CHAPTER 5: ENVIRONMENTAL ELEMENT

Santaquin City, like most cities located along the foothills of the Wasatch Front, is subject to those environmental conditions and hazards associated with close proximity to high mountain ranges. Some of these conditions include extremes in seasonal weather and temperatures, varied soils, topography, hydrology, vegetation and wildlife. Natural hazards common to the area include earthquakes, rock falls, flooding, forest fires, and debris flows. Each of these environmental elements or hazards affects or can be affected by the land uses and developments on the land. How these are regarded will determine the quality of life in the area as well as the amount of safety and protection afforded to the City's residents and their property when natural disasters occur.

CLIMATE

The climate in Santaquin is semi-arid, characterized by higher summer temperatures, low humidity, wide temperature ranges, and low seasonal precipitation. The average maximum temperatures and average precipitation for the City are shown in Figure 1.

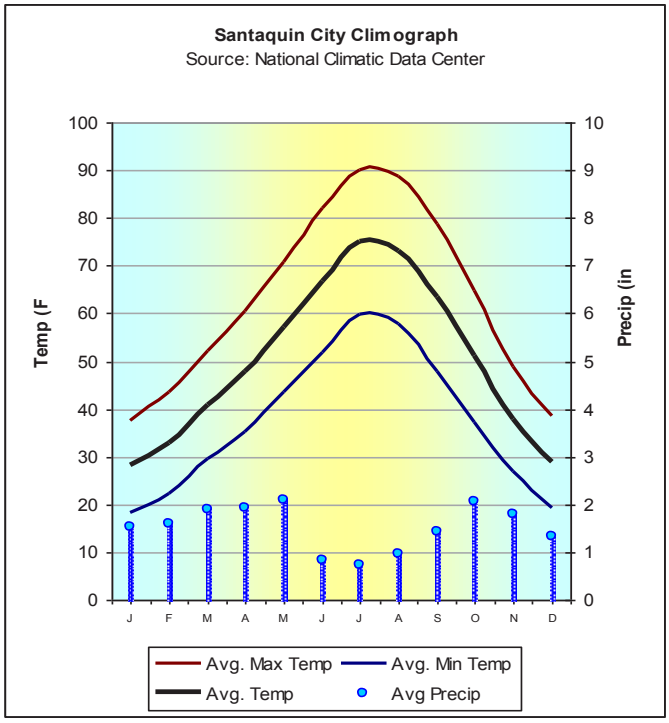


Figure 1

Precipitation is mainly due to the proximity of the Wasatch Front Mountain Range and the general westerly flow of weather patterns through the area. Santaquin averages 18.22 inches per year, which occurs evenly throughout the year. Spring and fall seasons typically receive 5.94 and 5.28 inches per respectively. Summer months generally receive a total of 2.55 inches of precipitation and winter months usually get 4.45 inches.

SOILS

The majority of Santaquin City is located on Steed sandy loam (Sd) and Steed gravelly sandy loam (Se) soils. The Steed series consists of well-drained, calcareous, gently sloping, very gravelly soils that formed in gravelly alluvium derived from limestone, sandstone and quartzite. The western portion of the city's boundary incorporates areas of Lakewin gravelly fine sandy loam(LaC), Welby silt loam (WeB), Sterling gravelly fine loam (SgC) and Pleasant Vale loam (PoA). The eastern foothills are made up of Cleverly gravelly fine sandy loam (CsD and CsC), Kilburn stony sandy loam (KOD), Lakewin cobbly fine sandy loam(LcE), Timpanogos loam (TmB) and Pleasant Grove stony loam(PmE2) all of which have steep slope constraints. The area around the south interchange is Parleys loam(PaB and PaC), and Parleys silty clay loam (PcB).

These soils generally have loam or gravelly, stony, or very stony loam topsoils. These soils formed from alluvial, colluvial, or residuum limestone, shale, sandstone, quartzite, conglomerate, or volcanic parent materials. Subsoils are typically loam, sandy loam, clay loam, or clay with high stone, gravel, or coble content. Soil depths range from non-existent to very deep. Most of these soils have

moderate to moderately slow permeability, and well or excessively drained. Disturbed erosion hazard ranges from slight to moderate. Soil productivity varies from moderate to low[1].

