



# Critical Lands Planning Toolkit for the State of Utah:

Governor's Office of Planning and Budget

Utah Governor's Office of Planning and Budget  
State and Local Planning Section  
State Capitol Complex  
East Office Building, Suite E210  
PO Box 142210  
Salt Lake City, Utah 84114-2210  
801.538.1027  
[www.planning.utah.gov/CriticalLandsHome.htm](http://www.planning.utah.gov/CriticalLandsHome.htm)  
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Illustrations by Allison Hopkin

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## table of contents

introduction.....	3
defining critical lands.....	5
critical lands encyclopedia.....	7
watershed.....	9
groundwater.....	10
lakes, streams, and riparian areas.....	11
wetlands.....	12
wildlife habitat.....	13
steep slopes.....	14
ridgelines.....	15
prime agricultural land.....	16
cultural and historic resources.....	17
earthquakes.....	18
wildland fires.....	19
landslides.....	20
avalanches.....	21
floodplains.....	22
dam safety.....	23
gis mapping tool.....	25
gis tool introduction.....	27
gis tool indicators.....	28
how the gis tool works.....	30
using the online tool.....	33
making use of your critical lands map.....	46



## introduction

The state of Utah is home to a variety of unique and contrasting landscapes. These landscapes provide water, food, recreation, tourism, and a host of fundamental values to residents and visitors. Because of its appeal, Utah's population is growing rapidly along the urbanized areas of the Wasatch Front and encroaching upon once rural areas of the state. Increasingly the state's mountains, lakes, wetlands, and deserts constrain potential sites for new development. This oftentimes leads to development on steep slopes, floodplains, wetlands, riparian zones, farmland, and areas of prime wildlife habitat. Despite this demand, it is critical that some lands are left to perform their natural function. As a result, proactive measures are needed to conserve Utah's critical lands while accommodating future growth.

Perhaps the most important measure that can be taken to protect Utah's future is to promote quality growth. Quality growth requires a balance between the protection of critical lands and the requisite development of residential, commercial, and industrial land to accommodate an ever-expanding economy and population. Many communities, however, lack the funds, resources, or staff needed to identify these critical lands, thus leading to an unbalanced system that favors unchecked and costly development.

This toolkit is intended to aid communities in defining, identifying, inventorying, mapping, and prioritizing their critical lands in an effort to achieve a balance between conservation and development. It provides objective data that can be used to cooperate with private landowners to protect property rights and achieve mutual goals in landuse planning. This toolkit is easy to use. This toolkit is comprised of a "Critical Lands Encyclopedia" that explains what critical lands are and why it is important that they be considered in future landuse decisions. Perhaps the most exciting part of the toolkit is the interactive on-line critical lands mapping tool (<http://www.planning.utah.gov/CriticalLandshome.htm>). The mapping tool, which is a Geographic Information System (GIS) based program, is designed to assist communities in creating maps that not only identify their critical lands, but prioritizes them as well. This toolkit is the first step in creating a critical lands plan for your community.



## defining critical lands

What is meant by “critical lands?” The word “critical” implies that something is essential or indispensable and is characterized by risk or uncertainty. Perhaps it can then be inferred that “critical lands” are those lands which are essential or indispensable.

Critical lands are defined here as the lands which are essential to the health, safety, and welfare of Utah and its residents. They provide clean air, clean water, and food that Utahans need, while protecting residents from floods, landslides, and other natural hazards. Critical lands also are important economically for the state in that they often generate tourism dollars, they may produce tax revenues, and they frequently protect development from the costs associated with natural hazards. Critical lands also play a vital role in defining the character of a community and providing the quality of life its residents value.

Lands exhibiting these important attributes are often held in public trust by a state or federal land management agency, but frequently they are owned by private citizens. It is these private lands that are under the greatest pressure for development. Care must be taken to protect the rights of the landowner and balance them with demonstrable needs of the community.

The following encyclopedia defines the characteristics basic to any critical lands plan. Communities are encouraged to further define lands they deem critical to their quality of life now and in the future.



critical lands encyclopedia



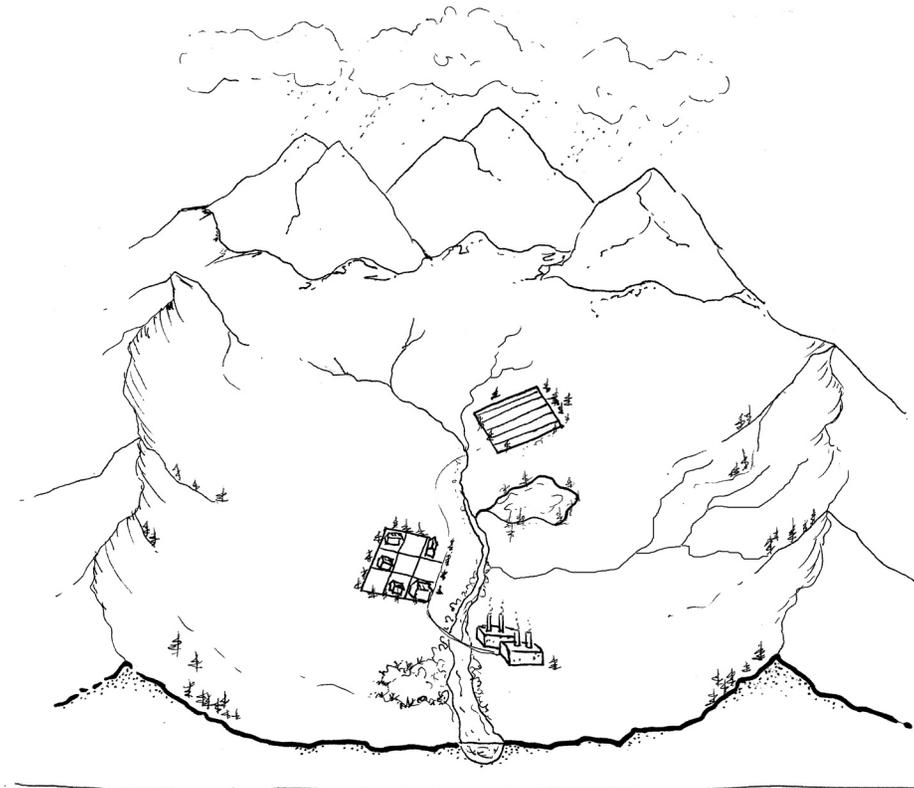
# watershed

A watershed is a land area that catches rain or snow and drains to a common point. A system of drainage pathways, either underground or on the surface, move the water. Often these pathways come together into a river system that gets larger as it progresses downstream. In arid regions such as Utah, the water often drains into a lake or wetland. Watersheds can be both large and small, with a number of smaller watersheds often making up a larger one (Oregon Watershed Enhancement Board 3 Dec. 2004).

A healthy watershed performs a number of vital functions. Watersheds capture, store, and release water, filter sediments and pollutants, cycle nutrients through the environment, and support many living organisms, including humans. These functions are dependent upon the climate, topography, soil, and vegetation within the watershed. When a function in any part of a watershed is disturbed, the effects are felt throughout the watershed (California Forest Stewardship Program 16 Dec. 2004).

Careful planning is needed to protect watersheds and their functions from disturbance. Watersheds cross political, social and economic boundaries, making their protection difficult to achieve at the local scale. It is important to include all parties within the watershed when making plans or implementations that may affect its wellbeing. Every community contained within a watershed should become a stakeholder in its management in order to maintain clean water, aesthetics, natural resources, and other amenities.

A basic watershed management plan contains an assessment of the watershed, identifies and prioritizes problems within the system, develops objectives and strategies based on economic and social goals of the stakeholders and finally, implementation strategies and assessment procedures (Know Your Watershed 16 Dec. 2004). Help with watershed management plans is available from the Environmental Protection Agency, the Utah Department of Environmental Quality, and a wide range of private organizations.



Industries, agriculture, and residents within a watershed all contribute to its health and water quality.

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Oregon Watershed Enhancement Board. An Introduction to Watersheds. 3 Dec. 2004 <[http://www.oweb.state.or.us/OWEB/WSHEDS/wsheds\\_overview.shtml](http://www.oweb.state.or.us/OWEB/WSHEDS/wsheds_overview.shtml)>.

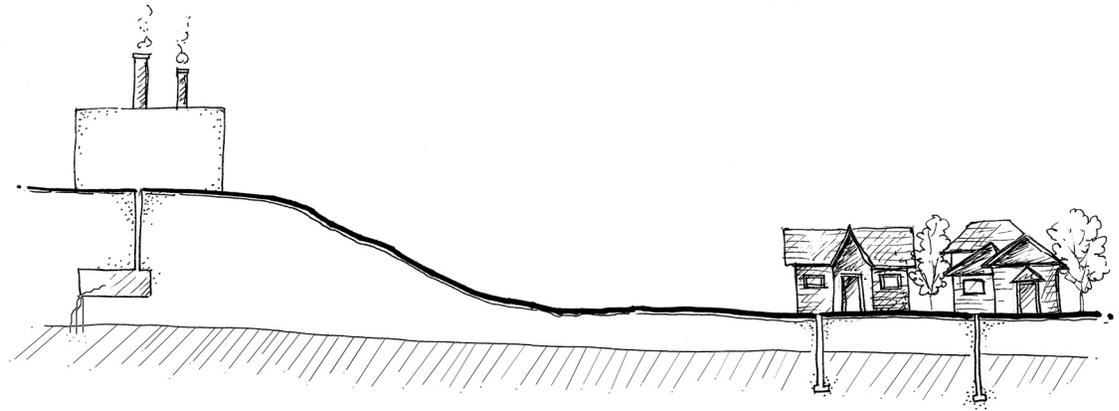
# groundwater

Groundwater is the water below the earth's surface. More specifically, it is the water from rain and snow melt that is found underground in the spaces and cracks in soil, rock, and sands. Groundwater is stored in aquifers, or underground geologic formations of rock, sand, soil, or gravel. It comes to the surface naturally through springs, or is released into lakes and streams. It may also be extracted through wells drilled into the aquifer (The Groundwater Foundation 13 Dec. 2004).

Almost every square inch of North America has groundwater beneath it. Groundwater is used for irrigation, recreation, industry, and of course most importantly, drinking water. In fact, groundwater accounts for 50% of the drinking water in the United States (Schwalbaum 1997). Most groundwater, however, is used for irrigation. As the need for groundwater increases with population growth, so does the potential threat of contamination.

Groundwater is vulnerable to contamination. This contamination occurs when pollutants seep into the groundwater. Sources of contamination include landfills, hazardous waste sites, leaking storage tanks containing gasoline, oil or other chemicals, road salts, insecticides and pesticides from lawns and farms, and septic systems. Drinking contaminated groundwater can be harmful. Wildlife can also be adversely affected by polluted groundwater. Restoring contaminated groundwater is not only time consuming, but costly as well. It often costs millions of dollars to remove contaminants from the water to make it drinkable. This cleanup can double or triple the cost of water. Preventing contamination is the best practice (The Groundwater Foundation 13 Dec. 2004).

Communities can help prevent groundwater contamination by making sure septic systems are properly sited and constructed, regulating development in groundwater recharge areas, reducing the amount of paved surfaces, removing leaking tanks, and educating the public about the proper way to dispose of oil and other chemicals.



Contaminated groundwater from industry, or other sources, is harmful to drink and costly to clean up.

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Schwalbaum, Jesse W. Understanding Groundwater. Commack, New York: Nova Science Publishing, Inc. 1997.

The Environmental Protection Agency. Groundwater. 13 Dec. 2004. <<http://www.epa.gov/ebtpages/wategroundwater.html>>.

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# Lakes, streams, and riparian areas

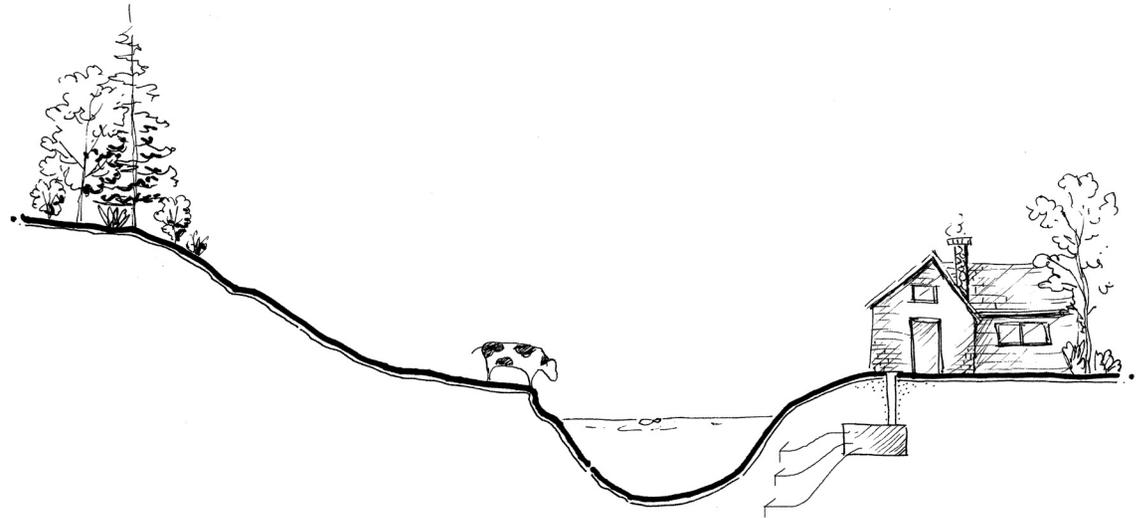
Water is the most important substance on Earth because all life is dependent on water for survival. Lakes, streams, and riparian areas provide not only water, but the food, irrigation and transportation needed for development. Their attractiveness for development, however, also threatens the health of these areas.

