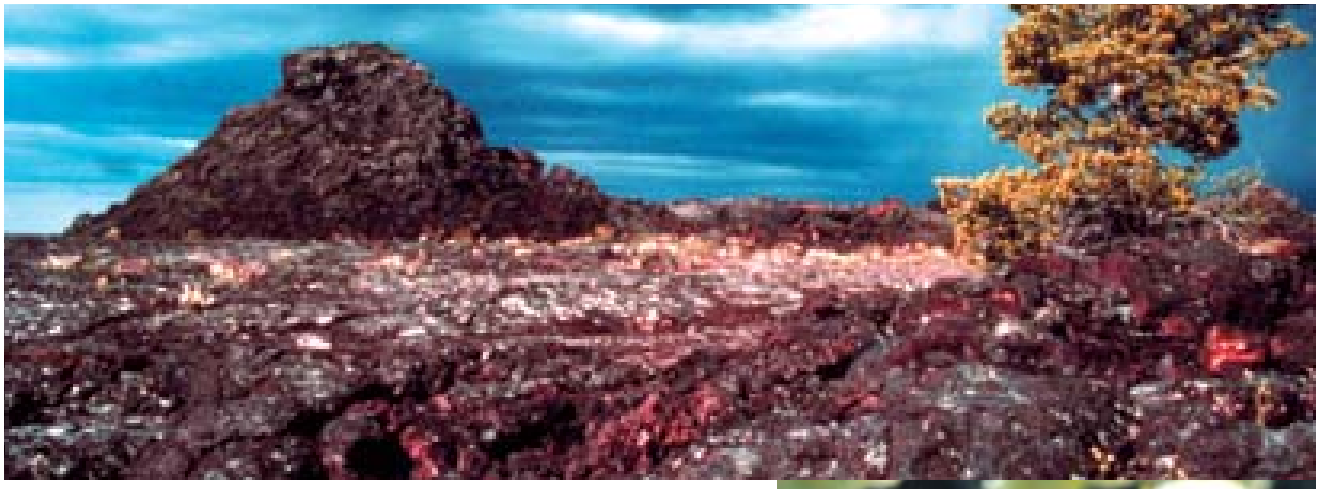
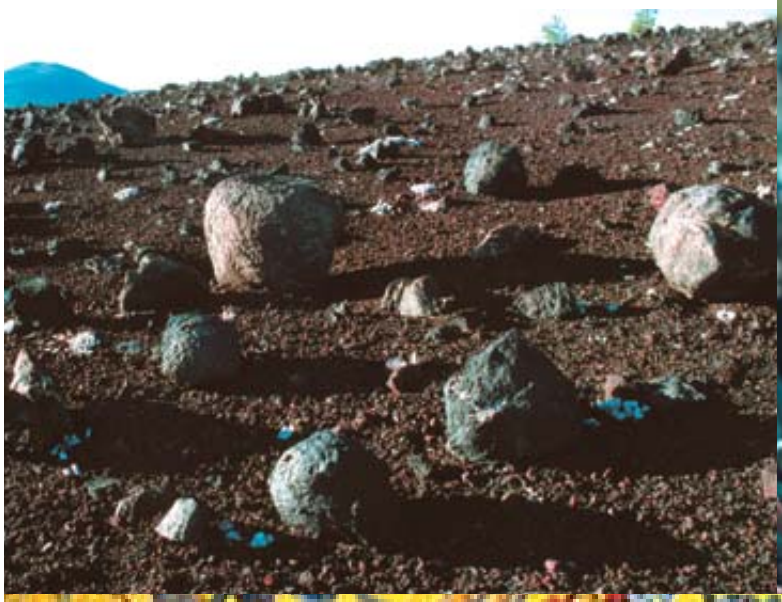
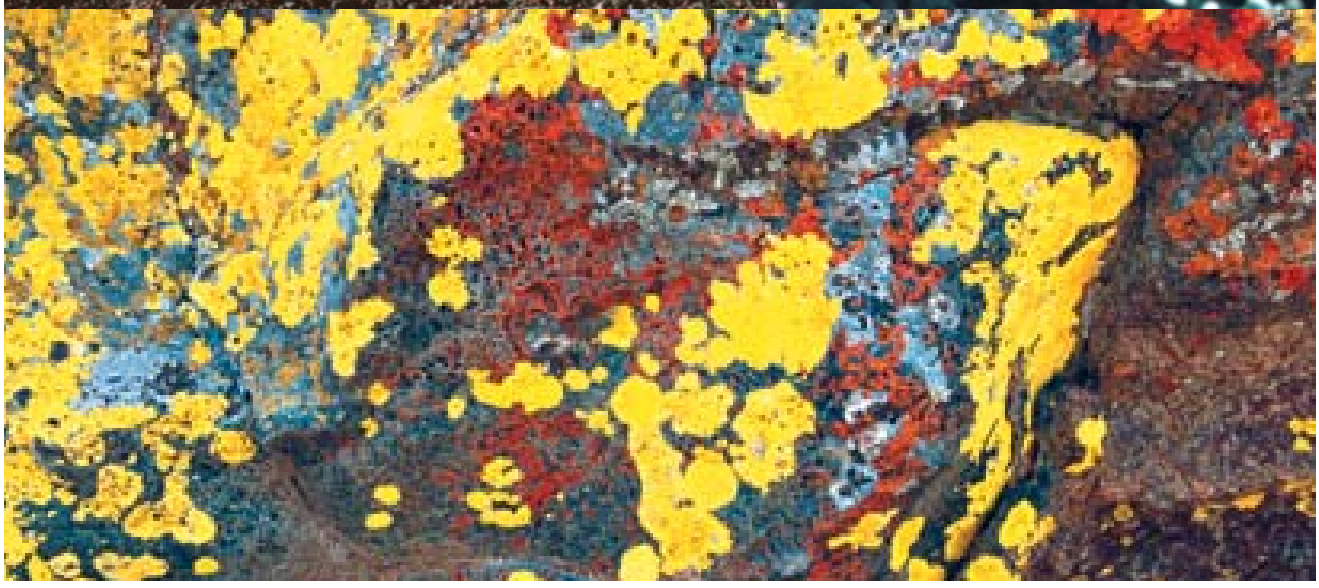
Chapter 3
Affected Environment







Previous page, clockwise, from top left
Hornito
Dwarf buckwheat
Lava lichen
Lava bombs

CHAPTER 3
AFFECTED ENVIRONMENT

The purpose of this chapter is to describe the physical, biological, cultural, and social environments of the Craters of the Moon National Monument and Preserve (the Monument), including human uses, that could be affected from implementing any of the alternatives described in Chapter 2. The topics discussed in this chapter are those identified as important issues by the public and the agencies during scoping. The discussion generally follows the order of the topics addressed in Chapter 2 under "Management Guidance Common to All Alternatives". The scientific names for species mentioned in the text are listed in Appendix D.

NATURAL RESOURCES

GEOLOGICAL RESOURCES

The purpose and significance of the Monument tie directly to its unique geology. Volcanism has generated an array of features and habitats that make the Monument a recognized outdoor laboratory. As a result, the Monument draws scientists and visitors from around the world to study and experience the diverse volcanic terrain.

Geologic Setting

The Monument is in the Snake River Basin-High Desert (Omernik 1986) and is primarily comprised of three geologically young (Late Pleistocene-Holocene) lava fields that lie along the Great Rift (see Figure 11 for regional setting and location). The Great Rift volcanic rift zone is a belt of open cracks, eruptive fissures, shield volcanoes, and cinder cones, which varies in width between approximately 1 and 5 miles. It begins north of the Monument, approximately 6 miles from the topographic edge of the Snake River Plain, in the vent area of the Lava Creek flows located in the southern Pioneer Mountains (Kuntz et al. 1992). The Great Rift extends southeasterly from the Lava Creek vents for more than 50 miles to somewhere beneath the Wapi Lava Field (Kuntz et al. 1982).

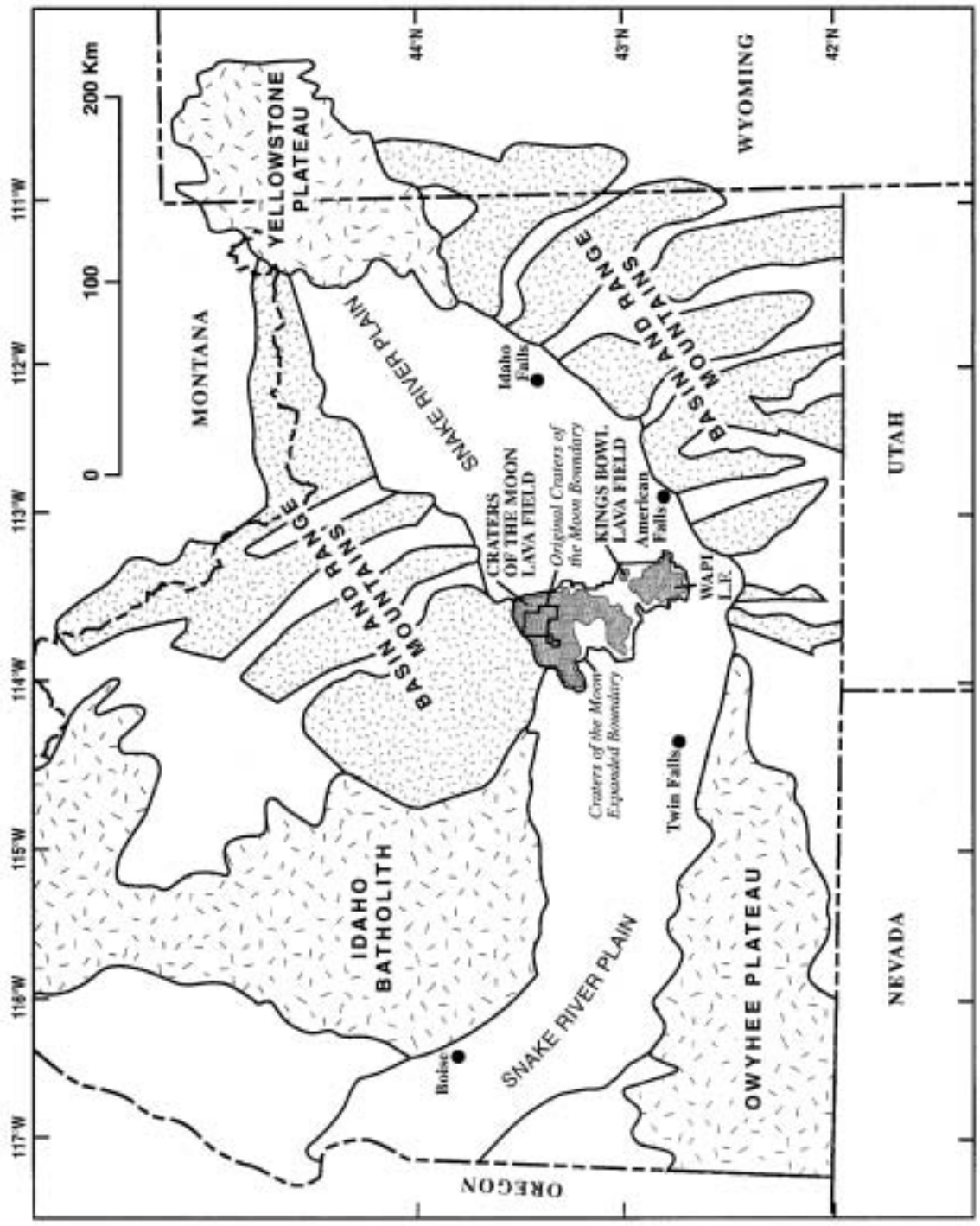
The Craters of the Moon Lava Field is the northernmost and largest of the three young lava fields. Kings Bowl Lava Field is the smallest and lies between Craters of the Moon Lava Field and the Wapi Lava Field. The rest of the Monument is composed of Pleistocene age pahoehoe and A?a flows, near-vent tephra deposits, cinder cones, lava cones, and shield volcanoes (Kuntz et al. 1988). These older areas are mantled with loess deposits (windblown silt) and in some places by windblown sand. During the Holocene (last 10,000 years), the most volcanic activity of any of the Eastern Snake River Plain (ESRP) basaltic rift systems was exhibited by these three lava fields associated with the Great Rift (Hughes et al. 1999).

The Craters of the Moon Lava Field covers 618 square miles and is the largest dominantly Holocene basaltic lava field in the lower 48 states (Kuntz et al. 1992). It contains a tremendous diversity of volcanic features, with nearly every type of feature associated with basaltic systems (Hughes et al. 1999). Contained within the Craters of the Moon Lava Field are at least 60 lava flows, 25 tephra cones, and eight eruptive fissure systems aligned along the northern part of the Great Rift (Kuntz et al. 1992).

Kings Bowl Lava Field formed approximately 2,200 years ago during a single burst of eruptive activity that may have lasted as little as six hours (Kuntz et al. 1992). Kings Bowl has a central eruptive fissure approximately 4 miles long, flanked by two sets of non-eruptive fissures. The dominant feature is a bowl, 280 feet long, 100 feet wide, and 100 feet deep, produced when lava came into contact with groundwater, causing a steam or phreatic explosion.

Adjacent to the bowl is an outstanding example of a lava lake with well-developed levees. The crust of the lake was broken by many of the blocks ejected by the phreatic explosion. The interior of this lake was still molten and oozed up through the holes punched in its crust, resulting in a large number of squeeze-up mounds of gas-charged lava (Hughes et al. 1999). Fissure caves, such as Crystal Ice Cave and Creons Cave, lie along the Great Rift at Kings Bowl. At South Grotto, the rift may be passable to a depth of 650 feet below the surface (Earl 2001). Feeder dikes and spatter cones can be seen along the Great Rift at Kings Bowl.

The Wapi Lava Field, approximately 2,200 years old (Hughes et al. 1999), is a classic shield volcano with a flattened dome shape. Kuntz et al. (1992) believe that the Wapi Lava Field began as a fissure eruption, but developed a sustained eruption from a central vent complex, which produced the low shield volcano seen today. Rising approximately 60 feet above the south side of the largest vent is Pillar Butte. Greeley (1971) reported that the only known dribblet spires in the continental United States occur on the flows associated with Pillar Butte. Now, however, dribblet spires are known to also occur in Diamond Craters in Oregon.



Note: L.F. = Lava Field

FIGURE 11
Regional Geological Setting and
Location of Craters of the Moon National Monument and Preserve

Potential for Future Eruptions

The Craters of the Moon Lava Field formed during eight eruptive periods with a recurrence interval averaging 2,000 years, and it has been more than 2,000 years since the last eruption. The constancy of the most recent eruptive periods suggests that slightly more than 1 cubic mile of lava will be erupted during the next eruption period.

In the past, eruptions in the Craters of the Moon Lava Field have generally shifted to the segment of the Great Rift with the longest repose interval. The next eruptive period should begin along the central portion of the Great Rift in the Craters of the Moon Lava Field, but may include the northern part of the Monument (Kuntz et al. 1986). Initial flows, based on past performance, will probably be relatively non-explosive and produce large-volume pahoehoe flows. Eruptions from potential vents on the northern part of the Great Rift may be comparatively explosive and may produce significant amounts of tephra, destroy cinder cones and build new ones (Kuntz et al. 1986).

Candy Kiss

Kings Bowl

Geologic Features

The lava is described by its physical appearance, which is largely determined by its composition, temperature, fluid and crystal content, and the influence exerted on it by the surface and slope it flowed down. Block lava has a surface of angular blocks and forms from very dense lava. A,a has a rough, jagged, or clinkery surface. Pahoehoe has a smooth, ropy, or billowy surface.

There are several types of pahoehoe. Shelly pahoehoe forms from highly gas-charged lava, often near vents or tube skylights, and contains small open tubes, blisters, and thin crusts. Some shelly pahoehoe crusts are so thin and fragile that they are easily broken by foot traffic; much of the shelly pahoehoe that surrounds Pillar Butte is like this. Spiny pahoehoe forms from very thick and pasty lava and contains elongated gas bubbles on the surface that form spines. Spiny pahoehoe is the dominant type of pahoehoe found in the Monument. Slabby pahoehoe is made up of jumbled up plates or slabs of broken pahoehoe crust. Many of the pahoehoe crusts are glassy and may exhibit various shades of blue or green prized by collectors. These glassy crusts are also prone to damage from foot traffic.

Pahoehoe

Lava tubes are hollow spaces beneath the surface of solidified lava flows, formed by the withdrawal of molten lava after the formation of the surface crust. Within lava tubes, various formations such as lava stalactites occur that are vulnerable to damage or theft.

Most of the lava flows in the Monument are pahoehoe and were fed through tubes and tube systems. Some lava flows produce tumuli (small mounds) or pressure ridges (elongate ridges) on their crusts. There are also pressure plateaus that were produced by the sill-like injection of new lava beneath the crust of an earlier sheet flow that had not completely solidified. In some places, squeeze-ups formed when pressure was sufficient to force molten lava up through tension fractures in the top of pressure ridges or cracks in the solidified crust of lava ponds. Because of their small size and unusual shapes, many of the squeeze-ups associated with the Kings Bowl Lava Field are vulnerable to theft.

When lava comes to the surface, highly charged with gas, and is ejected from one or a few vents, it can spray high into the air forming a fire fountain(s). The highly gas-charged molten rock cools and solidifies during flight and rains down to form cinder cones. Loose cinders are particularly vulnerable to compaction and wind and water erosion. Cinders displaying a play of colors, caused by a thin layer of glass, also make a tempting target for souvenir gatherers.

Other lava features include spatter cones that formed when fluid globs (spatter) were ejected short distances (generally less than 200 feet) from some of the vents and accumulated right around the vent, forming short steep-sided cones. Along eruptive fissures where a whole segment erupted, spatter accumulated to produce low ridges called spatter ramparts. Hornitos, also known as rootless vents, are similar in appearance to spatter cones, but formed from spatter ejected from holes in the crust of a lava tube instead of directly from a feeding fissure. The individual globs that comprise the spatter cones, spatter ramparts, and hornitos are frequently not very well adhered to one another and are easily dislodged, making them very vulnerable to human damage.

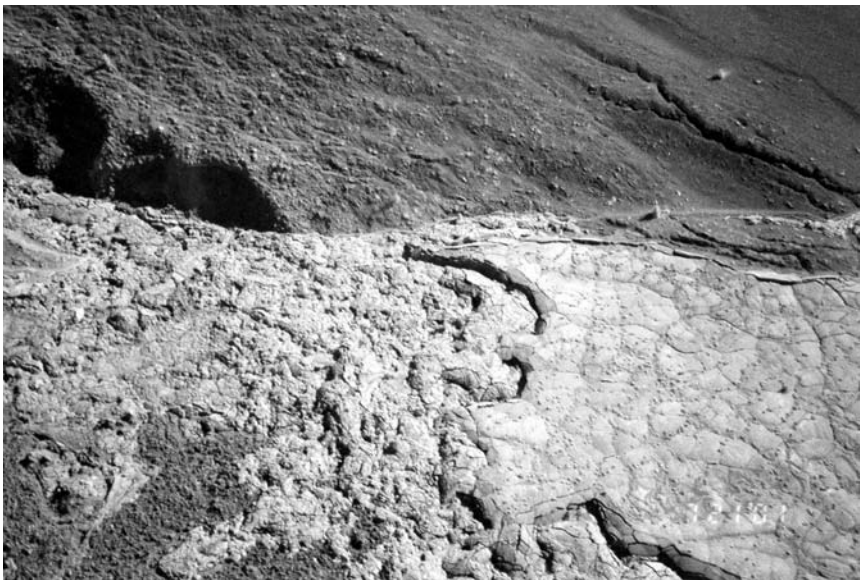
Four kinds of volcanic "bombs" are found in the Monument; all of which started off as globs of molten rock thrown or ejected into the air. The smaller bombs (backpack size or less) are frequently a target for collection and are now rare in proximity to roads and high-use trails in the Monument. The photo on page 77 depicts one type of bomb known as a "breadcrust bomb".

Caves

There are many different kinds of caves in the Monument. Shelly pahoehoe areas contain many small open tubes and blisters. There are thousands of these small open tubes and blisters within the Monument. The photo on page 84 depicts one cave known as Indian Tunnel.

Some fissure caves associated with the Great Rift can be passable to hundreds of feet below the surface. Earl (2001) reported at South Grotto in the Kings Bowl Lava Field that the Great Rift can be passable to a depth of at least 650 feet, depending on the internal ice conditions. Bears Den Waterhole,

Spatter Cone



Pressure Plateau

another fissure cave located in cracks of the Great Rift, is ice floored and usually a source of water even in a drought year.

The nature of flowing lava can produce shallow caves and overhangs at flow fronts as a result of inflation processes. Differential weathering of cinder layers on some cinder cones has also generated a few shallow caves. Some of these small caves are more than 10 feet deep.

These various types of caves in the Monument can also be associated with archaeological and paleontological features, and they can harbor wildlife such as the blind lava-tube beetle, bushy-tailed woodrats, and Townsend's big-eared bats. Deep cracks and fissures, including cracks with likely connections to lava tubes beneath, and the entrances to caves often create or provide microenvironments or microhabitats. Some of these microenvironments support impressive moss, algal, or lichen communities and even ferns.

Breadcrust Bomb

Indian Tunnel

People are attracted to caves, and some of the easily accessed caves in the Monument now contain considerable graffiti (e.g., Lariat Cave), litter, and other forms of vandalism.

Paleontology

Tree molds are impressions in the solidified lava that form as trees are enveloped by the lava flows, begin to burn, release water and other vapors that quickly cool the surrounding lava, and leave behind a mold of the charred tree and occasionally some carbon residue (see photos on page 84). Generally, tree molds preserve impressions of the cracked, partly burnt wood, but do not preserve bark or other textures that would aid in the identification of tree species. In the northern end of the Monument, more than 100 tree molds have been identified. Of the more than 100 inventoried tree molds, 11 showed minor damage from humans, and these were at developed sites.

Animal bones accumulate in lava tubes as inhabitants die naturally and are also introduced into the caves as a result of human or animal disposal. Exploration of such deposits in the lava tubes of the Snake River Plain has revealed bones of extinct animals such as mammoth and camel and modern large animals such as grizzly bear, gray wolf, bison, elk, and pronghorn (Miller 1989). In addition to lava tubes, lava blisters have also accumulated a faunal record. The openings create an excellent

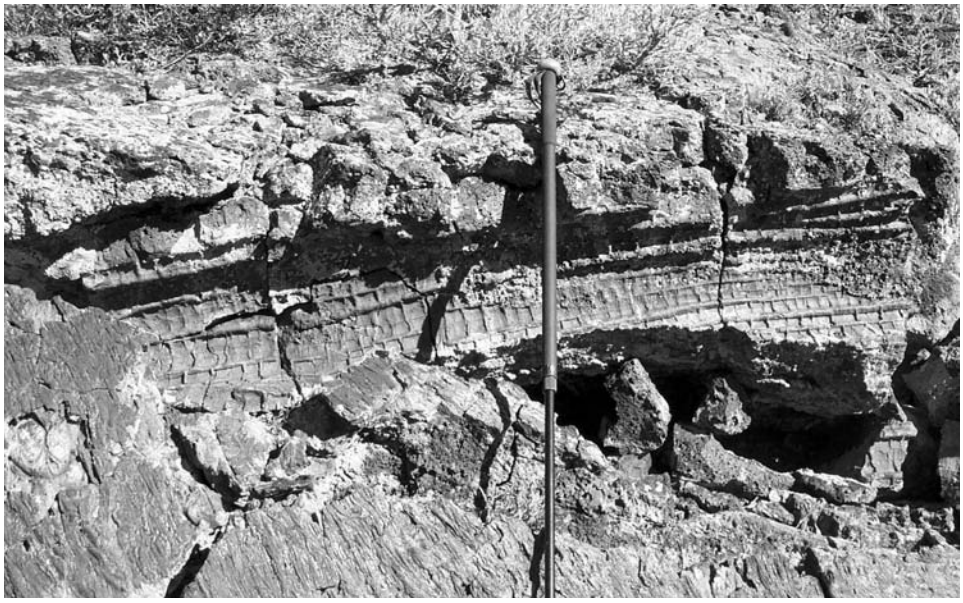


Photo above. Vertical tree nol on left is 8 feet deep and over 1 foot wide; horizontal tree nold on right is almost 2 feet wide. Photo on right. Mold of charred wood: hiking staff for scale.

trap for larger animals. Carnivores found in these blister traps on the ESRP include the now extinct noble marten and animals no longer found in the area such as bison, wolverine, and Canada lynx (Miller 1989).

A third type of unaltered fossil accumulation occurs in packrat nests. These nests, or middens, are an important contributor to the fossil record because of the ability to date the pollen and bone assemblages and relate that information to the paleoecology of the area.

SOILS

The soils of the Monument area are variable, reflecting the differences and interactions between parent material, topography, vegetation, climate, and time. The most significant differences involve the presence or absence of lava flows and the degree of soil development on volcanic substrates. The lava flows, which occupy two-thirds of the Monument, are made up of basalt lava rock. The soils on the younger basalt flows and cinder beds are limited to the initial decomposition of rock and cinders and deposition of windblown loess within crevices, cracks, and fissures. Plants can establish and grow in little to no soil. As time progresses, soil development continues and more vegetation establishes.

Sagebrush steppe, mountain areas, and kipukas within the Monument have deeper, well-formed soils. The high desert environment results in lighter colored soils with low organic matter content. Most of the soils in the Monument area are silt loam to sandy loam in texture and vary in depth. They are moderately drained to well drained, except where clay horizons are present. Soils that are disturbed, not properly vegetated, or located on steep slopes are susceptible to water and wind erosion.

Soil Origins

The soils in the Monument and surrounding area have developed from rocks deposited during a sequence of geologic events that began almost 600 million years ago, during the Cambrian Period. For approximately 500 million years, ancient seas intermittently covered the region, depositing limestone and other sedimentary rocks typical of ocean floors (Shallat and Burke 1994). Beginning about 17 million years ago, fault block mountain building has pushed up the rocks, exposing them to weathering and soil development processes. The many mountain ranges in the Basin and Range Province have developed in this way. Recent earthquake activity is evidence that these mountain-building processes continue today.

During the latter part of the Tertiary Period, from about 16 million years ago, until recently in the Yellowstone area, explosive volcanic activity across the Snake River Plain deposited layers of pyroclastic tuffs and silica rich lavas. More recent basalt lava flows and windblown loess have subsequently covered these rhyolite rocks. The basalt flows that are visible on the surface of the majority of the Snake River Plain began approximately 2 million years ago, during the Pleistocene, and continued until very recent times.

The lava flows on the Snake River Floodplain are approximately 1 million years old (Anderson et al. 1996). This volcanic activity built up the central part of the plain, forming some internally drained basins within, such as Big and Little Lost River sinks.

During recent times, the region has periodically received layers of windblown dust from sources fur-

ther west. These loess deposits have mantled the local geology and have resulted in many of the deeper soils on the eastern Idaho foothills and the leeward sides of lava flows within the Snake River Plain.

Soil Types

Soil surveys have been completed and published by the Natural Resource Conservation Service (NRCS) for most of the Monument outside of the recent lava. Other portions of the area have been partially mapped at different times by the Bureau of Land Management (BLM) in the late 1980s and 1990s. Many of the soils surveys are now in Geographic Information System (GIS) form, where they can be viewed in Arcview and other GIS software.

Soil types in the Monument fall into the following categories:

- **Soils of the Mountains and Foothills** – These soils are located primarily in northern part of the Monument. They have developed in mixed metamorphic and/or volcanic shallow, rocky material and have carbonate accumulations at depth. Typical vegetation includes sagebrush mountain shrubs and tree types found native to eastern and southern Idaho.
- **Soils of Alluvium from the Mountains and Streams** – These soils have developed in lime-rich alluvial materials eroded from the mountains on the Snake River Floodplain and streams. Typical shrub vegetation includes mountain or Wyoming big sagebrush, low sagebrush, and occasionally some basin big sagebrush.
- **Shallow Basalt Soils** – This is a complex of soils developed on the recent basalt flows. Due to the uneven, broken surface of the basalt, soil depths range from a few inches on exposed ridges to 6 or 8 feet on the lee sides of the ridges and in low-lying areas. The type of vegetation varies depending on soil depth and may include various types of shrubs including fern-bush, syringa, and mountain big sagebrush, with some low and Wyoming big sagebrush.
- **Loess Soils** – The loess soils are from glacial Snake River silts and lacustrine materials that have been windblown out of the Snake River drainage. Typical shrub vegetation includes mountain big sagebrush, Wyoming big sagebrush, basin big sagebrush, or some threetip sagebrush.
- **Sandy Soils and Playa Lake Bottoms** – These soils have formed in alluvial and eolian accumulations usually near dry lake bottoms. The sands have weathered from quartzite, basalt, and sedimentary rocks, generally of local origin (Nace et al. 1975). Typical shrub vegetation includes basin big sagebrush or Wyoming big sagebrush.
- **Cinder Soils** – This is a complex of soils mapped by NRCS and particular to cinder cones and deposits located within the Monument. Soils within this complex consist of varying ratios of cinder and eolian loess accumulations. Typical vegetation includes dwarf buckwheat, antelope bitterbrush, mountain big sagebrush, and limber pine.