TOPOGRAPHY

Within the Santaquin Annexation Policy Plan (APP) area the elevation changes from approximately 4,640 feet above sea level at the northern end of the area to over 6,200 feet in the south east portion of the APP where the City abuts the Wasatch Mountains. The Wasatch Mountains which loom over the City on the east quickly rise to over 11,000 feet. This portion of the Wasatch Mountains is known as Dry Mountain. West Mountain is located to the northwest of the City and rises from 4,600 feet to over 5,500 feet. Long Ridge, which is located along the western border of the City rises to a similar height. The area generally slopes down toward the valley floor from the south end of the study area to the north.

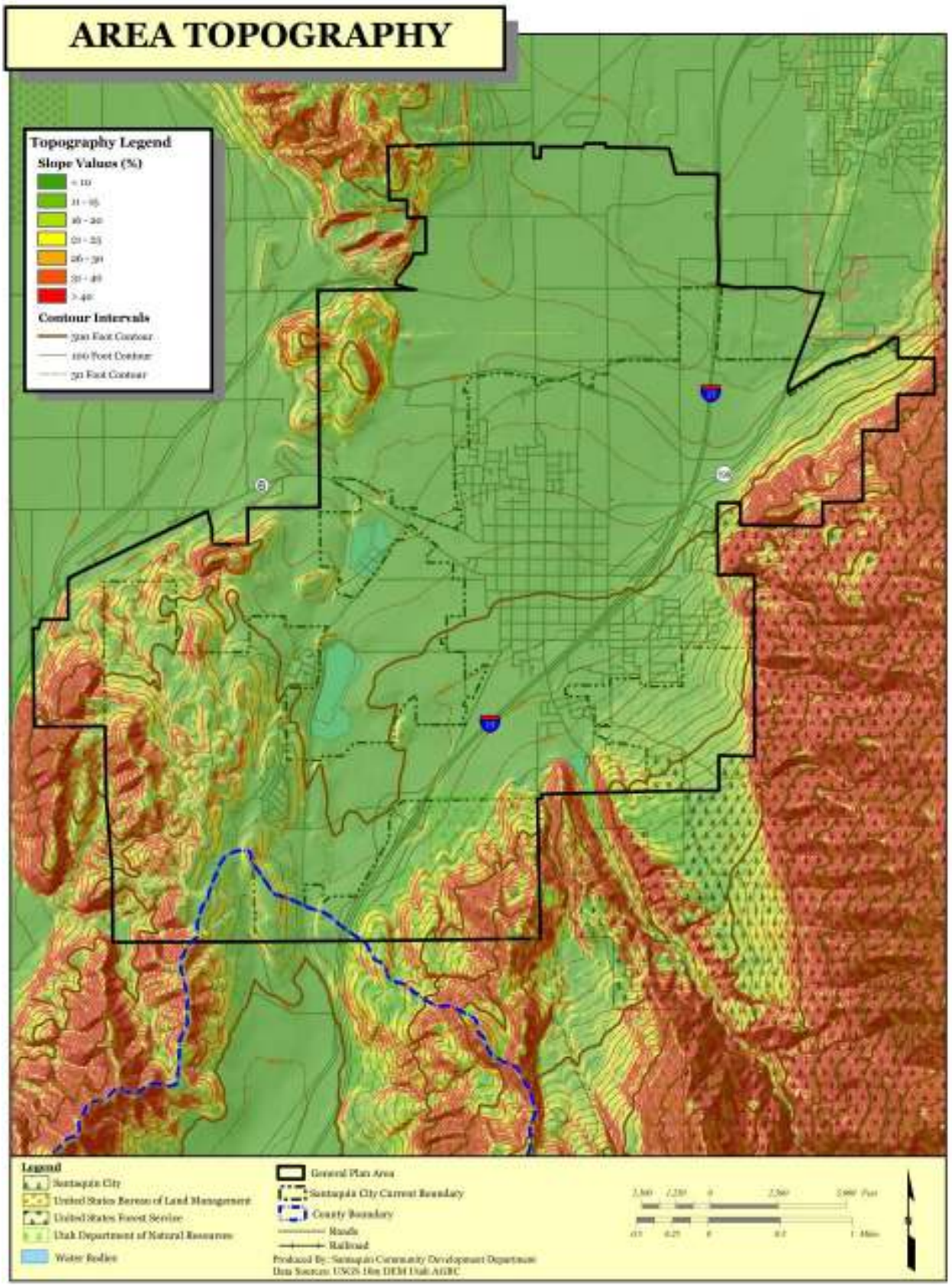
Most of the lands on which development has occurred or is occupied by agricultural operations have been at the lower elevations of the area which generally have slopes less than 10 percent. Development on the foothills of the Wasatch and Long Ridge Mountains are beginning to encroach upon slopes of 20 percent or greater. As these foothills develop the City faces increased challenges of slope stability, erosion impacts, storm runoff, structural integrity, and cost of providing services. If the City allows the foothills around it to be developed, great care needs to be taken to assure the safety and protection of those whose homes will be built on those slopes.