Lakes are large bodies of normally freshwater, which may be formed by river drainage, surface water runoff, glaciers, or ground water seepage. Lakes provide important habitat for fish, wildlife, and migratory birds. They are also valuable areas for recreational activities such as water sports, fishing, and hunting (Environmental Protection Agency 13 Dec. 2004).

Streams are natural bodies of flowing water that form complex ecosystems. According to the Environmental Protection Agency, "a stream begins at its headwaters and gathers water from runoff, rain, snow melt, or from underground springs. Streams hold great importance regardless of size or flow. They provide water, a variety of aesthetic values, and are important wildlife habitats" (www.epa.gov/maia/html/glossary.html 13 Dec. 2004)."

Riparian zones are the areas of vegetation that are found along the banks of streams, lakes, and wetlands. Riparian areas are similar to wetlands in that they share some of the same functions of wetland ecosystems. These areas filter runoff, slow the velocity of high water, protect stream banks against erosion, and provide critical habitat for wildlife (Gilmer 1995).

It is important to protect lakes, streams, and riparian areas for habitat, recreation, flood protection, water quality, and ecosystem health. Keeping an undeveloped area between building lots and the bank, shoreline, or riparian area is a simple means of protection. Pollution can be prevented by not placing septic or sewer systems, industrial areas, or animal feed lots too close to these areas and by controlling runoff from storm water. Bank erosion can also be minimized by restricting livestock from congregating and watering in riparian areas and along shorelines. Careful planning around lakes, streams, and riparian areas is an essential means of ensuring clean water and a healthy ecosystem.



Allowing livestock to water near stream banks and placing septic systems too close riparian areas are just two ways that water quality can be harmed.

## references and further reading:

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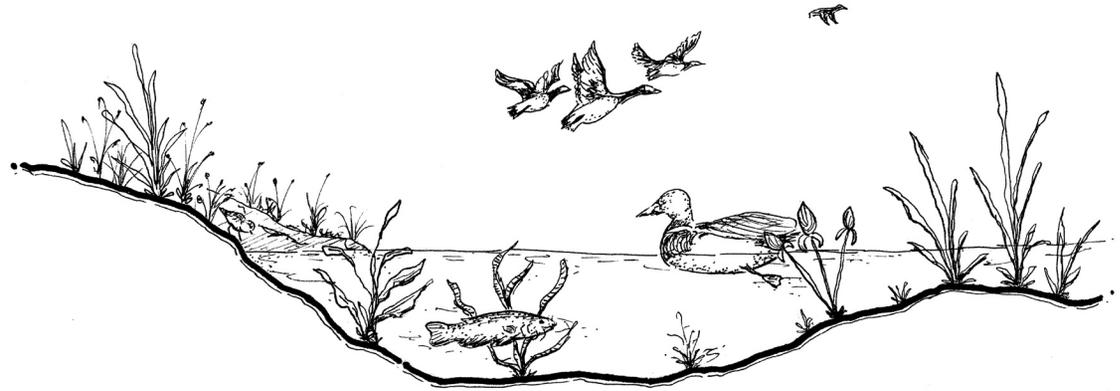
# wetlands

Wetlands are transition areas between dry land and open water where the water table is usually at or near the surface or the land is covered by shallow water all or part of the year. All wetlands have three common characteristics:

- 1) Wetlands are sometimes or always covered with water.
- 2) Wetland soils are hydric, meaning they are poorly drained and contain little or no oxygen.
- 3) Wetlands contain plants called hydrophytes or "water-lovers." These plants can survive with little or no oxygen (Lock 1993).

Wetlands play a vital role in a healthy ecosystem. They control flooding, store floodwater, provide a home to a diverse population of wildlife, filter pollutants from runoff, and provide many recreational opportunities (Utah Department of Natural Resources May 2000).

In the past, wetlands were considered wastelands. They were often drained and filled to accommodate development. The perception of wetlands has changed in recent years and their value is being recognized. In 1977, the Clean Water Act established a program to regulate the release of fill materials into U.S. waters, including wetlands. There is also a federal policy of "no net loss" that emerged in the late 1980s. "No net loss" means wetlands should be preserved wherever possible or must be replaced by "artificial" wetlands if they are converted to other uses ([US Fish and Wildlife Service](#) 4 Jan. 2005). These policies have increased the costs of developing wetlands, making them less attractive to developers.



Wetlands provide wildlife habitat and recreational opportunities while filtering pollutants from runoff.

## **references and further reading:**

Gilmer, Maureen. Living on Flood Plains and Wetlands: A Homeowner's High-Water Handbook. Dallas, Texas: Taylor Publishing Company, 1995.

Lock, Patricia A. Utah's Wetlands Handbook: A Guide to Proper Wetlands Management and Development. Salt Lake City, Utah: Utah Division of Wildlife Resources, 1993.

Utah Department of Natural Resources. A Landowner's Guide to Utah Wetlands. Salt Lake City, Utah: Utah Division of Wildlife Resources, May 2000.

[US Fish and Wildlife Service](#). 7 Dec. 2004. National Wetlands Survey. 4 Jan. 2005 <<http://wetlands.fws.gov/index.html>>.

# wildlife habitat

A habitat is a place where an animal (or plant) lives and finds water, food, shelter and room to grow and reproduce. A habitat can be a wetland, an alfalfa field or even a park (Urban Wildlife Habitat). As the population of Utah grows, so does the demand for houses, schools, stores, and roads. This growth puts pressure on critical habitat and increases the chances for conflict with wildlife. The amount of wildlife habitat statewide has been in decline in recent years. Some of the most significant reasons for this decline is the loss of open space to urbanization, agricultural conversion, draining of wetlands and other development patterns which often fragment habitat (Wilmer 2000).

The protection of habitat is important for a number of reasons. First and foremost, the preservation of habitat is important for ecological diversity and ecosystem health. It is also important to recreation and tourism opportunities such as hunting, bird watching, and hiking. These activities often translate into expenditures for food and lodging, increasing income in many communities. Perhaps the biggest incentive for the protection of wildlife habitat is the threat of federal control. If a species becomes listed as threatened or endangered under the federal Endangered Species Act, the result is federal jurisdiction of that species' habitat or federal regulation of local planning and development (Wilmer 2000).

Communities can reduce the chance of federal intervention through careful planning. Including wildlife habitat in planning and zoning maps is the first step to the successful protection of habitat. From there, a conservation plan which can cover multiple species and habitats and can facilitate habitat protection or restoration is useful. Perhaps one of the most important parts of habitat protection is cooperation with private landowners. Making sure landowners are educated about the potential economic and quality of life values associated with wildlife and are willing to do their part to protect wildlife habitat is an essential step to avoiding federal intervention.



Wildlife habitat is important not only for ecosystem health, but for recreation and tourism as well.

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Utah Division of Wildlife Resources. Utah Conservation Data Center. 4 Jan. 2005. <<http://dwrcdc.nr.utah.gov/ucdc/>>.

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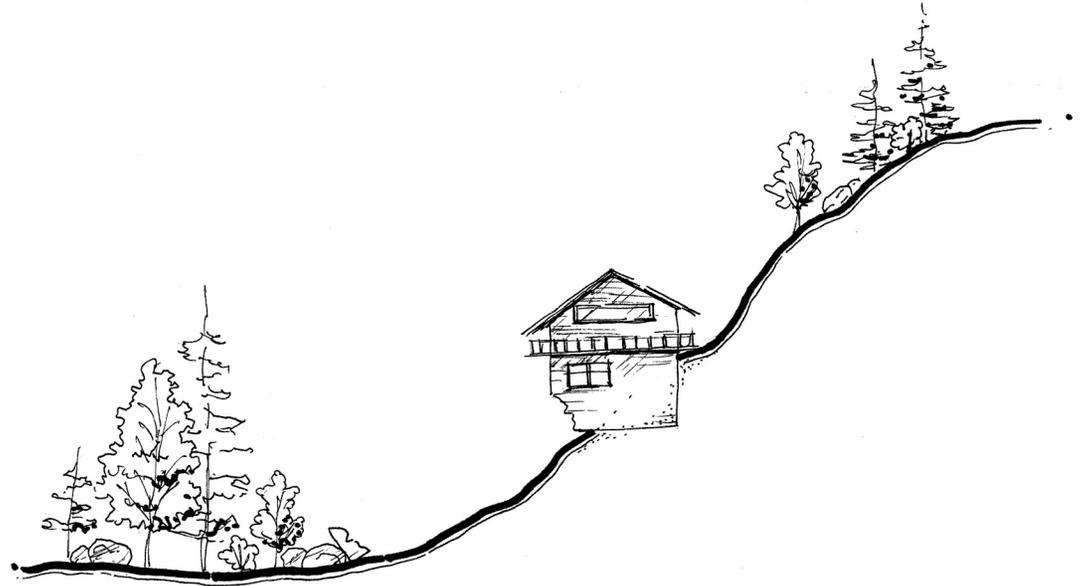
# steep slopes

Steep slopes are generally defined as land with a slope angle of 20% or greater for a minimum of 30 feet horizontally. These slopes are becoming increasingly popular for home sites as the valleys and flat lands in Utah are lost to development. These steep slopes may make for dramatic home sites, but they also pose problems. Steep slopes are prone to natural disasters, are often expensive to build on, and expensive to maintain. Most likely, they are of aesthetic value to the community below as well (City of Nanaimo 3 Dec. 2004).

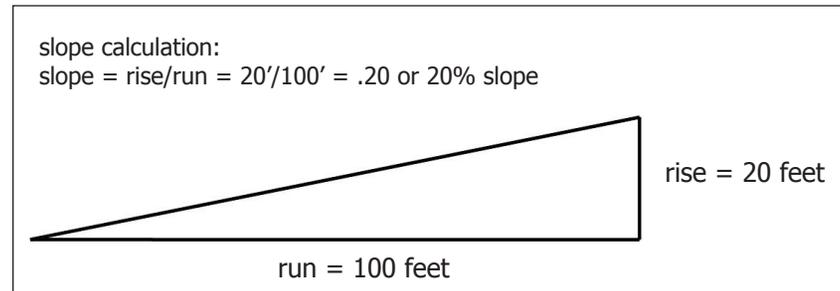
Slope failures, erosion, or avalanches may not be as spectacular as tornadoes or earthquakes, but they are usually more widespread. Financial losses from these mass movements of earth and snow are costly. They include not only the direct costs associated with property damage, but also indirect costs such as loss of tax revenues, reduced real estate values, and degraded water quality (Gray 1996). Also, development on steep slopes is often susceptible to wildfire and may be expensive to defend if necessary.

Construction on steep slopes is costly. The costs associated with the cut and fill, earthwork, retaining walls, erosion prevention, etc., is often prohibitive. In cases where cost is not an issue, the maintenance of roads and utilities must be addressed. Cities and towns may be left holding the bill for maintenance costs unless prior arrangements with developers and homeowners have not been made.

It is hard to place an economic value on the aesthetic value and visual quality of steep slopes. If development is to be allowed on steep slopes, care should be taken not to disturb natural scenic features such as cliffs or rock outcroppings. The design of buildings should compliment the natural surroundings and should be placed as to minimize the visual impact (City of Nanaimo 3 Dec. 2004).



Houses built on steep slopes are prone to damage from slope failure.



## references and further reading:

City of Nanaimo. September 2002. Steep Slope Development Permit Area Guidelines. 3 Dec. 2004. <[http://www.city.nanaimo.bc.ca/uploadedfiles/Site\\_Structure/Development\\_Services/Engineering\\_and\\_Environmental\\_Services/Environmental\\_Services/SSguidelines.pdf](http://www.city.nanaimo.bc.ca/uploadedfiles/Site_Structure/Development_Services/Engineering_and_Environmental_Services/Environmental_Services/SSguidelines.pdf)>

Gray, Donald H. and Robbin B. Sotir. Biotechnical and Soil Bioengineering Slope Stabilization. New York: John Wiley & Sons, 1996.

# ridgelines

The term ridgeline is used to describe a visually prominent and narrow piece of land that includes the highest points of elevation within a watershed. Ridgelines are characterized by the lack of a topographical backdrop, where the sky is visible beyond the ridge or by a backdrop of a nearby higher topographic feature such as a mountain range. Ridgelines are often considered scenic areas and add to the character and visual quality of the communities they surround (Napa County 3 Dec 2004).

In times of rapid growth, the scenic views of these ridgelines may be altered by development. Building on a ridgeline or at the crest of a hill interferes with the natural profile of the land and allows buildings to dominate the skyline. Protecting ridgelines by developing below the ridgeline preserves the natural landform and character of the land. Protection of ridgelines can lead to increased property values and preserve a community's distinctiveness while attracting positive growth (Scenic America 14 Dec. 2004).

The protection of ridgelines may be accomplished in a number of ways. Communities can use overlay zoning, design guidelines, transfer of development rights, and other means to protect ridgelines from development. Zoning laws that limit building heights based on their proximity to scenic areas have proved effective in some areas. Establishing clear design guidelines and design reviews allow communities to decide how development near ridgelines or other scenic areas will look. Transfer of Development Rights, or TDRs, preserve ridgelines by transferring development rights away from sensitive areas such as ridgelines to areas better suited to growth (Scenic America 14 Dec. 2004).