Biological Soil Crusts

Biological soil crusts are a feature common to nearly all plant communities in arid and semiarid regions throughout the world (Belnap et al. 2001). The development of biological soil crusts is dependent on a number of factors, including soil texture and chemistry, annual precipitation amount and timing, associated vegetation, and disturbance history. Biological soil crusts have not been observed as a highly conspicuous element in the Monument, which could be due to any one of these elements.

Soil textures in the Monument range from fine- to coarse-textured, with silt loams and sandy loams being predominant in areas where biological soil crusts are most likely to occur. Coarse-textured soils are more difficult for biological crusts organisms to stabilize due to the size of the particles. While crusts occur on soils with a variety of chemical natures, they tend to be highly developed on soils with basic pH and that are more saline or calcareous. Mosses are often a dominant organism on soils with neutral to acidic pH. Annual precipitation in the Monument averages from 8 to 16 inches. Areas with approximately 14 inches of annual precipitation have vegetation of a density where crusts are no longer needed to stabilize the soil surface.

The presence or absence of biological soil crusts on the Monument landscape depends on a variety of environmental factors as well as land use and fire history. While several BLM-administered areas and some kipukas in the Monument do not show good development of biological soil crusts, more areas, particularly in the drier southern portions, need to be investigated to determine the potential for crusts development. For example, areas with non-sprouting

basin and Wyoming big sagebrush need to be compared with similar areas supporting the re-sprouting threetip sagebrush to determine if areas with a naturally shorter fire cycle (as indicated by the re-sprouting shrub) might have less potential for crust development than areas with longer historic fire return intervals.

VEGETATION, INCLUDING SPECIAL STATUS SPECIES, AND FIRE MANAGEMENT

Although some of the younger lava flows are devoid of vegetation, there is a surprising diversity of plants and plant communities in the Monument. The type and density of vegetation varies widely, depending on the availability of soil. The lavas and kipukas (islands of vegetation surrounded by younger lava flows) show a full range of ecological succession – from pioneer plants, such as lichens and mosses on the basalt surfaces, to complex plant communities in the kipukas and rangelands bordering the lava flows. The rough topography of the lava flows creates numerous microsites where soil and water accumulate to support plants that would normally occur in higher precipitation zones.

Limber pine stands occur on the cinder cones and lava flows in the northern part of the Monument. The transition between limber pine and juniper vegetation types occurs between Blacktail Butte and the original Monument. This ecotone normally occurs only in montane regions and is thus an unusual feature for the lava flows (BLM 1980). Quaking aspen and Douglas fir stands are found on some north-facing slopes in the northern portion of the Monument. Riparian and wetland habitats are limited to the northern periphery due to the geology, topography, and climate of the area.

Early successional plant communities on the cinder cones produce stunning spring wildflower displays. A areas with greater soil development support the sagebrush steppe vegetation that typifies the Snake River Plain. Sagebrush steppe is found on approximately 60 percent of the Monument and covers the more developed soils of the rangelands, kipukas, cinder cones, older lava flows, and the foothills of the Pioneer Mountains. This once was the most common vegetation throughout the Snake River Plain, as well as in the Intermountain West and Upper Columbia River Basin. However, fire, agriculture, and livestock grazing have modified composition and reduced the extent of this vegetation type throughout these regions (Blaisdell et al. 1982; Whisenant 1990; Bunting et al. 2002).

Some of the kipukas and portions of the original Monument have not been grazed by domestic livestock and have seen little in the way of other human-related disturbances. Thus, these areas, which are protected by new, rough lavas, offer some of the best remaining examples of native sagebrush steppe for the Snake River Plain. They are valuable as examples of range conditions before European-American settlement and the introduction of domestic livestock, and they offer an opportunity to observe climax vegetation, as well as successional processes associated with natural disturbances such as fire.

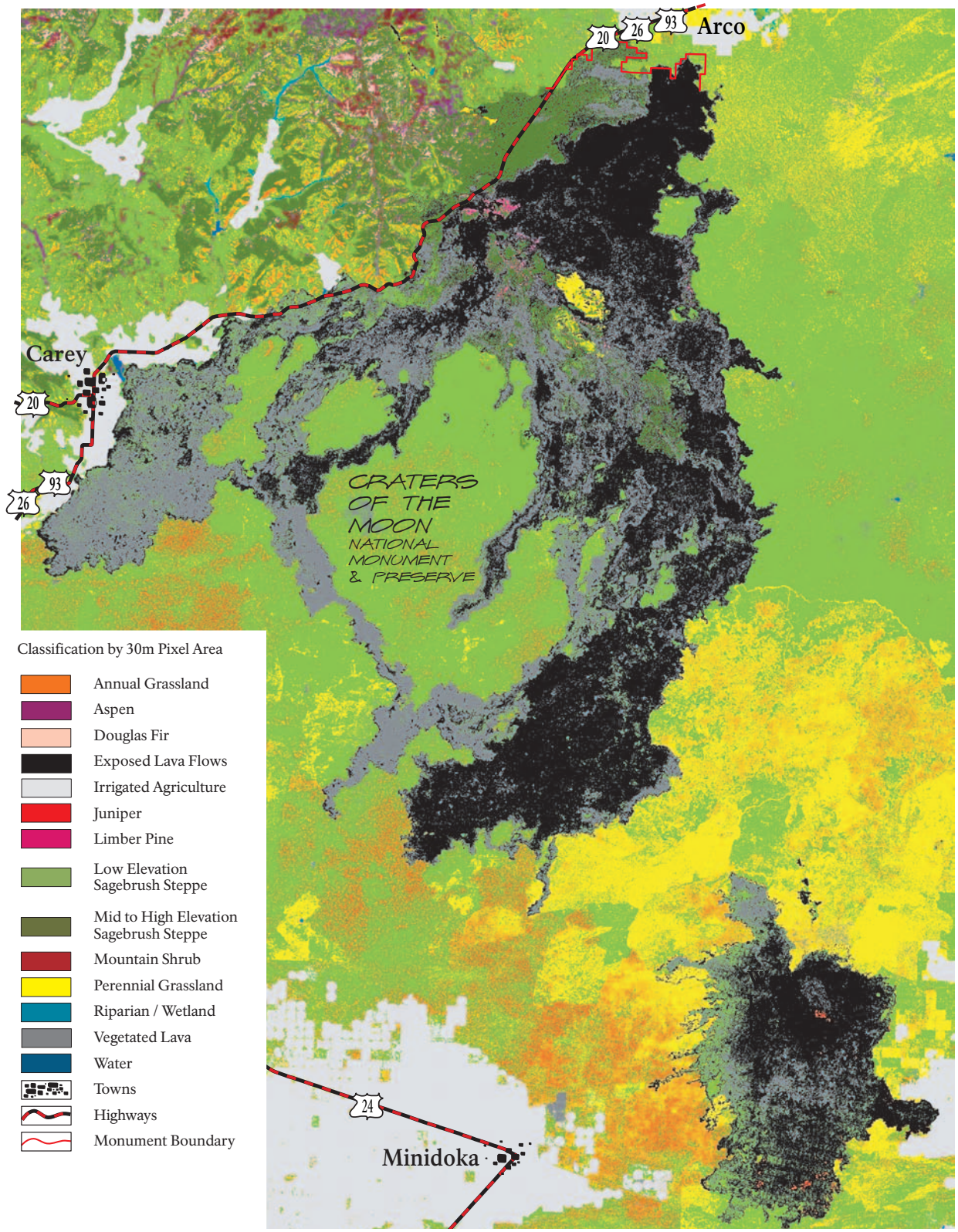
Vegetation in the original Monument and parts of the expanded Monument has been inventoried and mapped through various efforts (Day and Wright 1985; Whipple 1992; Jurs and Sands 2003). A recent vascular plant inventory effort estimates the presence of more than 600 species and at least 35 vegetation communities within the Monument (NPS, unpubl. data). The current vegetation map of the Monument was created with the use of LandSat imagery.

Data from the various vegetation studies, as well as inventory and monitoring points, were used to define spectral signatures. Vegetation inventory and ground-truthing of the map are ongoing; the vegetation map is a dynamic resource. This map, which is relatively broad in scale, is intended to provide a frame of reference for vegetation distribution and diversity within the Monument. The following discussion describes complexes that group and define the various vegetation types illustrated on the map.

Vegetation Types in the Monument

–Vegetated Lava Complex

Exposed lava flows are the newest lava flows or rough A'a flows that are mostly devoid of vascular plants; however, lichens and mosses are frequently present. Based on statewide Gap Analysis of Idaho Land Cover from 1996, approximately 20 percent of the Monument is exposed lava flows and 33 percent is vegetated lava (Landscape Dynamics Lab 1999). Vegetated lava is defined as lava fields with greater than 5 percent total vegetative cover, with plants occurring as islands, pockets, or clustered individuals in the lava flow. The vegetated lava complex mainly consists of early successional and adaptable plants that grow in the limited soil that blows into the cracks and fractures on young basalt rock.



No warranty is made by the Bureau of Land Management or National Park Service for use of the data for purposes not intended by these agencies. Frontcountry and Passage Zone polygons have been oversized for graphic presentation and are not to scale.

FIGURE 12
Vegetation Type Classification
Craters of the Moon National Monument & Preserve
U.S. Department of the Interior / National Park Service
DSC • Feb 04 • 131 • 20,049

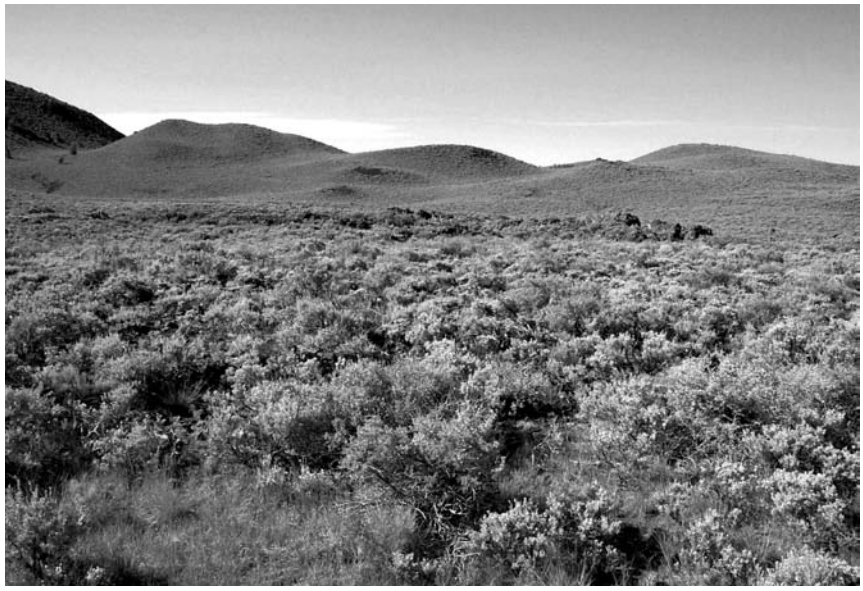
The type of lava and the amount of soil determine the type and density of vegetation. Penstemon and gland cinquefoil grow in shallow soils, while fern-bush, rock spirea, and syringa are present in deeper crevices. Trees, such as limber pine in the north end of the Monument and juniper in the south end, also grow in crevices and cracks where sufficient moisture is funneled and retained. These trees may grow as scattered individuals or as small woodlands. Antelope bitterbrush, rabbitbrush, and sagebrush can also be found (up to 15 percent vegetative cover) where more soil development or deposition has occurred.

– Sagebrush Steppe Complex

Sagebrush steppe, which is the dominant vegetation in the Monument, includes all areas where adequate soil deposition or development has occurred to allow sagebrush taxa and associated shrubs with a bunchgrass understory to dominate. Due to the drastic reduction of sagebrush steppe in southern Idaho by cultivation, fire, and weed invasion (Hironaka et al. 1983), some of the sagebrush communities in the Monument are the best remaining examples of this vegetation type on the Snake River Plain.

The sagebrush steppe appears to be a monotonous landscape; however, there is a remarkable diversity of plant and community types. Many factors influence the diversity, density, cover, distribution, and health of this high desert sagebrush steppe, including differences in soil depth and development; the precipitation gradient ranging from 8 to 16 inches; the elevation gradient ranging from 4,000 to 7,500 feet between the southern and northern ends of the Monument; historical and current land management; invasive species; and fire frequency. In turn, vegetation structure and composition influence the ability of the community to resist invasive species infestation; its susceptibility to, as well as recovery from, fire; and land management goals, decisions, and practices imposed upon the landscape.

Sagebrush steppe vegetation in the Monument occurs over an elevational gradi-



Top photo - Lava vegetated with sagebrush and fern-bush. Photo center - Vegetated lava complex. Photo below - Low-elevation sagebrush steppe.

ent and is dominated largely by three subspecies of big sagebrush – mountain big sagebrush, basin big sagebrush, and Wyoming big sagebrush – as well as threetip sagebrush. The Mid- to High-Elevation Sagebrush Steppe vegetation type is generally defined by the presence of mountain big sagebrush and antelope bitterbrush, which occur in the higher elevation areas of the northern Monument that are colder and receive more precipitation. Low sagebrush is also found in this vegetation type, occurring in a mosaic with mountain big sagebrush.

The Low-Elevation Sagebrush Steppe vegetation type is defined by basin and Wyoming big sagebrush and threetip sagebrush, although these may overlap to some extent with the mid-elevations. Both basin and Wyoming big sagebrush are adapted to the hot, seasonally dry conditions of the Snake River Plain. Basin big sagebrush communities occur in pockets of deeper, more fertile soils. Wyoming big sagebrush communities tend to be found in shallower soils and can be found intermixed with basin big sagebrush.

Threetip sagebrush is widespread throughout the Monument, particularly in areas burned within the last 20 years. Threetip sagebrush is the only sagebrush found in the Monument that re-sprouts following fire. Both the Low- and Mid- to High-Elevation Sagebrush Steppe vegetation types contain other common shrubs such as antelope bitterbrush, rubber rabbitbrush, and green rabbitbrush.

Understory components in the sagebrush steppe complex vary widely in type and abundance, but common species include Sandberg bluegrass, Idaho fescue, needlegrasses, bluebunch wheatgrass, and the exotic annual cheatgrass. Forbs such as buckwheats, arrowleaf balsamroot, lupine, phlox, and milkvetches are also commonly found growing in these vegetation types. Both diversity and abundance of herbaceous plants increase with increasing elevation and moisture in the Monument.

The reduction of large tracts of sagebrush through increased size and frequency of wildfires is a concern in the area. Less obvious is the loss of native understory plants, particularly native bunchgrasses that are valuable components to the ecosystem. Plants such as bluebunch wheatgrass and Idaho fescue may not be resilient under conditions of closed shrub communities, frequent fire regimes, cheatgrass invasion, altered climate or site conditions, or excessive grazing. The reduction in these native species by one factor increases their susceptibility to other factors. Once native understory species are excluded, they are very difficult to reestablish (Hironaka et al. 1983).

The variation of sagebrush steppe communities influences the multiple values and uses of this landscape in the Monument. These areas are valued as crucial winter range habitat for mule deer and pronghorn, essential habitat for sagebrush-obligate wildlife such as sage grouse, important watersheds, sources of forage for livestock, and enjoyable recreational sites. There is a range of conditions, primarily due to relative isolation and past and present land uses.

The Monument contains more than 500 kipukas, many of which contain relatively undisturbed native sagebrush steppe communities. Fire, livestock grazing, recreation, or cheatgrass invasion has altered some of the kipukas; however, other kipukas in the Monument have been protected from access and buffered by rough lavas. The abundance and condition of resources within most these kipukas is undocumented and relatively unknown. However, for those kipukas that have been documented and studied, it is clear that these unique islands of nearly pristine native vegetation are important rangeland and scientific benchmarks (Henderson and Murie 1958; Yingst and Handy 1961; Tisdale et al. 1965; Caicco and Wellner 1983a, 1983b, 1983c).

The Monument also includes parks. Laidlaw Park, Paddelford Flat, and Little Park technically meet the definition of a kipuka, but are referred to as "parks" due to their larger size, accessibility, and land use. There is road access to and within these parks, and livestock grazing is a current and historical use. All three parks contain the Low-Elevation Sagebrush Steppe vegetation type, as well as areas dominated by annual and perennial grasslands. The abundance of native species and the quality of these sagebrush steppe communities depends mainly on management practices and cumulative effects of environmental responses. For example, the northern parts of Laidlaw Park have not been overgrazed; retain sufficient native under-

story and sagebrush; and support big game as well as sage grouse. However, historic overgrazing, frequent wildfires, Aroga moth infestations, cheatgrass invasion, and noxious weeds have negatively affected the southern portions of Laidlaw Park. In addition, the southern part of the park receives slightly less rainfall than the northern part, making it less resilient to disturbance (Jurs and Sands 2003).

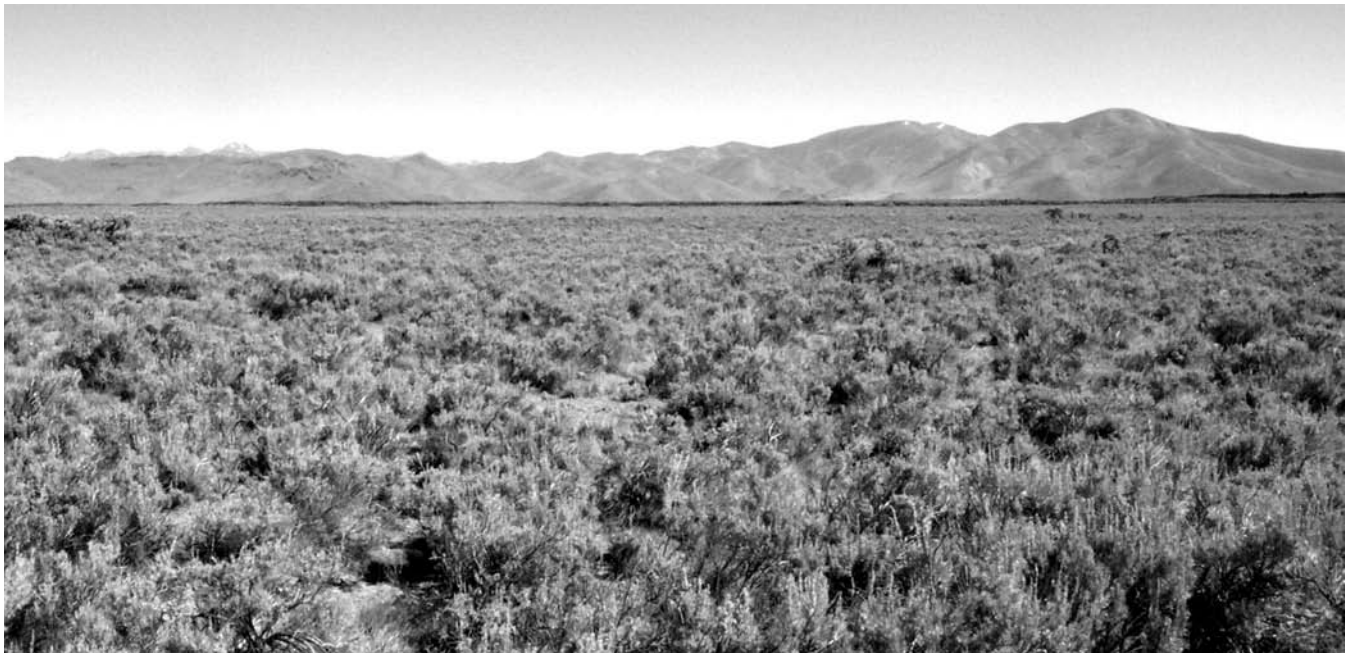
– Grasslands Complex

The Perennial Grassland vegetation type is dominated by native or introduced perennial grasses. Historically, these grasslands were part of the sagebrush steppe complex and formed as a result of disturbance, primarily through fire. Shrubs would eventually reinvade perennial grasslands if they remained unburned for several decades. In most cases, fire is the main cause of shrub removal. Some shrubs such as mountain big sagebrush, threetip sagebrush, rubber rabbitbrush, and green rabbitbrush are able to re-sprout or reestablish within a short time (10 years). However, Wyoming and basin big sagebrush must regenerate from seed and can be slow to reestablish after fire. The Annual Grassland vegetation type is the result of altered disturbance regimes, such as soil surface disturbance or frequent fires in areas with long natural fire return intervals. The primary component is cheatgrass, the exotic species that perpetuates short fire-return intervals and conditions that maintain its dominance.

In many cases, microsite conditions have often been altered to the extent that native grasses are unable to effectively compete with cheatgrass and noxious weeds. Under these conditions, managers revegetate burned areas by seeding perennial vegetation to prevent the establishment of annual grasslands. In areas where altered site conditions and high competition from exotic species exist, select cultivars of introduced and native perennial grasses and forbs are used to rehabilitate burned areas. Some of the species seeded in rehabilitated areas are crested or Siberian wheatgrass, Snake River wheatgrass, tall wheatgrass, big bluegrass, and Sandberg bluegrass. Forbs such as blue flax, sainfoin, and alfalfa have also been seeded. Exclusively native plant seedings have also been conducted to a limited extent. Both the National Park Service (NPS) and BLM encourage the use of native species for restoration and rehabilitation efforts.

– Mountain Complex

The complex of mountain vegetation occurs at the far north end of the Monument in the



Perennial grassland resulting from the 1992 Potter Butte Fire.

foothills of the Pioneer Mountains. This complex covers less than 1 percent of the Monument, but it includes vastly different and important habitat types that contribute to its diversity.

Five vegetation types are included in this complex. The Douglas fir type is found on relatively steep, north-facing slopes of older cinder cones and along Little Cottonwood Creek. The Aspen type is predominantly found in upland sites away from permanent stream courses. The Riparian type is characterized by dense woody vegetation such as black cottonwood, chokecherry, willow, alder, and a dense layer of tall forbs close to permanent watercourses. The Mountain Shrub vegetation type includes communities dominated by mountain big sagebrush, low sagebrush, and mountain snowberry that occupy slopes and ridges of the Pioneer Mountains. The Wetland type predominantly occurs along the periphery of the Monument where this vegetation is supported by cold water and thermal springs, small lakes, playas, and pools.

Human-based activities (e.g., water right diversions, livestock grazing, thermal spring recreation), in the past and present, have degraded the Riparian and Wetland types. For example, NPS water right spring diversions in Little Cottonwood Creek, facility development, and maintenance activities may have altered the plant species composition and influenced the spread of Canada thistle. NPS facilities recently converted to well water and reinstated full spring flow to Little Cottonwood Creek.

Dwarf Monkey Flower

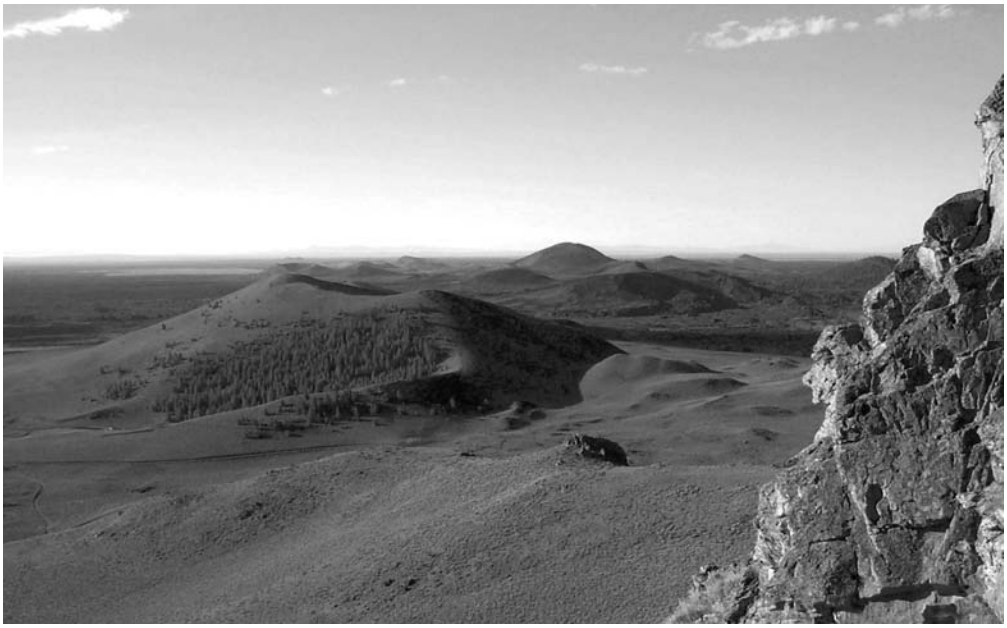
– Cinder Cone Complex

This complex is located in the north end of the Monument, south of the highway, where many cinder cones are present. This area is mapped primarily as the Vegetated Lava, Limber Pine, and Mid- to High-Elevation Sagebrush Steppe types. The cinder cone complex includes three different plant communities, depending on aspect, soil development, and successional stage. Less than 1 percent of the Monument is cinder gardens. Cinder gardens occur on cinder deposits with little to no soil development. These communities produce spectacular spring wildflower displays and are dominated by dwarf buckwheat, scorpion weed, Douglas chaenactis, dwarf monkeyflower, and bitterroot. As soils develop on the cinders, antelope bitterbrush dominates newly establishing mid- to high-elevation sagebrush steppe communities.

The Limber Pine type is present on north-facing slopes where sufficient moisture is available. Limber pine stands with antelope bitterbrush understory provide valuable wildlife

Mountain vegetation complex north of the highway.

habitat and are used by mule deer for fawning. Attempts were made in the 1950s to eradicate native dwarf mistletoe from the limber pine population. More than 6,000 trees were cut or poisoned until managers realized that limber pine and mistletoe had coexisted for thousands of years. The effects of this action have not been studied and are not understood; however, there was a change in the population and age structure of the limber pine forest (Blakesley and Wright 1988).



Cinder Cone Complex

– Nonvascular Plants

Mosses, liverworts, lichens, and fungi are vegetative life forms that have been historically overlooked in the Monument flora due to their inconspicuous nature. These organisms occur to some extent in every vegetation type occurring in the Monument and are commonly observed on exposed lava. This large group of organisms has been studied to some degree in other areas, but limited information exists for the Monument area specifically. Nonvascular plants perform a number of ecologically important functions – they actively decompose detritus, break down rock, and add structure and nutrients to the soil. They are important components of the functioning ecosystem and also serve as environmental quality indicators.

Noxious and Exotic Species

Ten species of weeds designated as noxious by Idaho State Law (State of Idaho 2001) have been identified in the Monument: spotted knapweed, diffuse knapweed, Russian knapweed, rush skeletonweed, leafy spurge, Canada thistle, musk thistle, Scotch thistle, dalmatian toadflax, and field bindweed. Disturbed areas such as road rights-of-way, intensively grazed areas, and burns are particularly susceptible to invasion by exotics; consequently, most of the noxious weeds are found specifically in these areas. No noxious weed infestations have

Diffus knapweed, a state-listed noxious weed occurring in the Monument

currently been documented on the few inventoried kipukas in the Monument.

Spotted knapweed and diffuse knapweed have been documented extensively along U.S. Highway 20/26/93 along the northern extent of the Monument. More than 200 infestations of these knapweeds occur along the highway within Monument boundaries. NPS mapped and treated these locations in 2001 and 2003 as a partner in the Lost Rivers and Blaine County Cooperative Weed Management Areas. Spotted and diffuse knapweeds have also been documented and treated in Paddelford Flat and Laidlaw Park, along the west and east edges of the Monument, respectively.