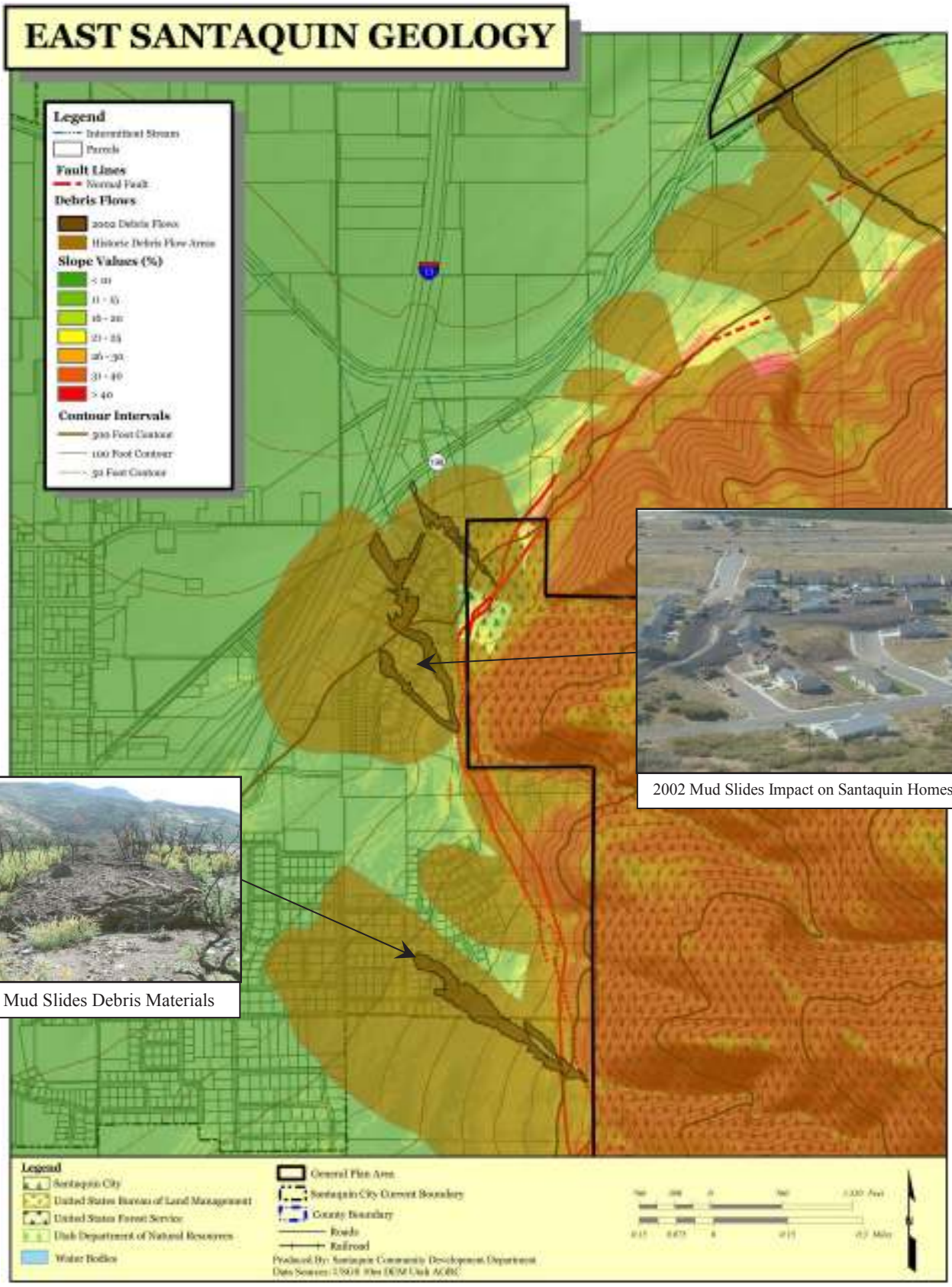
GEOLOGY

Many of the challenges of steep slopes around Santaquin City are due to the folding and faulting processes which take place along the Wasatch Front. The steep, western face of the Wasatch Mountains, including the scarp that extends from Spanish Fork to Nephi, is the line of offset with the Wasatch fault. This fault is the easternmost major normal fault of the Basin and Range province[1]." Evidence of this fault scarp is visible along the eastern foothills of Santaquin. Other fault lines have been identified around Dry Mountain and West Mountain. Each of these has been categorized as normal faults. Properties near these faults have already been approved for development. Santaquin needs to work closely with the United States Geologic Survey (USGS) and the Utah Geologic Survey to develop appropriate review criteria and establish which geologic studies may need to be performed prior to additional developments being approved near these faults.

Many areas in these foothills are also subject to the effects of debris flows as evidenced by the alluvial patterns in the area. Debris flows and avalanches are dominant geomorphic processes in steeper canyons and in headwater drainages, and may occur in any rock type. Debris flows occur during spring runoff in high water years and in response to intense summer thunderstorms. Large ancient earthflows can be seen in the Santaquin area[1]. The most recent destructive debris flow events occurred in 2002. At that time five homes and two businesses received major damage and 27 homes received minor damage at a total cost of about $500,000[2]. Although mitigation measures like flood channels and catch basins have been constructed to ebb the effects of debris flows, Santaquin cannot treat these fully containable or manageable events. Regulations need to be adopted to limit the amount of development on alluvial areas most subject to future debris flow events.