Development below the ridgeline, instead of on top of it, preserves the character of the land.

## references and further reading:

Napa County. Dec. 2001. Viewshed Ordinance. 3 Dec. 2004. <<http://www.co.napa.ca.us/gov/apps/viewshed107/>>.

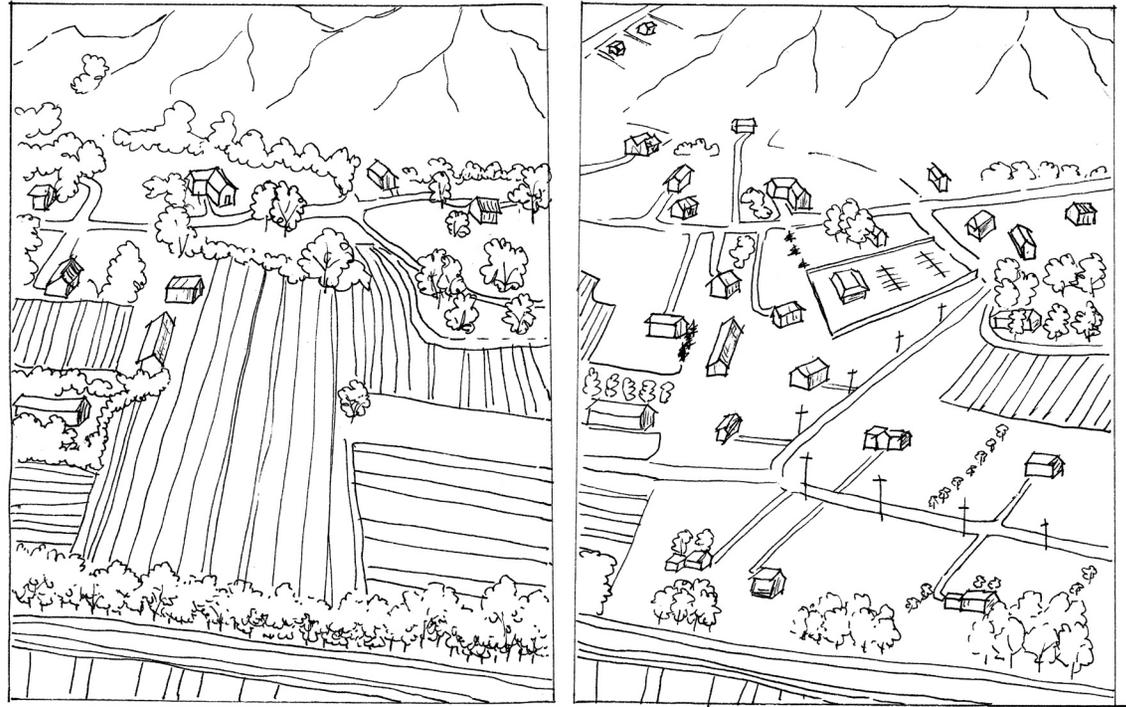
Scenic America. 2003. Scenic Vistas and Viewsheds. 14 Dec. 2004. <<http://www.scenic.org/viewprotection/identify.htm>>.

# prime agricultural land

Agricultural land or farmland may include cropland, pasture land, rangeland, forestland, and other rural land. According to the Utah Department of Agriculture, farmers and ranchers generate more than \$1 billion annually in raw products and employ more than 100,000 people. The effect on the economy is much larger because of its links to a variety of industries. For example, farming requires machinery, seed, feed, fertilizer, labor, financial services, and other inputs to produce crops and livestock. A productive farm or ranch also generates taxes to help local communities. In most cases, when farmers subdivide their land the resulting sprawl is a tax drain on communities (Utah Department of Agriculture 3 Dec. 2004).

Agricultural land provides more than simply food production and economic benefits. It also provides open space, wildlife habitat, and water recharge, along with other amenities such as visual quality and landscape diversity. Deer, elk, and many species of birds rely on ranches or farms. Rain and snowmelt seep back into the groundwater in agricultural areas instead of being evaporated on driveways and parking lots.

As Utah's population continues to grow, more and more agricultural land is being lost to development. Fortunately, there are many tools that can be used to protect agricultural land, such as agricultural districts, conservation easements, and transfer of development rights. Agricultural districts permit farmers to form distinctive areas where agriculture is not only protected, but encouraged. Conservation easements are voluntary agreements that allow farmers to retain the right to use their land for ranching and farming while protecting the land from development. The farmer continues to hold title to their property while receiving fair market compensation for their property. Further, they may restrict public access and sell the property as they desire. Transfer of development rights allow landowners to transfer the right to develop from one parcel of land to another, thereby protecting one parcel and allowing higher density development on the other. Other policies and programs include comprehensive planning and cluster zoning (The American Farmland Trust. "The Farm Protection Toolbox." 13 Dec. 2004).



Developing prime agricultural land can change irreversibly the character of a community or region.

## references and further reading:

American Farmland Trust. "Farming on the Edge." 13 Dec. 2004. <<http://www.farmland.org/farmingontheedge/Farming%20on%20the%20Edge.pdf>>.

American Farmland Trust. Oct. 2002. "The Farm Protection Toolbox." 13 Dec. 2004. <[http://www.farmlandinfo.org/documents/27761/FS\\_Toolbox\\_10-02.pdf](http://www.farmlandinfo.org/documents/27761/FS_Toolbox_10-02.pdf)>.

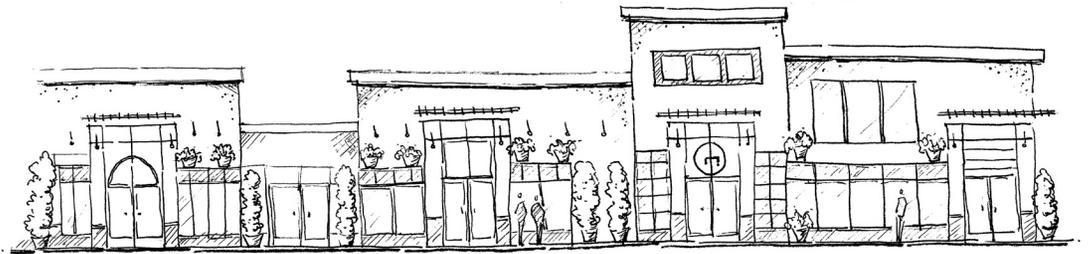
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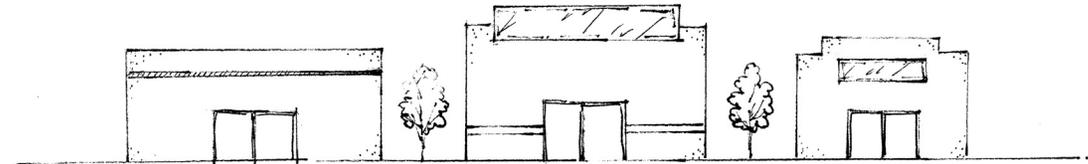
# *cultural and historic resources*

Urban and rural cultural and historic resources encompass a variety of buildings, objects, landscapes, etc. These non-renewable resources enhance our understanding and appreciation of our heritage. Preservation of historic and cultural resources can increase our knowledge of history, provide scientific data, and stimulate economies through tourism. Often it is up to the community to decide what they value and desire to protect as historical or cultural resources. Protecting these resources preserves the character and quality of a community and its values.

Careful planning can prevent irreversible damage to historic and cultural resources. The National Park Service promotes a planning system that identifies, documents, and evaluates these resources. It involves historical research, inventory and documentation of existing conditions, site analysis and evaluation of significance, and the development of a management and maintenance strategy for the resource. Community efforts can mimic the National Park Service's planning system in their own preservation efforts (National Park Service 3 Dec. 2004).



Historic Main Street



New Main Street

Preserving historic and cultural resources, such as a historic main street, maintains the character of a town.

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National Park Service. Sept. 1994. Preservation Briefs: Protecting Cultural Landscapes. 3 Dec. 2004. <<http://www2.cr.nps.gov/tps/briefs/brief36.htm>>.

National Trust for Historic Preservation. 2004. Historic Preservation Information. 13 Dec. 2004. <<http://www.nationaltrust.org>>.

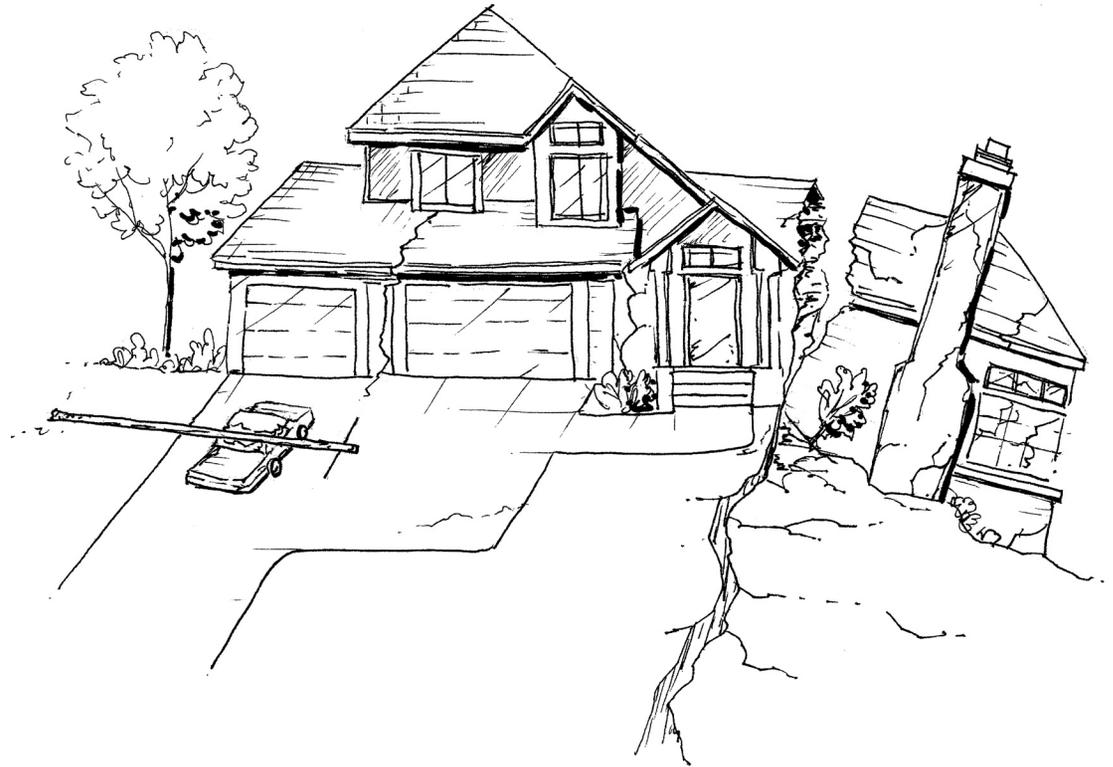
Advisory Council on Historic Preservation. Historic Preservation Information. 13 Dec. 2004. <<http://www.achp.gov>>.

# earthquakes

The U.S. Geological Survey defines an earthquake as “both sudden slip on a fault [a crack in the earth’s crust caused by the displacement of one side with respect to the other] and the resulting ground shaking and radiated seismic energy caused by the slip, by volcanic or magmatic activity, or other sudden stress changes in the earth.” Utah experiences about 700 earthquakes every year, the majority of which are not felt by people and do not cause any damage (Bolt 1986).

There are many hazards associated with earthquakes. These include ground shaking, fault rupture and ground deformation, liquefaction, slope failure and avalanches, flooding, fires, and hazardous material situations. Ground shaking is a result of the seismic vibrations caused by the earthquake. This ground shaking can cause objects to fall and buildings to collapse. Fault rupture and ground deformation happens when the ground at or near the fault is broken and drops, causing damage to buildings on or near the fault. Liquefaction occurs when sandy, water saturated soils temporarily act like a liquid in response to the vibrations caused by the earthquake. Development in valleys bordering the mountain ranges across the State are at risk of being damaged by liquefaction. Slope failures, such as landslides and avalanches, can cause damage to buildings, depending on the magnitude of the earthquake and slope conditions. Dam failures, flooding, fire, and hazardous materials spills may also result with significant consequences from an earthquake (Bolt 1986).

Proper planning can do much to reduce the risks associated with earthquakes. Mapping fault lines and liquefaction zones is an important part of this planning. Re-directing development to avoid fault lines will reduce risk of damage during an earthquake. Engineering buildings to withstand the shaking, liquefaction, and other hazards associated with earthquakes can reduce the costs associated with damage.



Building on or near a fault line can cause major damage if an earthquake occurs.

## references and further reading:

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Utah Department of Public Safety. 2004. Earthquake Information. 3 Dec. 2004. <<http://des.utah.gov/hazards/earthquake.htm>>.