Rush skeletonweed has been reported in approximately 10 locations in Laidlaw Park and the west side of the Monument; approximately 18 locations have been documented in the Bear Trap Cave and Kings Bowl vicinities along the east side of the Monument. Many observations of this species have not been documented. This weed also takes advantage of disturbed soil and spreads primarily by seed. It is reported to be the most invasive (rapidly spreading) noxious weed in recent years within the Monument.

Leafy spurge has been documented in the west part of the Monument as small, scattered sites within the sagebrush steppe and vegetated lava (Carey Lava Field). It has also been recently documented in the group campsite north of the highway. Large infestations are known to exist along the west edge of the Monument in the Carey area and in the Monument Butte and Sand Butte vicinities. These large infestations have increased the potential for further introduction and spread onto the Monument via bird, deer, livestock, and vehicles. BLM is continuing a successful 10-year control program specifically developed to address infestations on lava-based terrain.

Thistles are found in scattered locations in the North Unit, Laidlaw Park, and along the west and east edges of the Monument. Approximately 75 total infestations have been documented for all three noxious thistles.

Both BLM and NPS have initiated integrated noxious weed programs. Efforts to control these species are in effect, including the use of mechanical and spray techniques, as well as limited use of biological control agents. The priority species discussed have been targeted specifically for mapping, treatment, and prevention programs. Education and public awareness are emphasized by both agencies. Involvement in Cooperative Weed Management Areas has resulted in strong community commitment and cost-effective management of noxious weeds.

Other invasive exotic species, such as cheatgrass, are as much of a concern as state-listed noxious weeds. Cheatgrass, a common and widespread invader throughout the West, was introduced in the early 1900s when domestic sheep grazed the area. Cheatgrass is extremely competitive and readily invades and dominates disturbed land. It can be a component of undisturbed or otherwise healthy sagebrush. For example, cheatgrass has been documented in several kipukas that lack a history of common human disturbances such as livestock grazing. This annual grass out-competes native vegetation and perpetuates a frequent fire regime, which further discourages the regrowth of native species and encourages more cheatgrass. This has been a key management concern for BLM and has driven the development of more effective disturbed land rehabilitation and restoration techniques. Approximately 80,000 acres of annual grassland and low-elevation sagebrush steppe dominated by cheatgrass have been identified in the Monument as needing management intervention to restore functional sagebrush communities.

BLM and NPS have implemented nationwide policies against invasive and harmful exotic species. All the species mentioned in this discussion have been targeted for eradication or control.

Fire and Vegetation

Between 1970 and 2002, approximately 300,000 acres (approximately 40 percent of the Monument) have burned in wildfires within the boundary of the expanded Monument, primarily on BLM-administered land. Peak fire years occurred in 1971 (29,000 acres), 1981 (22,000 acres), 1992 (61,000 acres), 1996 (31,000 acres), and 1999 (87,000 acres). Extensive acreages outside of and adjacent to the Monument also burned during this period. About half of Laidlaw Park and Paddelford Flat and nearly all of Little Park have remained unburned in the last decade. Relatively small fires have burned on vegetated lava and in kipukas, notably Little Prairie in 1992 (1,900 acres) and Echo Crater in 2000 (632 acres). Overall, fires within the original NPS Monument boundaries represent only 8 percent of the total area burned since 1970.

As previously noted, fire plays a key role in determining the diversity and condition of vegetation communities. Large tracts of sagebrush have been lost due to extensive wildfires, and fires have perpetuated

Fire in low-elevation sagebrush steppe dominated by cheatgrass

exotic annual grasslands. However, fire also plays an important role in the maintenance of some vegetation types, including aspen and mountain shrub.

Native Americans historically used fire to manipulate vegetation and wildlife (Williams 2001). Since the mid-1800s, sheepherders used fire in the Monument to reduce shrub cover and encourage herbaceous plant growth. Good fire records prior to 1950 are not available; however, traditional practices throughout southern Idaho are known to have included the use of fire to eliminate sagebrush and promote grass growth. In 1982, the BLM proposed to burn approximately 19,000 acres to break up continuous tracts of sagebrush, create more diverse wildlife habitat; reduce fuel loads; and improve forage for domestic livestock and wildlife (Saras 1982). The burning of approximately half of this acreage was accomplished by 1992, at which time large wildfires occurred in the area and the use of prescribed fire was curtailed. The use of prescribed fire was reinitiated in 2001, when small areas within the Monument (part of larger projects near the southern boundary) were burned to reduce cheatgrass, in conjunction with herbicide and seeding treatments.

The length and timing of the fire season is highly dependent on annual weather and fuel conditions. Generally, the season can extend from mid-May through mid-October. Warm, dry, and windy weather associated with thunderstorm cells can result in lightning activity with or without rain. Ignition of vegetation can occur from natural sources, primarily lightning, or from human sources such as vehicles, campfires, or cigarettes.

Areas most at risk for large, destructive wildfires are the rangelands in the southern part of the Monument where fuel loading is high due to an abundance of cheatgrass in the understory. Ignitions on vegetated lava are rare; however, there is a risk that fires near the edge of the lava can lie low for a period of time and then ignite adjacent rangelands if weather conditions become hot or windy. Fires in kipukas remain localized and small, because the surrounding lava limits spread.

The northern end of Laidlaw Park, in particular, and other isolated areas in the Monument contain good examples of sagebrush steppe vegetation, which could

potentially be lost or degraded by invasive or noxious weeds following a fire. In areas of the Monument north of the highway, mountain shrub, aspen, and Douglas fir communities might benefit somewhat from fire; however, watershed protection in Little Cottonwood Creek (which provides potable water in the Monument) and the protection of research and group campsite facilities necessitate aggressive suppression.

Fire management in the Monument is directed by the current BLM Land Use Plans, Fire Management Plans for the east and west zones of the Upper Snake River District, and the NPS Craters of the Moon National Monument Wildland Fire Plan within the original Monument boundaries (USDI NPS 2000). Under these plans, all wildfires are suppressed except for naturally ignited fires in designated wilderness, which may be managed for resource benefit (also known as wildland fire use).

Fire suppression responsibility is currently delegated to the BLM South Central Idaho Fire Management Officer by the NPS Superintendent. A Mutual Aid Agreement authorizes the suppression of fire on NPS-administered lands by the BLM. Fire management priorities are focused on public and firefighter safety, protection of structures and other infrastructure, maintenance of air and water quality, and protection of plant and animal communities. Suppression methods include ground attack using light and heavy engines, dozers, and hand crews and air attack using fixed-wing or helicopter units and retardant or water. The use of mechanized equipment in NPS Wilderness is prohibited and is limited in Wilderness Study Areas (WSAs) by BLM Wilderness Interim Management Policy, but such use can be authorized by the appropriate manager to prevent the loss of critical resources.

– **Fire and Related Vegetation Management**

Federal wildland fire policy (USDI and USDA 1995; USDI et al. 2001; USDI 2003) focuses on protecting sensitive resources while using fire along with other treatments (such as herbicides and seeding) to achieve desired future conditions for vegetation resources. Currently all federal land management agencies are implementing, or preparing to implement, this policy through a Cohesive Strategy (Laverty and Williams 2000). This strategy presents guidelines for reducing wildland fire risk to human communities and to restore and maintain ecosystem health within fire-prone areas. The Cohesive Strategy is based on the concept of restoring vegetation composition and structure (and thus fire regimes) to historical levels. As part of this process, three Fire Condition Classes (FCC1 through 3) have been identified to help clarify the degree to which a particular vegetation community departs from its historic fire regime, as described below:

- **FCC1** represents low departure from the historic fire regime. Key ecosystem components include a healthy mosaic of various successional stages for each vegetation type. For example, these components would include sagebrush steppe communities with native perennial grass and forb understories, or aspen or Douglas fir communities with trees of variable age, openings to allow tree regeneration, and an abundance of understory grasses and forbs.

- **FCC2** represents moderate departure from the historic fire regime, resulting in some risk of more frequent fire return intervals and/or greater levels of severity.

- **FCC3** represents high departure from the historic fire regime, resulting in high risk of resource loss due to frequent fire return intervals and/or high levels of severity. An example of FCC3 is an area that was formerly low-elevation sagebrush steppe that is currently dominated by an understory or monoculture of cheatgrass.

Currently, several vegetation types within the Monument are in FCC2 or FCC3, with the exception of plant communities on lava (Table 9). The Cohesive Strategy seeks to restore fire to its historic role in ecosystems through managing fire, fuels, and vegetation in order to return areas that are in FCC2 and FCC3 to the FCC1 class. It encourages proactive treatments to reduce fuels and restore plant community structure. These treatments can include prescribed fire, thinning, mowing, herbicide treatments, and seeding.

Similar efforts may also follow unplanned wildland fires through emergency stabilization or rehabilitation (ESR) treatments, which can

Table 9
Approximate acreage of each vegetation type in the Monument and percentage that occurs in each Fire Condition Class

Vegetation Type	Approximate Acreage in Monument	% FCC1	% FCC2	% FCC3
Low-Elevation Sagebrush Steppe	157,000	40	20	40
Annual Grassland (exotic)	31,000	0	0	100
Perennial Grassland (seeding and native)	153,000	10	90	0
Mid-Elevation Sagebrush Steppe	9,400	0	100	0
Lava (bare and vegetated)	399,000	100	0	0
Mountain Shrub	400	50	50	0
Aspen	60	0	100	0
Conifer (Douglas fir)	140	50	50	0
Riparian	670	90	10	0

stabilize burned areas against erosion by wind or water, prevent the dominance of invasive or noxious weeds, and reestablish desirable perennial vegetation. ESR treatments are most commonly required on sites with highly erosive soils and areas in FCC3, and such treatments may be needed in areas in FCC2. The need for post-fire ESR is determined case by case, and Emergency Stabilization and Rehabilitation Plans are prepared in accordance with the Interagency Burned Area Emergency Stabilization and Rehabilitation Handbook, Department of the Interior Manual, and supplemental guidance by the BLM and NPS (http://fire.r9.fws.gov/ifcc/Esr/Handbook/Default.htm).

Special Status Plants

The Monument also provides habitat for two state- and BLM-designated special status plants. Special status plants are those listed under the federal Endangered Species Act (ESA), plus species recognized by Idaho and BLM as sensitive. All species identified as sensitive by BLM must be managed proactively by BLM to protect these species, and NPS strives to manage its land to protect any federally listed, state-listed, or special status species.

The Idaho Native Plant Society (INPS) and Idaho Department of Fish and Game (IDFG) Conservation Data Center (ICDC) meet annually with state and federal agencies to review the status of plants considered to be globally, state, or locally rare. The resulting list is used to determine which species, if they lack federal protection under ESA, require or would benefit from protection at a local or regional level.

Many of the plant communities in the Monument have undisturbed, relict, or pristine conditions or are excellent examples of a specific or even rare habitat type. The areas designated as Research Natural Areas (RNAs) are discussed later in this chapter.

There are no proposed or listed threatened or endangered plants known within the Monument. Potential habitat for Ute ladies, tresses (Spiranthes diluvialis), a federally listed threatened plant species, may exist throughout Idaho. Ute ladies, tresses, an orchid, occurs in moist to mesic sites associated with wetland and riparian areas, including springs, wet meadows, and river meanders. The plant is known to occur at sites ranging from 1,500 to 7,000 feet in elevation. This species generally flowers from mid-August through September in the Intermountain Region and can be identified definitively only at that time. Marginal, potential habitat for Ute ladies, tresses is limited to very small wet meadows associated with creeks and springs in the north part of the Monument.

Surveys for Ute ladies, tresses have been conducted in the past by ICDC botanists (Murphy 2002a) and were again performed in September 2002 by NPS and BLM botanists. No orchids were located as a result of these surveys. Although potential habitat is marginal, these areas will be revisited in the future, because the orchid can remain dormant for several years.

Two BLM sensitive plants are known to occur within the Monument. These species and their associated habitats are summarized in Table 10. Obscure phacelia (Phacelia inconspicua) is one of Idaho,s most rare plants, with only six occurrences (population areas) known statewide. This species is also listed as endangered in Nevada. It occurs on north- and east-facing slopes of volcanic-based mountains and buttes. Picabo milkvetch (Astragalus oniciformis) is narrowly endemic to stable, sandy soils in the north-central portion of the ESRP, near the foothills of the Pioneer Mountains.

Table 10
Vegetation Habitat Characteristics and Location Information for Special Status Plant Species Occurring in the Craters of the Moon National Monument and Preserve

NAME	HABITAT	LOCATION	SOILS	COMMUNITIES
Obscure phacelia (*Phacelia inconspicua)* (Murphy 2002)	Northeast- to east-facing aspects on basaltic and rhyolitic buttes and foothills. Elevation ranges from 5,390 to 6,200 feet. Concave, lower to mid-slopes below the rimrock of butte tops or foothill ridgetops. Slopes are generally moderately steep (averaging about 32 percent), although some populations occur on nearly flat, sheltered terraces. The micro-topography is often undulating due to numerous large boulders and stones deposited from the rimrock or ridges above. *Phacelia* grows in the depressions between boulders. Typi cally grows in small gaps (1 to 5 m^2) within shrubby vegetation in partially shaded microsites to full sunlight. Often grows on disturbed soil associated with older cattle trails, native ungulate trails, and gopher diggings. Subpopulations occupy transitional areas between mesic, dense vegetation dominated by *Populus tremuloides* (quaking aspen), *Prunus virginiana* (chokecherry), or *Lymus cinereus* (Great Basin wildrye), and open, xeric vegetation dominated by *Artemisia ridentate* ssp. *Vaseyana* (mountain big sagebrush) with *Purshia ridentate* (bitterbrush), *Pseuoroegneria spicata* (bluebunch wheatgrass), and *Balsamorhiza sagittata* (arrowleaf balsamroot).	Eastern side of the Great Rift of the upper Snake River Plain and in the foothills of the Pioneer Mountains.	Dark-colored, well-drained silt-loams with varying amounts of sand, gravel, cobble, stone, and boulder colluvium intermixed. Most microsites are not cindery or extremely gravelly. Soils are derived from and overlay volcanic substrates. Areas supporting *Phacelia* usually lack litter accumulation, are always relatively loose or scarified (due to animal and erosion disturbance), and lack dense perennial vegetation. The soil depth varies from shallow (over boulders) to moderately deep.	1*) Prunus virginiana/Leymus cinereus* *2) Artemisia tridentata* ssp. *vaseyana-Symphoricarpos oreophilus* (snowberry)*/Leymus cinereus* *3) Prunus virginiana-Symphoricarpos oreophilus* *4) Populus tremuloides/Symphoricarpos oreophilus* *5) Prunus virginiana-Symphoricarpos oreophilus/Pseudoroegneria spicata* *6) Artemisia tridentata* ssp. *vaseyana/Pseudoroegneria spicata*
***Picabo milkvetch (*Astragalus oniciformis)** (Moseley and Popovich 1995; Alexander 2001)	Sandy basins, bowls, and flats within rolling basalt on the northern edge of the Snake River Plain. *A. oniciformis* is frequently found in open grassy areas (often in previously burned patches within *Artemisia* shrubland) and is rarely found in the understory of late seral *Artemisia* stands.	At the northern edge of the upper Snake River Plain and at the base of the foothills of the Pioneer Mountains and Picabo Hills.	Sandy loams or uniformly, highly calcareous silt loams overlying basalt plains. *A. oniciformis* prefers stabilized sandy soils and is never found on unstabilized sand dunes.	Primarily found in the *Artemisia tridentata* ssp. *wyomingensis* (Wyoming big sagebrush) / *Stipa comata* (needle-and-threadgrass) habitat type, but also *Artemisia tripartita/Pseudoroegneria spicata*. Common associates are *Oryzopsis hymenoides, A. tridentata* ssp. *tridentata*, and *Chrysothamnus* sp.

Areas within and surrounding the Monument have been systematically surveyed for both obscure phacelia and Picabo milkvetch, and population information is documented in status and monitoring reports (Moseley and Popovich 1995; Murphy 2002b). Two-headed onion (Allium anceps) was previously thought to occur on cinder cones in the original Monument and was documented by one historical collection (Davis 1933). This collection was recently determined to have been incorrectly identified (Popovich 2003).

One location for meadow pussytoes (Antennaria arcuata), which is rare in Idaho but not a BLM sensitive species, has been documented directly outside of Monument boundaries in moist meadows associated with Huff Creek. There is a small amount of potential habitat at the northern edge of the Monument. Mourning milkvetch (Astragalus atratus var. inseptus), a BLM sensitive species, was recorded in a plant inventory of Brass Cap kipuka RNA (Caicco and Wellner 1983). However, a plant survey conducted by ICDC and BLM in the late 1980s did not confirm the occurrence of the milkvetch (Popovich 2002).

WATER RESOURCES, INCLUDING WETLANDS

Surface water resources are limited in the Monument. Stream channels are largely nonexistent within the exposed lava flows, and streams draining the Pioneer Mountains rapidly become subterranean once they encounter the lava flows. There are several small perennial streams in the Pioneer Mountains at the north end of the Monument. The entire watersheds of Little Cottonwood and Leech Creeks lie within the Monument. Very short segments of the Little Wood River, Big Cottonwood Creek, and Fish Creek fall just within the Monument boundaries.

The slopes of the Pioneer Mountains contain numerous perennial and ephemeral springs that feed small creeks and marsh wetlands. Just north of the Craters of the Moon Lava Field is a small hot springs complex. Parts of Lava Lake, Huff Lake, and Carey Lake Marsh also lie within Monument boundaries. Seasonal playa lakes are scattered throughout the sagebrush steppe desert. Many of these playas have been developed by BLM to create reservoirs, which increases their water holding capacity and longevity. Numerous caves within the Monument lava flows contain year-round ice deposits, which produce melt water during the summer.

Wetlands and Riparian Communities

Wetland and riparian communities are somewhat rare in the Monument. The cold-water springs, creeks, lakes, and marshes on the lower slopes of the Pioneer Mountains support limited aquatic, wetland, and riparian habitat for numerous plant and animal species. Several species of water-loving (hydrophilic) plants, waterfowl and marsh birds, two frog types, several small mammals, beaver, and moose use these habitats. Many other species use the water sources these areas provide.

Wetlands mapped by the U.S. Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI) are limited to the northwest corner of the Monument. Most wetlands and wetland habitat are palustrine (non-tidal, inland wetlands dominated by terrestrial and emergent vegetation) and are only seasonally or temporarily flooded.

The Monument is mostly composed of a semiarid sagebrush steppe ecosystem. These areas generally receive 8 to 14 inches of precipitation a year. With such little precipitation, snow runoff is the primary source of water for the few wetland areas in the Monument. The snow runoff accumulates in the flat-floored bottom of an undrained desert basin that sometimes becomes shallow lakes called playas. They hold water long enough to allow some specialized aquatic organisms to grow and reproduce, but not long enough for a pond or marsh ecosystem to develop because most of the playas dry up by July and August.

Fairy shrimp, a scarce freshwater crustacean, can be found in almost every seasonal pool (Baraton 1990). Fairy shrimp serve as a valuable food source for migratory waterfowl that use the playas as resting areas along their long trek north in spring and early summer.

Water Quality

Steep-sided canyons with high gradient channels and a narrow floodplain characterize the watershed of Little Cottonwood and Leech Creeks. Mean discharge rates for both streams are less than 1 cubic foot per second. Since the 1930s, NPS has diverted water from four springs in the upper Little Cottonwood Creek Watershed for a public drinking water supply. During dry years, these diversions accelerate the dewatering of stream channels throughout the middle and lower reaches of Little Cottonwood Creek. However, the lower reach of Leech Creek has also run dry with no diversions in place.

To meet new drinking water standards, efforts were initiated in 2000 to replace the existing surface drinking water sources with groundwater sources. Shallow water wells have been developed at the bottom of Leech and Little Cottonwood drainages. Surface water from the two streams disappears below the surface in this vicinity even during wet years. Once the wells are fully operational in 2004, upstream diversions will cease.

Mining activities in the Little Cottonwood Creek drainage predate the establishment of the Monument in the 1920s. Open adits and tailings material remained along the stream until an NPS reclamation project was completed in the mid-1990s. Before this reclamation work, copper and zinc concentrations had exceeded U.S. Environmental Protection Agency (EPA) water quality criteria (NPS 1998).

Streamwater quality in Little Cottonwood and Leech creeks has been monitored and has generally been found to be good, with no violations of Idaho State standards for temperature, dissolved oxygen, and turbidity (Falter 1996). Total dissolved solids content of the water, as indicated by electrical conductivity, has been found to be moderate to low. The streams, waters are carbonate-based, of moderately low alkalinity and carbon dioxide, and neutral to slightly basic pH. Streamwater nutrient concentrations of total phosphorus have been shown to be moderately high with nitrogen limitation indicated, and streamwater concentrations of nitrate nitrogen are high.

Low to moderate levels of fecal coliform with high fecal streptococcus bacteria in streams suggest animal, rather than human, influence on the stream. Aquatic insect associations are balanced, with the exception of the middle reach of Little Cottonwood Creek, where Dipteran (true flies) dominance suggests metals impact from the Martin Mine site (Falter 1996). Stream bank and channel stability is good, with little indication of eroding or collapsing banks.

Ice caves easily accessible to the public have been found to have much higher levels of nutrients than caves located in remote areas. This may be attributable to human waste (Falter 1996).

Water Rights/Water Use

The State of Idaho granted NPS federal reserved water rights within the Monument in 1998. The priority dates of the rights range from 1924 to 1996, depending on the date when each area was added to the Monument. These rights grant diversions of 54.5-acre feet per year from all surface water and groundwater sources within the 1998 Monument boundaries. The rights provide for domestic, irrigation, or industrial use within the Monument, as well as in-streamflow rights on areas including Little Cottonwood and Leech Creeks (Hurlbutt 1998). The rights do not entitle the United States to maintain any specific water table elevation in the Snake River Aquifer beneath the Monument.

The BLM has 337 filed water right claims on 18 springs, 192 playa lakes, and 127 reservoirs within the Monument. The claims, primarily used for stock water and wildlife, are for 333.5 total acre-feet per year, and a de minimus amount of 0.02 cubic feet per second on each source. Priority dates of the water rights claims are as early as 1926.

Many of the water resources in the Monument are used in a variety of ways: drinking water for the Monument Visitor Center, irrigation water for farms, livestock watering sites, and recreational opportunities like bird watching. Human use and activities sometimes alter water and associated resources. Playas and reservoirs developed by BLM are an integral part of this semiarid ecosystem, and they often are the only source of water for wildlife and livestock.

The aquatic and wetland habitat supported by the only thermal spring complex in the Monument has historically been altered by concentrated livestock use and human recreation. Efforts are underway to protect the unique Monument habitat and allow recovery of the biological resources present.

WILDLIFE, INCLUDING SPECIAL STATUS SPECIES

During some portion of each year, about 200 species of birds, 60 mammals, 10 reptiles, and at least three amphibians occupy the Monument. (see Appendixes D and E). Surveys in the late 1960s in a very small portion of the northernmost area identified more than 2,000 species of insects (Horning and Barr 1970).

Wildlife Habitats and Common Monument Wildlife

Sagebrush steppe communities comprise much of the wildlife habitat within the Monument. Numerous species are found in sagebrush habitats (Braun et al. 1976, Trimbel 1989). Some of these are sagebrush obligates (restricted to sagebrush habitats during the breeding season or year-round) or near obligates (occurring in both sagebrush and grassland habitats) (Paige and Ritter 1999).

Sagebrush obligates that occur in the Monument include the sage sparrow, black-throated sparrow, Brewer,s sparrow, sage thrasher, greater sage grouse, pygmy rabbit, sagebrush vole, and sagebrush lizard. Some species, such as Brewer,s sparrows, are at their highest densities statewide in ungrazed portions of the Monument (Bart 2001). Table 11 lists some sagebrush-associated species that can be found in the Monument.

Sagebrush itself and the native perennial grasses and forbs of the shrub-steppe are important sources of food and cover for wildlife (Dealy et al. 1981). During winter, the evergreen foliage of sagebrush often provides the only available green vegetation, and its protein level and digestibility are higher than that of most other shrubs and grasses (Peterson 1995). Pronghorn, pygmy rabbits, and sage grouse may eat exclusively sagebrush in winter, and sagebrush also becomes a major portion of mule deer and elk diets. Taller sagebrush provides cover for mule deer and sage grouse (Dealy et al. 1981), and the crowns of sagebrush break up hard-packed snow,

Table 11
Sagebrush-Associated Species that Occur in the Monument

BIRDS		
Chukar	Grasshopper sparrow	Sage sparrow
Black-throated sparrow	Golden eagle	Short-eared owl
Burrowing owl	Great horned owl	Ferruginous hawk
Red-tailed hawk	Swainson's hawk	Rough-legged hawk
Turkey vulture	Greater sage grouse	Lark sparrow
Common nighthawk	Northern harrier	Common raven
American crow	Bobolink	Gray flycatcher
Horned lark	Brewer's blackbird	Gyrfalcon
Peregrine falcon	Prairie falcon	American kestrel
Loggerhead shrike	Brown-headed cowbird	Ash-throated flycatcher
Long-billed curlew	Sage thrasher	Savannah sparrow
Lazuli bunting	Gray partridge	Common poorwill
Ring-necked pheasant	Green-tailed towhee	Spotted towhee
Vesper sparrow	Say's phoebe	Brewer's sparrow
Western meadowlark	Mourning dove	White-crowned sparrow
MAMMALS		
Pronghorn antelope	Pygmy rabbit	Coyote
Elk	Ord's kangaroo rat	Bobcat
Sagebrush vole	Black-tailed jackrabbit	White-tailed jackrabbit
Yellow-bellied marmot	Montane vole	Long-tailed vole
Mule deer	Northern grasshopper mouse	Great Basin pocket mouse
Deer mouse	Raccoon	Merriam's shrew
Piute ground squirrel	Nutall's cottontail	Least chipmunk
Badger	Northern pocket gopher	Red fox
Kit fox		
REPTILES & AMPHIBIANS		
Rubber boa	Western yellow-bellied racer	Western rattlesnake
Western skink	Long-nosed leopard lizard	Night snake
Short-horned lizard	Desert horned lizard	Gopher snake
Sagebrush lizard	Western terrestrial garter snake	Great Basin spadefoot

making it easier for animals to forage on the grasses beneath (Peterson 1995).

Throughout the rest of the year, sagebrush provides food for pygmy rabbits and sage grouse; protective cover for fawns, calves, rabbits, and grouse broods; and nesting sites for many shrub-nesting birds. The sage thrasher, Brewer's sparrow, sage sparrow, and greater sage grouse most frequently nest in or beneath sagebrush.

The Monument contains portions of the lower slopes of the Pioneer Mountains, which contain both perennial and ephemeral springs. Several of these springs feed small creeks and marshes, and several species of waterfowl and marsh birds, two frog species, several small mammals, beaver, and moose use these habitats exclusively, along with several other species. Numerous species of birds use these areas exclusively or as primary habitat in the area.

The Monument contains some scattered stands of trees, including riparian stands of black cottonwood, willows, alders, and quaking aspen; upland stands of quaking aspen or Douglas fir; and lava- or cinder-based stands of limber pine and junipers. These forested sites are used by more than 110 species of birds, at least four reptile types, and at least 37 mammals (NPS 2003). These coniferous stands are widely scattered throughout the Monument. The open shrub-steppe and agricultural lands of the Snake River Basin surround these small islands of trees.

Migrant forest birds are highly selective of resting habitat (Kerlinger 1995), and these forest stands are important to forest birds migrating from the Northern Rocky Mountains, needing to cross the open habitat of the basin. Dozens of species of migratory birds use the conifer stands. Many resident species, including Clark's nutcracker, chickadees, nuthatches, woodpeckers, and others use them exclusively. Forested sites also provide critical thermal cover for deer, elk, and moose in the foothills of the Pioneer Mountains (Griffith 1983).

Extensive lava flows also serve as habitat for numerous animal species. At least eight species of bats, several species of rodents, and several species of cave invertebrates use lava tubes and flows in the Monument. The flow surfaces also are used by many species of vertebrates and invertebrates, and several species are dependent on the lava structures. Species such as pika, woodrats, skinks, and rock wrens are found primarily on the rock surfaces. Several snake and bat species are dependent on cavities in the lava for hibernation sites. Two of the three known bat maternity colonies of Townsend's big-eared bat in Idaho are in the Monument (Pierson et al. 1999).

Subspecies of the Great Basin pocket mouse, the pika, and the yellow-pine chipmunk are endemic to the lavas of the Great Rift. Darker fur characterizes these subspecies, which may be an adaptation to the black lava rock. Known primarily as residents of high-elevation alpine regions, pikas living on the Craters of the Moon Lava Field occupy lower elevations and the highest mean temperatures within the species, range (Bever 2002).