[1] USDA Uinta National Forest, 2003 Land and Resource Management Plan, May 2003.
[2] U.S. Small Business Administration Damage Assessment Report dated September 19, 2002.


AREA TOPOGRAPHY
Topography Legend
Slope Values (%)
Contour Intervals
Legend
Santaquin City
United States Bureau of Land Management
United States Forest Service
Utah Department of Natural Resources
Water Bodies
General Plan Area
Santaquin City Current Boundary
County Boundary
Roads
Railroad



2002 Mud Slides Impact on Santaquin Homes

2002 Mud Slides Debris Materials

HYDROLOGY

There is only one watershed around Santaquin which has a fourth order stream, i.e. river. That watershed is commonly known as Santaquin Canyon. There are many perennial streams around Santaquin, such as "Peter Rabbit Springs" and those from which the City obtains culinary water. Prior to settlement of the area all surface streams in the area eventually flowed into Utah Lake. When the City was settled a vast irrigation system was constructed to capture and direct the water from local canyons to the surrounding farms and the dwellings. The amount of available water in the area is heavily dependent upon the fall and spring rains as well as the winter snow pack.

Aside from available surface water, wells tapping into local ground water are utilized. Some concerns have been raised by property owners north of the current City limits about how development is affecting ground water levels and what the future holds for the area. The status of ground water in the area was summarized by the Utah Divisions of Water Resources, Water Rights, Water Quality, and the United States Geologic Survey (USGS) in a report titled "Ground Water Conditions, Spring 2011". From that report the following is taken.