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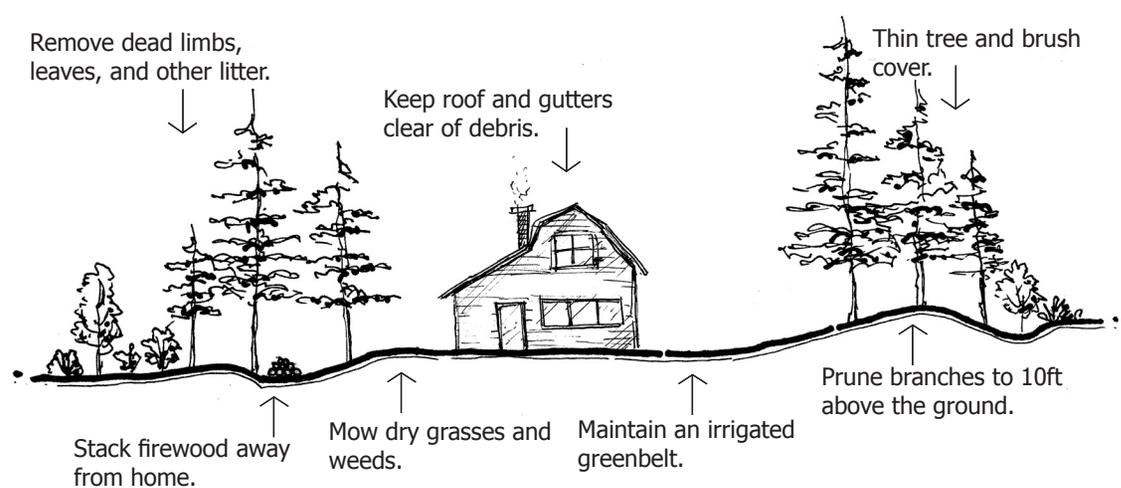
United States Geological Survey. Earthquake Hazards Program. 3 Dec. 2004. <<http://earthquake.usgs.gov/bytopic>>.

# wildland fires

A wildland fire is a fire occurring on relatively undeveloped and often public land. There are three classes of wildland fire. Surface fires are the most common and burn slowly along the ground, damaging and killing trees. A ground fire is usually started by lightning and burns on or below the forest floor. A crown fire is fueled by trees and burns quickly as it spreads along the tops of the trees (Federal Emergency Management Agency 3 Dec. 2004).

There is a trend toward residential development expanding into wildland environments throughout the West. This trend is creating an expansion of the wildland/urban interface where structures are located near large amounts of vegetation. Development in these areas is vulnerable to destruction if a wildland fire should occur in the surrounding area. Further, if a fire does occur and development is spared, it is still prone to damage from landslides, mudflows, and flooding that often follow fire (National Wildland/Urban Interface Fire Protection Program 13 Dec. 2004).

Defending development from wildland fires is not only costly, but risky as well. The best mitigation for structural damage by wildland fire is to keep development away from fuels such as stands of trees and undergrowth. In areas where this is impossible or impractical, steps may be taken to reduce the risks to property and lives. Steps include removing dead limbs and leaves from around development, maintaining an irrigated greenbelt, mowing dry grasses and weeds, and reducing the density of surrounding vegetation (Colorado State Forest Service 1 Dec. 2004).



Tips for protecting your home from wildland fire from the Colorado State Forest Service.

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Utah State University Extension. 2001-2004. Utah Extension Disaster Education Network: Wildfire. 16 Dec. 2004. <<http://extension.usu.edu/cooperative/ueden/index.cfm/cid.325/>>.

# Landslides

The term "landslide" describes a wide variety of processes that result in the downward and outward movement of slope forming materials such as rock, soil, artificial fill, etc. The materials may move by sliding, spreading, toppling, flowing, or falling (United States Geological Survey 3 Dec. 2004). Landslides can move slowly and cause damage over time, or they may move quickly, destroying property and taking lives. There are many causes of landslides, but most common are water, earthquakes, and volcanic activity. Intense rainfall or snowmelts are the primary causes of landslides. Often, a landslide happens simultaneously with flooding or after a fire has removed the vegetation from a slope. The occurrence of earthquakes increases the chance of landslides in areas with steep slopes already prone to failure (United States Geological Survey).

Each year, landslides kill between 25 and 50 people and cause \$3.5 billion in damages. Landslides are capable of destroying homes, washing away cars, roads and bridges, wiping out utility lines, and obstructing streams and roadways (United States Geological Survey). It is usually the municipality that picks up the tab when it comes to damages caused by landslides.

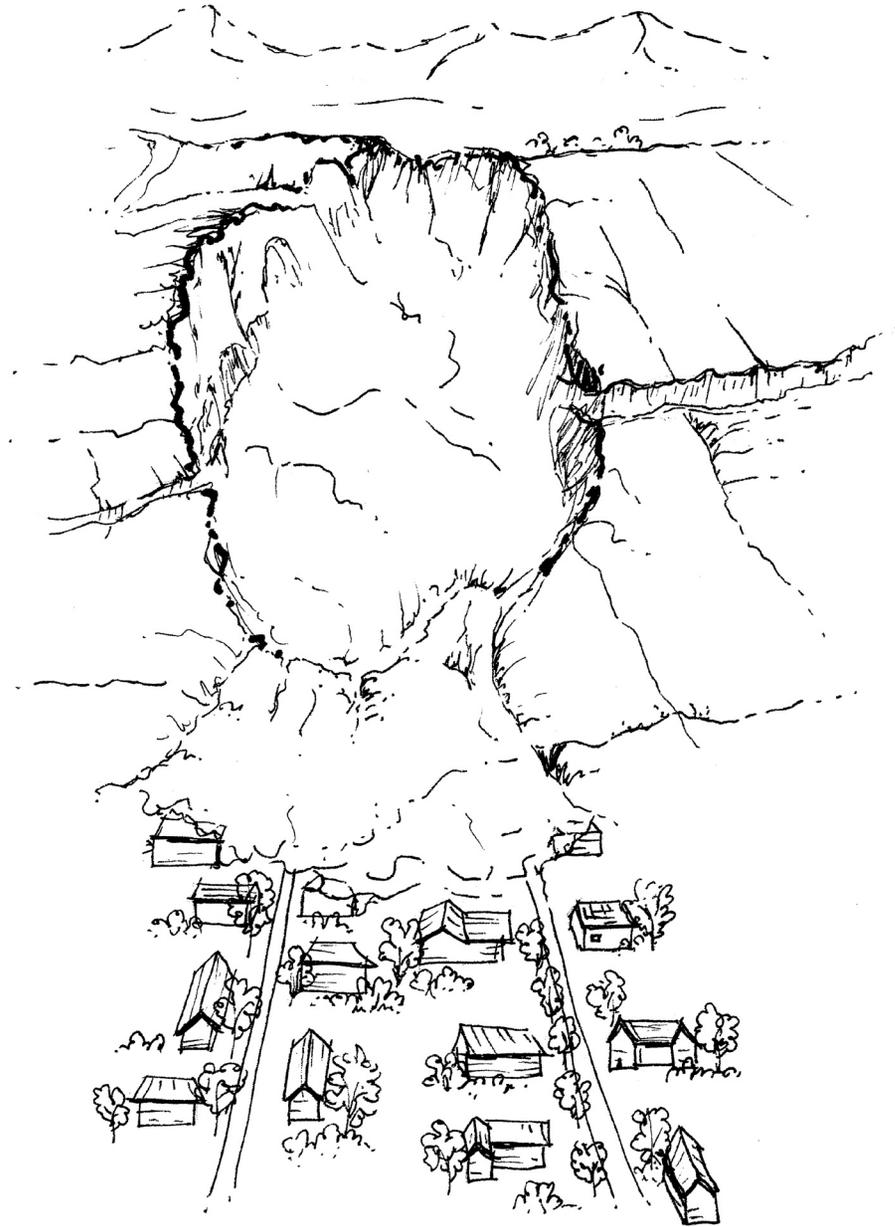
The effects of landslides can be reduced by mitigation. Perhaps the most important step in the mitigation process is the mapping of areas of landslide potential. The most obvious measure to prevent damage from landslides is to prohibit or restrict development in potential hazard areas. If development is to occur in a hazardous area, the landslide potential should be disclosed to the consumer. Having disclosed the potential for landslides, the consumer then assumes the cost for any damages that may occur.

## references and further reading:

National Academy of Sciences. 2004. "Partnerships for Reducing Landslide Risk: Assessment of the National Landslide Hazards Mitigation Strategy." 13 Dec. 2004. <<http://www.nap.edu/books/0309091403/html/>>.

United States Geological Survey. Landslides Hazards. 3 Dec. 2004. <<http://landslides.usgs.gov/>>.

Federal Emergency Management Agency. 1 Nov. 2004. Hazards: Landslides. 3 Dec. 2004. <<http://www.fema.gov/hazards/landslides/>>.



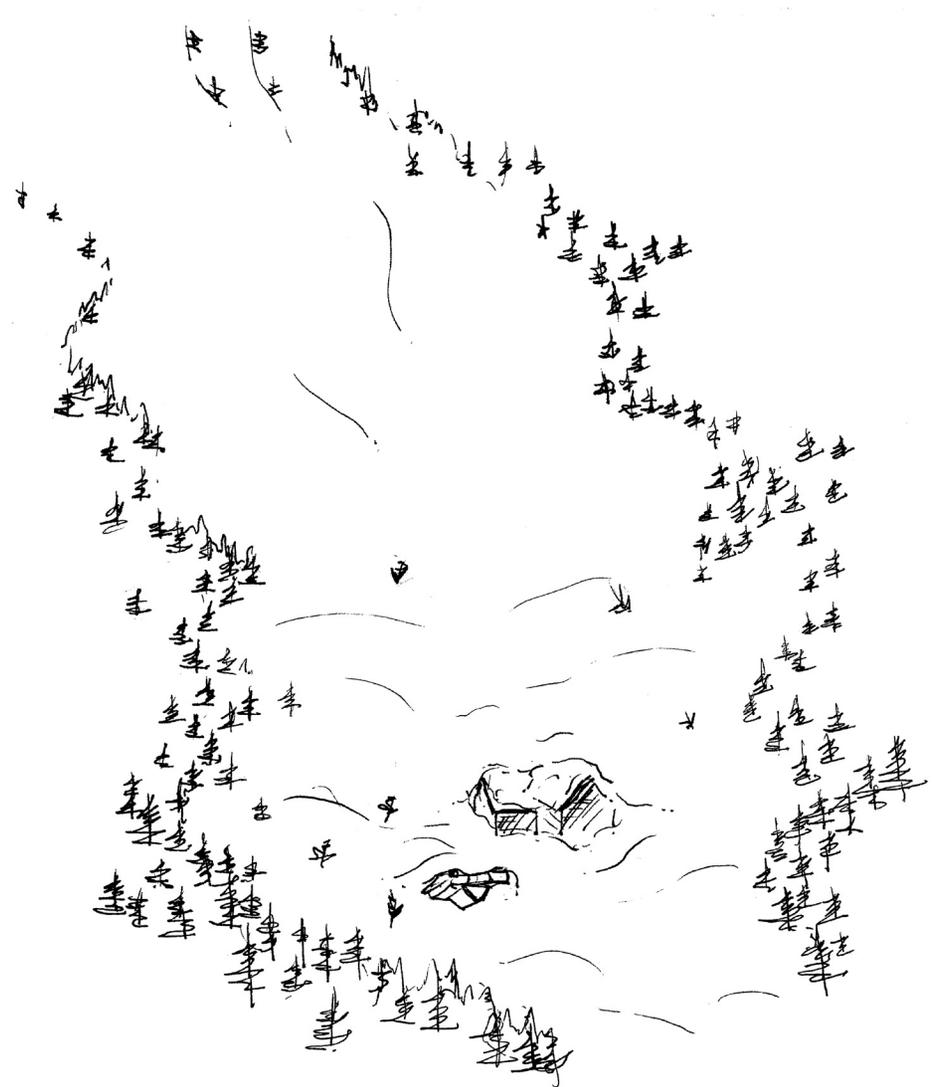
Landslides are capable of destroying homes, cars, roads, bridges, and utility lines.

# avalanches

An avalanche is a falling mass of snow that may contain ice, rock, or soil (McClung and Schaerer 1993). An avalanche occurs when driving forces, such as gravity, outweigh resisting forces, such as the bonding between snow grains. There are four elements to every avalanche: snow, a weak layer in the snow cover, a steep slope, and a trigger. Nearly 90% of avalanches occur on slopes of 30 to 45 degrees. Most avalanches happen on slopes above the tree line that face away from the prevailing wind (Utah Department of Public Safety 3 Dec. 2004). However, an avalanche can occur anywhere the four elements are present.

Avalanches generally affect people by causing injury or death. However, avalanches can cause property damage and affect the environment. They can cause an interruption in transportation on highways and railroads. Buildings and utility lines can be damaged or destroyed by avalanches. Tourism can also be harmed by avalanches in recreation areas. Past avalanches may cause anxiety to tourists and deter them from spending vacations in some areas. Direct costs from avalanches are usually associated with property damage (McClung and Schaerer 1993). Costs associated with road closures and clearing of debris are often incurred by the municipality responsible for the road.

Comprehensive planning is the best way to avoid avalanche damage. Restricting development on steep slopes prone to avalanches is one way to mitigate. If development is to occur in areas with avalanche potential, steps should be taken to avoid removing vegetation which could further increase the chance of an avalanche occurring. In instances where development in areas with avalanche hazards cannot be avoided, care should be taken to educate the public about emergency procedures associated with avalanches and their prevention.



Developing in avalanche prone areas can have disastrous effects.

## references and further reading:

McClung, David, and Peter Schaerer. The Avalanche Handbook. Great Britain: Cordee, 1993.