Several species of birds are also dependent on the lava structures. The Monument has a large population of rock wrens that nest almost exclusively on basalt formations. Many cavity nesting species nest in rock cavities on the flows. Chickadees and swallows are typically associated with woodlands but will use rock crevices when near limber pine or juniper stands. Mountain bluebirds and violet-green swallows nest primarily in tree cavities but are known to use rock crevices for nesting. Both species have been documented nesting in crevices and bubbles in flow surfaces in the Monument (Rich 1985; NPS 2003).

Bluebirds of all species have experienced major range-wide declines as result of habitat loss and competition from introduced European starlings. Bluebirds nest in high densities in the northern part of the Monument but are seen far less frequently in the southern areas, where substantial flocks of starlings now breed.

Fox

Numerous bird species protected under the Migratory Bird Treaty Act (USC Title 16, Chapter 7, Subchapter II) (Appendix E) have been documented in the Monument, occupying all habitat types. The migrant patterns include permanent residents, summer residents, migrants only using resting areas a few days a year, and winter-only residents.

Reptiles in the Monument also occupy a wide range of habitats. Ten species of reptiles have been identified in the Monument, including five snakes and five lizards. Several hibernating sites for snakes have been identified in the Monument (Lee 2002). These hibernacula may contain animals from several square miles of summer habitat both inside and outside the Monument. Garter snakes and rubber boas are predominantly riparian species, and skinks and gopher snakes use primarily rocky habitats with sparse vegetation. Night snakes may occupy the area but are rare and difficult to survey (C. Peterson 2003).

Two frog species make up the Monument's amphibians, Boreal chorus frog and Pacific tree frog. Two toad species may exist in the Monument as well. One, the Great Basin spadefoot toad, has not been detected in recent inventory work, but it can remain dormant for several years and is not readily detected while in burrows. These toads are well documented in the Snake River Plain and it is likely that they occupy the Monument as well. Western toads have not been detected in surveys since 1987; they may have been extirpated.

Six species of large mammals are known to inhabit the Monument: mule deer, pronghorn, elk, cougar, black bear, and moose. Most are widespread throughout the Snake River Plain and Pioneer Mountains and regularly can be found in the Monument.

Mule deer occupy the northern parts of the area as spring and summer range, with two distinct herds migrating into the Pioneer Mountains by autumn (Griffith 1983). One of these herds comes from lands to the north and west of the Monument. The other herd winters in the desert area south of the Craters of the Moon Lava Field. This herd slowly migrates to the northwest as vegetation dries out throughout the summer. By late summer or early fall this herd has merged with the herd from the northwest. Upon reaching the riparian areas, they have access to water and browse that is still fresh.

Mule deer are scattered throughout the most of the vegetated areas. Few studies have been conducted outside of the northwest portion (Griffith 1983). NPS monitoring since 1988 in the northwest part of the Monument indicates a very dynamic population that fluctuates greatly with varying annual conditions. This may even include shifting migration routes out of the area in some years (IDFG 2003). The south part of the Monument contains substantial winter range for deer and pronghorn (IDFG 2003). Since 1999, moose have been regularly seen in both the Big and Little Cottonwood Creek watersheds of the Pioneer Mountains.

Elk summer in the riparian areas of the northwest part of the Monument (NPS 2003). Elk occupy widely scattered areas, with records from both immediately east and west of the Craters of the Moon Lava Field and in larger kipukas like Laidlaw Park. Larger numbers of elk winter in the Pioneer Mountains along the northwestern part of the Monument. Two distinct groups of more than of 100 animals each were recorded moving back and forth across the west boundary during early 2003 (IDFG 2003). In summer, most of these elk move to summer range west and north of the Monument, with only a few animals remaining in the Monument.

Pronghorn are found within much of the Monument and are common throughout the year in Laidlaw Park (IDFG 2003, NPS 2003). A migratory herd of pronghorn uses the western part of the Monument as a migratory corridor and birthing area (IDFG 2003; NPS 2003). Occasional use during winter has also been recorded in this area (NPS 2003).

Mule deer

Smaller numbers of animals can be found along the east boundary and in the rift crack area. Winter range has been identified in the southern areas and the rift crack area (IDFG 2003).

Both cougar and black bear are found in the Pioneer Mountains area of the Monument. In recent decades, documented observations have been confined to the northern part of the Monument in or adjacent to the Pioneer Mountains. Sightings of these two species are rare, and little is known about their status in the Monument.

Moose colonized the riparian areas of the Monument in 1999 and continue to be present. Suitable habitat is limited in the Monument, so that further expansion is not likely.

Four species of large mammals and one small mammal were extirpated from the Monument during the twentieth century. The North American bison, bighorn sheep, wolf, and grizzly bear were last documented in the early twentieth century (Smithsonian Institution 2003). Some wolves from the reintroduced Central Idaho packs occupy territory immediately north of the area. One previously extirpated species, the porcupine, has recently reoccupied historic habitat within the Monument (NPS 2003).

Pest Control – Grasshoppers

The BLM currently implements an integrated grasshopper/Mormon cricket control program in cooperation with the U.S. Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS). Extreme grasshopper population increases can occur during years favorable to their survival. High numbers of grasshoppers have caused and will continue to cause damage to agricultural crops adjacent to public lands.

There are areas of the Monument adjacent to agricultural crops. One is the private land that borders the Monument south and east of Carey, another is the private land that borders the Monument east of the Wapi Lava Flow, and a third is located along the northeast tip of the Monument near Arco. These agricultural cropland interface areas potentially could be grasshopper treatment areas. These cropland interface areas have traditionally grown crops such as potatoes, beets, corn, barley, alfalfa, and beans, which may be fertilized and treated with pesticides and herbicides.

The USDA, APHIS, and BLM have worked together since the 1960s to control grasshoppers and Mormon crickets on public lands. In 1985, the Secretary of Agriculture issued Instruction Memorandum No. ID-85-242, approving application for applying pesticides by APHIS on more than 6.4 million acres of BLM-managed public land to control grasshopper. That year, the southern one-fourth to one-third of what is now the Monument was aerially sprayed with malathion to control grasshoppers.

In 1986, APHIS and BLM conducted the Nosema Locustae Project along the Little Wood River northeast of Richfield, which is now part of the Monument. Nosema is a biological control agent that affects the grasshoppers, reproductive organs. It was aerially applied to 10,279 BLM acres, 956 state acres, and 673 private acres.

The state directors have issued a Final Decision for the Environmental Assessment (EA) completed for *Strategies for Grasshopper Control in Southern Idaho*. This final decision has a concise version of APHIS and BLM standard operating procedures and application guidelines. The USDA and APHIS are working on new BLM policy that allows some control of insect outbreaks in WSAs and Areas of Critical Environmental Concern (ACECs) as related in Washington Office Instruction Memorandum No. 87-408.

NPS policies address the management of native species, such as grasshopper, which may become pests. Chapter 4 of the NPS Management Policies (2001) addresses *Management of Native Plants and Animals* (4.4.2.1) and *Pest Management* (4.4.5), including the use of pesticides. According to NPS policy, native pests will be allowed to function unimpeded, except that native pests may be controlled to:

- Conserve threatened, rare, or endangered species or unique specimens or communities;
- Preserve, maintain, or restore the historical integrity of cultural resources;
- Conserve and protect plans, animals, and facilities in developed areas;
- Prevent outbreaks of a pest from invading uninfested areas outside the Monument; or
- Manage a human health hazard when advised to do so by the U.S. Public Health Program, or to otherwise protect against a significant threat to human safety.

The NPS follows an integrated pest management process to address all pest issues on a case-by-case basis. Controversial issues, or those with potential to negatively impact the environment, must be assessed according to the National Environmental Policy Act (NEPA). Intervention to control pests may not be undertaken if the pest control actions would cause

unacceptable impacts on the populations of other species or other components and process of the ecosystem that support them.

Wildlife Damage Control

The Wildlife Services (WS) branch of USDA APHIS is authorized by the U.S. Congress to protect American resources and human health and safety from damage associated with wildlife (Animal Damage Control Act of March 2, 1931, as amended [46 Stat. 1486: 7 USC 426-426c] and the Rural Development, Agriculture, and Related Agencies Appropriations Act of 1988 [PL 100-102, Dec. 27, 1987; Stat. 1329-1331 7 USC 426C]. A 1995 Memorandum of Understanding (MOU) between APHIS WS and BLM is the basis for an annual APHIS WS plan covering those APHIS WS wildlife damage control activities on public (BLM) lands within BLM's Upper Snake River District (USRD).

APHIS WS conducts wildlife damage control activities in response to requests for assistance, when and where there is a demonstrated need, and after review of the available evidence. Assistance includes providing technical assistance and direct control by APHIS WS wildlife damage specialists. Direct control includes the use of traps, snares and other devices, as well as aerial gunning (shooting animals from aircraft). Most animal damage control activities in the Monument have been directed at controlling coyote depredation on sheep.

The state authorizes animal damage activities on BLM-administered land; therefore, wildlife damage control will continue to be implemented during the planning process. For BLM-administered land, wildlife damage control, including any necessary preemptive strategies, will continue to be governed by applicable laws. The BLM will continue to coordinate with Wildlife Services as described in existing national MOUs, BLM state policy, and USRD annual meetings with APHIS WS. Aerial gunning over WSAs requires approval of the BLM State Director.

Within the original Monument and Preserve, NPS management policy limits the management of native animals to specific circumstances, including unnaturally high populations resulting from human influences or to protect property. The NPS Superintendent has the authority to authorize removal of native pest animals (animals that interfere with the purposes or management objectives of a specific area or that jeopardize human health) on NPS-administered land when needed to:

- Conserve threatened, rare, or endangered species or unique specimens or communities;
- Preserve, maintain, or restore the historical integrity of cultural resources;
- Conserve and protect plants, animals, and facilities in developed areas;
- Prevent outbreaks of a pest from invading uninfested areas outside the NPS lands; or
- To manage a human health hazard.

NPS actions to remove or control native pests require appropriate compliance with NEPA.

Special Status Animals

Special status species are those listed as endangered or threatened under the ESA; candidates or species proposed for listing under the ESA; species listed by IDFG as endangered, threatened, or species of special concern; and/or species listed by BLM as sensitive. The BLM manages all species identified as sensitive to minimize the need for future listing as threatened or endangered under the ESA. NPS strives to manage its lands to protect any federally listed, state-listed, or BLM listed species.

The USFWS has provided a list of endangered, threatened, proposed, and/or candidate species that may be present in the area of the Monument (Appendix H). According to this list, threatened and endangered animal species that could potentially occur in the Monument area are Canada lynx *(Lynx canadensis)*, gray wolf *(Canis lupus)*, bald eagle *(Haliaeetus leucocephalus)*, bull trout *(Salvelinus confluentus)*, Bliss Rapids snail *(Taylorconcha serpenticola)*, Utah valvata snail *(Valvata utahensis)*, and Snake River physa *(Physa natricina)*. However, sufficient habitat for Canada lynx, bull trout, and the snails is not available. The Monument area is not in a Lynx Analysis Unit because it lacks suitable habitat for the species. There is not adequate surface water present in the Monument area for the survival of bull trout or the snails, all of which require substantial riverine habitat.

Gray wolves are known to occur in the vicinity of the Monument (Williams 2002). In the spring and winter of 2001, a pack was observed and tracked just north of the Monument. The pack was thought to have followed migrating elk and deer. In addition, individual wolves have been observed near the boundary of the Monument, with several confirmed sightings in this area since 2000.

There is a bald eagle breeding territory just west of the Monument near Carey Lake. Transient, wintering bald eagles might be found anywhere throughout

Blaine, Butte, Minidoka, and Power counties, including parts of the Monument.

Greater sage grouse *(Centrocercus urophasianus)* has been petitioned for federal listing and is a BLM sensitive species. Aerial and ground surveys conducted by IDFG have identified 169 known active and non-active sage grouse leks (breeding display sites) in the Monument. Laidlaw Park contained the greatest concentration, with 79 leks, 29 of which were active and occupied by 184 birds during 2002 (IDFG 2002b). Sage grouse population numbers are not known for the Monument; however, IDFG annual lek studies indicate a downward trend on the Snake River Plain over the last two decades.

The Monument contains suitable lek, nesting, brood rearing, and wintering habitat for sage grouse. The Monument contains several large tracts of stronghold habitat (IDFG 2002a). However, over the last two decades, invasions of cheatgrass, as well as an increase in fire frequency, has resulted in a decrease in the quality of sage grouse habitat by fragmenting contiguous sagebrush stands, eliminating large acreage of sagebrush, or converting sagebrush communities to grasslands (IDFG 1997).

Leks typically occur in small open areas surrounded by sagebrush. Nesting habitat requirements include sagebrush with broad canopies, herbaceous ground cover, and forbs (Schroeder et al. 1999). While sagebrush (typically 12 to 30 inches tall) provides cover for nesting birds, herbaceous cover may provide scent, visual, and physical barriers to potential nest predators. Early brood rearing areas are found in upland sagebrush habitats relatively close to nest sites; usually they are characterized by an abundant forb and insect diversity (Drut et al. 1994). As sagebrush habitats desiccate, grouse usually move to more mesic sites for late-summer brood rearing habitats. During winter, sage grouse feed almost exclusively on sagebrush leaves, requiring canopy cover that remains above snow level (Connelly 2000). When necessary, the grouse will migrate tens of miles to find suitable winter range with exposed sage.

Pygmy rabbits have been documented in several areas of the Monument. Records ranging from the 1930s through 2003 indicate locations from the southernmost areas to the original Monument lands (Hoffman 1988; NPS 2003). Pygmy rabbit populations have experienced severe declines throughout their range, including in Idaho. The rabbits prefer areas with taller and denser sagebrush (Gabler et al. 2001), and it is likely that suitable habitat exists in the Monument. However, there are few surveys for the species in southern Idaho, and the distribution and status of the species is not well understood.

The Monument contains hundreds of caves and several cave-related species of concern, including seven species of bats that are USFWS species of concern, Idaho species of special concern, or BLM sensitive species. As of 1999, three maternity colonies of Townsend,s big-eared bat *(Corynorhinus townsendii)* have been identified in Idaho (Pierson et al. 1999), with two occurring in the Monument. Numerous hibernacula have been identified in the Monument for this and other bat species. Six other cave roosting bats that are classified as sensitive or of concern are found in the Monument (Table 12) (Keller 1996). In addition to bats, other cave species are of concern, including the blind cave leiodid beetle *(Glavcicavicola bathysciodes)*. Two of the four known worldwide sites for this species are in the Monument (IDCDC 2002a).

Two additional insects listed as sensitive by BLM and as USFWS species of concern have been documented on lands adjacent to the Monument. One, the Idaho point-headed grasshopper *(Acrolophitus pulchellus)*, is found in the Lost River drainage adjacent to the Monument. Two of the five known sites are near the northeast perimeter of the Monument (ICDC 2002b). The preferred habitat is relatively level or rolling terrain with gravelly to rocky soil having low sparse vegetative cover between 4,800 and 7,000 feet elevation (ICDC 2002b).

The Idaho dunes tiger beetle *(Cicindela arenicota)* is found only in sand dunes in south central and southeast Idaho. Beetles have been documented at several sites near the southeast corner of the Wapi Lava Field (Idaho State Conservation Effort 1996). More potential habitat for this beetle may exist with the Monument.

Table 12 lists the special status animal species that are known or reported in the Monument, including all those mentioned above. In addition, the table lists 42 sensitive species that are either migratory birds or sagebrush related species that have been discussed in this section.

AIR QUALITY

The Monument and Preserve lie within one of the cleanest air regions of the country. While generally below the national average for most pollutants, the area's relative ranking varies, depending on the specific pollutant. Air quality also varies, depending on

Table 12
Special Status Animal Species in the Monument

MAMMALS			
Gray wolf (*Canis lupus*)	T		
Townsends's big-eared bat (*Corynorhinus townsendii*)	I	S	S
Western small-footed myotis (*Myotis ciliolabrum*)	I	W	
Long-eared myotis (*Myotis evotis*)		W	
Fringed myotis (*Myotis thysanodes*)		S	S
Long-legged myotis (*Myotis volans*)	I	W	
Yuma myotis (*Myotis yumanensis*)	I	W	
Western pipistrelle (*Pipstrellus hesperus*)	I	W	S
Pygmy rabbit (*Brachylagus idahoensis*)	I	S	S
Kit fox (*Vulpes macrotis*)	I	S	
Piute ground squirrel (*Spermophilis mollis*)		S	
BIRDS			
White-faced Ibis (*Plegadis chihi*)	I	S	
Bald eagle (*Haliaeetus leucocephalus*)	T		
Northern goshawk (*Accipiter gentilis*)	I	S	S
Ferruginous hawk (*Buteo regalis*)	I	S	
Swainson's hawk (*Buteo swainsoni*)		W	
Prairie falcon (*Falco mexicanus*)		S	
Peregrine falcon (*Falco peregrinus*)			E
Blue grouse (Dendrogapus obscurus)		W	
Greater Sage-grouse (*Centrocercus urophasianus*)	I	S	
Columbian sharp-tailed grouse (*Tympanuchus phasianellus columbianus*)	I	S	S
Wilsons's phalarope (Phalaropus bicolor)		W	
Long-billed curlew (*Numenius americanus*)	I	W	
Black tern (*Chlidonias niger*)			S
Short-eared owl (Asio flammeus)		W	
Western burrowing owl (*Athene cunicularia*)	I	W	S
Calliope hummingbird (*Stellula calliope*)		S	
Lewis' woodpecker (*Melanerpes lewis*)		S	
Red-naped sapsucker (*Sphyrapicus nuchalis*)		W	
Williamson's sapsucker (*Sphyrapicus thryoideus*)		S	
Olive-sided flycatcher (*Contopus borealis*)		S	
Loggerhead shrike (*Lanias ludovicianus*)	I	S	SA
Cordilleran flycatcher (*Empidonax occidentalis*)		W	
Hammond's flycatcher (*Empidonax hammondii*)		S	
Willow flycatcher (*Empidonax traillii*)		S	
Pinyon jay (Gymnorhinus cyanocephalus)		W	
Sage thrasher (*Oreoscoptes montanus)*		W	
Green-tailed towhee (*Pipilo chlorurus*)		W	
Grasshopper sparrow (*Ammodramus savannarum*)		W	
Brewer's sparrow (*Spizella breweri*)		S	
Sage sparrow (*Amphispiza belli*)		S	
Black-throated sparrow (*Amphispiza bilincata*)		S	

Species	Status		
	Federal	BLM	Idaho
Brewer's blackbird (Euphagus cyanocephalus)		W	
Cassin's finch (Carposdacus cassinii)		W	
REPTILES & AMPHIBIANS			
Western night snake (*Hypsiglena torquata*)		S	
Western toad (*Bufo boreas*)	I	S	S
Short-horned lizard (*Phrynosoma douglassi*)	I		
INVERTEBRATES			
Idaho dunes tiger beetle (*Cicindela arenicola*)	I	S	
Blind cave leiodid beetle (*Glacicavicola bathysciodes*)	I	S	
Idaho pointheaded grasshopper (*Arolophitus pulchellus*)	I	S	

Federal Designations:
E = Federally Endangered
T = Federally Threatened
C = Federal Candidates for listing as T or E
I = Species of concern to USF&WS but without formal federal status

BLM
S = Bureau of Land Management Sensitive Species: in this listing, all species without other current status but formerly federal candidates or state species of concern; additionally all species with either federal or state status should also be considered BLM Sensitive Species.
W = Watch list species: Species that are not BLM sensitive species but current population or habitat information suggests that the species may warrant sensitive species status in the future

Idaho Species of Special Concern: (Native species that are either low in numbers, limited in distribution, or have suffered significant habitat losses)
E = Endangered

the location within the unit, the pollutant being measured, the season and time of day, wind direction, and climatic factors. Clean air enhances the understanding and appreciation of the Monument's geologic resources by allowing clear views of distant landscape features.

Sources of air pollutants are both local and regional. Emission sources within the Monument are limited to automobile exhaust, smoke from wood stoves and campfires, smoke from wildfires, and windblown dust. Smoke from forest and rangeland fires, as well as agricultural burning, are seasonal sources of fine particulate matter, carbon monoxide, and volatile organic compounds. Industrial point sources are located at the Idaho National Engineering and Environmental Laboratory (INEEL), which is 12 miles east of the Monument, and Bonneville, Bingham, and Bannock Counties to the east. Population densities in the four counties surrounding the Monument range from 1.3 to 26.6 people per square mile, with a total population of 50,000 people across 7,043 square miles (Idaho Department of Commerce 2000).

The air quality management of fire and roads is the primary activity affecting resources in the Monument. Both naturally ignited wildland fires and prescribed fires produce smoke emissions over the life of the fire. The amount of smoke produced and the rate at which it disperses will vary, depending on weather conditions existing during the fire, the amount and type of vegetation burned, and the moisture content of the vegetation consumed. As actively managed events, prescribed fires burn at a controlled size, intensity, and time; therefore, smoke emissions can be minimized and dispersal rates maximized. While wildland fires result from natural, unplanned ignitions, decisions to manage the fire for resource benefits or extinguish it are based in part on the potential impacts of the smoke generated over the life of the fire.

The major pollutant of concern in smoke from fire is fine particulate matter (PM), both PM10 and PM2.5. National Ambient Air Quality Standards (NAAQS) for PM are established for two aerodynamic diameter classes: PM10 is particulate matter less than 10 microns in diameter, and PM2.5 is less

than 2.5 microns in diameter. Studies indicate that 90 percent of all smoke particles emitted during wildland burning is PM10, and 90 percent of PM10 is PM2.5 (Ward and Hardy 1991). In 2001, the PM2.5 annual average within the Monument was 2.8 micrograms per cubic meter ($\mu g/m^3$) (Visibility Information Exchange Web System: http://vista.cira.colostate.edu/views/Default.htm), compared with the national health-based standard of 15 $\mu g/m^3$.

Fugitive dust consists of PM suspended in the air by the wind and human activities. It originates primarily from the soil and is not emitted from vents, chimneys, or stacks. Soils on burned lands or bare agricultural lands lacking vegetative cover are subject to wind erosion of soil particles until vegetative cover is restored. Fugitive dust can also be generated by wind blowing across unpaved roadbeds and by the passage of vehicles along the same roads.

Estimates of the quantity of fugitive dust generated are imprecise and difficult to calculate. The amount of dust produced and its effects vary seasonally with weather conditions (soil moisture, wind speed, and direction) and the amount and speed of motor vehicle traffic. The best indicator of fugitive dust potential is fugitive dust sources, including unpaved roads and lands burned to remove vegetative cover.

The Craters of the Moon National Wilderness Area (43,243 acres) within the Monument is a mandatory Class I area, as defined in Clean Air Act (42 USC Sections 7401-7671q; as amended in 1990, PL 101-549). Congress created a *Prevention of Significant Deterioration* (PSD) section, the purpose of which is "to preserve, protect, and enhance the air quality in national parks, national wilderness areas and other areas of special national or regional natural, recreational, scenic, or historic value." Specifically, the PSD section reflected the law's intention that, among the clean air regions of the country, certain areas – the Class I areas – deserve the highest level of air quality protection. The impairment of visibility within Class I areas was a major concern addressed in the Clean Air Act. Integral vistas include those views perceived from within Class I areas of landmarks or panoramas located outside the boundary of a Class I area.

The rest of the Monument is a Class II area (including the WSAs). Class II areas also have limits on increases of particulate matter and sulfur dioxide above baseline concentrations. The allowable increases for Class II areas are higher than those established for Class I areas. Other Class I areas in the region are the Sawtooth Wilderness (70 miles northwest) and Yellowstone and Grand Teton National Parks (140 miles east).

Air quality monitoring in the Monument has recorded concentrations of ozone, PM, visibility, acid deposition, and radionuclides (gross alpha, gross beta, and gamma spec). These monitoring programs have been conducted as part of NPS responsibilities under the Clean Air Act, as well as part of the INEEL off-site environmental surveillance program. All the monitoring sites have been at the north end of the Monument.

Ozone is a widespread air pollutant formed in the atmosphere from emissions of nitrogen oxides and volatile organic compounds. High levels of ozone can injure vegetation and affect human health. Ozone concentrations monitored in the Monument have not exceeded the primary national ambient air quality standard for ozone. The primary ozone standard is exceeded when the annual fourth-highest maximum 8-hour ozone concentration averaged over three years exceeds 80 parts per billion (ppb) (USDI 2000).

The annual fourth-highest maximum 8-hour ozone concentration averaged from 1994 to 2000 was 63 ppb (USDI NPS 1994-2000). The peak ozone concentration (the second-highest 1-hour average) measured at the northern end of the Monument in 2000 was 77 ppb, which was comparable to concentrations in Yellowstone National Park (73 ppb) the same year. The peak ozone ranged from 63 to 89 ppb and averaged 73 ppb during the 1994 to 2000 period. Peak ozone concentrations in 2000 at other NPS units in the Western United States ranged from 123 ppb at Joshua Tree National Park in Southern California to 56 ppb at North Cascades in Washington (USDI NPS 1994-2000).

The SUM06 statistic (the sum of hourly average ozone concentrations greater than 0.06 parts per million) calculated over a 3-month period is used to correlate with vegetation impacts. The recommended SUM06 value is no more than 8 to 12 parts per million per hour (ppm/hr) to prevent foliar injury to vegetation, which compares to a maximum three-month ozone SUM06 of 12 ppm/hr in the Monument between 1995 and 1999. While at or well below the average for other NPS-monitored units, the trend in ozone concentrations from 1992 through 1999 indicates a statistically significant degradation in ozone-related air quality (USDI NPS 2002).

The scattering and absorption of light by particles and gases emitted by, or formed as a result of, natural

and human-caused activities degrades the visibility of distant features of the landscape. On the clearest days, visibility at the northern end of the Monument is much better than the national average (Visibility Information Exchange Web System: http://vista.cira.colostate.edu/views/Default.htm), compared with 28 other Class 1 areas scattered across the country (USDI NPS 2002). In 2001, the best visibility days (upper 20 percent) at the Monument averaged 5 deciviews (a haziness index, lower = clearer) compared with a 7.2 deciview national average between 1990 and 1999. For the worst visibility days (lowest 20 percent), the Monument averaged 14.5 deciviews in 2001, which is comparable with the national average of 16.9 deciviews. In 2001, the Monument's annual average visibility range was 106 miles as compared to the 1996 to 1999 annual average at Yellowstone National Park of 102 miles (USDI NPS 2002).

Trends from 1990 to 1999 in nearby national parks (Yellowstone and Great Basin) indicate improvement in visibility during the clearest days of the year, but the haziest days have improved only slightly or even gotten worse (USDI NPS 2002). Fine particulates (less than 2.5 micrometers) have been monitored at the Monument as part of the Interagency Monitoring of Protected Environments Program (IMPROVE) since 2000.

EPA has designated portions of Power and Bannock counties (located 50 miles east of the Monument) as non-attainment areas for the national PM standard (EPA Web site: http://www.epa.gov/oar/oaqps/greenbk/pnp.html#16078). The standard is defined as PM that is smaller than 10 micron (PM10).

A National Atmospheric Deposition Program/National Trends Network (NADP/NTN) site has been operated at the north end of the Monument since 1980. The network measures the chemistry of precipitation to monitor the graphical and temporal long-term trends of hydrogen (acidity as pH), sulfate, nitrate, ammonium, chloride, and base cations (such as calcium, magnesium, potassium, and sodium). In 2000, pH levels of Monument samples ranged from 4.6 to 6.7 with an annual mean of 5.5 (NADP/NTN 2000). This compares with a similar result (5.4) at the NADP/NTN site in Yellowstone National Park.

Ammonium and nitrate ion concentrations are generally higher at the Monument. In 2000, the annual mean concentration of ammonium at the Monument was 0.32 milligrams per liter (mg/L) compared to 0.19 mg/L at Yellowstone and 0.20 mg/L in Owyhee County in southwest Idaho.

CULTURAL RESOURCES

Both the NPS and the BLM are responsible for identifying, protecting, managing, and enhancing archaeological, historic, architectural, and traditional lifeway values located on their lands, as well as those that might be affected by BLM or NPS undertakings on non-federal lands. BLM and NPS both manage archaeological remains, historic values, and traditional lifeway values important to Native American groups.