> Utah Valley is divided into two ground-water basins, northern and southern, which are separated by Provo Bay in northern Utah Valley. Ground water occurs in unconsolidated basin-fill deposits in the valley. The principal ground-water recharge area for the basin-fill deposits is in the eastern part of the valley, along the base of the Wasatch Range.
>
> Southern Utah Valley is bounded by the Wasatch Range, West Mountain, and the northern extension of Long Ridge. Goshen is bounded by West Mountain, Long Ridge, the Lake Mountains, and the East Tintic Mountains. Ground water in Utah and Goshen Valleys occurs in the basin-fill deposits under both water-table and artesian conditions, but most wells discharge from artesian aquifers.
>
> Total estimated withdrawal of water from wells in Utah and Goshen Valleys in 2010 was about 109,000 acre-feet, which is the same as in 2009, and 1,000 acre-feet less than the average annual withdrawal for 2000-2009. Withdrawal in southern Utah Valley was about 30,900 acre-feet, which is 800 acre-feet more than in 2009. Overall withdrawals in 2010 were similar to withdrawals in 2009. Increased withdrawal for irrigation was offset by decreased withdrawal for public supply and industrial uses.
>
> Water levels generally rose slightly from March 2010 to March 2011 in most of the wells measured in the northern and southern parts of Utah Valley. Water levels in all three parts of Utah Valley generally rose in the early 1980s. The rise corresponds to a period of greater-than-average precipitation and recharge from surface water. Water levels generally declined from 1985 to 1993 in Utah Valley and generally rose from 1993 to 1998. This rise is the result of greater-than-average precipitation during this period. Water levels generally declined throughout Utah Valley from March 1999 to March 2005. Water levels in some wells reached their lowest level for their period of record, many dating back to 1935. From March 2005 to March 2007, most water levels in Utah and Goshen Valleys rose as a result of average to greater than average precipitation in 2005 and 2006 following 6 years of less-than-average precipitation.

Although the current status of ground water around Santaquin City appears positive, increased development on recharge areas will limit the amount of water entering the aquifer. Increased development of roads, housing, and impervious surfaces in recharge areas will also increase the amount of contaminant sources flowing into the City's surface and ground water systems. The City needs to carefully regulate development in recharge areas and around surface waters to protect both its future supply and quality of water resources. Future regulations can be implemented through watershed protection plans and hillside development restrictions.

Flooding concerns around Santaquin City revolve around Santaquin Canyon. Currently Santaquin incorporates detention and retention basins, natural washes, ditches and storm drains into the city-wide storm drainage system. The City's location and topography necessitate receiving storm and spring runoff water from the unincorporated areas east of the City. A storm water master plan needs to be implemented to handle the natural flooding area as well as the surface runoff caused by the additional impervious surface materials brought with new roads and homes in developments. Santaquin City should coordinate with irrigation companies, Utah County, federal agencies and surrounding communities in flood mitigation and storm water management.