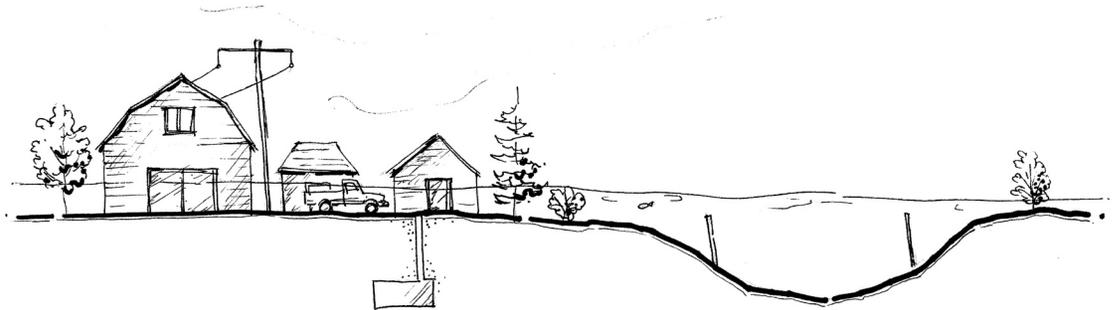
Utah Department of Public Safety. 2004. Avalanche Information. 3 Dec. 2004. <<http://des.utah.gov/hazards/avalanche.htm>>.

# *floodplains*

A floodplain is a low-lying area adjacent to a river that is made-up primarily of river sediment and is subject to flooding. Flooding can be fast or slow, but usually develops over a period of days. Development often occurs in the floodplain because of the rich, fertile soils that occur there. Some of the most desirable agricultural lands in the United States are in floodplains. In the past, flooding was not as catastrophic as it is today because there was a smaller population living in the floodplain and runoff was kept in check by vegetation. As the population in floodplains has increased, so has the damage caused by flooding (Glimer 1995).

Every year, billions of dollars are spent across the United States to clean up damage caused by flooding. Much of this damage occurs in floodplains. Damage can range from water inundating a basement, to the complete loss of a structure. Ecological problems are also associated with flooding. Sewers and septic systems can rupture or overflow during a flood event, causing contamination of lakes, streams and groundwater. Soil erosion is also prevalent as the flood waters recede because of the lack of vegetation in the developed floodplain.

Proper planning can help communities avoid the damage, devastation and costs associated with flooding. A comprehensive plan that relates that use of the land to the land's hazards is important. Hazardous areas such as floodplains may be reserved as parks, greenways, or other open spaces. Zoning ordinances give teeth to a land use plan and can be used to restrict development in floodplains.



Ecological and structural damage is possible when development occurs in the floodplain. Loss of property and life are probable as well when a flood event occurs.

## *references and further reading:*

The Association of State Floodplain Managers. Floodplain Information. 3 Dec. 2004. <<http://www.floods.org>>.

Gilmer, Maureen. Living on Flood Plains and Wetlands: A Homeowner's High-Water Handbook. Dallas, Texas: Taylor Publishing Company 1995.

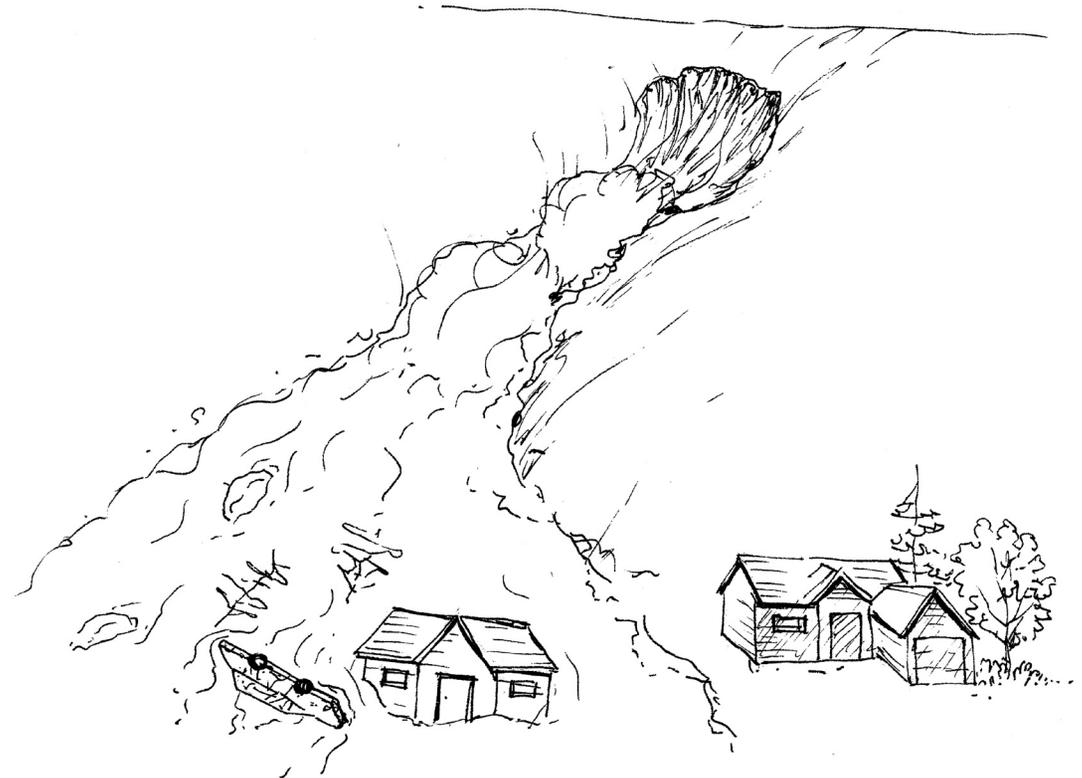
Federal Emergency Management Agency. 1 Nov. 2004. Hazards: Floods. 3 Dec. 2004. <<http://www.fema.gov/hazards/floods>>.

# dam safety

Dams are generally used for water storage, irrigation, flood control, electricity, wildlife habitat, navigation, and recreation (Federal Emergency Management Agency 3 Dec. 2004). A dam failure is an unintended release or surge of stored water. This release or surge of water can cause a significant amount of property damage, injury and even the loss of life to people living downstream. Dam failure may be caused by structural problems with the dam itself such as poor design, improper construction, inadequate maintenance, or age. Failure can also be caused by flooding, landslides, earthquakes, or vandalism.

The damage that occurs from a dam failure is generally determined by the population living below the dam and the amount of water stored in the dam. As the population increases in valleys below dams, so does the potential for catastrophic effects. The effects of a dam failure will vary depending on the size of the dam, the amount of water stored at the time of failure, stream flow, and the proximity and size of the population downstream. The destruction of homes and property, damage to roads and utilities, loss of agriculture, destruction of wildlife habitat, and loss of flood control capabilities are all possible effects of dam failure (Pierce County, Washington 3 Dec. 2004).

Prevention should be the goal of any community at risk from the effects of a dam failure. Regular inspections and maintenance of dams can do much to reduce risk of failure. Ensuring proper design and construction is essential in any new dam construction, as is educating the public about the risk associated with living downstream from a dam and having appropriate emergency procedure in place in case of failure.



Dam failures can have catastrophic effects on people living below the dam.

## references and further reading:

Pierce County, Washington. Sept. 2002. Technological Hazards: Dam Failure. 3 Dec. 2004. <<http://www.co.pierce.wa.us/xml/abtus/ourorg/dem/EMDiv/HIVA/dams.pdf>>.

Federal Emergency Management Agency. 1 Nov. 2004. Hazards: Dam Safety. 3 Dec. 2004. <<http://www.fema.gov/hazards/damsafety>>.

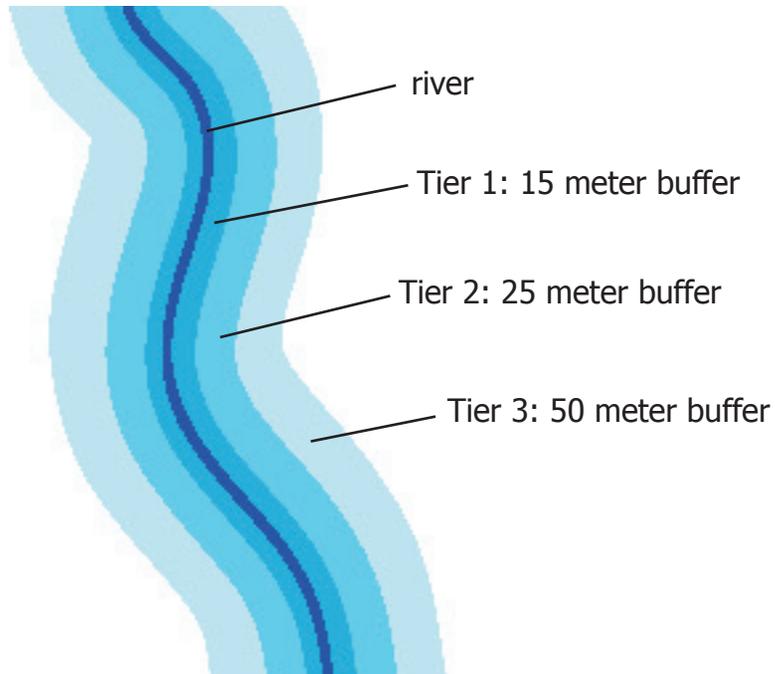
Utah Department of Public Safety. 2004. Utah's Dam Safety Program. 3 Dec. 2004. <<http://des.utah.gov/nathaz/damsafety.htm>>.



gis mapping tool



## gis tool introduction



example of tiering for the river indicator

A Geographic Information System (GIS), combines digital layers of map-based information about a geographic location to better understand relationships between the various characteristics of that location. The GIS in this Toolkit combines layers of data that deal with critical lands and produces a composite "critical lands map." The tool uses six critical lands indicators or layers to produce the map. The critical lands indicators are:

- Steep Slopes
- Prime Agricultural Land
- Wildlife Habitat
- Streams
- Lakes
- Wetlands

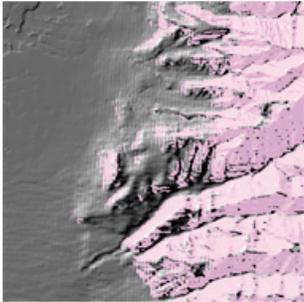
Each indicator has three "tiers" or levels of protection. Tier 1 encompasses the least amount of physical area or restriction for an indicator, while Tier 3 encompasses the most area. For example, consider the river indicator shown to the left. Tier 1 is the river itself, with a 15-meter buffer. Tier 2 is the river and a 25-meter buffer. Tier 3 is the river and a 50-meter buffer.

When creating a critical lands map one would choose the tier level of an indicator based on the level at which they want to see the indicator protected. For instance, if a large part of the economy of a community is comprised of hunting they may want to protect wildlife habitat at a Tier 3 level to ensure that plenty of land is conserved for habitat and hunting purposes. A community whose economy is influenced by recreation on its waterways may protect its streams at a Tier 3 level as well.

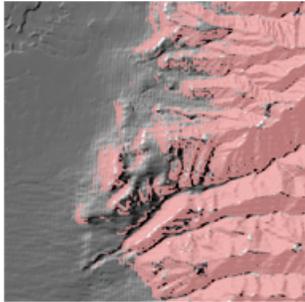
The tiering system allows a community to have choices and experiment with different indicator levels when creating a critical lands map.

## gis tool indicators

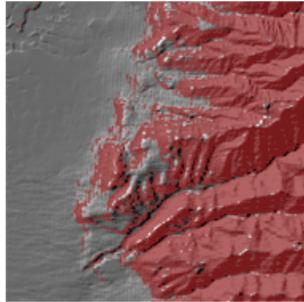
### steep slopes



Tier 1: 30% or greater



Tier 2: 25% or greater

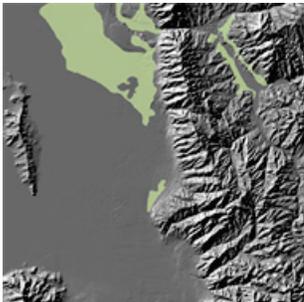


Tier 3: 15% or greater

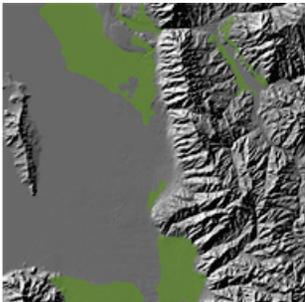
Steep slope indicators are based on observations of standard development practices across the United States. A steep slope is generally defined as a land with a 20 - 25% or greater slope. Tier 1 is land with a 30% slope or greater, Tier 2 is land with a 25% slope or greater, and Tier 3 is land with a 15% slope or greater.

Data Source: a state-wide slope map can be created from the Digital Elevation Models found at: <ftp://ftp.agrc.state.ut.us/DEM/>

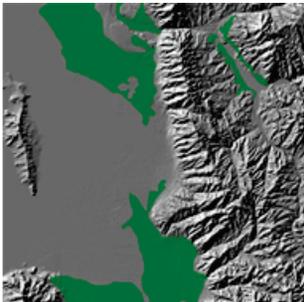
### prime farmland



Tier 1: NRCS category 1



Tier 2: NRCS categories 1 & 4



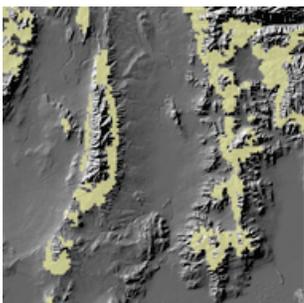
Tier 3: NRCS categories 1, 4, & 6

The prime farmland indicators are based on the Natural Resources Conservation Service's (NRCS) prime farmland designations within the STASGO Soil Survey for Utah. Three categories of NRCS prime farmland are found in Utah: 1, 4, and 6. Several factors are used by the NRCS to designate prime farmland including; soil type, available water, and erodibility. For more information refer to the technical information below.