Cultural resources are generally identified through field inventories conducted by qualified professionals in compliance with Section 106 of the National Historic Preservation Act of 1966 (NHPA). Informant information and historical records are also used to identify archaeological, historical, and traditional lifeway values. David Louter (1992) completed a Historic Context Statement for Craters of the Moon National Monument in 1992. This document provides a broad historical overview for the area.

There has been no systematic, formal inventory to document the presence of any potential cultural landscapes within the Monument to date; however, the public did not identify any cultural landscapes of concern during scoping for this Draft Plan/EIS, and this topic was therefore dismissed as an impact topic. Museum collections would not be affected by any of the alternatives considered and were also dismissed as an impact topic. During scoping for this Draft Plan/EIS, No ethnographic resources of importance were identified by any associated cultural groups, except for the Shoshone-Bannock Tribes. Further discussion of Shoshone-Bannock ethnographic resources is included in the section entitled "American Indian Rights and Interests," below.

ARCHAEOLOGICAL AND HISTORICAL RESOURCES

Three types of inventories – Class I, II, and III – are conducted to identify and assess cultural values on BLM lands. A Class I inventory, a literature review, was completed for the BLM portion of the Monument in 1982, as part of a larger study that included the Boise and Shoshone management areas. Several smaller Class III, intensive inventories have been completed in the Monument to fulfill Section 106 responsibilities. These inventories were associated with project activities where sites needed to be identified and evaluated in order to protect signifi-

cant values and minimize effects on these values.

Over the years, several different universities have also conducted Class III inventories on the Monument, unassociated with any specific development project, expanding the information base. It is estimated that less than 5 percent of the Monument has been intensively inventoried for cultural resources. No systematic inventory of the caves associated with the lava flows has been completed. There may be many important cultural resources associated with the lava tubes, as well as the harder to reach kipukas, which have not been recorded by archaeologists because of their remote nature.

Early NPS surveys in the 1960s suggested that there was not a great deal of prehistoric use in this area, but more recent surveys on the adjacent BLM lands would seem to indicate otherwise. These early surveys were concentrated in areas archaeologists deemed likely because they contained known water sources. Today it is known that Native Americans used this area much more than was originally believed. Data from recent nearby fire rehabilitation surveys indicate a rather high density of prehistoric sites in association with the lava flows. Therefore, it is believed that there is a significant prehistoric cultural component associated with the Monument area, in addition to the well-documented historic component.

While these inventories have identified many cultural resource sites, little work has been done to synthesize the results and provide a comprehensive framework for assessing cultural resource function, significance, variability, and distributional patterns. There are also many previously recorded cultural resources that should be revisited so that the present condition of these sites can be assessed. Older records are in need of informational details that can only be obtained by revisiting the sites themselves. The synthesis of this data will be necessary to identify cultural resources that may be suitable for public education or interpretation, as well as resources that will require special preservation measures. Patterns of anticipated visitor use will guide these decisions as well. Most recorded sites in the Monument are considered eligible for listing on the National Register of Historic Places (NRHP). Presently, however, only Goodale's Cutoff is listed on the NRHP.

Cultural resources condition and trend within the Monument varies considerably because of the variability of terrain and geomorphology, access and visibility, and past and current land use. Exposed artifacts and features on the ground surface can be disturbed by elements such as wind and water erosion, animal and human intrusion, and development and maintenance activities. Based on limited site visitation and site form documentation, the trend of site condition within the Monument is considered stable in most areas. Vandalism and unauthorized collection at sites constitutes the main source of cultural resource degradation.

Looting of archaeological sites has been occurring in the Monument for some time, especially in the remote, hard to reach kipukas. With the advent of Internet auctions, illegal artifact collection is becoming more profitable than ever. As long as there is a market for such items, looting will continue to be a problem.

It is likely there are many sites in the interior of the lavas that are unknown at present, and they might lead to clues needed to understand just what prehistoric people were doing in this area thousands of years ago. Undisturbed caves also may hold a fascinating record of the Monument,s early natural history in the form of fossilized skeletal material of Pleistocene mammals. Other caves on the Snake River Plain have produced fossil remains of mammoth, grizzly bear, bison, musk ox, and camel.

Prehistoric and Historic Sites

There are approximately 346 known, recorded cultural resources sites in the Monument, representing a variety of types and chronological periods, dating from at least 8,000 years old to the present. Only one site in the Monument has ever been radiocarbon dated. Identified prehistoric sites include lithic scatters, rockshelters, rock structures and piles, and pictographs. Near the north end of the Monument there may be stone tool quarry sites yet undocumented. These remains mainly represent activities in the area before European contact in the 1800s.

Although there is no evidence of earlier occupation at the Monument, there is certainly evidence to suggest an earlier PaleoIndian occupation elsewhere on the Snake River Plain. Sites that are relatively nearby with definite PaleoIndian artifacts are Wilson Butte Cave (Gruhn 1961), the Buhl Burial, and the Simon Site (Butler 1963). The recent discovery of the Buhl Burial in 1991 provided researchers with an undisputable carbon date of 9,600 years ago. The oldest carbon dates recovered from Wilson Butte Cave (14,500 years ago) were not in clear association with cultural material, and there is some doubt among scholars as to whether the cultural deposits themselves are older than 9,000 years.

The Monument contains portions of an NRHP-listed historic trail. Goodale's Cutoff was an alternate route of the Oregon Trail that skirted the northern edge of the Craters of the Moon Lava Field. These portions of Goodale's Cutoff from U.S. Highway 20/26/93 in Butte County west to Blaine County are on the NRHP. Historic sites in the Monument include portions of historic trails, as well as sheep-herder camps, cairns, and dumps. A few stock-raising homestead claims were filed within the Monument in the 1890s and early 1900s, but the environment proved too harsh for them to succeed, and most were canceled. Virtually no visible physical evidence of these endeavors remains (Louter 1992). During the early days of Euro-American settlement in southern Idaho, sheep and cattle grazing were the predominant economic pursuit in this area. During the 1880s, silver, gold, and lead mining also took place in the mountains just north of the Monument.

The Monument headquarters complex, including the Visitor Center, employee residences, and maintenance buildings, was recently determined to be eligible for nomination to the NRHP (NPS 2000). A nomination has not yet been forwarded to the keeper of the NRHP for approval. The eligibility is based on the continued integrity of the modern architectural design with grouping of public and administrative facilities in a headquarters area. This approach typified the NPS Mission 66 Program of the late 1950s and early 1960s (Allaback 2000). Mission 66 was a 10-year development program designed to upgrade facilities throughout the National Park System. The National Park Visitor Center, as it is known today, is from the Mission 66 era. The concept of a single building incorporating public facilities, interpretive programs, and administrative functions originated during the Mission 66 Program.

AMERICAN INDIAN RIGHTS AND INTERESTS (ETHNOGRAPHIC RESOURCES, RESOURCE AND PUBLIC LAND VALUES, TREATY RIGHTS)

ETHNOGRAPHIC RESOURCES

Native American Indians inhabited southern Idaho, including the present day Monument lands, for thousands of years prior to European contact. Ethnographic information generally suggests that aboriginal populations constantly traversed the Snake River Plain during their seasonal subsistence rounds, moving to the Camas Prairie in spring and then farther into the mountains for summer. In autumn they would return to the Snake River, where they would stay for the winter (Steward 1938). This ancient way of life was disrupted by European settlement of America, when large numbers of immigrants seeking land sought to displace the tribes. During the 1850s and 1860s, treaties were negotiated with the tribes in the Northwestern United States to facilitate peaceful relations and to open unoccupied Indian lands for homesteading.

On July 3, 1868, the Eastern Band of Shoshone and Bannock Tribes and the United States signed the *Treaty with the Eastern Band Shoshoni and Bannock, 1868*, commonly referred to as the Fort Bridger Treaty (15 Stat. 673). Through negotiations with the Federal Government, the tribes relinquished claims to approximately 20 million acres of land to the United States and retained exclusive use of prescribed reservation lands. The treaty retains the tribes, reserved rights to hunt, fish, graze, and gather natural resources off reservation, and provides other associative rights necessary to effectuate these rights on open and unoccupied lands of the United States. Open and unclaimed lands have been determined through court proceedings to be Forest Service and BLM-administered lands.

The BLM and NPS have a unique relationship with federally recognized American Indian tribes and are responsible for maintaining a formal government-to-government relationship with tribal leadership. As outlined in treaties, executive orders, legislation, regulations, and federal policies, this relationship focuses on ensuring the rights and/or interests of tribes are considered and protected. This includes consulting with tribal representatives and identifying and protecting important archaeological, religious, and/or sacred sites, as well as providing tribal members appropriate access to these sites. Also included are provisions for reasonable access for tribal members to gather and harvest plant, animal, and aquatic resources for treaty, subsistence, or traditional use purposes.

NATIVE AMERICAN TRADITIONAL USE AND TREATY RIGHTS

At present Native American tribes are not dependent on commodity resources from the Monument for their economic livelihood. However, they do rely on BLM public land resources for subsistence and

cultural purposes. Tribal treaty rights pursued on public lands within the Monument include hunting of large and small game and gathering various natural resources for both subsistence and medicinal purposes. Game identified by the tribe as having importance are elk, deer, antelope, moose, sharp-tailed grouse, sage grouse, rabbits, rock chucks, squirrels, partridges, and other associated small game.

The Idaho Fish and Game Commission establishes regulations and other needed controls on fishing, hunting, trapping, and management of wildlife that are in line with the state's wildlife policy. The Idaho Department of Fish and Game (IDFG) is charged with enforcing fish and game regulations in the state of Idaho. However, the IDFG recognizes the authority of the Law and Order Division of the Shoshone-Bannock Tribes of the Fort Hall Indian Reservation to regulate tribal members residing on the reservation when hunting on federally administered and state-administered lands outside the reservation, except when those lands have been specifically closed to hunting by state or federal statute.

Hunting is not allowed in units of the National Park System – areas administered by the NPS (16 USC, Parts 1 and 1a-1), unless specifically authorized by Congress. Such authorization does not exist for the original 53,400 acres of the NPS-administered portion of the Monument. However, Congress redesignated the approximately 410,000 acres of the expanded Monument under the administration of the NPS as a National Preserve and has authorized hunting on these lands (Public Law 107-213). Therefore, hunting is not allowed on the 53,400-acre original NPS Monument, but hunting is allowed on the approximately 410,000-acre National Preserve and the approximately 251,000 acres of the BLM-administered part of the Monument.

As a general rule, NPS may not allow consumptive uses of natural resources such as plants, rocks, and wildlife from NPS-administered lands (36 CFR 2.1). However, as a matter of policy, the NPS generally supports the limited and controlled acquisition and use of natural resources for traditional religious and ceremonial purposes (NPS Management Policies, Chapter 8.9).

The American Indian Religious Freedom Act (42 USC 1996) enunciates United States policy to recognize and protect American Indian religion. In part, the law states that the policy of the United States is to protect and preserve the right of American Indians to access sites and use and possess sacred objects for ceremonial and traditional practices. Accordingly, the agencies will accommodate access to and ceremonial use of Native American sacred sites, consistent with the purposes of the Monument (Executive Order 13007).

No specific sacred sites or cultural landscapes in the Monument have been identified by the Shoshone-Bannock Tribes, but there are oral histories documenting the use of the area by tribal members. It is likely tribal members still visit and use isolated areas of the Monument for spiritual purposes today. The local tribes generally do not disclose the location of sacred sites to federal agencies because of a concern over public disclosure of this information. Not knowing the location of these sacred areas sometimes makes it difficult for land managers to assess the impacts of federal actions on them. However, continued consultation with tribes is the best way to maintain an open dialog so tribal members can voice their concerns should a federal action threaten a sacred site, a treaty use, or traditional use area.

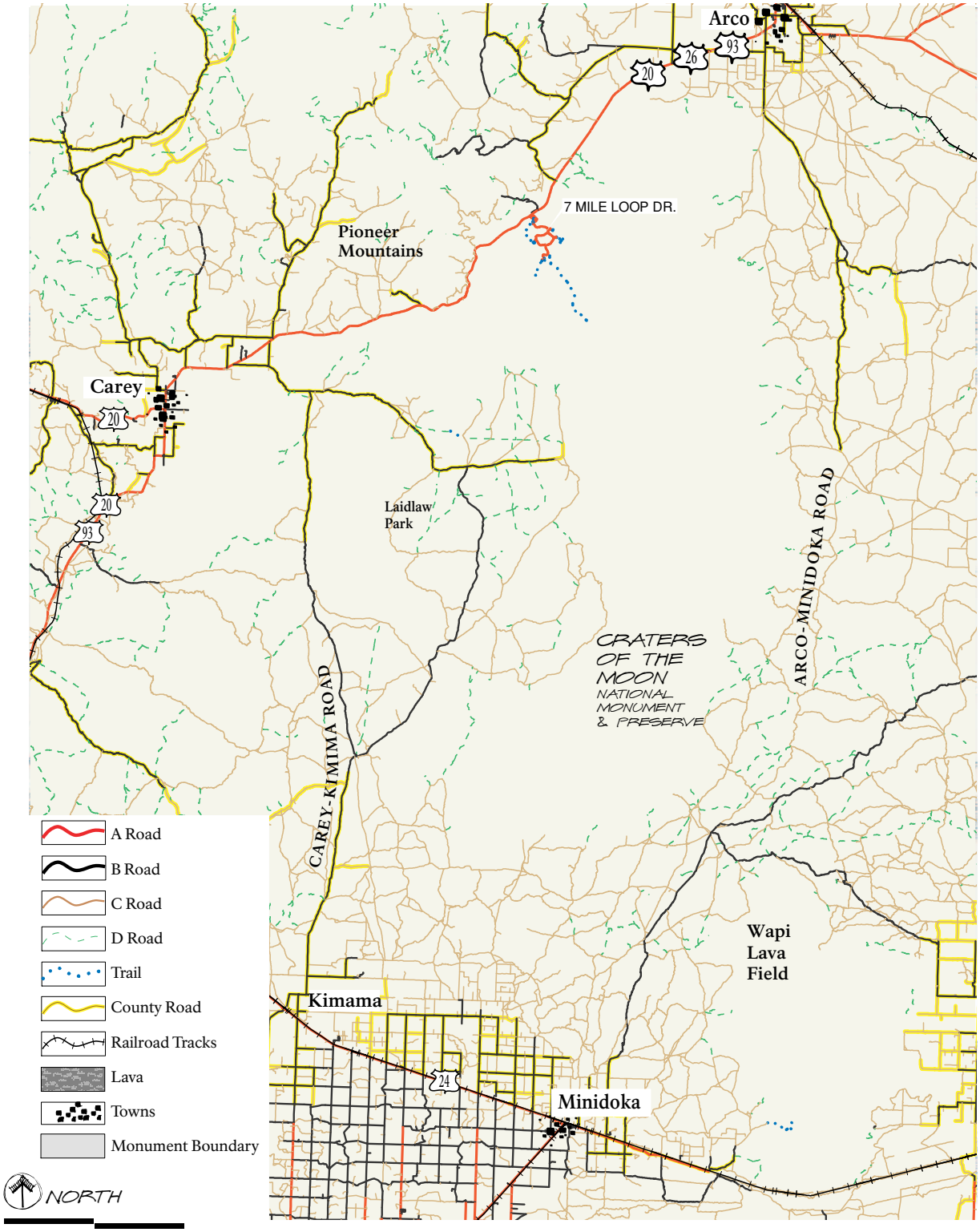
LAND USE AND TRANSPORTATION ACCESS AND TRAVEL

One of the most important issues to be considered in this planning effort is the amount and type of access to and through the Monument. Figure 13 depicts the current road network in the planning area.

Major Transportation Routes

Interstate Highways 15, 86, and 84 on the south and east, U.S. Highways (US) 20/26/93 on the west and north, and US 26 on the northeast connect population centers and constitute the primary access to the planning area. Idaho State Highway (SH) 24 (parallel with the Union Pacific Railroad) connects Shoshone with Rupert by way of Minidoka, and to the east, SH 39 connects Blackfoot and American Falls by way of Aberdeen.

US 20/26/93 traverses the north end of the Monument, and in the developed area of the Monument around the Visitor Center, there is a paved 7-mile Loop Drive and developed trails. No public transportation is available to the Monument. While paved roads surround the Monument, the roads within the Monument are either gravel or dirt, and very few roads cross the lava flows. There is no vehicle access to most of the interior of the Monument in winter or spring because of snow and wet road conditions.



No warranty is made by the Bureau of Land Management or National Park Service for use of the data for purposes not intended by these agencies. Frontcountry and Passage Zone polygons have been oversized for graphic presentation and are not to scale.

FIGURE 13
Transportation Network
Craters of the Moon National Monument & Preserve
U.S. Department of the Interior / National Park Service
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On the east side of the Craters of the Moon Lava Flow, a 69-mile dirt/gravel road connects Arco and Minidoka. The Arco-Minidoka Road has a wide variety of road conditions. The north and south ends of the road, maintained by Butte and Minidoka counties, are relatively well-maintained gravel roads. The middle part of the Arco-Minidoka Road, within the Monument, is a difficult to follow dirt, two-track road that receives relatively little maintenance. The main travel way on the west side of the Monument is the 39-mile Carey-Kimama Road, of which 11 miles are within the Monument. Carey-Kimama Road is a continuous gravel road that receives regular maintenance.

The southern part of the Monument, including Crystal Ice Cave and Kings Bowl, is accessed by paved and gravel county roads, which lead to dirt/gravel BLM and county roads near and within the Monument.

Road Classification

Within the Monument, a "road" is defined as an established route capable of accommodating travel by a full-sized automobile or truck. Following other routes or establishing new routes with motorized or mechanized vehicles is considered "off-road" use, which is not permitted in the Monument (see below). There are four different types of roads within the Monument:

Class A Roads generally are paved and have a surface of asphalt, concrete, or similar continuous material. In addition to US 20/26/93, the only Class A roads are the Loop Drive, spur roads, and associated parking areas in the original NPS Monument. Class A roads are only found in the Frontcountry Zone.

Class B Roads are improved roads constructed with a natural or aggregate surface, and they may have berms, ditches, or culverts. Regular maintenance allows passage by standard passenger and commercial vehicles such as cars, light trucks, and some heavy trucks. Within the Monument, seasonal conditions and lack of snow removal may render these roads impassable. Class B roads are found primarily in the Passage Zone.

Class C Roads have an unimproved natural surface and may be either constructed or established over time by repeated passage of vehicles. The natural surface may be dirt, sand, or rock. A minimal amount of maintenance, if any at all, is limited primarily to spot surface grading to allow vehicle passage within the original road corridor. Class C roads accommodate a much smaller range of vehicles than Class B roads, usually high-clearance two-wheel-drive and four-wheel-drive vehicles. Seasonal conditions or wet weather may render these roads impassable at any time. Class C roads are found primarily in the Passage and Primitive zones.

Class D Roads are primitive roads that were not constructed but have been established over time by the passage of motorized vehicles. These roads receive no maintenance or grading. Occasional emergency repairs or limited maintenance may be performed for resource protection and administrative purposes. These roads are generally referred to as "two-tracks". The condition of these roads varies from sometimes passable by a passenger car, to only suitable for high-clearance four-wheel-drive vehicles, to passable only by adventurous off-highway vehicle (OHV) enthusiasts with special equipment. Seasonal conditions or wet weather may render these roads impassable at any time. Class D roads are found primarily in the Primitive Zone. (See Figure 13 and photos on next page).

Ways are defined in the BLM *Handbook 8550-1 Interim Management Policy for Lands Under Wilderness Review* as a "trace maintained solely by the passage of vehicles which has not been improved and/or maintained by mechanical means to ensure relatively regular and continuous use." The BLM identified all ways inside WSAs as part of the wilderness inventory process. Ways are generally open to motorized and mechanical use until Congress designates a WSA as Wilderness or releases it from wilderness consideration. Technically, ways fall into the Class D road classification in this plan. However, this does not imply that roads would be permitted in WSAs.

Trail Classification

A "trail" is a constructed (or established by past use) linear feature, with a single tread designated, designed, and intended for travel by hikers, horses, and two-wheeled vehicles (for example, mountain bikes and motorcycles). Trails are sometimes

referred to as "single track." Trails within the Monument are classified into two types based on use.

Class 1 Trails are restricted to non-motorized/non-mechanized travel (wheelchairs are allowed). Examples of permitted forms of travel include foot travel, pack animal, and horseback. Examples of prohibited forms of travel on Type 1 trails are mountain bikes and all motorized vehicles. Class 1 trails may be further restricted; for example, to foot travel only.

Class 2 Trails are open to motorized/mechanized travel in addition to foot travel, pack animal, horseback, and other forms of passage. Examples of prohibited forms of travel are any vehicle with a footprint wider than an 18-inch tread (all-terrain vehicles, four-wheelers, and four-wheel-drive vehicles).

Class C Road

Class D Road

Class A Road

Class B Road

Road Classes within the Monument.

Table 13
Roads and Trails within Craters of the Moon National Monument and Preserve

ROADS WITHIN THE MONUMENT	MILES	MAINTENANCE
Class A	30	Idaho Transportation Department maintains 21 miles; NPS maintains 9 miles.
Class B	70	BLM maintains 37 miles; remaining 30 miles maintained by Blaine (28) and Butte (2) counties.
Class C	355	BLM maintains 353 miles, NPS maintains 1 mile, Blaine County maintains 1 mile.
Class D	174	Not maintained.
Arco-Minidoka Road	69	BLM maintains 15 Class B miles and 25 Class C miles; remaining 29 miles maintained by Butte (24) and Blaine (5) counties.
Carey-Kimama Road	40	BLM maintains 15 miles (all Class B); remaining 25 miles maintained by Blaine (12) and Lincoln (13) counties.

Table 13 summarizes the current status of roads and their designated classes in the Monument.

Costs vary tremendously for road maintenance, whether performed by BLM or by the counties. The counties and local highway districts receive funding from the Federal Highway Administration (FHWA) at a fixed dollar per mile cost for the number of miles of road they maintain. For example, costs associated with annual maintenance of a Class C road can be relatively low, between $200 and $400 per mile. This would involve smoothing the road surface with a road grader. One-time deferred maintenance (every 10 to 15 years) such as reshaping the road, cleaning ditches, and adding aggregate material on a Class B standard road can cost $10,000 per mile. To completely rebuild a road, or to bring a road from a Class D standard to a Class B standard, can cost as much as $50,000 per mile. These maintenance costs apply to roads leading to the Monument as well as roads within the Monument.

BLM policy requires land use plans to make OHV (also referred to as "off-road vehicle") designations in the land use planning process (Land Use Planning Handbook H1601-1). The three OHV designations are "open", "limited", and "closed". Open means an area where all types of vehicle use is permitted at all times, and closed means an area where off-road vehicle use is prohibited (43 CFR 8340-0-5(f)(g)(h). The limited designation means that the travel plan completed following the final management plan will identify seasonal limitations, vehicle type and size restrictions, road construction, and maintenance standards for all roads and trails.

Federal regulations applying to areas under the jurisdiction of the NPS stipulate that motor vehicles may be operated only on park roads, in parking areas, and on routes designated for off-road motor vehicle use. Routes designated for off-road motor vehicle use may be designated in National Preserves by way of special regulations (36 CFR 4.10(a)(b)). The Idaho Transportation Department (ITD), counties, and local highway districts manage roads leading to and passing through the Monument under the terms of right-of-way grants.

Off-Road Access

Proclamation 7373 prohibits *"all motorized and mechanized vehicle use off road"* except for emergency or authorized administrative purposes. In this plan, "off-road" is synonymous with cross-country travel, so this type of travel is not confused with the use of OHVs. In other words, OHVs may be used on roads and Class II trails, but may not be driven cross country.

Administrative purposes include the authorized activities of the agencies, permit holders (e.g., livestock permittees), and other agencies. In all cases, off-road travel must be specifically authorized by the agencies. The agencies coordinate with livestock permittees, USDA WS, IDFG, and others who may require authorizations for off-road vehicle use.

Existing BLM land use plans address off-road (cross-country) travel on public lands outside of the Monument. Generally, the public lands outside the Monument are designated "open" to OHV use.

Livestock use at the Monument

LIVESTOCK GRAZING

The Proclamation expanding the Monument states: "Laws, regulations, and policies followed by the Bureau of Land Management in issuing and administering grazing permits or leases on all lands under its jurisdiction shall continue to apply with regard to the lands in the Monument administered by the Bureau of Land Management." The Monument encompasses a total of 754,862 acres, which are cooperatively managed by NPS and BLM. NPS administers 469,804 acres, or 62 percent, of the Monument, and that area is closed to livestock use. These areas consist primarily of exposed lava flows, which are mostly devoid of available forage and/or inaccessible to livestock; therefore, prohibiting grazing in these areas has little to no impact on the livestock industry.

Three BLM USRD field offices (Idaho Falls, Burley, and Shoshone) administer livestock use on the 289,111 BLM acres in the Monument. Sheep and/or cattle graze these lands, which are divided into management units known as allotments. There are an additional 4,971 acres of BLM-administered land adjacent to privately owned agriculture fields and NPS-administered lava, which are not within a grazing allotment. Figure 14 is a map showing all grazing allotments in the Monument.

Grazing permits are awarded to permittees by allotment. These permits, or leases, convey no right, title, or interest in the land or resources. Although the Proclamation specifically mentions livestock grazing, it does not establish the practice as a "right" or convey to it any new status.

Table 14 shows the breakdown of allotment acres, animal unit months (AUMs), and permittees by field office. Table 15 shows the individual allotment information within the Monument, including AUM figures, which are estimates based on the percentages of each allotment that lies within the Monument.

Grazing systems, or acceptable grazing practices, for allotments are detailed in Allotment Management

Table 14
Livestock Use per BLM Field Office

INFORMATION	SHOSHONE	IDAHO FALLS	BURLEY	TOTALS
Number of Allotments	10	9	4	23
Total Acres	153,610	77,730	52,800	284,140
Number of AUMs	19,047	9,143	8,503	36,693
Number of Permittees	30	35	14	79

No warranty is made by the Bureau of Land Management or National Park Service for use of the data for purposes not intended by these agencies. Frontcountry and Passage Zone polygons have been oversized for graphic presentation and are not to scale.

FIGURE 14

Allotments in the Monument

Craters of the Moon National Monument & Preserve

U.S. Department of the Interior / National Park Service

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Table 15
Craters of the Moon Allotment Animal Unit Months

FIELD OFFICE	ALLOTMENTS	ALLOTMENT			ESTIMATED AUMS WITHIN THE MONUMENT					
		Total Acres	Acres in Monument	% of acres in Monument	Active Cattle AUMs	Suspended Cattle AUMs	Active Sheep AUMs	Suspended Sheep AUMs	Exchange of Use	Total AUMs per Allotment
Idaho Falls	Blizzard Mountain	3,700	160	4	26	-	-	-	-	26
	Huddles Hole	2,300	2,300	100	24	20	-	-	-	44
	Sunset	12,700	1,600	13	197	9	-	-	-	206
	Quaking Aspen	81,400	2,880	4	241	18	-	-	-	259
	Smith	19,800	2,790	14	352	-	-	-	-	352
	Coxes Well	21,500	6,650	31	659	-	-	-	-	659
	Big Desert	235,900	53,950	23	-	-	6,710	-	-	6,710
	Rudeen	15,400	6,600	43	378	421	-	-	-	799
	Craters	2,300	800	35	-	-	88	-	-	88
	TOTAL	**395,000**	**77,730**	**20**	**1,877**	**468**	**6,798**	**-**	**-**	**9,143**
Burley	East Minidoka	21,100	4,920	23	1,025	-	-	-	-	1,025
	Minidoka	99,000	42,720	43	-	-	5,750	1,095	-	6,845
	Sand	8,700	1,670	19	86	-	-	-	-	86
	Schodde	20,900	3,490	17	547	-	-	-	-	547
	TOTAL	**149,700**	**52,800**	**35**	**1,658**	**-**	**5,750**	**1,095**	**-**	**8,503**
Shoshone	Bowl Crater	2,800	2,800	100	133	-	-	-	-	133
	Cottonwood	6,300	670	11	-	-	20	-	-	20
	Crater	2,500	1,620	65	-	-	85	-	-	85
	Kimama	33,000	800	2	-	-	115	-	2	117
	Laidlaw Park	94,300	94,300	100	8,507	-	2,924	-	-	11,431
	Lava Lake	15,100	1,850	12	88	-	-	-	-	88
	Pagari	26,700	1,850	7	159	21	-	-	-	180
	Poison Lake	18,700	18,700	100	2,856	-	406	-	-	3,262
	Timber Butte	8,000	520	7	38	25	-	-	-	63
	Wildhorse	240,800	30,500	13	51	-	3,617	-	-	3,668
	TOTAL	**448,200**	**153,610**	**34**	**11,832**	**46**	**7,167**	**-**	**2**	**19,047**
GRAND TOTAL		**992,900**	**284,140**	**29**	**15,367**	**606**	**19,715**	**1,095**	**2**	**36,693**

Table 16
The Monument Expansion Facts – Upper Snake River District

ALLOTMENT	% OF ALLOTMENT AFFECTED	AUMS IN PROPOSAL	NUMBER OF PERMITTEES	YEAR STANDARDS & GUIDELINES COMPLETE	PERMIT EXPIRATION DATE	STANDARDS MET
IDAHO FALLS						
Blizzard Mountain	4	26	1	1999	2009	Yes
Craters	35	88	1	1999	2009	Yes
Huddles Hole	100	44	1	1999	2009	Yes
Sunset	13	206	1	1999	2009	Yes
Quaking Aspen	4	259	11	1999	2009	Yes
Smith	14	352	1	2008	2008	
Coxes Well	31	659	1	2005	2005	
Big Desert	23	6,710	18	1999	2009	Yes
Rudeen	43	799	1	2005	2005	
BURLEY						
East Minidoka	23	1,025	1	1999	2005	Yes
Minidoka	43	6,845	9	2002	2/05, 4/07, 1/08, 2/09	
Sand	19	86	1	2006	2007	
Schodde	17	547	3	2000	1/06, 2/09	Yes
SHOSONE						
Bowl Crater	100	133	1	2004	2/28/02	
Cottonwood	11	20	1	1999	2/28/02	No
Crater	65	85	1	1999	2/28/02	No
Kimama	2	117	6	1999	Varies	No
Laidlaw Park	100	11,431	14	2003	Varies	No
Lava Lake	12	88	1	2004	2/28/02	
Pagari	7	180	3	2004	Varies	
Poison Lake	100	3,262	1	2005	2/28/02	
Timber Butte	7	63	1	2006	2/28/02	
Wildhorse	13	3,668	22	1999	Varies	No

Plans (AMPs). Grazing systems result from certain decisions and agreements and are subject to standards and guidelines, as are adjustments made to stocking rates.