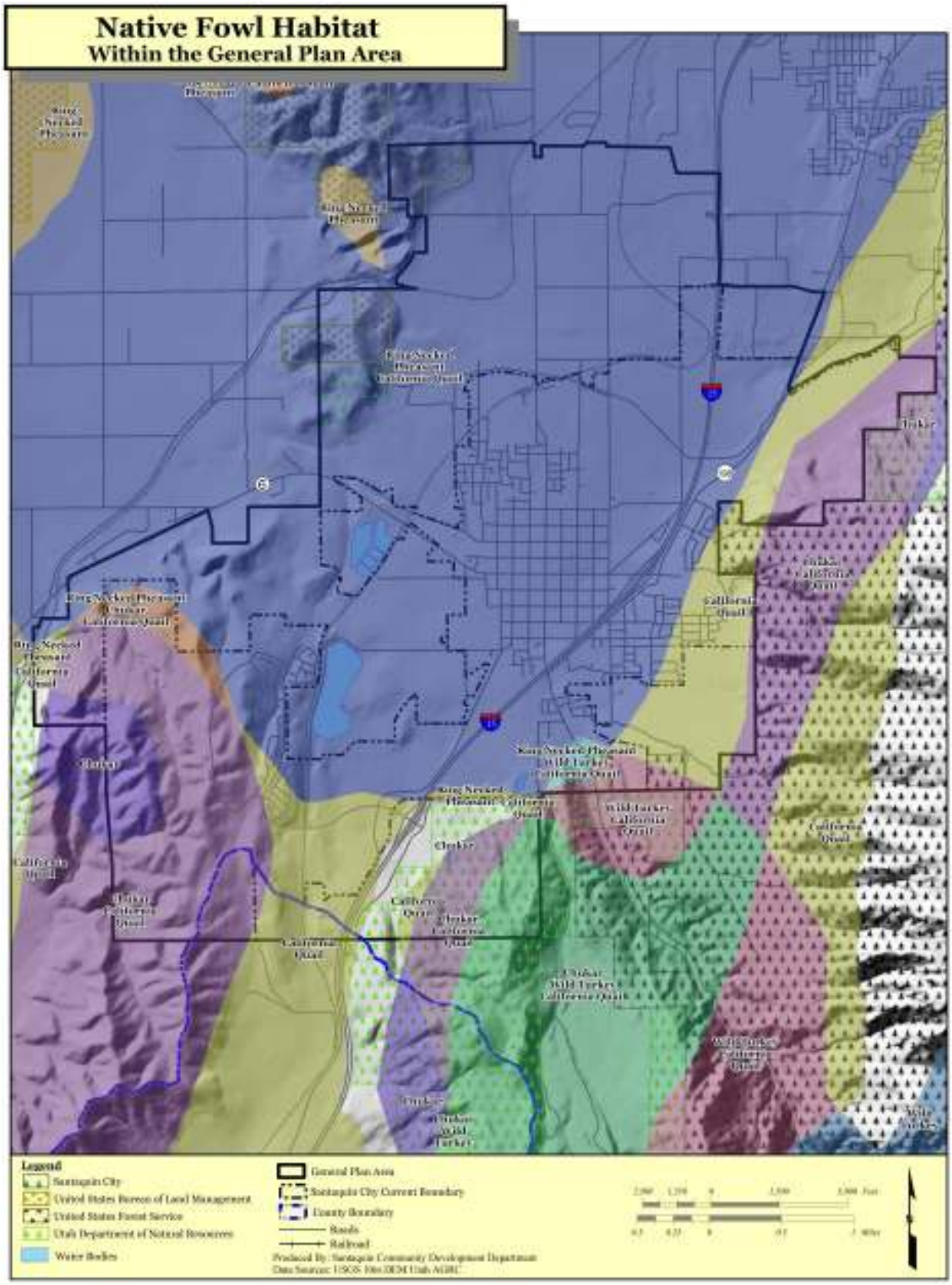
Santaquin has participated in the Federal Emergency Management Agency (FEMA) flood control program since December 11, 1985. FEMA has determined that Santaquin is a "No Special Flood Hazard Area" (NSFHA). The Community Identification Number is 490227. No special flood related requirements are needed to build in Santaquin. Newly annexed property would need to refer to the Utah County Flood Insurance Rate Map (FIRM).