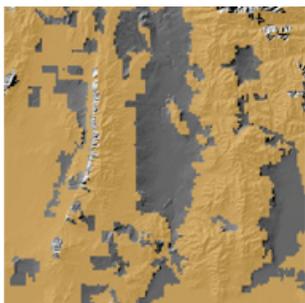
Data Source: [www.ncgc.nrcs.usda.gov/branch/ssb/products/statsgo/data/ut.html](http://www.ncgc.nrcs.usda.gov/branch/ssb/products/statsgo/data/ut.html)

Technical Information: [www.nrcs.usda.gov/technical/techttools/statsgo\\_dp.pdf](http://www.nrcs.usda.gov/technical/techttools/statsgo_dp.pdf)

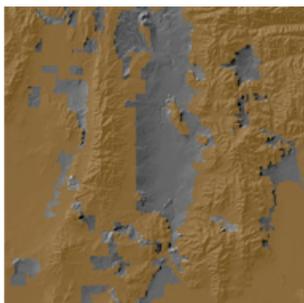
### habitat



Tier 1: 7 - 13 species



Tier 2: 4 - 13 species



Tier 3: 1 - 13 species

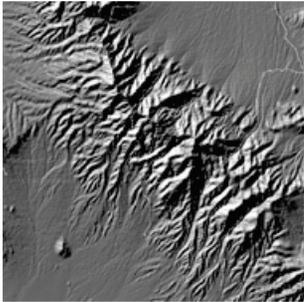
Wildlife habitat indicators were created by making a species richness model using the "Utah State Sensitive Species List" from the Utah Division of Wildlife Resources. Habitat was determined using data from the GAP (Geographic Approach to Planning) Analysis Program of the USGS. Tier 1 consists of 7-13 species overlapping each other, Tier 2 is 4-13 species overlapping, and Tier 3 is 1-13 species overlapping.

Data Source: [www.gis.usu.edu/downloadabledata/UtahGAPAnalysis.html](http://www.gis.usu.edu/downloadabledata/UtahGAPAnalysis.html)

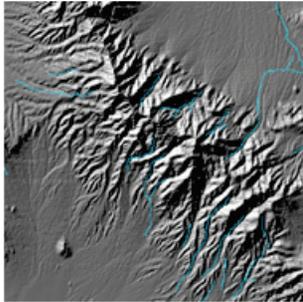
Technical Information:

GAP Analysis: <ftp://ftp.gap.uidaho.edu/products/Utah/report/UT-GAP.pdf>  
Utah Sensitive Species List: [www.wildlife.utah.gov/pdf/utsoclist.pdf](http://www.wildlife.utah.gov/pdf/utsoclist.pdf)

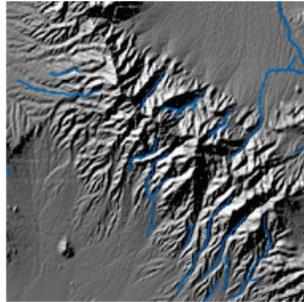
### streams



Tier 1: 15-meter buffer



Tier 2: 25-meter buffer

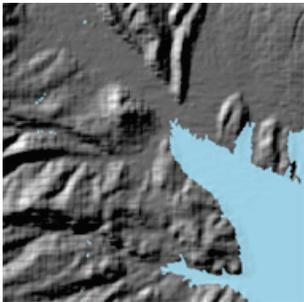


Tier 3: 50-meter buffer

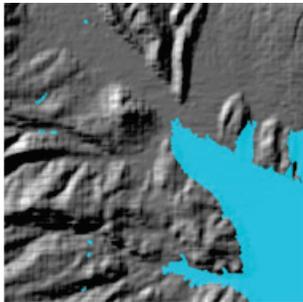
Stream indicators are based on “braided streams” as identified by the State Automated Geographic Reference Center. The streams were buffered to create three different tiers. Tier 1 is a 15-meter stream buffer, Tier 2 is a 25-meter stream buffer, and Tier 3 is a 50-meter stream buffer.

Data Source: [ftp://ftp.agrc.state.ut.us/NAD83/Hydrology/Streams/state\\_wide/shape\\_file/SGID024/SGID024\\_Streams.zip](ftp://ftp.agrc.state.ut.us/NAD83/Hydrology/Streams/state_wide/shape_file/SGID024/SGID024_Streams.zip)

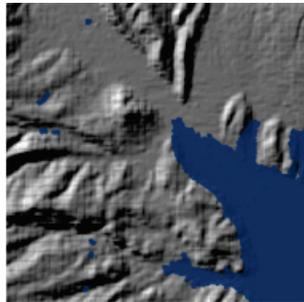
### lakes



Tier 1: 15-meter buffer



Tier 2: 25-meter buffer

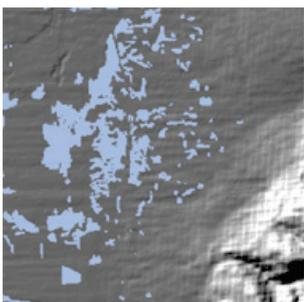


Tier 3: 50-meter buffer

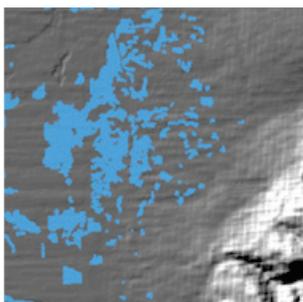
The lake indicators are based on “lakes or ponds” and “reservoirs” as identified by the State Automated Geographic Reference Center. The lakes were buffered to create three different tiers. Tier 1 is a 15-meter lake buffer, Tier 2 is a 25-meter lake buffer, and Tier 3 is a 50-meter lake buffer.

Data Source: [ftp://ftp.agrc.state.ut.us/NAD83/Hydrology/Lakes/state\\_wide/shape\\_file/SGID024/SGID024\\_Lakes.zip](ftp://ftp.agrc.state.ut.us/NAD83/Hydrology/Lakes/state_wide/shape_file/SGID024/SGID024_Lakes.zip)

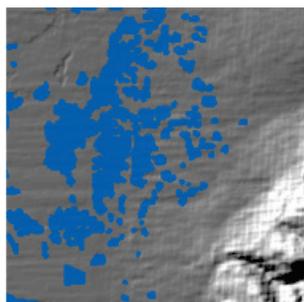
### wetlands



Tier 1: 15-meter buffer



Tier 2: 25-meter buffer

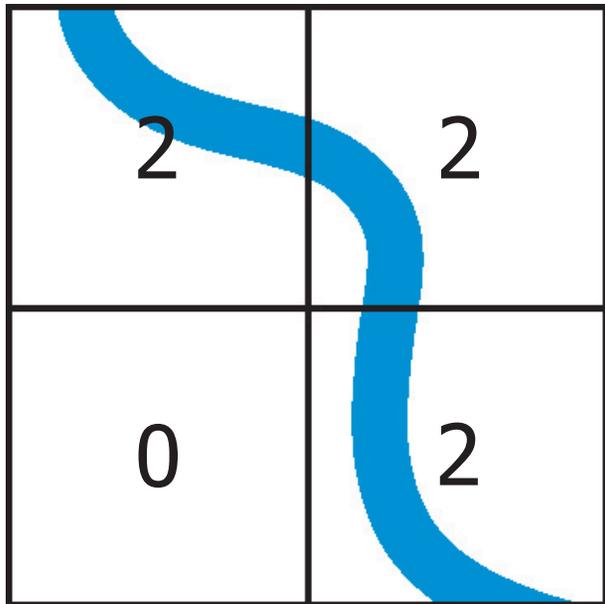


Tier 3: 50-meter buffer

The wetland indicators are based on “saturated, seasonally flooded, seasonally flooded/well-drained, seasonally flooded/saturated, semi-permanently flooded, permanently flooded, and saturated/semi-permanent/seasonal wetlands” as identified by the State Automated Geographic Reference Center. The wetlands were buffered to create three different tiers. Tier 1 is a 15-meter wetland buffer, Tier 2 is a 25-meter wetland buffer, and Tier 3 is a 50-meter wetland buffer. It should be noted that a statewide wetlands survey has not yet been completed.

Data Source: [ftp://ftp.agrc.state.ut.us/NAD83/Hydrology/Wetlands/state\\_wide/shape\\_file/SGID024/SGID024\\_Wetlands.zip](ftp://ftp.agrc.state.ut.us/NAD83/Hydrology/Wetlands/state_wide/shape_file/SGID024/SGID024_Wetlands.zip)

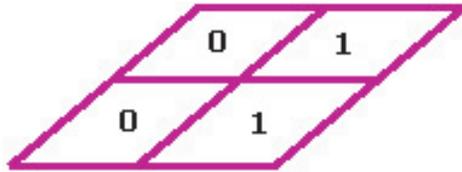
## how the gis tool works



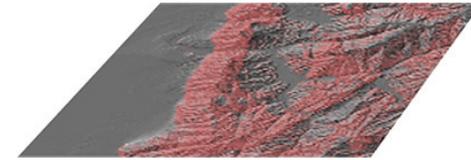
example of grid or raster data

The output of the Critical Lands Mapping Tool is a composite map of all of the indicators or layers selected by the user to be included in the map. The tool works with data converted to a grid or raster format. Each cell of the grid is 30 meters by 30 meters. Every indicator or layer used in creating the map is divided into the same type of grid. Each cell of the grid has a value. The value of the cell is based on what tier was chosen for each indicator. For instance, in the example to the left, the Tier 2 river indicator is running through the top two cells and the bottom right cell. Therefore, those cells with the river running through them are given a value of "2" and the cell without the river is given a value of "0."

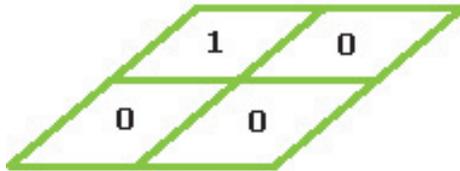
The indicators are layered one on top of one another. The model, simply adds layers of indicators together and puts the information on an output digital map. The higher the value of each cell, the more indicators overlapped and/or a higher tier was chosen. A green color ramp is associated with the calculation. The higher the number, the darker the green and thus a higher priority for conservation. An example of this calculation process is provided on the following pages.



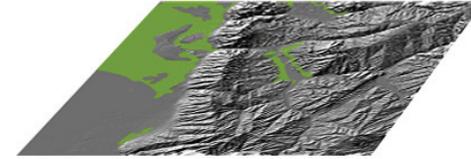
steep slopes - Tier 1



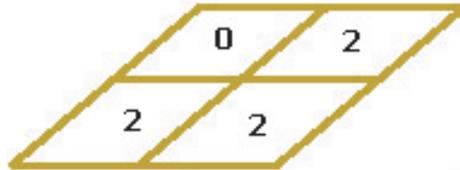
+



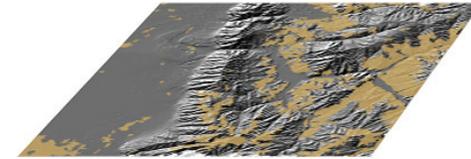
prime farmland - Tier 1



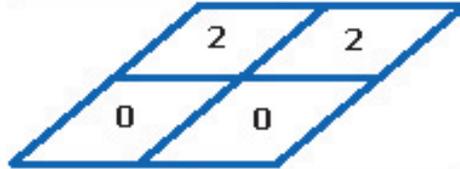
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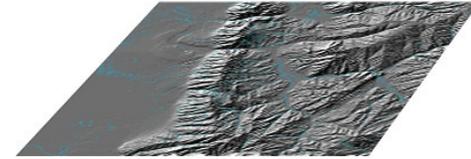
habitat - Tier 2



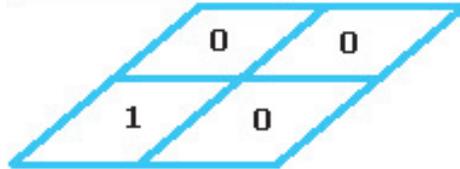
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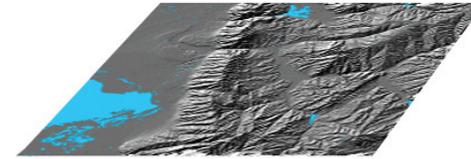
streams - Tier 2



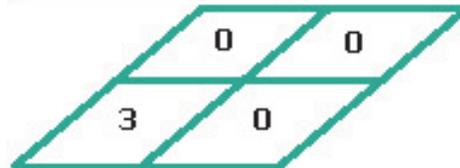
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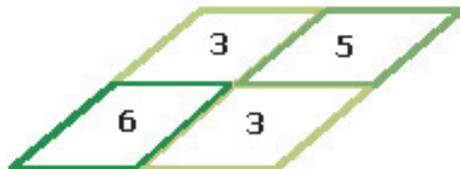
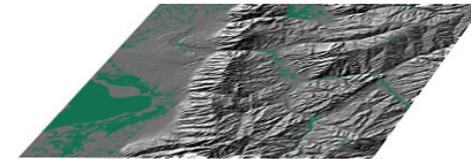
lakes - Tier 1



