilities at risk <ul style="list-style-type: none"> a. Access b. Police c. Fire d. Communications e. Schools f. Health care (hospitals, nursing homes) g. Utilities h. Emergency management facilities i. Transportation 6. Aggravating influences (roads, structures, landscaping, removal of vegetation, or other land uses that contribute to landslide hazard) 	<ul style="list-style-type: none"> 2. Emergency management activities <ul style="list-style-type: none"> a. Warning systems b. Emergency plans (life-saving, evacuation, facility-specific) c. Public education/hazard awareness campaigns d. Training exercises 3. Local financial capabilities and needs <ul style="list-style-type: none"> a. Funds available b. Major resource shortfalls c. State and federal programs and grants d. State and federal technical assistance <hr/>
<p>D. Landslide Hazard Management Capabilities</p> <ul style="list-style-type: none"> 1. Landslide hazard mitigation activities <ul style="list-style-type: none"> a. Land-use regulations b. Land-use plans c. Building and grading codes d. Design and location standards e. Development and redevelopment plans f. Landslide control structures g. Monitoring/instrumentation h. Acquisition and relocation projects i. Public utility extension guidelines j. Planning team formation k. Land exchanges l. Real estate disclosure requirements m. Lending and financing policies n. Additional public works o. Private sector involvement p. Special assessment districts q. Tax adjustments 	<p>By comparing local risks and possible impacts with the capability of a jurisdiction to respond to those risks, a state planning team can identify major resource deficiencies, or unmet needs, that become the basis for projects in the state plan. Unmet needs are technical and financial resource needs that exceed the capabilities of the communities at risk. In many cases, these resource shortfalls represent substantial obstacles to reducing the impacts of future landslides on people, property, and essential services.</p> <p style="text-align: center;">Step 5—Determination of Unmet Local Needs</p> <p>Based on the analysis of local capabilities, unmet needs that should be considered by state and federal governments are identified and a state mitigation assistance strategy is formulated. In order to determine unmet needs, specific human activities should be examined to evaluate potential impacts on public health and safety, public and private property, commerce, and the community at large. Group meetings and individual interviews can yield sufficient information to determine the most critical needs of local governments and to develop priority mitigation projects for state action. Less urgent needs can be addressed in future projects. The state planning team should also identify existing local mitigation projects so that state projects can be coordinated to support their efforts.</p>

Step 6—Formulation of Goals and Objectives

Fundamental to a mitigation program is the establishment of a system for landslide mitigation planning and management at the state and local government levels. The establishment of a permanent state system to effect mitigation projects should be considered. This management system would help ensure that:

- existing hazardous conditions are dealt with expeditiously,
- new landslide hazards are assessed and prioritized,
- new options are developed and evaluated,
- intergovernmental and interagency technical advice and mitigative action can be coordinated,
- priorities are established for high- and moderate-risk situations that are beyond local government capability,
- decisions are made and funding obtained and spread over a period of time that is commensurate with state fiscal capabilities,
- feedback is evaluated and needed program adjustments made, and
- a systematic approach to mitigation is established.

Local Landslide Hazard Mitigation

Local jurisdictions should institute mitigation programs that coordinate landslide hazard information and mitigation needs with state government and the private sector. Local mitigation systems should effectively employ state assistance and be ready to take on new problems as solutions to old problems are found. Local mitigation plans need to be in place so that work on mitigation projects can begin as soon as funds become available.

Effective local systems are important to state planning because they provide direction for state action. A comprehensive local hazard mitigation program should be based on community consensus, developed through local planning committees with citizen support and involvement, and should conform to local goals and objectives and budget constraints. Local governments involved in landslide hazard miti-

gation face a number of important planning challenges, including: (a) the preparation of emergency management plans that ensure the timely warning and evacuation of people in high-risk areas; (b) the formation of local planning committees to identify unmet local needs and schedule the implementation of mitigation projects; (c) the coordination of public, private, and volunteer resources; and (d) the integration of landslide hazard information into community development plans in order to protect existing development and guide, discourage, or restrict future development in landslide-prone areas.