Standards and guidelines have been applied to 14 out of 23 allotments, as is shown in Table 16. This analysis begins with consultation between an authorized officer, interested publics, and resource users. Field assessments and evaluations are then conducted to determine the achievement or non-achievement for each standard. A plan to reach uniform achievement, when needed, is typically developed through an environmental assessment (EA). EAs identify changes necessary for allotments to meet, or to make significant progress toward meeting, all standards. EAs also require follow-up monitoring and the reporting of results. Appendix F contains the handbook, "Standards for Rangeland Health and Guidelines for Livestock Grazing Management".

Grazing preference is not expected to decrease as a result of standards and guidelines analysis because most allotments are attaining, or are making significant progress toward attaining, uniform achievement.

Rangeland developments are used in the Monument to improve livestock distribution, provide livestock forage, restore degraded areas, protect sensitive sites, improve wildlife habitat, and facilitate intensive management of livestock through the

implementation of grazing systems. Many of these are also closely associated with the road system in the Monument. The photo below depicts a traditional sheep camp that is used in today's sheep herding operations.

Proclamation 7373 recognized existing roads and two-tracks across narrow strips of exposed lava that are used to trail livestock from one grazing area to another. Trailing of livestock between allotments is another common practice in the livestock industry, and historic trail routes are still used today in many areas of the Monument. The majority of this trailing occurs along existing roads. In the map accompanying the Proclamation, these corridors were designated for primary management by the BLM to allow for continued livestock trailing and other authorized uses in these corridors. However, there are two known areas in the Monument where historic livestock trails do not follow designated roads and cross lava flows that are now administered by the NPS. These two much less obvious trails historically used for trailing livestock were not identified on the Proclamation map. While not in use at the time of Proclamation 7373, the question of their future use has been raised during the preparation of this plan. Both were once used for trailing sheep. One leads between US 93 and Paddelford Flat and the other across Brigham Point in the southern portion of the Craters of the Moon Lava Flow.

The Paddelford Flat Trail, in the northern part of the Monument (T.1S, R.23E, Sec. 5,8), allows the passage of livestock from the north end of Paddelford Flat to US 20/26/93, about 1 mile west of Lava Lake. Without this trail, it would take about 13 miles to trail out around the lava and along the highway back to Lava Lake. This trail, which is approximately 1.5 to 2 miles long, is passable by foot traffic only because it is narrow and goes through rugged lava.

Traditional sheep camp

The Brigham Point Trail, in the southern part of the Monument (T.5S, R.25E, Sec.15), is at the north end of the Brigham Point Lava Flow. This trail, which is less than 0.25-mile long, has similar characteristics to the Paddelford Flat Trail, and therefore it is passable only by foot traffic. This trail allows passage between the east and west sides of Brigham Point without having to go around the entire flow, which would be approximately 9 miles.

OTHER LAND USES

Administrative and Visitor Facilities

Existing administrative and visitor facilities in the Monument are concentrated in an area of approximately 90 acres adjacent to US 20/26/93 in the north area of the Monument. These are the visitor center/administrative building, maintenance shop, five residential buildings, the entrance station, paved parking areas and roads, a 51-unit campground, a campsite, and related sites. The Visitor Center (which also serves as the NPS administrative headquarters), the maintenance building, and five residential buildings were built in the late 1950s as part of the NPS Mission 66 Program.

The Visitor Center building contains a lobby with book displays, sales, and an information desk; a small exhibit room; and public restrooms. The administrative office area of the building consists of six rooms serving as offices and shared work areas. A construction proposal to renovate the building and add 1,800 square feet for staff work area and 450 square feet for a multipurpose audiovisual room was dropped from the administration's 2003 fiscal year budget before passage of the 2003 appropriations. The Department of the Interior Fiscal Year 2004 budget has not yet been passed into law, so no funding to proceed with the project has yet been approved.

The six-bay maintenance building provides limited area for its intended purposes, since parts of the building have been converted to offices for maintenance staff, administrative staff, and storage of park supplies. One of the residential buildings has been converted to staff offices and museum collections storage. Sewage is handled by separate septic tanks and leaching wells for the Visitor Center/maintenance building and for the residential area. Each of the campground restrooms is served a separate system.

The 51-unit campground contains a 130-seat amphitheater and two restrooms. An entrance station where visitors are contacted before entering the paved loop drive is located adjacent to the campground. North of the highway is a public group campsite. In this vicinity is also a modest research camp, the park's potable water wells and delivery systems, and underground water storage reservoirs.

A 7-mile paved loop drive with short spur roads, pullouts, and parking areas gives visitors access to scenic vistas, hiking trailheads, and other attractions. Vault toilets are available at three of the parking areas.

Kings Bowl was once a developed site. From the mid-1960s to late-1980s, private operators under permits from the BLM operated a concession at the site with a developed trail/tunnel system into Crystal Ice Cave, a parking and picnicking area, a trailer pad, a generator building, and a small concession stand. All of the aboveground facilities have been removed because of safety concerns. A small parking area and remnants of footpaths and vehicle trails remain. NPS and BLM are in the process of installing a series of waysides and signs in the area to convey important safety and resources protection messages to people who might visit this site.

Lands and Realty

The planning area encompasses approximately 755,000 acres. Figure 15 shows land status, and land ownership is detailed in Table 17.

Private and state land within the Monument boundary is not part of the Monument and is not subject to the direction in this plan. Most of the private land holdings in the planning area were obtained through agricultural entries such as the Desert Land Act, the Carey Act, the Reclamation Homestead Act, and the Stock Raising Homestead Act. There were no pending agricultural entries in the Monument on the date of Proclamation 7373. The private and state land inholdings are used for grazing and contain related developments such as fences, wells, corrals, camp trailers, and seedings. There are no houses, cabins, or other permanent human dwellings on the private or state land.

The agencies will consider acquiring private and state land in the Monument through exchange, purchase, or donation. Acquisitions of private land must be initiated by the private landowner as a willing seller. The Idaho Department of Lands (IDL) has initiated a proposal to exchange state land in the Monument for BLM land outside of the Monument (see letter from IDL in Appendix J). Private or state land acquired by the agencies would automatically become part of the Monument and subject to the direction in this plan.

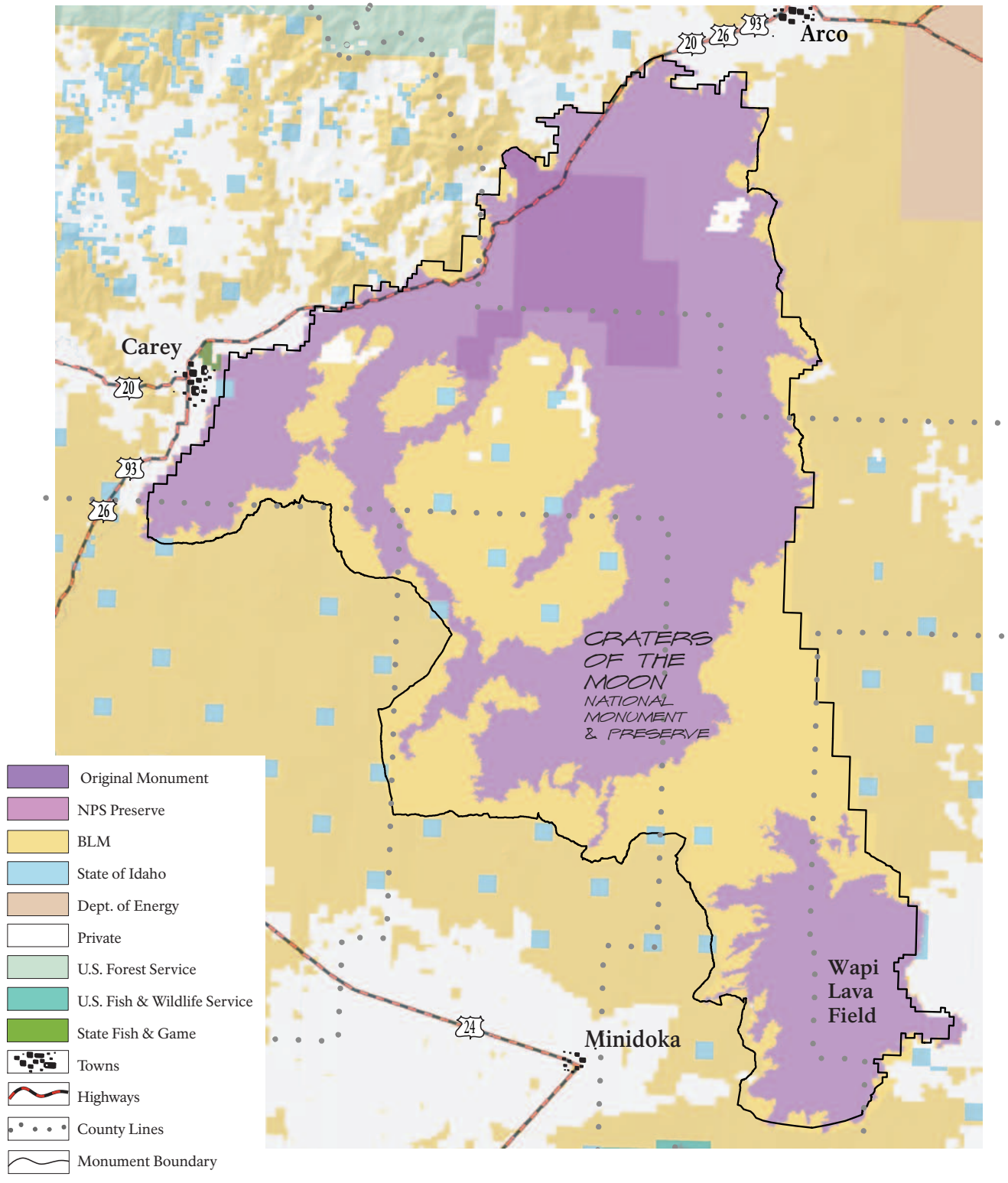
Proclamation 7373 transferred 412,391 acres in the Monument from BLM to NPS administration. In 2002, Congress changed the designation of this land from National Monument to the Craters of the Moon National Preserve.

Proclamation 7373 withdrew all federal land within the Monument and Preserve from all forms of entry, location, selection, sale, and other forms of disposition. Therefore, the agencies cannot exchange, sell, or dispose of any federal land in the Monument except for extremely rare situations that would further the protective purposes of the Monument. This withdrawal includes the disposal of land to local governments for public purposes and community expansion.

The Monument contains multiple land use authorizations for a wide variety of purposes. Lands and realty

Table 17
Landownership

LAND STATUS	ACRES	% OF MONUMENT
NPS Lands		
Federal	465,835	62
Original Monument	53,440	7
National Preserve	412,395	55
State	1,822	0.2
Private	2,147	0.3
NPS Area Total	**469,804**	**62**
BLM Lands		
Federal	273,847	36
State	6,499	0.9
Private	4,713	0.6
BLM Area Total	**285,058**	38
Combined Total		
Federal Total	739,682	98
State Total	8,321	1
Private Total	6,860	1
Grand Total	**754,862**	**100**



No warranty is made by the Bureau of Land Management or National Park Service for use of the data for purposes not intended by these agencies. Frontcountry and Passage Zone polygons have been oversized for graphic presentation and are not to scale.

FIGURE 15
Land Status

Craters of the Moon National Monument & Preserve
U.S. Department of the Interior / National Park Service
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Table 18
Valid Existing Rights

LOCATION ON FIGURE 16	CASE TYPE	CUSTOMER NAME	CASE FILE NUMBER	SIZE IN ACRES	EXPIRATION DATE
1	Federal Aid Highway 93	ITD	IDI-001314	94	Perpetuity
2	ROW Powerline	Lost River Electric Cooperative	IDI-002855	19	12/16/2019
3	ROW Observation Well	USGS	IDI-012671	10	12/02/2009
4	ROW Telephone Line	ATC Communications	IDI-020118	6	08/08/2012
5	ROW Seismic Station	DOE	IDI-028657	<1	04/16/2012
6	ROW Snow Fence	ITD	IDI-032380	14	09/09/2017
7	ROW Mineral Material Site	ITD	IDI-006614	109	Perpetuity
8	ROW Observation Wells	BOR	IDI-0008954	4	Perpetuity
9	Emergency Airstrip Lease	Idaho Division of Aeronautics	IDI-0010307	43	03/05/2013
10	Emergency Airstrip Lease	Idaho Division of Aeronautics	IDI-0010310	40	09/19/2013
11	Federal Aid Highway 93	ITD	IDBL-0047476	87	Perpetuity
12	ROW Mineral Material Sites	ITD	IDBL-0047852	156	Perpetuity
13	Federal Aid Highway 93	ITD	IDBL-0049776	373	Perpetuity
14	ROW Mineral Material Site	ITD	IDBL-0052624	40	Perpetuity
15	Federal Aid Highway 93	ITD	IDBL-0052700	141	Perpetuity
16	Federal Aid Highway 93	ITD	IDBL-0053778	28	Perpetuity

authorizations fall into two broad categories, valid existing rights and other valid but lesser interests. Proclamation 7373 states that: "The establishment of this monument is subject to valid existing rights." Land use authorizations that give "rights" to the holder under various laws, leases, and filings under federal law, such as some rights-of-way (ROWs), are listed in Table 18 and shown on Figure 16.

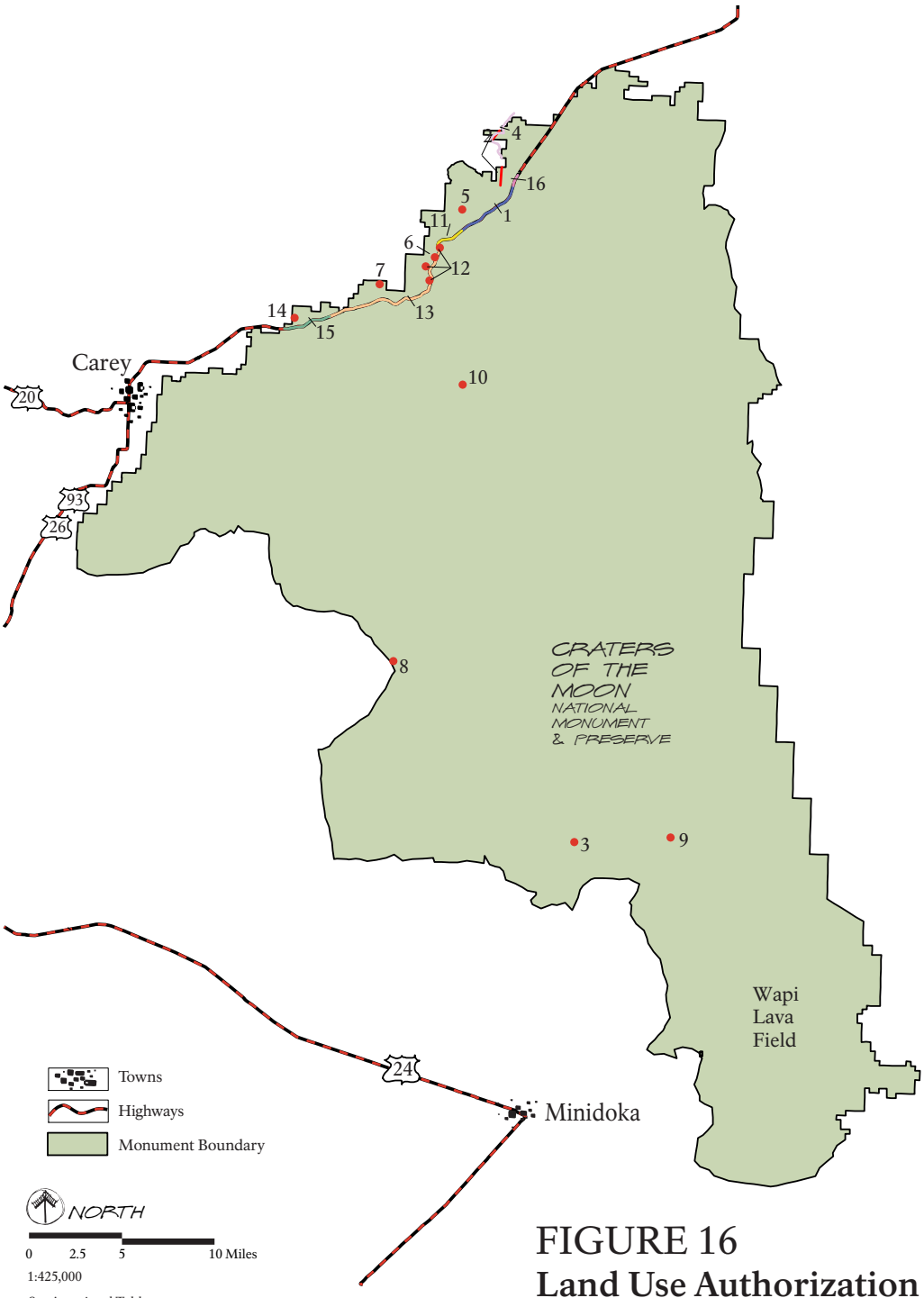
Other existing authorizations in the Monument are three Free Use Permits for mineral materials (see the "Minerals" section, below) and 14 easements held by BLM across state and private land. Only one pending authorization/application for a land use authorization within the Monument existed on November 9, 2000. This is a proposed cooperative agreement for a groundwater recharge area along the Little Wood River, approximately 5 miles south of Carey. At the time of Proclamation 7373, there were no other pending lands and realty cases or applications such as ROWs, Land Use Permits, exchange or sale proposals, or trespass cases.

A potential powerline corridor was identified in 1984, running southwest to northeast between the Craters of the Moon and Wapi lava fields in the Monument (Montgomery 1984). However, because of conflicts with the Great Rift WSA, this corridor has not been carried forward in other regional powerline and utility corridor studies (Western Regional Corridor Study 1992). A utility corridor, an existing 500-kilovolt transmission line, and a railroad ROW border the Monument on its southern extremity near the Wapi Lava Field.

Minerals

The Proclamation expanding the Monument withdrew all federal lands and interests in lands within the Monument from entry, location, selection, sale, leasing, or other dispositions (except for exchanges that would further the protective purposes of the Monument) under the public land laws, including the mineral leasing and mining laws. Thus, new federal mineral leases or prospecting permits may not be issued, nor may new mining claims be located within the Monument. No mining claims existed in the Monument on the date of Proclamation 7373.

There are no known natural gas, oil, or mineral deposits within the Monument boundaries. The general area has moderate potential for developable



No warranty is made by the Bureau of Land Management or National Park Service for use of the data for purposes not intended by these agencies. Frontcountry and Passage Zone polygons have been oversized for graphic presentation and are not to scale.

FIGURE 16
Land Use Authorization for Valid Existing Rights

Craters of the Moon National Monument & Preserve
U.S. Department of the Interior / National Park Service
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geothermal resources (Kuntz et al. 1979, Ridenour 1979). Active mining claims for locatable minerals, primarily gold, exist just to north of the Monument in the Pioneer Mountain foothills. NPS has rehabilitated two old abandoned gold mine adits in the northern portion of the original Monument. BLM processed several applications for geothermal leases in the 1970s and issued one lease, which was relinquished in 1982.

The Monument contains three Free Use Permits for pumice/cinders, Butte County and Blaine County use these sites as a material source for gravel road maintenance. Free Use Permits authorize use only by state or local governments. These material sites are not available to the general public or commercial parties.

The amount of suitable road surface material available within the Monument is essentially unlimited. However, Proclamation 7373 and agency policy restricts extraction of mineral materials to valid existing rights and administrative uses only. Cinders are generally considered to be an undesirable material for road maintenance because they are not very durable compared to gravel. Cinders are very light, which reduces transportation costs. High quality crushed gravel is available outside of the Monument, but at a substantially higher cost than the readily available cinders.

ITD also holds three ROW grants for five pumice/cinder material sites in the Monument. These ROWs are valid existing rights unaffected by Proclamation 7373. The former General Land Office granted these ROWs in the 1930s during the construction of US 20/26/93. ITD has used only two of these material sites during the last 10 years.

The Monument contains no known industrial minerals, gems, semiprecious stones, or petrified wood. The collection of any lava rock features in the Monument is authorized only under a scientific collecting permit issued to institutions. Public collecting is illegal. Many public and commercial sources exist throughout southern Idaho for lava-based materials used in landscaping, barbecue grills, and saunas.

SPECIAL DESIGNATION AREAS

Wilderness

Congressional designation of the 43,243-acre Craters of the Moon National Wilderness Area was enacted on October 23, 1970, making the Monument and Petrified Forest National Park the first units within the National Park System with designated wilderness areas (PL 91-504).

The Craters of the Moon Wilderness is south of US 93 entirely within the original Monument (Figure 17). All but the north end of the wilderness boundary is adjacent to lands inventoried by BLM as the Great Rift WSA in 1980 (USDI 1980). When designated, the wilderness boundary was offset one-eighth of a mile (660 feet) inside the Monument boundary. Thus, a narrow non-wilderness strip of the Monument separates the Great Rift WSA and the designated wilderness. This "buffer" area was intended to permit administrative vehicle access for firefighting and other management needs (U.S. House of Representatives 1970). Since the narrow buffer area does not contain roads and consists largely of impassable lava flows, it never has been used for such purposes.

Much of the scenic 7-mile Loop Drive developed by NPS in the 1930s and 1950s lies close to the northern edge of the wilderness area. At two points, the wilderness boundary lies within 2,000 feet of US 20/26/93. The openness of the terrain results in the sights and sounds of traffic on the highway and the 7-mile Loop Drive being perceivable from some of the northernmost areas of the wilderness.

Human-made facilities in the wilderness area are limited to the Wilderness and Tree Molds trails, a small concrete watering trough that predates the Monument, and numerous rock cairns and rock rings of historic or prehistoric origin. Initially developed as a primitive wagon trail to serve pre-1924 livestock use on Little Prairie, the 5.1-mile Wilderness Trail later served as a primitive vehicle route until 1970. At some point, perhaps as early as the 1950s, the route was closed to the public, and only administrative use was permitted. The extent of construction or maintenance on the route up until 1970 is poorly documented, but no evidence of grading exists. There has been no documented maintenance of the route since 1970. The trail to Echo Crater remains distinct, but south of Echo Crater, the trail has faded in some areas.

Before the wilderness was designated, the 1.5-mile Tree Molds Trail was developed to gain access to numerous tree mold features. The Tree Molds Trail is the only maintained trail listed in the 1996 NPS Wilderness Management Plan (USDI 1996). A spur trail leading from the Tree Molds Trail to Great Owl Cavern was closed following wilderness designation, and a large metal stairway leading into the cavern was removed.

NPS management activities have been limited to monitoring air quality, vegetation, wildlife, and recreational impacts and fire suppression. In 2000, a fire management plan was completed that provided for managing natural fires for resource benefits under certain conditions (USDI 2000).

Wilderness Study Areas

WSAs are lands identified through the BLM wilderness inventory process as possessing wilderness characteristics (defined by the Wilderness Act of September 3, 1964, 16 USC 1131). WSA lands are designated in BLM land use plans and managed

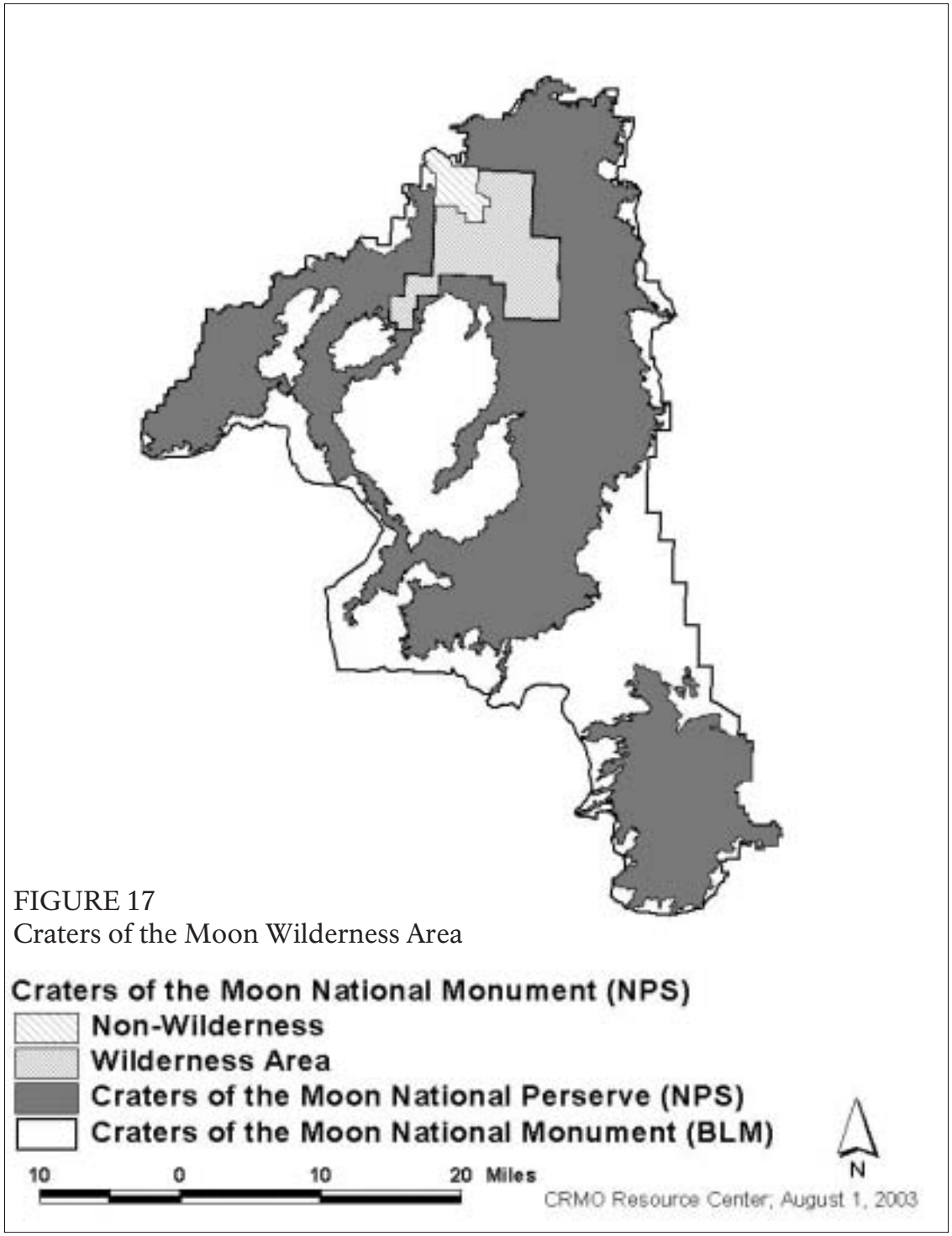

FIGURE 17
Craters of the Moon Wilderness Area

under the BLM Interim Management Policy (IMP) for Lands Under Wilderness Review, Handbook H8550-1, so as not to impair their suitability for wilderness designation (USDI BLM 1995).