+

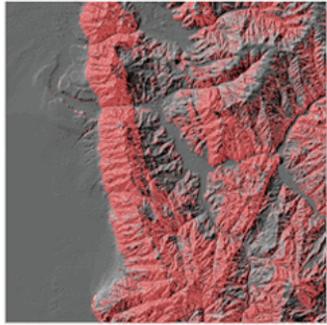


wetlands - Tier 3

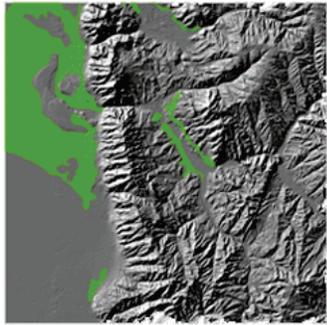


critical lands map

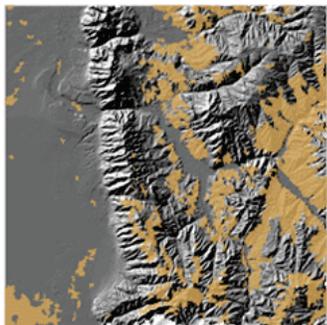




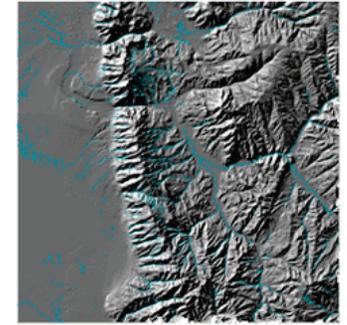
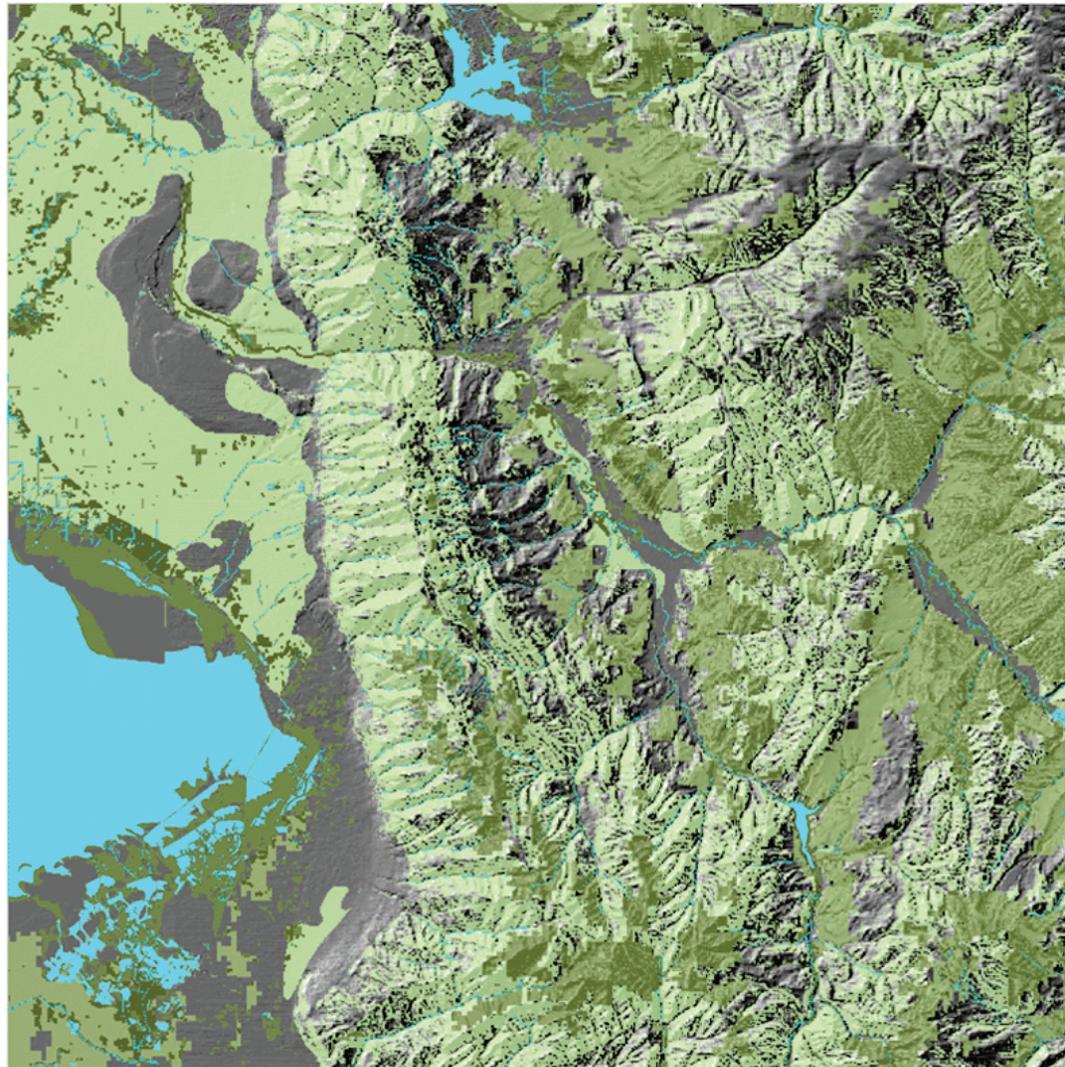
**Steep Slopes Tier 1**



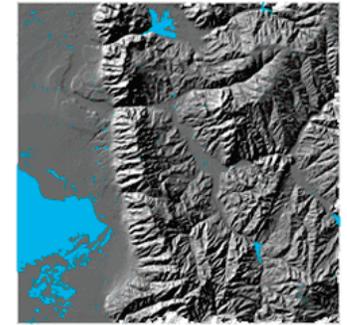
**Prime Agland Tier 1**



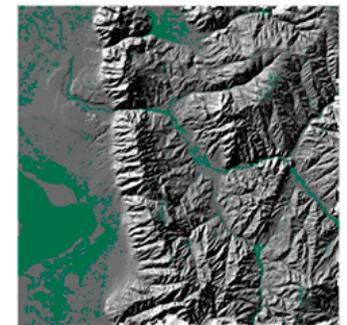
**Wildlife Habitat Tier 2**



**Streams Tier 2**



**Lakes Tier 2**



**Wetlands Tier 3**



**Indicator**

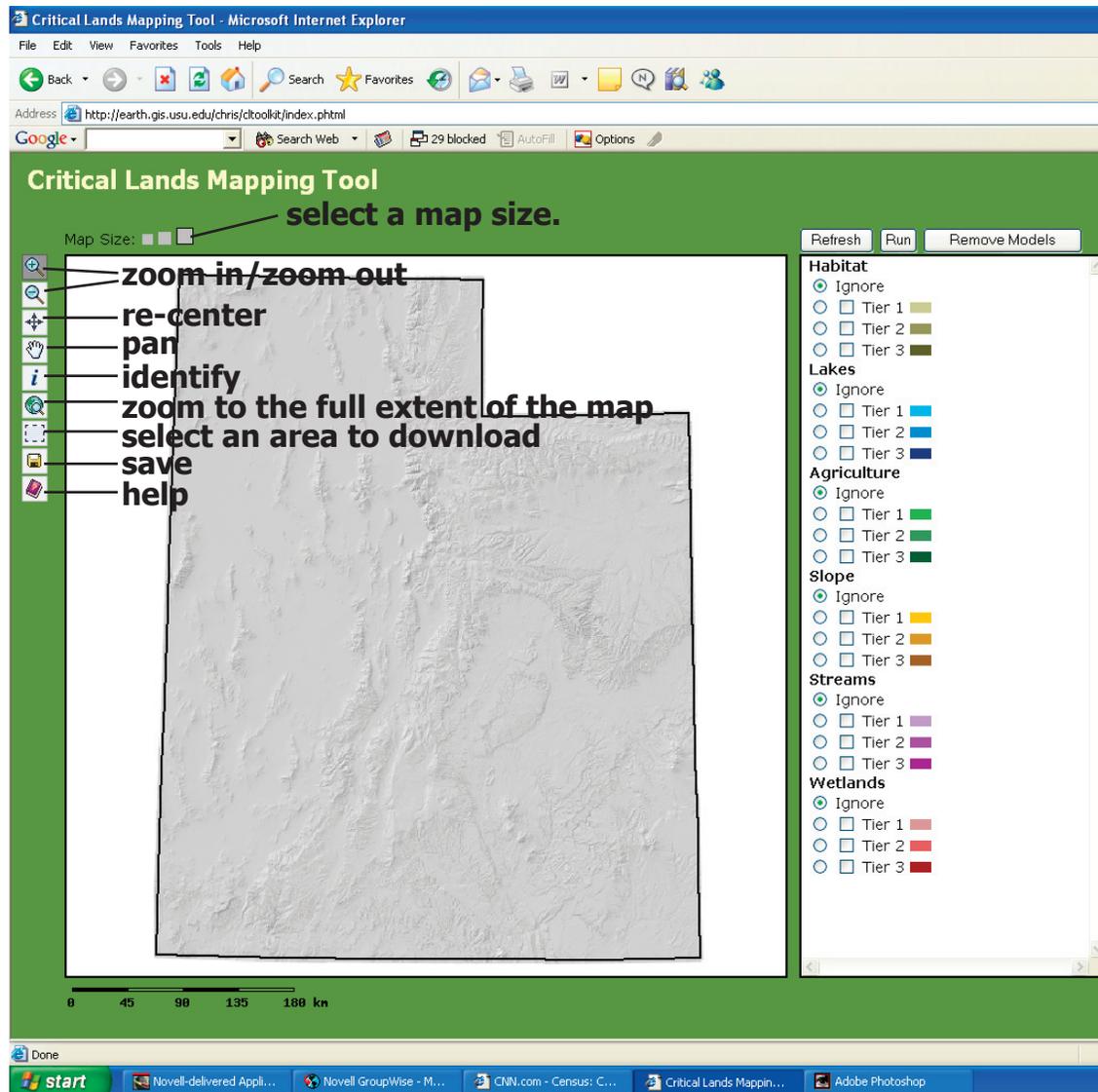
**High Indicator**

using the online mapping tool



using the online tool:

<http://www.planning.utah.gov/CriticalLandsGIS.htm>



Zoom In: Select this tool and then draw a box around the area you want to zoom in to.



Zoom Out: Select this tool and then click on a point and the map will zoom out and be centered on the point you clicked.



Re-center: Select this tool and then click on a point and the map will be re-centered on that point.



Pan: Select this tool and then drag the map in order to change the visible extent.



Info: Select this tool and then click on a spot on the map to get the values for the model and tier layers at that location.



Full Extent: Clicking this tool will cause the map to refresh and show the entire map extent.



Select Box: Select this tool and then draw a box around the area of the map you want to select for download. After you draw a box, the Clip Tool will appear. Click on this tool to download the selected part of the data sets.

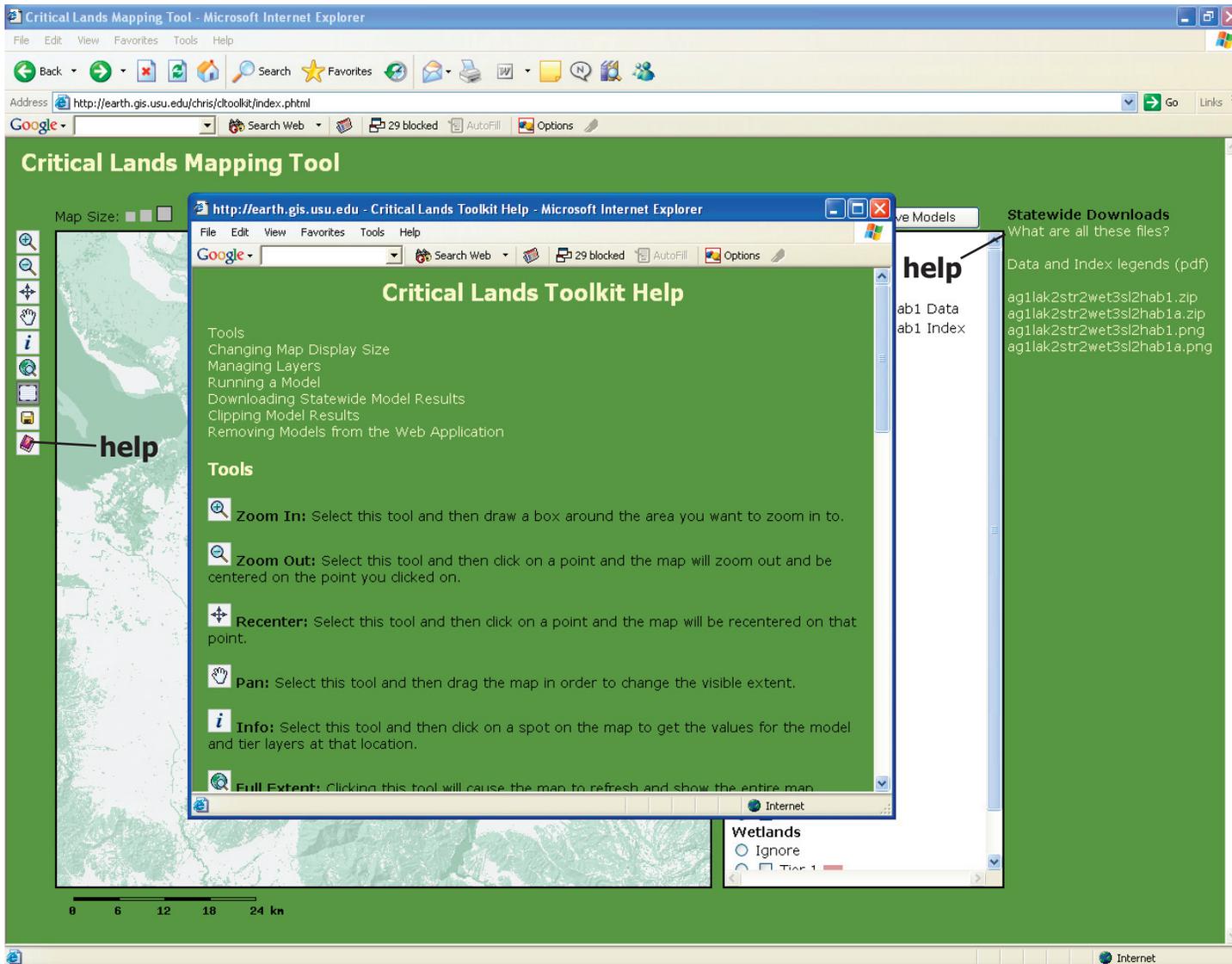


Save Image: Clicking this tool will either start a download of the map image currently displayed or send you to a new page that only shows the map (behavior depends on how your browser is configured). If you are sent to a new page, right-click on the image and choose to save it. This image is in PNG format.