Local hazard mitigation and emergency planning are generally carried out separately from the basic planning of local government. Integrating hazard information into the comprehensive or master plan of a community, however, better enables a jurisdiction to guide the activities of builders, investors, and developers in areas known to be hazardous. Communities that have an adequate base of technical information about local landslide problems, and that have succeeded in applying this information to development and planning decisions, have met an important precondition to most types of mitigation. Land-use plans that consider available hazard information demonstrate to developers and to the public that public health and safety concerns are important factors in community development. According to Olshansky and Rogers (1987, p. 957), "By incorporating landslide hazard information into long-term local plans, local governments give developers advance notice of land use policies and the reasons for those policies."

Development of Mitigation Projects

The identification of areas in the state that are vulnerable to catastrophic landslide losses will enable the planning team to formulate the goals and objectives of the state plan, which may be expressed in the plan in the form of prioritized mitigation projects. With the support of the planning, technical, and policy-making staff of state and local agencies that have resources, capabilities, or statutory responsibilities relating to landslide hazard management, the planning team should be able to develop an initial group of projects.

A wide range of project ideas and opinions, representing the perspectives of planning, geology, engineering, emergency management, private industry, elected leadership, and others, should be solicited to enable the planning team to determine the cost effectiveness, feasibility, and political and social implications of each possible approach. The highest initial priority should be assigned to those projects that establish a permanent system in state government for continuous support of state hazard mitigation opportunities. A second priority should be state support to long-term mitigation programs in local government and the private sector. Another ongoing priority should be the identification of and participation in state and federal programs that can provide funding support for mitigation initiatives.

Although implementation of many recommendations may be difficult if financial resources are limited, government agencies should be encouraged to use the plan and its identified projects as a resource in formulating annual work programs, budgets, and policy statements concerning landslides. Projects that modify existing programs or improve coordination are usually relatively low-cost and stand the best chance of being implemented first. Funds to implement the more costly projects should be aggressively sought from state legislatures, the federal government, and the private sector.

Projects recommended in the state plan should include a brief statement of the problem, a general statement of the recommended solution, a description of short- and long-term initiatives, a designated lead agency, and a preliminary estimate of cost effectiveness, where possible. Projects should contribute toward an effective and coordinated state/local landslide management system, and should be flexible both in content and priority to allow for modification during the implementation process. Local jurisdictions should report their accomplishments and important unmet needs to the state mitigation organization so that new state/local strategies can be developed. New projects should be introduced into the system as new landslide threats are identified and as new approaches to old problems are found.

Step 7—Establishment of a Permanent State Hazard Mitigation Organization

A permanent state hazard mitigation organization should be created to coordinate the resources of state, local, and federal agencies with landslide hazard mitigation responsibilities and authorities. For states with serious landslide problems, establishment of a permanent organization institutionalizes in state government the consideration of opportunities to reduce landslide losses. In Colorado, this has been accomplished by an Executive Order (Figure 28) that formalizes landslide hazard mitigation planning within a natural hazards mitigation council.

States with no existing system for hazard mitigation should consider establishing an organization that also addresses and promotes the mitigation of other hazards impacting the state. Most of the public agencies involved in landslide hazard mitigation—those concerned with geology, natural resources, highways, climatology, water resources, emergency management, and others—are also involved with problems of flooding, drought, and, depending upon location, hurricanes, and earthquakes. Although the focus and extent of short-term mitigation activities at any given time may depend upon the prevailing threats, the organization should maintain a broader, long-term perspective on all of a state's natural hazards. An all-hazards approach should result in an efficient, multi-purpose process that can gain the support and approval of state leadership and the public.

The role of the state mitigation organization should essentially be a continuation of the activities performed by the state planning team and those coordinating agencies with a role in landslide mitigation that participated in the development of the plan. One type of organization might consist of a state mitigation council supported by working groups. The council would be made up of decision makers selected from key state, local, and federal agencies and could include representatives from the governor's office and the state legislature. Representatives from local and regional governments and academia may also be included in working groups.