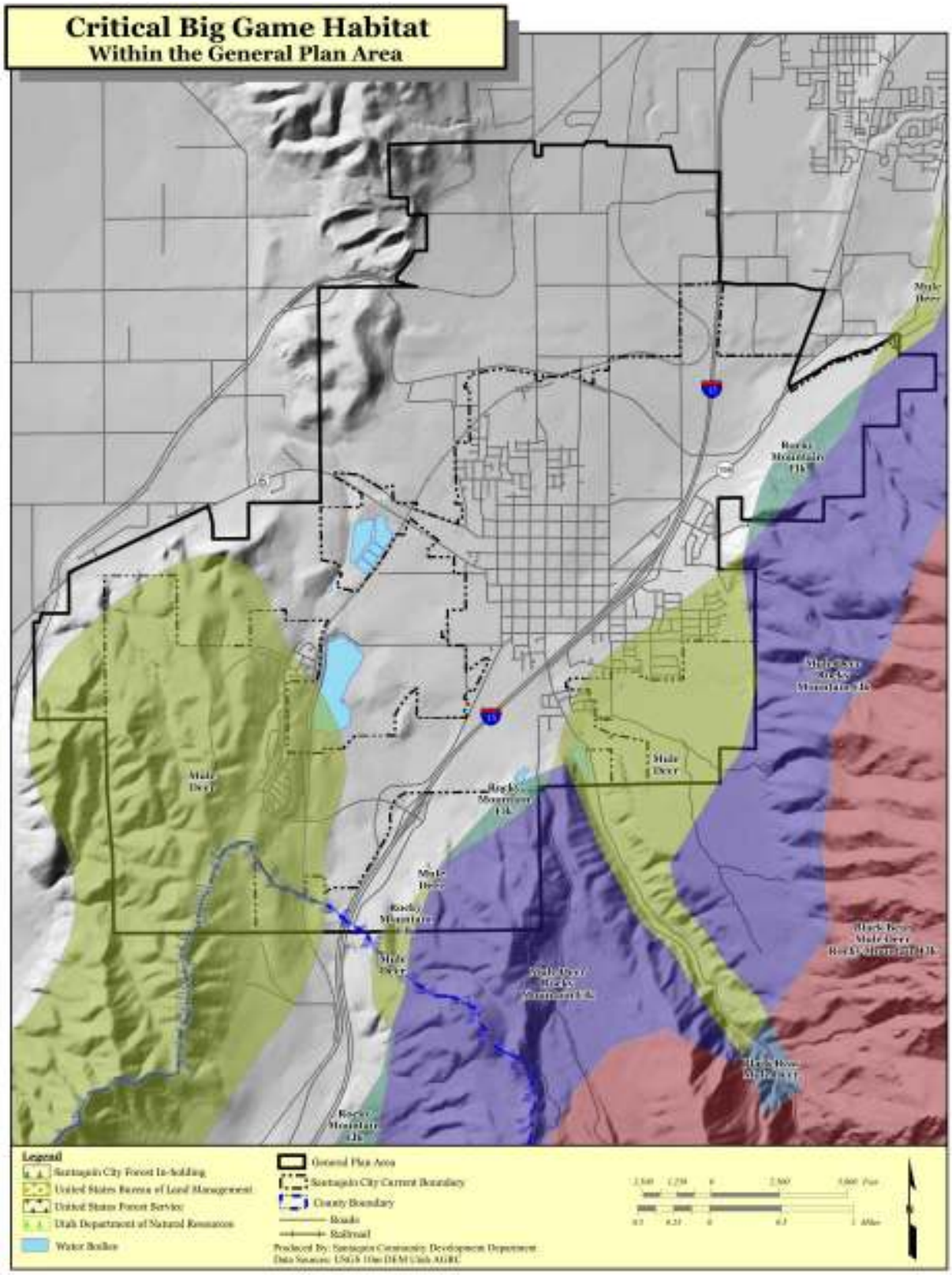
VEGETATION AND WILDLIFE HABITAT

According to the Uinta National Forest 2003 Land and Resource Management Plan (Forest Plan), the area around Santaquin and the National Forest System lands which border Santaquin, is made up of varying vegetative community types. These types include aspen forest, oak/maple, sagebrush, conifer forest, pinyon/juniper woodlands, mountain brush, and riparian. The long term condition and variability of these vegetative types largely determine types and amounts of food and cover available for wildlife in the area. The majority of Santaquin is consistent with the sagebrush and mountain brush types.

Each of these vegetation communities has associative wildlife. Some of those species include a variety of lizards, rodents, birds, and small or big game animals like rabbits, badgers, weasels, elk, mule deer, moose, mountain lions, and black bear. The sagebrush cover type, which is typical of the Santaquin foothills, provides critical and high value winter range for many of the big game animals listed. With the increased number of houses creeping up the east bench, many residents have commented on the lessening number of large game herds bedding in the foothills during the winter.