Four WSAs have been designated within the boundaries of the Monument (Table 19, Figure 18). Eighty-five percent of the WSAs lie within the National Preserve, the rest is managed by BLM. The 380,200-acre Great Rift WSA was designated in 1980 (BLM 1980). The Great Rift WSA encompasses most of the Craters of the Moon and Wapi lava fields, along with parts of the surrounding sagebrush grasslands. The Raven's Eye WSA covers 67,110 acres of the western part of the Craters of the Moon Lava Field, with 68 percent of the area within the Monument. The Little Deer WSA takes in 33,531 acres of a narrow extension of the Craters of the Moon Lava Field and adjacent sagebrush grasslands. The 9,700-acre Bear's Den Butte WSA is centered on a narrow finger of the Craters of the Moon Lava Field, which extends into Laidlaw Park. The Raven's Eye, Little Deer, and Bear's Den Butte WSAs were designated in 1986 (BLM 1987).

BLM land use plans indicated that parts of the WSA were suitable for preservation as wilderness. Designation of the WSA as wilderness requires a recommendation by the President and an Act of Congress. The lands remain in WSA status until Congress acts either to designate the land as wilderness or to release it for other uses. In 1985, President Reagan recommended that Congress designate 322,450 acres of the Great Rift WSA as wilderness.

Presidential Proclamation 7373 transferred portions of the four WSA to NPS in 2000. The proclamation directed the following:

> Wilderness Study Areas included in the Monument will continue to be managed under Section 603(c) of the Federal Land Policy and Management Act of 1976 (43 USC 17011782).

Section 603(c) requires that WSAs be managed to maintain their suitability for wilderness designation and prevent unnecessary or undue degradation. The BLM and NPS will follow the BLM WSA IMP in guiding management decisions within the WSA until completion of this Plan/EIS (BLM/NPS 2001) and completion of a Wilderness Management Plan for the Monument.

There are no roads within the WSA boundaries. BLM wilderness inventory procedures (BLM 2001) define roads as routes improved and maintained by mechanical means to ensure relatively regular and continuous use. A route maintained solely by the passage of vehicles is defined as a vehicle way. Numerous vehicle ways exist within the WSA. The BLM IMP for WSAs permit continued motorized travel on those ways recorded during the wilderness inventory. Additional vehicle routes created since the inventory were not authorized, and motorized vehicle use of such routes is prohibited.

Wilderness inventories recorded 20 miles of vehicle ways in the Raven's Eye WSA, 5.1 miles in the Little Deer WSA, and 2 miles in the Bear Den Butte WSA (BLM 1987). Inventories of the Great Rift WSA indicate that it contains approximately 25.7 miles of vehicle ways. Unauthorized vehicle ways may have been created since the inventories were completed, but the numbers are unknown. New vehicle ways may have also been created during authorized fire suppression and restoration activities.

Other human-made facilities in the WSAs include wildlife guzzlers, sheep bed grounds, fences, and watering structures associated with livestock use. The sights and sounds of roads adjacent to the WSAs are visible and audible from within limited portions of the WSAs. Communication towers near Arco and Lava Lake are visible from portions of the Great Rift WSA.

Table 19
Summary of Wilderness Study Areas

WILDERNESS STUDY AREA	AREA WITHIN MONUMENT (ACRES)	NPS AREA (ACRES)	BLM AREA (ACRES)	TOTAL WSA AREA (ACRES)	AREA WITHIN MONUMENT RECOMMENDED SUITABLE BY BLM (ACRES)
Great Rift	380,200	335,123	45,077	380,200	341,000
Raven's Eye	45,578	37,211	8,367	67,110	67,110
Little Deer	33,531	20,073	13,458	33,531	0
Bear Den Butte	9,700	4,289	5,411	9,700	0

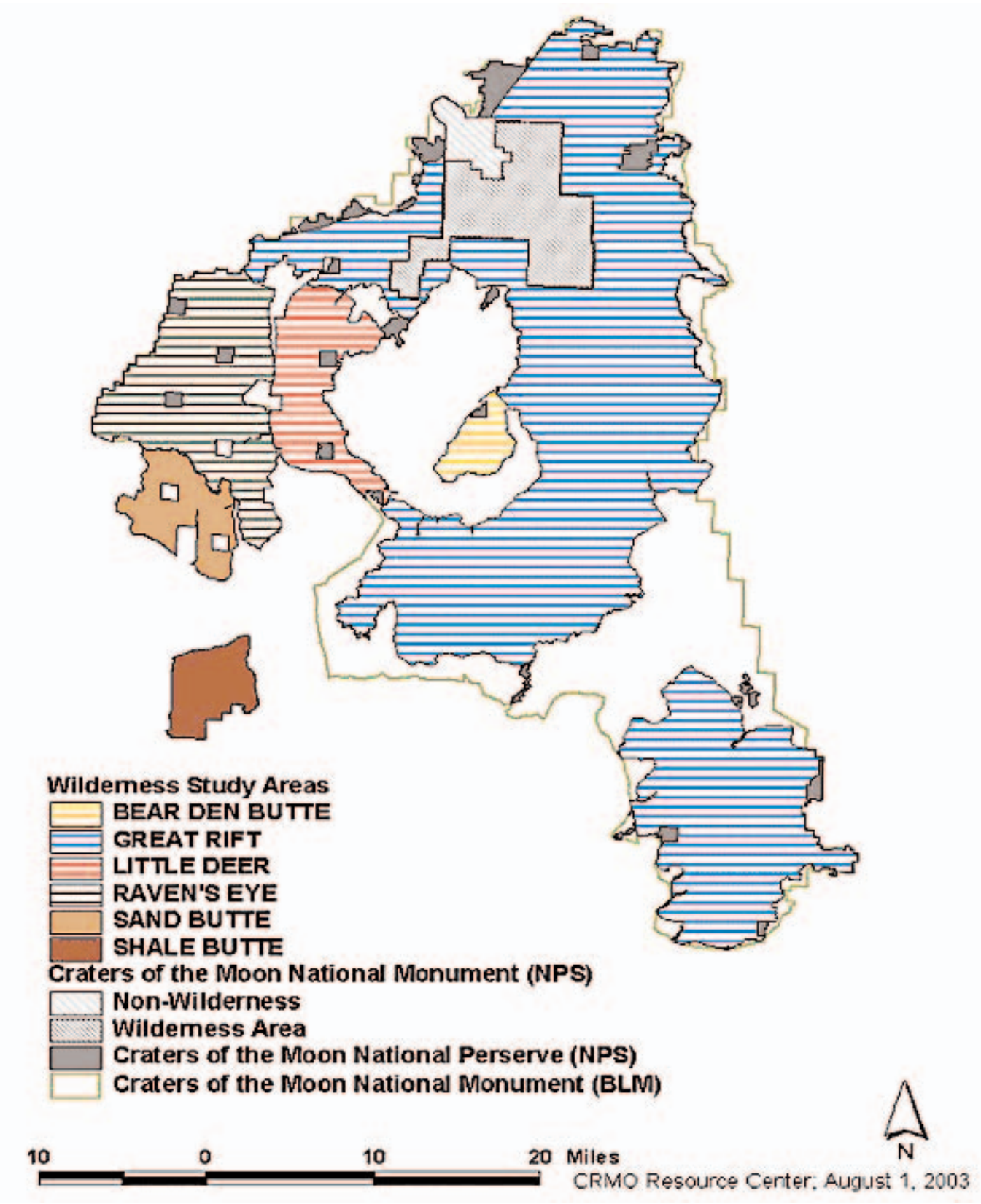

FIGURE 18
Location of Wilderness Study Areas

Research Natural Areas, National Natural Landmark, Areas of Critical Environmental Concern

– Research Natural Areas

NPS policies define RNAs as areas with prime examples of natural ecosystems or significant genetic resources with value for long-term research. Activities within RNAs are restricted to non-manipulative research, education, and other activities that will not detract from the area's research value.

Four RNAs have been designated within the Monument: Carey Kipuka RNA, Big Juniper Kipuka RNA, Brass Cap RNA, and Sand Kipuka RNA. Three of the four were nominated and designated by BLM before 1991 (Hilty 1991). The fourth, Carey Kipuka, was nominated and designated by NPS in 1993. All four RNAs feature kipukas, an area of older vegetated landscape surrounded by recent lava flows. Isolation, difficulty of access, and a lack of surface water made these areas unsuitable for livestock, and little or no grazing has been recorded. Isolation has also limited recreational access to the kipukas. (See Figure 18).

Carey Kipuka RNA is a 170.3-acre kipuka in the Craters of the Moon Lava Field, 14 miles east of Carey, Idaho. The kipuka and surrounding area was added to the Monument in 1961 and became designated wilderness in 1970. The area has also been nominated as a National Natural Landmark (NNL).

The entire kipuka is dominated by sagebrush vegetation represented by three distinct vegetative communities. The area is a particularly good representative of the Low Sagebrush Theme, Low Sagebrush/Idaho Fescue Subtheme. Cheatgrass *(Bromus tectorum)*, an aggressive invader of areas disturbed by fire, is widespread throughout much of the kipuka. No other invasive exotic plants or noxious weeds have been recorded. Scientific investigation of the area dates to 1956, and its value for basic and applied study of sagebrush-grassland ecosystems has long been recognized (Tisdale 1965). Long-term monitoring of vegetation and breeding birds in the area continues to be conducted by NPS.

Big Juniper Kipuka RNA is a 320-acre area within the Wapi Lava Field, 14 miles northeast of Minidoka, Idaho. This RNA contains undisturbed examples of several habitat types that occur on the ESRP, including Wyoming big sagebrush/bluebunch wheatgrass, Wyoming big sagebrush/Thurber's needlegrass, and threetip sagebrush/bluebunch wheatgrass. Surrounding lavas contain a sparse cover of Utah juniper woodland with a mixed shrub later (Caicco 1983b).

Brass Cap Kipuka RNA is an 854-acre area surrounding the Brass Cap Kipuka on the Craters of the Moon Lava Field, 11 miles east of Carey, Idaho. This area is an undisturbed example of a major habitat type. Alkali sagebrush and Idaho fescue are the dominant species, covering nearly 100 acres of the kipuka (Caicco 1983a).

Sand Kipuka RNA is a 320-acre area surrounding Sand Kipuka, 12 miles east of Minidoka within the Wapi Lava Field. The kipuka is dominated by Wyoming big sagebrush or basin big sagebrush and needle-and-thread grass. Utah juniper woodlands are well developed on the lava surfaces surrounding the kipuka (Wellner 1983).

– National Natural Landmarks

NNLs are areas of national significant designated by the Secretary of the Interior as being outstanding representatives of a region's biotic or geologic features (U.S. Government Printing Office 2001). The Monument contains portions of the Great Rift NNL, which was designated by the Secretary of the Interior in 1968 for its geological significance and enlarged in 1980 in recognition of its biological significance.

The low sagebrush/Idaho fescue habitat of the north unit and the early low sagebrush/Idaho fescue habitat in Carey Kipuka have been evaluated and found to meet the criteria for NNL status. They are outstanding representatives of the Low Sagebrush/Idaho Fescue Subtheme in the Low Sagebrush Theme within the Columbia Plateau Natural Region (Rust 2002). Part of the north unit of the proposed NNL extends outside of the Monument onto BLM lands.

– Areas of Critical Environmental Concern

ACECs are certain areas designated by BLM because of their unique or significant environmental qualities or features. The three RNAs (Old Juniper Kipuka, Sand Kipuka, and Brass Cap Kipuka) in the National Preserve were

BLM ACECs before the Monument was expanded. The Laidlaw Park area would be considered for ACEC designation under Alternative C (see Appendix G, Proposed Laidlaw Park ACEC evaluation).

VISITOR EXPERIENCE

INTERPRETATION/VISITOR UNDERSTANDING

Through interpretive and educational programs, NPS and BLM strive to instill in visitors an understanding, appreciation, and enjoyment of the significance of the Monument. Interpretive and educational programs encourage the development of a personal stewardship ethic and broaden public support for preserving our nation's natural and cultural resources.

The interpretive program at the Monument focuses on providing an educational experience to the widest possible variety of visitors. Major target audiences are summer visitors, school students, visitors from local communities, and winter visitors. Other groups are backcountry travelers, hunters, and people planning visits to the Monument. Programs to best meet the needs of these groups are regularly scheduled walks and talks during summer; school group orientations and teacher workshops in spring and fall; special topic weekend programs; and winter ecology workshops.

Informational kiosks, press releases, and the development of Web sites have been implemented recently to address the needs of more users. Visitors unable to attend or take advantage of these activities have an excellent opportunity to learn about the Monument through a broad range of educational opportunities, including a museum, wayside exhibits, self-guided trails, and publications.

Interpretive themes are important ideas, stories, and concepts that are presented to visitors in exhibits, publications, and programs. With the development of a Comprehensive Interpretative Plan for the Monument, the following themes will be addressed:

- An extraordinary example of the creation of a volcanic landscape.
- A place with a diverse population of plants and animals associated with a wide variety of volcanic habitats.
- A resource associated with thousands of years of human history, giving insight into a variety of people, cultures, and times.
- A laboratory that supports a diverse natural and cultural history, which provides important opportunities for research and education.
- A landscape of lava and sagebrush — one of the few remaining examples of what is "natural."

The primary theme of the interpretive program at the Monument is the significance of the awesome effects of volcanism on this landscape. Other themes stress the incredible diversity of plants and animals that have adapted to this harsh environment and the unique cultural history that reflects the interactions between people and the rugged volcanic terrain. An ongoing effort to make visitors aware of their relationship to this environment and their role in preserving and protecting this area is also an integral component of all interpretive activities. Visitor safety, orientation, and trip-planning information are available through a variety of media. See the "Social and Economic Conditions" section for more information about public health and safety, including visitor health and safety.

Making visitors aware of the need to avoid certain behaviors that may have a detrimental impact on Monument resources is the first step in the protection of fragile natural and cultural features. The need for visitors to stay on trails, avoid walking in sensitive areas, and leaving the rocks in place is stressed. This approach is believed to have a positive effect in protecting such features as spatter cones, cinder cones, and ropy lava flows. The need to protect plants, animals, and archaeological and historic sites is also a part of a diverse interpretive program.

A visitor survey done at the Monument in 1989 indicates that interpretive programs were considered important by at least 74 percent of Monument visitors (Machlis et al. 1989). More specifically, the percentage of those visitors using non-personal services such as NPS folder and map (91 percent), wayside exhibits (58 percent), self-guided trails (75 percent), and Visitor Center exhibits (77 percent) indicates wide use among visitors (Machlis et al. 1989). The

Visitor Center

percentage of all visitors using personal services such as evening programs (10 percent) and guided walks (17 percent) indicates that a much smaller number of visitors attend these types of programs. Such visitor statistical information is not available on the expanded part of the Monument.

Nearly all interpretive efforts take place in the developed section of the Monument adjacent to US 20/26/93. Along what is known as the 7-mile Loop Drive, visitors have access to a visitor center with accompanying exhibits and audiovisual programs, a series of self-guided trails, and a system of wayside exhibits at roadside pullouts and along several trails. Interpretive walks and activities, available primarily during the peak season, are also conducted from this site. Although not all interpretive activities or sites are considered accessible to all visitors, a few recently developed sites offer a higher level of access.

The Monument's interpretive facilities are in good to excellent condition. Visitor Center exhibits done in the 1950s have been completely redone in recent years. A few wayside exhibits are dated, but most have been installed within the past 15 years.

The interpretive program also has several other components, including publications, educational programs, winter ecology walks, a Junior Ranger Program, and off-site programs that offer interpretive opportunities to a much larger, diverse audience. Both the NPS and BLM Web sites contain information about the Monument.

Interpretation in the recently expanded Monument is limited, consisting primarily of informational signs at key attractions like Crystal Ice Cave, Kings Bowl, Baker Caves, and Bear Trap Cave. A detailed map of the area published several years ago offers orientation and interpretation. A series of signs is being developed for use in the Kings Bowl/Crystal Ice Cave area to convey critical safety messages and site information. This project, which predates the Monument expansion, is being carried out in connection with the rehabilitation of a defunct commercial operation site that left behind numerous deteriorating structures and unsafe conditions.

Kiosks containing orientation, safety, and user information have been installed at key access points. An extensive self-guiding trail system has been developed at Hell's Half Acre on I-15 which, although not in the Monument, interprets many related subjects.

RECREATION AND PUBLIC SAFETY

General Visitation

Visitation to the original Monument averages 200,000 people per year, with peak visitation on summer weekends. Many visitors are on vacations that include Yellowstone and Grand Teton National Parks to the east and Sun Valley and the Sawtooth National Recreation Area to the west (NPS 1990). Table 20 presents visitation statistics for the original Monument for 1990 through 2001, and Appendix H presents various recreational statistics for 1999 to 2002.

Commonly, visitors spend less than 3 hours at the Monument; 5 percent remain overnight. The typical

Table 20
Visitation at the NPS Craters of the Moon National Monument 1990-2001

YEAR	TOTAL VISITS *	PERCENT CHANGE
2001	186,993	-14.31%
2000	213,758	0.86%
1999	211,929	7.83%
1998	195,328	-10.66%
1997	216,145	-0.44%
1996	217,087	-9.09%
1995	236,827	2.28%
1994	231,427	-1.99%
1993	236,027	-2.17%
1992	241,160	9.60%
1991	218,000	5.50%
1990	206,000	-

Total visits are the total of recreation and non-visits. To view a detailed breakdown, visit the Public Use Statistics Office Web site.

Cross-country skiing in the Monument

visitor will stop and tour the Visitor Center, then sight-see along the 7-mile paved loop drive, taking advantage of photographic opportunities and often having a picnic before leaving.

Within the original Monument, nearly 80 percent of visitors are in family groups, with the most common visitors in age groups over 62 and under 11. For nearly 80 percent of visitors, this is their first visit to Craters of the Moon, and 19 percent of all visitors in the 1988 survey were from foreign countries. Most U.S. visitors originated from the states around the Monument – Idaho, Wyoming, California, Colorado, Oregon, and Washington (Machlis 1989).

School groups represent an important visitor group. More than 100 school groups comprising more than 3,000 students visit the Monument each year. Teachers who have attended one of the Monument-provided teacher orientation workshops lead many of these groups.

Commercial tours also come to the Monument through the primary visitation season. Commercial tour numbers vary from year to year, but the average is between 30 and 40 tour buses each year.

Winter visitation is low, but winter attracts local and regional visitors familiar with the quality cross-country skiing and snowshoeing opportunities. The Loop Drive is closed to vehicle traffic and groomed for skiing in winter. The NPS has also offered winter ecology programs for the past few years; these are always well attended.

Visitation to the expanded parts of the Monument over the last 10 years averages approximately 20,000 visits per year, according to BLM's Recreation Management Information System (RMIS). Some popular sites are Pillar Butte, Wood Road Kipuka, Bear Park, Snowdrift Crater, Kings Bowl, and Bear Trap Cave. No visitor facilities are available at any of the sites, but all receive day use and occasional overnight camping. Recreational activities in the expanded part of the Monument, in order of popularity, are hunting; driving for pleasure; geologic exploration including caving, lava hiking, and sightseeing; hiking; primitive camping; photography; horseback riding; and mountain biking.

Hunting

The Idaho Fish and Game Commission sets hunting seasons and other regulations for hunting in Idaho. Most of the Monument and Preserve is within Idaho Fish and Game Hunting Unit 52A. The southern part of the area, including all of the Wapi Lava Field, is included in Unit 68. A very small portion of the northern edge of the Monument and Preserve fall within Units 49 and 50. The length of season and number of available controlled-hunt tags vary annually on the basis of wildlife population levels and other factors.

RMIS and IDFG estimates indicate that sage grouse hunting and open mule deer hunting attract the highest number of hunters in the Monument. The open seasons for archery (antelope, elk, and deer), other small game (rabbits, upland birds), predators and unprotected species, along with the controlled seasons (draw tags) for antelope, elk, and deer, account for a much smaller portion of hunting use.

Almost all hunting has historically has been in the BLM portions of the Monument. A very small amount of hunting occurs in what is now the NPS Preserve. The exposed lava flows in the NPS Preserve can be used for a quality hunt for a few hunters who seek the challenge. Hunting has never been authorized in the original NPS Monument.

The very small amount of hunting by members of the Shoshone-Bannock Tribes that takes place in the Monument is considered a treaty right and is not considered a recreational hunting experience.

Motorized and Mechanized Recreation

OHV use in the Monument includes off-highway motorcycles, all-terrain vehicles (ATVs), and snowmobiles. Most OHV use in the Monument takes place during hunting seasons or in association with other land uses like livestock operations. The amount of OHV-specific recreation activity in the Monument is quite small (RMIS estimates less than 5,000 visits per year). Most OHV activity takes place on the existing road network, since no trails have been designated for motorized use.

A small amount of mountain biking takes place in the expanded part of the Monument. This small but growing recreational use is confined primarily to the existing road network, because no designated trails for mountain biking exist. In the area of the original Monument, mountain bike permits are available for riding along portions of Goodale,s Cutoff and along the 7-mile Loop Drive and other areas. No OHV use is permitted within the original Monument.

Hiking and Horseback Riding

Most hikers hike on designated trails in the original Monument. Hiking trails to features of interest in the original Monument are the North Crater Flow,

Devils Orchard, Inferno Cone, the Big Craters/Spatter Cones area, Tree Molds, and the Cave Area. Hikers in the non-Wilderness part of the original Monument regularly see other visitors, because the area is highly used. Opportunities for solitude are limited; however, the Craters of the Moon Wilderness offers outstanding opportunities for self-directed hiking, with an excellent chance to experience solitude.

Hiking in Craters of the Moon National Monument

Wilderness use is extremely light, with an average of 130 overnight backpackers per year (based on backcountry permits issued 1990 through 2002). Backpacking parties usually consist of fewer than four persons, and they seldom stay out more than two nights (NPS 1990). All water must be packed into the backcountry. Exact numbers of day users are unavailable.

Hiking in the expanded part of the Monument offers outstanding opportunities to experience a high degree of solitude. Since no designated hiking trails exist within the expanded portion of the Monument, most hiking experiences are cross-country and self-directed. Some constructed hiking trails exist at the Crystal Ice Caves/ Kings Bowl area (RMIS estimates 1,000 visits).

Horseback riding and the use of pack stock in the original Monument usually is limited to one or two groups a year and is concentrated primarily along the Craters of the Moon Wilderness Trail. In the expanded part of the Monument, most stock animals and horseback riders work in association with livestock operations and in other non-recreation activities, but there is a small amount of recreational horseback riding and pack-stock use in this area. Hunters also regularly use horses. The few recreational users enjoy outstanding opportunities for solitude and a self-directed experience. Riders and pack-stock users travel cross-country or along the existing road network. No designated trails currently exist for horseback riding.

Camping

In the original Monument, 51 developed campsites with water, restrooms, charcoal grills, and picnic tables are available on a first-come-first-serve basis. Most campers stay only one night and are usually gone by 10 a.m. The campground is rarely full, with the exception of several weekends during the summer season, generally around holidays.

Recreational overnight use of the Wilderness area is light. The NPS issues fewer than 100 overnight camping permits per year in the Wilderness. The entire area is snow-covered and accessible by snowshoe and ski for at least one-third of the year. Most overnight Wilderness users hike the Wilderness Trail and camp in or near Echo Crater. Stock use is restricted to day use by groups of 12 or less on the Wilderness Trail. No overnight camping with stock is permitted (USDI NPS 2002).

Recreational camping in Cinder Butte

The expanded part of the Monument does not contain any developed campgrounds. Currently, dispersed camping is available throughout the entire expanded portion. Many use-established primitive campsites near crossroads, access points, and major features of interest are available throughout the Monument.

Caving

Caving does not draw large numbers of visitors; however, caving is an important and unique recreation opportunity at Craters of the Moon National Monument. Opportunities exist for recreational cave experiences ranging from hiking a paved trail to an easily accessible lava tube such as Indian Tunnel, to visiting a remote wild cave somewhere in the expanded portion of the Monument, to the potential to actually discover a previously unknown cave.

Monument caves differ from limestone caves in that they are lava tubes once formed by flowing lava. Although they exhibit flowstones and other speleothems and erosion features, those features are primarily associated with volcanism and lava transport.

Many easily accessible caves in the area have been known locally for a long and are frequently visited. Over time, some caves show signs of irresponsible use such as graffiti and vandalism, which can detract from the caving experience.

Cave exploration, discovery, survey, and mapping are important activities for local caving organizations. The local and regional chapters (Grottos) of the National Speleological Society play an important role in conserving the cave recreation resource. The groups engage in cleanup projects and other cave conservation activities, in addition to mapping, surveying, exploring, and educating users about caves and cave conservation.

Most caves do not appear on maps but can be explored upon discovery. Other caves require a permit for access. Some cave locations that appear on maps are the 15-mile-long Bear Trap Lava Tube along the Arco-Minidoka Road and the Lariat Cave near Kings Bowl.

The best-known cave in the region is Crystal Ice Cave, which is a fissure cave rather than a lava tube cave. In 1964 a concessioner, under permit from the Idaho Falls BLM District Office, developed the cave. When the cave was open, annual visitation was 5,000 to 10,000 people. Improvements at the cave included buildings, restrooms, and trails. Generators provided electricity to light the cave and run a refrigeration unit used to maintain the ice formations. Prompted by safety concerns and vandalism, BLM removed most outside facilities and signs, sealed the tunnel doors, and installed signs to inform the public about the site closure in 1988. At present, Crystal Ice Cave offers an outstanding opportunity for technically experienced and adventurous cavers.

Health and Safety

Several factors are involved in health and safety concerns for Monument visitors and surrounding communities. These are discussed below.

–Access in and Near the Monument

The Monument contains several hundred miles of roads of various qualities and levels of maintenance. Most of these roads and ways are not maintained at all. In addition to different types of roads, road conditions vary seasonally from impassable snow in winter to deep-rutted mud in spring and late autumn to dry and very dusty in summer. Nearly all the roads in the interior of the Monument require a high-clearance four-wheel drive vehicle equipped with good tires. At any time of year, rain can render the roads impassable to any vehicle.

Due to the size of the Monument and the complexity of the road system, navigation can be confusing. The BLM maintains a system of directional signs on the Monument; however, many roads and ways have appeared throughout the years, making map-based navigation difficult. It is recommended that travelers in unfamiliar parts of the Monument use a good map and use automobile odometers to count mileage from landmark to landmark. The iron-rich nature of the lava and rocks underlying the sagebrush steppe of the Monument can cause compasses to give incorrect readings by as much as 40 degrees.

In many remote areas of the Monument, emergency services can be anywhere from hours to days away. It is advisable to carry a reliable form of emergency communication in these areas at all times.

Two main roads bisect the Monument, and a U.S. Highway runs along its northern border. The Arco-Minidoka Road starts near the town of Arco, on the north side of the Monument, and runs to Minidoka on the south side. Farther to the west, the Carey-Kimama Desert Road

connects the town of Carey, along US 93 to SH 24 on the south end of the Monument near the town of Kimama. US 20/26/93 runs along the northern edge of the Monument.

–Weather

South Central Idaho and the Monument experience various degrees and extremes of weather for all four seasons. Winter can bring high winds, subzero temperatures, and deep snow. Generally, the undeveloped portions of the Monument are inaccessible during winter to all but snowmobile and ski/snowshoe travel, and cross-country travel over lava fields in winter is discouraged for safety reasons. It is inadvisable to drive a wheeled vehicle in the Monument in winter because deep snow and fast-changing weather conditions can leave travelers stranded.