STATE OF COLORADO

EXECUTIVE CHAMBERS
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Roy Romer
Governor

EXECUTIVE ORDER

ESTABLISHING A COUNCIL FOR THE IMPLEMENTATION OF
STRATEGIES TO MANAGE MITIGATION OF NATURAL HAZARDS IN COLORADO

WHEREAS, various natural hazards have caused physical and financial impacts in Colorado and will continue to do so; and

WHEREAS, these impacts have resulted in unexpected costs to state and local governments as well as degradation of the state's health, safety, environment, infrastructure and economy; and

WHEREAS, the opportunities to significantly manage floods, landslides, wildfires and other natural hazards are identifiable and should be executed as funding is available; and

WHEREAS, mitigation recommendations can be effectively prioritized and managed by a state council, supported by interagency working groups; and

WHEREAS, a need exists to provide formal recognition, authority and responsibilities to this organizational structure;

NOW, THEREFORE, I, Roy Romer, Governor of the State of Colorado, by virtue of the authority vested in me under the constitution and laws of the State of Colorado, including the Colorado Disaster Emergency Act of 1973, 24-33.5-701, et seq., hereby Order:

1. The Colorado Natural Hazards Mitigation Council is hereby created. The council will be chaired by the Colorado Department of Natural Resources and consist of as many as 25 representatives. The following organizations or groups shall be appointed by the Governor:

- The Governor's Office
- State departments of Natural Resources, Highways, Local Affairs, Public Safety, Health and Agriculture
- The Colorado Municipal League and Colorado Counties, Inc.
- The Natural Hazards Center, University of Colorado
- Business community
- The Federal Emergency Management Agency (Region VIII) and the National Weather Service (National Oceanic and Atmospheric Administration)
- U.S. Army Corps of Engineers
- Elected local officials from areas of the state with high-risk natural hazards
- The general public

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The Speaker of the House of Representatives, the President of the Senate, the Minority Leader of the Senate and the Minority Leader of the House of Representatives may each appoint one legislative representative. All members will serve for a term of two years with reappointments permitted at the pleasure of the Governor. The Governor will appoint the chairperson.

2. The chairperson will appoint a steering committee and an executive secretary to carry on the administrative activities of the council.

3. The responsibilities assigned to the council are to:

- a. Identify vulnerability to various natural hazards and evaluate the options available to mitigate such risks.
- b. Review current mitigation plans for such hazards as wildfires, droughts and avalanches.
- c. Develop a unified management strategy with recommendations concerning state, federal or local mitigation responsibilities.
- d. Prioritize hazards statewide.
- e. Assist local government in seeking funding to implement hazard mitigation recommendations.
- f. Meet at the call of the chairperson, but no less frequently than once a year.
- g. Prepare an annual work program and status report covering progress achieved and provide periodic updates to the Governor and the state legislature.
- h. Inform local government and the general public of the activities and recommendations of the council.

The council is directed to place high priority on use of the Colorado Flood Hazard Mitigation Plan and Landslide Hazard Mitigation Plan, and should coordinate and prioritize the projects contained in these plans and any other plans dealing with natural hazards.

Given under my hand and the
Executive Seal of the State
of Colorado, this 23rd day
of March, 1989.

Roy Romer
Governor

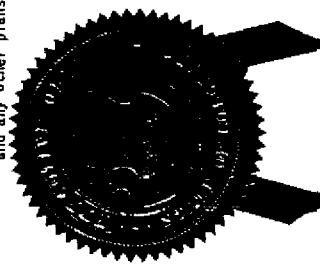


Figure 28. Executive Order establishing Colorado Natural Hazards Mitigation Council.

The council should be responsible for prioritizing strategies and projects, securing and directing funding, and monitoring overall program effectiveness to ensure that policies and directed measures are implemented in a timely and efficient fashion. Since funds for the implementation of many of the recommended projects will not likely be immediately available, an ongoing and aggressive search for funding sources will be a major role of the council. State and federal support should be obtained immediately for those projects that address landslides where potentially catastrophic or serious economic impacts have been identified.

The responsibilities of the working groups will be to: (1) review risks and options and provide additional information to the council once projects have been selected from the plan for

implementation, (2) monitor identified landslide areas and collect and interpret information about emergency situations as they occur, (3) prepare new projects as needed to meet changing conditions, (4) implement projects as funding becomes available, (5) recommend projects for funding by government and the private sector as specific needs arise, and (6) provide technical support to the council, including recommendations on project priority.

Step 8—Review and Revision

A continuous process for evaluating mitigation progress and for making adjustments to the program should be a part of any hazard mitigation system. Procedures for review and revision of plans and the planning process are discussed in the following chapter. □