Developments and impacts caused by increased human population along the Uinta National Forest and State of Utah Division of Wildlife Resource lands to the south will greatly impact the natural vegetation and wildlife resources in the area. Lands most susceptible to negative human impacts are referred to as Wildland Urban Interface areas. Santaquin can partner with developers, Federal agencies and the Utah Division of Natural Resources to preserve some of the most critical Interface. Preservation methods can include encouraging donation or sale of properties to appropriate land management agencies, acquiring conservation easements, or land use regulations providing for the clustering of densities and maintaining of sensitive lands.


Native Fowl Habitat
Within the General Plan Area
Legend
Santaquin City
United States Bureau of Land Management
United States Forest Service
Utah Department of Natural Resources
Water Bodies
General Plan Area
Santaquin City Current Boundary
County Boundary
Roads
Railroad


Critical Big Game Habitat
Within the General Plan Area
Mule Deer
Rocky Mountain Elk
Legend
General Plan Area
Santaquin City Current Boundary
County Boundary
Roads
Railroad
Water Bodies

FIRE HAZARD

Another impact caused by development in these Wildland Urban Interface areas is increased fire hazards. Between 1980 and 2012 there have been 62 small fires (under 10 acres each) and three large fires (the Mollie Fire in 2001, approximately 8,000 acres, the Dry Mountain Fire in 2008, approximately 762 acres, and the Molly 2 Fire in 2008, approximately 20 acres) between the Santaquin and Payson Canyons. Cumulatively these fires have burned approximately 8,800 acres. The Mollie Fire resulted in extensive damage to soils, vegetation, watershed, and wildlife habitat, with over 34 percent of the burn area having burned under high intensity. Predicted soil loss as a result of the fire is 64.07 tons per acre for 2002. Santaquin, the National Forest Service and USGS have conducted aggressive rehabilitation treatments to reduce potential flood and debris flow damage to those areas most affected during the 2002 mud slides[3].

The areas east of Santaquin consist of steep slopes and rugged terrain; fires that start on the lower third of these steep mountainsides have a greater risk of becoming large damaging fires with long-term effects on soil, vegetation, wildlife, and public and private infrastructure. The Uinta National Forest has adopted plans for fuels reduction treatments in Urban Interface areas and around improved campground areas, like the Trumboldt day camp area in Santaquin Canyon.

GOALS AND POLICIES OF THE ENVIRONMENTAL ELEMENT:

Goal 1: Limit disturbance of hillside areas having 30 percent or steeper slopes.

Goal 2: Enforce the provisions of the hillside development ordinance.

Goal 3: Minimize soil and geologic hazards to people and properties.

- Policy 1: Establish special review procedures and ordinances for building on hillsides or in other environmentally sensitive areas.
- Policy 2: Require developers to have qualified professionals identify and assess soils and geologic hazards prior to development.
- Policy 3: Construction standards and guidelines for roads and other improvements should be established to limit impacts on sensitive hillsides.
- Policy 4. Regulate development densities in areas that are determined to have geologic hazards or constraints.

Goal 4: Protect the water resources of the City.

[3] USDA Uinta National Forest, 2003 Land and Resource Management Plan, May 2003.

Policy 1: Implement recommendations and requirements of drinking water source protection plans prepared for the City.

Policy 2: Limit and/or regulate development in critical watershed areas and source protection zones.

Policy 3: Work with the National Forest Service and Utah Division of Natural Resources to assure protection of watersheds east and south of the City.

Goal 5: Implement Wildland Urban Interface standards for new development.

Policy 1: Work with other public agencies to establish and implement fire hazard reduction measures.

Policy 2: Work with other public agencies to protect winter range habitat for big game animals.

Policy 3: Existing open spaces should be identified and preserved on a priority basis.

Policy 4: Provide and cooperate with other public changes for low impact public recreation facilities.