In spring, high winds, cold temperatures, rain, and thunderstorms can present safety hazards to Monument visitors. A sudden rain at any time of year can render the roads impassable to vehicles outside the Frontcountry Zone. In contrast, summer months can be very hot and dry. The average annual rainfall in south-central Idaho is below 14 inches, and it is not uncommon for areas of the Monument area to receive no rainfall at all in summer. The temperatures are typically dangerously hot, often exceeding 100 degrees Fahrenheit for days or weeks on end.

Visitors to areas outside the Frontcountry Zone are advised to come prepared for extreme hot weather and carry the necessary general and emergency supplies, including plenty of water, extra vehicle fuel, a first aid kit, food, navigation equipment such as maps, compasses, and Global Positioning System (GPS) units, and a reliable form of communication. Because there are few, if any, sources of potable water in the Monument, all water must be carried in. :Livestock well water is usually not safe to drink. Dehydration from exposure to extreme desert conditions is a serious hazard in the Monument.

– Caves, Fissures, and Lava

Both the open lava areas and the sagebrush steppe of the Monument area contain lava tube-type caves. These caves range in size and complexity from small rock shelters to several-miles-long convoluted tube systems with ice formations and steep vertical drops. People who want to enter and explore caves should be experienced and familiar with all the provisions and contingencies of safe caving, and they should follow the Monument's cave plan.

Along the Great Rift are many open cracks and fissures, which can expose vertical drops varying from a few feet to an unknown depth. The basalt rock, of which these features are composed, is notoriously friable and can collapse without warning, leading to a serious or deadly fall.

Exposed lava features in the Monument are very rough and difficult to traverse, and in summer the surface temperatures of the lavas can reach 140 degrees Fahrenheit. Hiking over lava surfaces, particularly A?a flows, can be arduous and can present tripping, falling, and joint-twisting hazards. Long hikes over the lava can result in fatigue, dehydration, and disorientation. People hiking on the lava are advised to wear sturdy boots, protective gloves, and carry plenty of water and a reliable emergency form of communication.

– Wildfire

During the annual wildfire season, approximately late-June through September, the Monument area receives little or no rainfall. Very dry vegetation and high wind contribute to hot, fast-moving wildfires that can present serious safety hazards to visitors and surrounding communities. Wildfires are primarily confined to the sagebrush steppe of the Monument. However, at times wildfire can "creep" through colonizing vegetation on the exposed lava flows. Visitors should familiarize themselves with the fire danger level and any warnings or restrictions currently in place.

It is also very easy to start a wildfire on the Monument through the careless use of fire, smoking materials, and many other means. Fires are often started by the catalytic converter on vehicles coming into contact with dry vegetation.

– Livestock

Many areas of the sagebrush steppe in the Monument are in cattle and sheep livestock use allotments. While generally not aggressive, cattle and sheep can be unpredictable and present

a safety hazard to visitors. Sheepherders often keep large sheep-guarding dogs with their bands of sheep. These animals are not human-friendly and may have little or no experience with humans or being treated as pets. Often, these dogs are left alone to tend a sheep band, and their only duty is to chase off or kill anything they deem to be a threat to the sheep. Visitors are advised to avoid these dogs and to prevent their pets from venturing near sheep-guarding dogs or the sheep.

– **Snakes**

Rattlesnakes inhabit the Monument area and are usually active between mid-spring and late-fall. They are most commonly found on the sagebrush steppe, but they can also be found on the open lava. They often hide near cave entrances where there is shade and cool temperatures, which attract prey species. They represent a serious safety issue in that any rattlesnake bite should be treated as an emergency.

VISUAL RESOURCES

Viewscape

Perpetuating scenic vistas and open western landscapes for future generations is one of the purposes identified for the Monument. The visual resources of the Monument represent a remnant of the undeveloped American West and one of the few remaining great expanses of sagebrush steppe. The contrasting lava flows were described in the in 1924 Presidential Proclamation originally establishing the Monument as a "weird lunar landscape ... peculiar to itself." This creates a viewscape unique in North America.

The gray-green sagebrush steppe and black lava fields ride up against the high Pioneer Mountains to the north. Across the Monument, 3,500 feet of vertical relief present visitors with enormous panoramic views to the south. On a clear day, the Grand Tetons, 140 miles to the east, can be seen from the Monument. One of the nation,s clearest airsheds enhances these long, uninterrupted vistas.

The Monument contains numerous striking volcanic features such as pahoehoe and A'a lava flows, cinder cones, spatter ramparts, and enormous lava fields. Low shield volcanoes and cinder cones (known locally as "buttes") rise up throughout the entire monument landscape. The exposed lava varies in color, while shapes and textures of the flows add scenic variety on a smaller scale. Nearly barren of vegetation, the most recent lavas at times flowed around kipukas, which offer some visual relief from the continuous lava. Expansive sagebrush steppe and grasslands, as well as the different ages and types of lava surfaces, support a remarkable variety of plant and animal communities that add to the visual diversity of the Monument.

Visual Resource Management

Visual Resource Management (VRM) is a standard tool used by the BLM to identify and protect visual values on public lands (8400-Visual Resource Handbook and Manual Series). A VRM inventory of the Monument area was completed in 1989, including an evaluation of scenic quality, identification of viewsheds, and key observation points for visitors. This inventory data was analyzed and presented as visual resource classes. This Plan/EIS places all public land into one of four VRM management classes. VRM classes provide standards for planning, designing, and evaluating future management projects.

The four VRM management class designations are as follows:

- **Class I** – The objective of this class is to preserve the existing character of the landscape. Any contrast created within the characteristic landscape must not attract attention. This classification is applied to Visual ACECs, wilderness and WSAs, Wild and Scenic Rivers, and other similar situations.

- **Class II** – The objective of this class is to retain the existing character of the landscape. Changes in any of the basic visual elements caused by management activity should not be evident in the landscape. A contrast may be seen but should not attract attention.

- **Class III** – The objective of this class is to partially retain the existing character of the landscape. Contrasts to the basic elements caused by a management activity may be evident and begin to attract attention in the landscape. The changes, however, should remain subordinate in the existing landscape.

- **Class IV** – The objective of this class is to provide for management activities that require major modification of the existing character of

the landscape. Contrasts may attract attention and be a dominant feature in the landscape in terms of scale. However, the change should repeat the basic element of the landscape.

Night Sky

Night sky is considered an important resource within the Monument. The night sky at the Monument is generally free of artificial light sources and related light pollution. As with daytime viewing of expansive vistas, one of the nation's clearest airsheds creates conditions favorable for stargazing. Astronomy groups have been coming to the Monument for many years to take advantage of dark night skies.

SOUNDSCAPE

Natural Quiet

The Monument is a quiet place. "Natural quiet" refers to the state of having only natural sources of sound; for example, wind, rustling leaves, water, and animal calls. Most of the Monument is not subject to many modern sources of unnatural sound intrusion, or noise. The only major noise producers are highway traffic from outside the Monument, the railroad near the southern edge of the Monument, and aircraft overflights.

The area around the Visitor Center and the campground is adjacent to US 93 and subject to highway noise. Occasional noise from OHVs, ATVs, snowmobiles, and other vehicles occurs in the road portions of the expanded Monument. These noise intrusions are most prevalent during high-use periods, such as hunting season, and least prevalent during low-use periods, such as during winter.

Aircraft overflights create a small amount of unnatural sound intrusion year-round. The Federal Aviation Administration (FAA) has established an advisory ceiling of 2,000 feet above ground level over the Craters of the Moon Wilderness Area. Nonetheless, many overflights occur above 2,000 feet, including commercial aircraft from the airports in Idaho Falls and Hailey, Idaho. There are also small airports in Arco, Picabo, and Burley that support smaller private aircraft that may operate over the Monument. Perhaps the noisiest aircraft overflights are associated with the two military flight-training corridors that cross the Monument.

Helicopter use associated with public land management activities such as wildlife population inventories, livestock monitoring, and firefighting also contribute a small amount of noise. The two emergency airstrips in the monument receive no regular use.

SOCIAL AND ECONOMIC CONDITIONS

This section contains a baseline description of social and economic conditions in and around the Monument. For the purposes of this Plan/EIS, the local and regional social and economic conditions that will be discussed are population, income, employment, and housing and related activities, including public health and safety.

OVERVIEW

Between 1990 and 1999, the populations of Idaho and the Mountain West grew at more than twice the United States average. According to the U.S. Census Bureau, the fastest growing populations in the nation are intermountain western states: Nevada (1), Arizona (2), Idaho (3), Utah (4), and Colorado (5). Nevada and Idaho are predicted to be the two fastest growing states in the nation until at least 2005. Since 1990, Idaho's statewide population has increased by more than 27,000 people per year. Two-thirds of these additional people have moved to the cities and towns of Idaho (Cooke 2000).

In the more than 200 cities and towns in Idaho, more than one-half of the towns have increased slightly in population size. Roughly 24 cities and towns have lost population since 1990. At the other extreme, approximately 24 cities have increased by more than 100 persons per year.

The Monument is in five Idaho counties: Blaine, Butte, Lincoln, Minidoka, and Power Counties. In 2000, approximately 53,700 people lived in this five-county region. Minidoka County was the largest with just over 20,000 people, followed closely by Blaine County with approximately 19,000 people.

Of the five largely rural counties around or within the study area, Blaine County is the fastest growing (U.S. Census Bureau). It includes relatively small populations with substantially high housing values (almost three times the state average). It also includes the growing communities of Sun Valley (1,427), Ketchum (3,003), and Hailey (6,200), all of which are neighboring towns and share high growth and unusually higher income rates compared to the other counties and many areas in the state as a whole.

Much of the affluence and growth in the Sun Valley area can be attributed to important recreation

and tourism attractions. Readers of *Ski Magazine*, *Conde Nast Traveler*, and *Gourmet* magazines have all recently voted Sun Valley as the #1 ski resort in the country (Idaho Department of Commerce). The economy of the valley is strongly represented by the recreation and tourism industry. In winter, visitors come to enjoy snow skiing at Sun Valley, as well as snowmobiling, cross-country skiing, and ice-skating. Summer tourists enjoy golf, tennis, fishing, river rafting, and summer music and arts festivals. The Sawtooth National Recreation Area, the largest National Recreation Area in the National Forest System, which is near these communities, averages more than one million visitor days per year. The BLM Shoshone Field Office records an average of 900,000 visitors per year. Blaine County Recreation accounts for more than $60 million in annual total taxable sales.

By contrast, the area of Blaine County closest to the Monument contains cities of individually small populations and relies on agriculture and recreation as major economic bases, as do the other four counties. For example, Shoshone, the county seat of Lincoln County, is a rural farming area of slightly more than 3,000 people (Association of Idaho Cities 2003). Like the other small towns in this study area, such as Carey, Arco, and Minidoka, Shoshone is a rural community where agriculture is the main economical base. It serves as a gateway to many important natural wonders of the region, and many state parks, museums, ski resorts, lakes, rivers, and dams. The population of Shoshone is of 1,446. Six privately owned lodging rooms are available, as are tourist-related services. Shoshone residents are culturally and ethnically diverse, with representatives of the Basque, Portuguese, Hispanic, and Oriental cultures, along with people of European and Scandinavian backgrounds.

Arco, northeast of the Monument, is located near the Lost Big River and at the base of the Lost River Mountains. Arco (population 1,026), the county seat of Butte County, was the first city in the world to be lit with electricity generated by nuclear power. In the early days of World War II, a Navy gunnery range was established in the desert east of Arco. After its closing in 1947, the Atomic Energy Commission established the National Reactor Testing Station in 1949. Now called the Idaho National Engineering and Environmental Laboratory (INEEL), the 890-square mile installation is the site of the greatest collection of nuclear reactors and test facilities in the world. INEEL is one of the state,s largest employers, with approximately 4,000 workers at the laboratory and 2,700 more employees in Idaho Falls (INEEL Impacts 2001).

Other major employers in Butte County are the Arco School District, Bechtel Bettis, Argonne National Laboratory, Lost River Hospital, and Bechtel BWXT Idaho. INEEL, agriculture, and tourism are the major elements of Arco,s economy. Arco residents are employed in health care and social assistance (16%), education (11%), public administration (11%), construction (11%), professional, scientific, and technical services (10%), and accommodation and food services (10%) (U.S. Census Bureau).

Currently, privately owned lodging totals 79 rooms, and there are a few restaurants and tourist-related services. Arco is also home to the Arco/Butte Business Incubation Center, which offers services and meeting rooms to small businesses. Most homes in Arco were built before (54%); 13 percent were built in the 1960s, 23 percent in the 1970s, and 11 percent since 1980. In comparison, more than 62% of the residences in Idaho were built since 1970 (U.S. Census Bureau). There has been virtually no population change in Arco between 1990 and 2000, with a population of 1,026 and 1,016, respectively, and the population of Butte County dropped slightly between 1990 and 2000.

Carey, 25 miles east of Craters of the Moon National Monument and Preserve, has a population of 525, with the largest employer being Carey Public Schools. Carey,s population grew 23 percent between 1990 and 2000. As in Arco, 54% of the residential homes in Carey were built before 1960.

In Minidoka County is the small community of Minidoka, located on Route 24 south of the Monument. Minidoka, the county,s first settlement, was originally a railroad siding. Its population is approximately 67 residents, which is double the 1990 population (U.S. Census Bureau). Growth in northern Power and Minidoka Counties has been relatively low (8.6 and 11%, respectively).

A major federal government employer is the BLM, which maintains a central field office and fire control office in Shoshone. BLM and NPS cooperatively manage Craters of the Moon National Monument and Preserve.

Three airports are the travel facilities nearest the Monument – in Hailey, Idaho Falls, and Twin Falls (60, 84 and 90 miles from Park Headquarters, respectively). From the nearest towns by vehicle, travel to

the Monument is 18 miles west of Arco via U.S. Highway 20/26/93; 24 miles east of Carey via US 20/26/93; 84 miles from Idaho Falls; and 90 miles from Twin Falls.

REGIONAL ECONOMIC CONDITIONS

Table 21 contains selected income and poverty information for the five counties and for the state of Idaho for comparison. For Blaine County, both countywide and U.S. Census Bureau tract data is presented. Census Tract #9601 consists of the southernmost portion of Blaine County and best represents the community closest to the Monument and Preserve. Blaine County, which contains the resort community of Sun Valley, is not the largest in population, but is by far the most prosperous county, with a per capita income approximately double the levels of the other counties and the state of Idaho. (See Appendix I). The per capita income in Blaine County grew 274% between 1980 and 1999, higher than the statewide average (244%), and considerably higher than the 95% rate in southern Blaine County (census tract 9601) over the same time period. Butte, Lincoln, Minidoka, and Power Counties grew by 147, 141, 137, and 85 percent, respectively, between 1980 and 1999 (U.S. Census Bureau).

The five counties surrounding the Monument are highly dependent on the service industry. Agriculture is also very important in Butte, Lincoln, and Minidoka counties; employment in those counties is nearly three times the state average.

The Monument is part of the local economic environment. Monument NPS staff consists of 15 part- or full-time workers and approximately 10 to 20 seasonal employees. It is estimated that the Monument contributes between $7 million and $11 million to the local economy per year. Also, NPS uses concession contracts and commercial use licenses (formerly incidental business permits) to manage commercial activities within units of the National Park System.

Currently, the only concession contract is issued to the Craters of the Moon Natural History Association, a nonprofit organization. This contract allows the association to offer convenience items such as sunscreen, camera film, and soft drinks, as well as books and educational materials for purchase by visitors in the NPS Visitor Center. There are no current commercial use licenses or incidental business permits issued for activities on NPS lands in the Monument. IDFG offers commercial use licenses on BLM-administered lands.

Under the National Parks Air Tour Management Act of 2000 and implementing FAA regulations, NPS, as a cooperating agency, will assist FAA in developing an air tour management plan for parks with existing or proposed air tours. No air tours currently take place over NPS-administered lands in the Monument on any regular or frequent basis.

Table 22 contains information on the levels of employment for the major economic sectors in the five counties, southern Blaine County Census Tract 9601, and the state of Idaho.

Farmland comprises a large portion of land use in Minidoka and Power counties. The value of farmland per acre in Minidoka County is more than 80 percent above the state average and substantially higher than the other four counties.

The importance of farming to the surrounding counties was reflected in comments received during public scoping. Table 23 contains several measures of the quantity of rural farmland across the five counties and in the state of Idaho, along with estimated market values of land and buildings.

The median housing value is substantially higher in Blaine County and almost three times the state average. The number of seasonal or recreational houses is very high in Blaine County, as would be expected in the Sun Valley Resort area. Table 24 contains housing information for the five counties, southern Blaine County Census Tract 9601, and for the state of Idaho.

As Figure 19 illustrates, the Monument receives about 200,000 visitors per year, with peak visitation occurring from mid-May through September. The principal visitor activities are touring the visitor center/museum, viewing an orientation field, taking the self-guided driving tour, and hiking the many trails off the loop road. Visitation to the Monument has been relatively stable over the past 35 years, with fluctuations in the 1970s and 1980s, possibly due to increases in gasoline prices and weakness in the national and regional economy.

REGIONAL SOCIAL CONDITIONS

Idaho experienced a nearly 82 percent population growth between 1970 and 2000, including a 29 percent growth rate between 1990 and 2000. Blaine County has experienced increasing residential and business development, with population growth of approximately 230 percent between 1970 and 2000, including 40 percent growth from 1990 to 2000. Power, Lincoln, and Minidoka Counties experienced

Table 21
Income

DATA	BLAINE COUNTY	BLAINE COUNTY TRACT 9601	BUTTE COUNTY	LINCOLN COUNTY	MINIDOKA COUNTY	POWER COUNTY	STATE OF IDAHO
Personal Income (per capita) (1999)[b]	$41,259	$22,832	$19,376	$19,877	$16,955	$18,027	$22,871
Government transfer payments per capita (1999)[b]	$1,746	Not available	$3,640	$3,135	$2,941	$2,682	$2,837
% persons below poverty level (1999)[a]	7.8%	5.6%	18.2%	13.1%	14.8%	16.1%	11.8%
Federal payments in lieu of taxes (2000)[c]	$507,692	Not available	$154,669	$199,607	$137,775	$228,262	$8,825,194

a. Source: U.S. Bureau of the Census, Census 2000
b. Source: County Profiles of Idaho (http://www.idoc.state.id.us/idcomm/profiles/index.html)
c. Source: BLM Facts (http://www.id.blm.gov/blmfacts/data/pilt_2000.htm)

Table 22
Employment by Major Industry

MAJOR INDUSTRY	BLAINE COUNTY	BLAINE COUNTY TRACT 9601	BUTTE COUNTY	LINCOLN COUNTY	MINIDOKA COUNTY	POWER COUNTY	STATE OF IDAHO
Agriculture, forestry, fishing/hunting, & mining	4%	13%	18%	19%	17%	18%	6%
Construction	14%	16%	8%	13%	6%	5%	8%
Manufacturing	4%	4%	4%	9%	16%	19%	13%
Transportation and warehousing, and utilities	3%	4%	9%	5%	7%	6%	5%
Wholesale and retail trade	14%	13%	11%	13%	16%	11%	16%
Services [a]	60%	50%	50%	41%	38%	41%	52%
Total Employed	10,846	2,322	1,226	1,799	8,788	3,325	599,453

[a] Includes information, media, finance, insurance, real estate, rental and leasing, public administration, and other services.
Source: U.S. Bureau of the Census, Census 2000

Table 23
Land Area and Values in Farming (1997)

ALL FARMS	BLAINE COUNTY	BUTTE COUNTY	LINCOLN COUNTY	MINIDOKA COUNTY	POWER COUNTY	STATE OF IDAHO
Land in farms (acres)[a]	214,985	129,639	131,473	206,882	424,085	11,830,167
Percent of land area in farms[a]	12.7%	9.1%	17.0%	42.6%	47.1%	22.3%
Average size of farm (acres)[a]	1,102	626	468	307	1,313	530
Estimated market value of land and buildings (average/acre)[a]	$1,361	$775	$1,030	$1,856	$916	$1,017
Average value per farm of products sold[a]	$120,943	$103,932	$156,215	$225,836	$374,535	$149,945
Grazing fee receipts distributed to Idaho counties (2001)*[b]	$5,740.04	$7,128.76	$9,566.65	$1,768.95	$2,569.83	$194,794.89

Note:
* Grazing Fee Receipts Distributed to counties are determined by the Taylor Grazing Act of June 28, 1934 as amended 48 Stat. 1269; 43 USC 315i to be 12.5% of the gross receipts of the grazing fees collected.
a. Source: County Profiles of Idaho (http://www.idoc.state.id.us/idcomm/profiles/index.html)
b. Source: BLM Facts (http://www.id.blm.gov/blmfacts/data/grazing_receipts.htm)

population growth rates of 55, 32, and 28 percent, respectively, between 1970 and 2000. During the same period, Butte County lost about 1 percent of its population (U.S. Census Bureau).

Residents of Butte, Lincoln, Minidoka, and Power Counties have moved less frequently than residents of Blaine County since 1985, and less than the state average. The region surrounding the Monument is sparsely populated; however, the population density of Minidoka County is substantially higher than that of the other counties. None of the counties are heavily populated, with Minidoka County being the most populous. The unemployment rates for the five counties are within 2 percentage points of the state unemployment rate (Table 25).

Residents of Butte, Lincoln, Minidoka, and Power Counties have attained less education than the state average; only Blaine County residents have higher education levels than the state average (Table 26). Similarly, residents of Butte, Lincoln, Minidoka, and Power Counties have fewer physicians than the state average, with Blaine County significantly above the state average (Table 27). Crime rates in Lincoln and Butte Counties are dramatically lower than the state average, whereas crime rates in Blaine, Minidoka, and Power Counties are much higher and closer to the state average (Table 28).

Figure 19
Park Visitation Statistics (1950-2001)

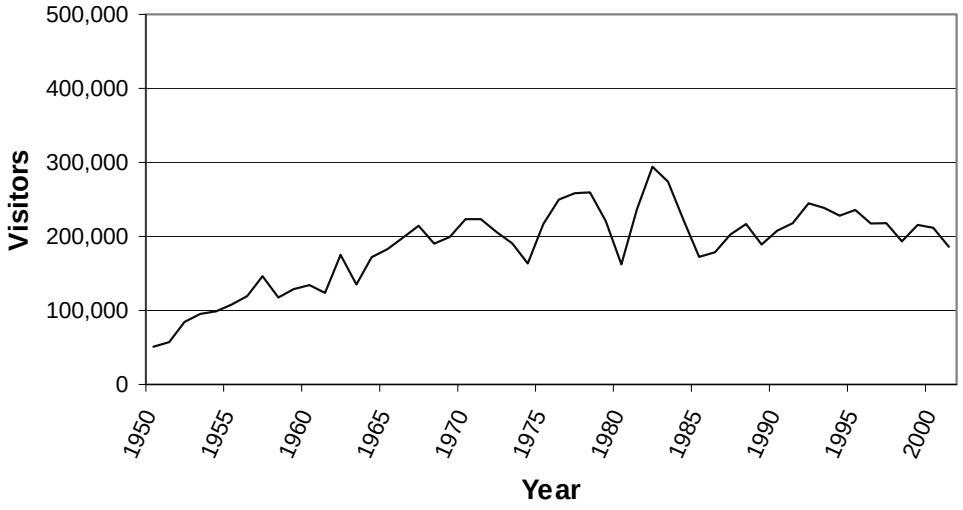

Table 24
Housing

HOUSING	BLAINE COUNTY	BLAINE COUNTY. TRACT 9601	BUTTE COUNTY	LINCOLN COUNTY	MINIDOKA COUNTY	POWER COUNTY	STATE OF IDAHO
Number of Units	12,186	1,968	1,290	1,651	7,498	2,844	527,824
Total Vacant Units	4,406	434	201	204	525	284	58,179
For Seasonal, Recreational, or Occasional use	3,723	354	38	36	31	29	27,478
Percent of Owner occupied units	68.90%	71.3%	77.00%	74.80%	76.90%	74.60%	72.40%
Percent of Tenant occupied units	31.10%	28.7%	23.00%	25.20%	23.10%	25.40%	27.60%
Household size	2.42	2.68	2.64	2.77	2.87	2.92	2.69
Median housing value	$288,800	$194,300	$68,700	$75,700	$74,600	$89,000	$106,300
Median rent	$740	$695	$335	$464	$394	$388	$515

Source: U.S. Bureau of the Census, Census 2000

Table 25
Population

DEMOGRAPHICS	BLAINE COUNTY	BUTTE COUNTY	LINCOLN COUNTY	MINIDOKA COUNTY	POWER COUNTY	STATE OF IDAHO
Population in 2000[a]	18,991	2,899	4,044	20,174	7,538	1,293,953
Population Density (per square mile)[b]	7.2	1.3	3.4	26.6	5.4	15.6
Labor Force (2000)[b]	11,316	1,302	1,872	9,402	3,488	641,088
Unemployment Rate[a]	4.2%	5.8%	3.9%	6.5%	4.7%	5.8%
Population Change 1970-1980[b]	71.2%	14.3%	12.4%	25.3%	40.7%	32.4%
Population Change 1980-1990[b]	37.7%	-12.7%	-3.7%	-1.8%	3.5%	6.6%
Population Change 1990-2000[b]	40.1%	-0.7%	22.2%	4.2%	6.4%	28.5%
Median Age[a]	37.4	38.8	34.3	33.5	31.6	33.2
Under 20 Years[a]	26.1%	31.7%	33.7%	34.9%	36.6%	32.0%
20 to 64 Years[a]	66.2%	53.3%	53.3%	51.8%	53.0%	56.8%
65 Years and over[a]	7.8%	15.0%	13.0%	13.3%	10.4%	11.3%
Geographic Mobility						
Persons 5 years and older living in a different state in 1985[b]	24.8%	10.6%	8.7%	7.4%	7.5%	14.8%
Persons 5 years and older living in a different county in 1985[b]	11.1%	11.6%	14.0%	11.7%	13.3%	---
Marriage Rate Per 1,000[b]	13.7	5.0	6.3	7.7	6.1	12.4
Divorce Rate Per 1,000[b]	5.2	2.3	4.7	2.7	3.3	5.5
Suicide Rate Per 100,000[b]	23.1	0.0	52.1	9.9	11.9	14.4

a. Source: U.S. Bureau of the Census, Census 2000
b. Source: County Profiles of Idaho (http://www.idoc.state.id.us/idcomm/profiles/index.html)
c. Source: Projections of the Total Population of States: 1995-2005 (http://www.census.gov/population/projections/state/stpjpop.txt)

Table 26
Education

EDUCATION LEVEL	BLAINE COUNTY	BUTTE COUNTY	LINCOLN COUNTY	MINIDOKA COUNTY	POWER COUNTY	STATE OF IDAHO
Population 3 years and over enrolled in school	4,341	758	1,127	5,884	2,319	368,579
Nursery School, Pre-School, Elementary School (grades K-8)	2,696	468	696	3,554	1,415	205,611
High School (grades 9-12)	997	216	311	1,660	629	85,576
College or graduate school	648	74	120	670	275	77,392
Educational Attainment of Population over 25	13,021	1,873	2,458	11,940	4,344	787,505
Percent high school graduate or higher	90.2%	82.6%	77.4%	73.7%	74.7%	84.7%
Percent bachelor's degree or higher	43.1%	13.0%	13.0%	10.1%	14.3%	21.7%

Source: U.S. Bureau of the Census, Census 2000

Table 27
Health Care

HEALTH CARE	BLAINE COUNTY	BUTTE COUNTY	LINCOLN COUNTY	MINIDOKA COUNTY	POWER COUNTY	STATE OF IDAHO
Physicians per 100,000	421	133	52	64	36	182
Number of Hospitals	1	1	0	1	1	49
Total Hospital Beds	39	14	0	25	10	3105

Source: County Profiles of Idaho (http://www.idoc.state.id.us/idcomm/profiles/index.html)

Table 28
Crime Rates

CRIME	BLAINE COUNTY	BUTTE COUNTY	LINCOLN COUNTY	MINIDOKA COUNTY	POWER COUNTY	STATE OF IDAHO
Murder	0	0	0	0	0	26
Rape	5	0	0	3	4	425
Robbery	0	0	0	2	1	234
Aggravated Assault	28	0	3	41	17	2,420
Burglary	76	8	1	124	40	7,356
Larceny	351	12	10	279	171	27,258
Motor Vehicle theft	26	12	2	31	9	1,929
Arson	3	0	0	3	1	274
Crime Rate per 100,000	2,791	1,036	414	2,346	2,871	3,189

Source: County Profiles of Idaho (http://www.idoc.state.id.us/idcomm/profiles/index.html)