Help: Clicking this tool will bring up the help menu.

## help menu



Clicking on the "help" icon or on "What are these files?" will bring up the "help menu." This menu explains the icons and their functions and how to download files from the toolkit.

## displaying the indicators

**2. click "Refresh"**

**1. select the indicator(s)**

Map Size: ■ ■ ■ ■

Refresh Run Remove Models

**Habitat**

- Ignore
- Tier 1
- Tier 2
- Tier 3

**Lakes**

- Ignore
- Tier 1
- Tier 2
- Tier 3

**Agriculture**

- Ignore
- Tier 1
- Tier 2
- Tier 3

**Slope**

- Ignore
- Tier 1
- Tier 2
- Tier 3

**Streams**

- Ignore
- Tier 1
- Tier 2
- Tier 3

**Wetlands**

- Ignore
- Tier 1
- Tier 2
- Tier 3

Statewide Downloads  
What are all these files?  
Data and Index legends (pdf)

0 45 90 135 180 km

Done Internet

You can display the indicators individually or together.

To display the indicator(s):

1. Select the indicator(s)/tier you would like to see displayed.
2. Click the "Refresh" button to display the indicator(s).

## displaying the indicators

Map Size: ■ ■ ■ ■

Refresh Run Remove Models

Statewide Downloads  
What are all these files?  
Data and Index legends (pdf)

**Habitat**

- Ignore
- Tier 1
- Tier 2
- Tier 3

**Lakes**

- Ignore
- Tier 1
- Tier 2
- Tier 3

**Agriculture**

- Ignore
- Tier 1
- Tier 2
- Tier 3

**Slope**

- Ignore
- Tier 1
- Tier 2
- Tier 3

**Streams**

- Ignore
- Tier 1
- Tier 2
- Tier 3

**Wetlands**

- Ignore
- Tier 1
- Tier 2
- Tier 3

0 45 90 135 180 km

Done Internet

The indicator(s) will display on the map.

To clear the map:

1. Deselect the indicator(s)/tier.
2. Click the "Refresh" button.
3. The map will be cleared.

## running a model

**2. click "Run"**

**1. select the indicator(s)**

Map Size: ■ ■ ■

Refresh Run Remove Models

**Habitat**

- Ignore
- Tier 1
- Tier 2
- Tier 3

**Lakes**

- Ignore
- Tier 1
- Tier 2
- Tier 3

**Agriculture**

- Ignore
- Tier 1
- Tier 2
- Tier 3

**Slope**

- Ignore
- Tier 1
- Tier 2
- Tier 3

**Streams**

- Ignore
- Tier 1
- Tier 2
- Tier 3

**Wetlands**

- Ignore
- Tier 1
- Tier 2
- Tier 3

Statewide Downloads  
What are all these files?  
Data and Index legends (pdf)

0 45 90 135 180 km

Done Internet

You can add some or all of the indicators in a model.

To run a model:

1. Select the indicator(s)/tier you would like to include in the model.
2. Click the "Run" button to calculate the model.

## running a model

**Critical Lands Mapping Tool** 1. click "Remove Models"

Map Size: ■ ■ ■

Refresh Run Remove Models

**Models**  
Model Data Legend  
Model Index Legend

ag1lak2str2wet3sl2hab1 Data  
 ag1lak2str2wet3sl2hab1 Index

**Habitat**  
 Ignore  
 Tier 1  
 Tier 2  
 Tier 3

**Lakes**  
 Ignore  
 Tier 1  
 Tier 2  
 Tier 3

**Agriculture**  
 Ignore  
 Tier 1  
 Tier 2  
 Tier 3

**Slope**  
 Ignore  
 Tier 1  
 Tier 2  
 Tier 3

**Streams**  
 Ignore  
 Tier 1  
 Tier 2  
 Tier 3

**Wetlands**  
 Ignore  
 Tier 1

**Statewide Downloads**  
What are all these files?  
Data and Index legends (pdf)  
ag1lak2str2wet3sl2hab1.zip  
ag1lak2str2wet3sl2hab1a.zip  
ag1lak2str2wet3sl2hab1.png  
ag1lak2str2wet3sl2hab1a.png

0 45 90 135 180 km

Internet

In a few minutes the map will display the model.

You can zoom in or out and pan around on the map. You can also query results and download and save the map.

To clear the model and run another model:

1. Click on the "Remove Models" button.
2. Run a new model.

## zoom tool

**1. select the zoom tool**

**2. draw a box**

The zoom tool can be used take a closer look at an area. You can zoom before or after you display indicators or run a model.

To zoom:

1. Select the "zoom" tool.
2. Draw a box around the area to zoom in on. The area in the red box will appear shortly in the map display.

## display choices - model index and legend

The screenshot shows the 'Critical Lands Mapping Tool' web application. The main map area displays a green color gradient representing model index values. A text overlay on the map reads 'click here to display Model Index Legend'. A legend window is open, showing 'Model Index Values' from 0 to 18, with corresponding color swatches. The legend is divided into several categories: Models, Habitat, Lakes, Agriculture, Slope, Streams, and Wetlands. Each category has radio buttons for 'Ignore' and 'Tier 1', 'Tier 2', and 'Tier 3'. The 'Models' section is currently selected, showing 'Model Data Legend' and 'Model Index Legend' options. The 'Statewide Downloads' section lists several files for download, including .zip and .png files. The browser window title is 'Critical Lands Mapping Tool - Microsoft Internet Explorer' and the address bar shows 'http://earth.gis.usu.edu/chris/ctoolkit/index.phtml'.

The model can be displayed by either "index" or "data." The index display is the default for the tool. The index display is the composite map that shows the green color gradient. The darker the green the higher priority the area is for conservation. The legend for this map can be seen by selecting "Model Index Legend."

## model data display and legend

**Critical Lands Mapping Tool**

2. click "Refresh"

3. click here to display Model Data Legend

1. select the data display box

Model Data Legend

Model Index Legend

ag1lak2str2wet3sl2hab1 Data

ag1lak2str2wet3sl2hab1 Index

Statewide Downloads

What are all these files?

Data and Index legends (pdf)

ag1lak2str2wet3sl2hab1.zip

ag1lak2str2wet3sl2hab1a.zip

ag1lak2str2wet3sl2hab1.png

ag1lak2str2wet3sl2hab1a.png

Model Data Values

- None
- Habitat
- Slope
- Slope, Habitat
- Wet
- Wet, Habitat
- Wet, Slope
- Wet, Slope, Habitat
- Stream
- Stream, Habitat
- Stream, Slope
- Stream, Slope, Habitat
- Stream, Wet
- Stream, Wet, Habitat
- Stream, Wet, Slope
- Stream, Wet, Slope, Habitat
- Lakes
- Lakes, Habitat
- Lakes, Slope
- Lakes, Slope, Habitat
- Lakes, Wet
- Lakes, Wet, Habitat
- Lakes, Wet, Slope
- Lakes, Wet, Slope, Habitat
- Lakes, Stream
- Lakes, Stream, Habitat
- Lakes, Stream, Slope
- Lakes, Stream, Slope, Habitat
- Lakes, Stream, Wet

The "data" display of the model shows layers that overlap without running a calculation. For instance, where the lake and wetland layers overlap this color  will be displayed.

There are 63 possible combinations, making delineation difficult without the help of the "query tool" explained on the next page

To change the display to "model data:"

1. Select the data display box.
2. Click "refresh" to display the model data.
3. Click on "Model Data Legend" to display the associated legend.

## identify/query tool

**Critical Lands Mapping Tool**

Map Size: ■ ■ ■ ■

**Query Results**

Models

**Model:** ag1lak2str2wet3sl2hab1  
Agriculture tier 1  
Lakes tier 2  
Streams tier 2  
Wetlands tier 3  
Slope tier 2  
Habitat tier 1  
**Significant layers:** Lakes, Wet  
**Index:** 5

Tiers

Agriculture: n/a  
Lakes: 1,2,3  
Streams: n/a  
Wetlands: 1,2,3  
Slope: n/a  
Habitat: 3

**Models**  
Model Data Legend  
Model Index Legend

ag1lak2str2wet3sl2hab1 Data  
 ag1lak2str2wet3sl2hab1 Index

**Habitat**

Ignore  
 Tier 1  
 Tier 2  
 Tier 3

**Lakes**

Ignore  
 Tier 1  
 Tier 2  
 Tier 3

**Agriculture**

Ignore  
 Tier 1  
 Tier 2  
 Tier 3

**Slope**

Ignore  
 Tier 1  
 Tier 2  
 Tier 3

**Streams**

Ignore  
 Tier 1  
 Tier 2  
 Tier 3

**Wetlands**

Ignore  
 Tier 1

Statewide Downloads  
What are all these files?  
Data and Index legends (pdf)  
ag1lak2str2wet3sl2hab1.zip  
ag1lak2str2wet3sl2hab1a.zip  
ag1lak2str2wet3sl2hab1.png  
ag1lak2str2wet3sl2hab1a.png

0 6 12 18 24 km

Perhaps one of the most useful functions of the map is the "query" tool. "Query" allows you to pick a point on the map and identify why the area has a particular value or color.

For example, if you query the point on the map with the star it will pop up the "Query Results" box.

This indicates the tiers used in the model and identifies the "significant layers." The "significant layers" are the tiers that are present at that point, in this case lakes Tier 2 and wetlands Tier 3 This gives the point a value of "5" (or 2+3=5).

## downloading and saving

The screenshot shows the Critical Lands Mapping Tool interface. The main window is titled "Critical Lands Mapping Tool - Microsoft Internet Explorer". The address bar shows the URL: <http://earth.gis.usu.edu/chris/ctoolkit/index.phtml>. The interface includes a map on the left, a legend on the right, and a "Statewide Downloads" section. Annotations with arrows point to the "save" button, the "select box" tool, and the file format selection options.

**1. use the "save" tool**

**2. use the "select box" tool**

**3. select a file format**

**more information**

**Statewide Downloads**  
What are all these files?  
Data and Index legends (pdf)  
ag1lak2str2wet3sl2hab1.zip  
ag1lak2str2wet3sl2hab1a.zip  
ag1lak2str2wet3sl2hab1.png  
ag1lak2str2wet3sl2hab1a.png

After creating your map you can download and save the data in your choice of formats.

To download:

1. Use the "save" button to open a image of the map in a new window. This image can be saved in a variety of formats by right clicking on the image and selecting "save as."

or

2. Use the "select box" tool to select an area to download.

or

3. Select one of the four file formats from "Statewide Downloads."

More information on downloading can be found by clicking on "What are these files?"

## making use your map critical lands map

Creating a critical lands map for your community is only the first step towards protecting these important lands. While the map provides an inventory and prioritization, it doesn't provide protection. The lands must first be "ground truthed" to assess their actual status. For instance, although the map may indicate that an area is prime farmland, it may in fact have been developed, and thus are no longer eligible for protection.

Once critical lands have been ground truthed and prioritization of conservation agreed upon, there are many methods for preservation or conservation. Changing a zoning map and including protection measures for these lands in your local zoning ordinance is the best way to begin. Envision Utah has a model ordinance that focuses on critical land protection and may be of use to communities. (<http://www.envisionutah.org/index.php?id=NTky>)

There are many methods that a community may employ to protect and conserve these lands. Transfer of Development Rights (TDRs), conservation easements, and land banking are just a few examples. The Governor's Office of Planning and Budget is an excellent resource to learn more about these ideas. (<http://www.planning.utah.gov/>)

Perhaps the most important thing to remember is that time is of the essence when it comes to protecting critical lands. Many communities experiencing rapid growth cannot afford to wait. They must be proactive if they want to conserve open land, preserve their cultural heritage, and avoid costly mistakes as their communities continue to grow.