

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, blue-bunch 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 blue-bunch 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 natu-

ral 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



Dwarf Monkey Flower

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.

#### – 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).

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



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



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 re-initiated in 2001, when small areas within the Monument (part of larger projects near the southern boundary) were burned to reduce cheatgrass, in con-

junction 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 (Lavery 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 list-

ed 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
<p><b>Obscure phacelia (<i>Phacelia inconspicua</i>)</b>  (Murphy 2002)</p>	<p>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. <i>Phacelia</i> grows in the depressions between boulders. Typically grows in small gaps (1 to 5 m<sup>2</sup>) 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 <i>Populus tremuloides</i> (quaking aspen), <i>Prunus virginiana</i> (chokecherry), or <i>Lymus cinereus</i> (Great Basin wildrye), and open, xeric vegetation dominated by <i>Artemisia tridentata</i> ssp. <i>Vaseyana</i> (mountain big sagebrush) with <i>Purshia tridentata</i> (bitterbrush), <i>Pseudoroegneria spicata</i> (bluebunch wheatgrass), and <i>Balsamorhiza sagittata</i> (arrowleaf balsamroot).</p>	<p>Eastern side of the Great Rift of the upper Snake River Plain and in the foothills of the Pioneer Mountains.</p>	<p>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 <i>Phacelia</i> 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.</p>	<p>1) <i>Prunus virginiana</i>/<i>Leymus cinereus</i>  2) <i>Artemisia tridentata</i> ssp. <i>vaseyana</i>-<i>Symphoricarpos oreophilus</i> (snowberry)/<i>Leymus cinereus</i>  3) <i>Prunus virginiana</i>-<i>Symphoricarpos oreophilus</i>  4) <i>Populus tremuloides</i>/<i>Symphoricarpos oreophilus</i>  5) <i>Prunus virginiana</i>-<i>Symphoricarpos oreophilus</i>/<i>Pseudoroegneria spicata</i>  6) <i>Artemisia tridentata</i> ssp. <i>vaseyana</i>/<i>Pseudoroegneria spicata</i></p>
<p><b>Picabo milkvetch (<i>Astragalus oniciformis</i>)</b>  (Moseley and Popovich 1995; Alexander 2001)</p>	<p>Sandy basins, bowls, and flats within rolling basalt on the northern edge of the Snake River Plain. <i>A. oniciformis</i> is frequently found in open grassy areas (often in previously burned patches within <i>Artemisia</i> shrubland) and is rarely found in the understory of late seral <i>Artemisia</i> stands.</p>	<p>At the northern edge of the upper Snake River Plain and at the base of the foothills of the Pioneer Mountains and Picabo Hills.</p>	<p>Sandy loams or uniformly, highly calcareous silt loams overlying basalt plains. <i>A. oniciformis</i> prefers stabilized sandy soils and is never found on unstabilized sand dunes.</p>	<p>Primarily found in the <i>Artemisia tridentata</i> ssp. <i>wyomingensis</i> (Wyoming big sagebrush) / <i>Stipa comata</i> (needle-and-threadgrass) habitat type, but also <i>Artemisia tripartita</i>/<i>Pseudoroegneria spicata</i>. Common associates are <i>Oryzopsis hymenoides</i>, <i>A. tridentata</i> ssp. <i>tridentata</i>, and <i>Chrysothamnus</i> sp.</p>

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**

<b>BIRDS</b>		
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
<b>MAMMALS</b>		
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	Nuttall's cottontail	Least chipmunk
Badger	Northern pocket gopher	Red fox
Kit fox		
<b>REPTILES &amp; AMPHIBIANS</b>		
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 north-east 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 plants, 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 (ICDC 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**

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



Species	Status		
	Federal	BLM	Idaho
Brewer's blackbird ( <i>Euphagus cyanocephalus</i> )		W	
Cassin's finch ( <i>Carposdacus cassinii</i> )		W	
<b>REPTILES &amp; AMPHIBIANS</b>			
Western night snake ( <i>Hypsiglena torquata</i> )		S	
Western toad ( <i>Bufo boreas</i> )	I	S	S
Short-horned lizard ( <i>Phrynosoma douglassi</i> )	I		
<b>INVERTEBRATES</b>			
Idaho dunes tiger beetle ( <i>Cicindela arenicola</i> )	I	S	
Blind cave leiodid beetle ( <i>Glacivicola bathysciodes</i> )	I	S	
Idaho pointheaded grasshopper ( <i>Arolophitus pulchellus</i> )	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 wind-blown 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 wild-land burning is PM<sub>10</sub>, and 90 percent of PM<sub>10</sub> is PM<sub>2.5</sub> (Ward and Hardy 1991). In 2001, the PM<sub>2.5</sub> annual average within the Monument was 2.8 micrograms per cubic meter ( $\mu\text{g}/\text{m}^3$ ) (Visibility Information Exchange Web System: <http://vista.cira.colostate.edu/views/Default.htm>), compared with the national health-based standard of 15  $\mu\text{g}/\text{m}^3$ .

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 (PM<sub>10</sub>).

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) com-

pared 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 dis-

turbed 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**

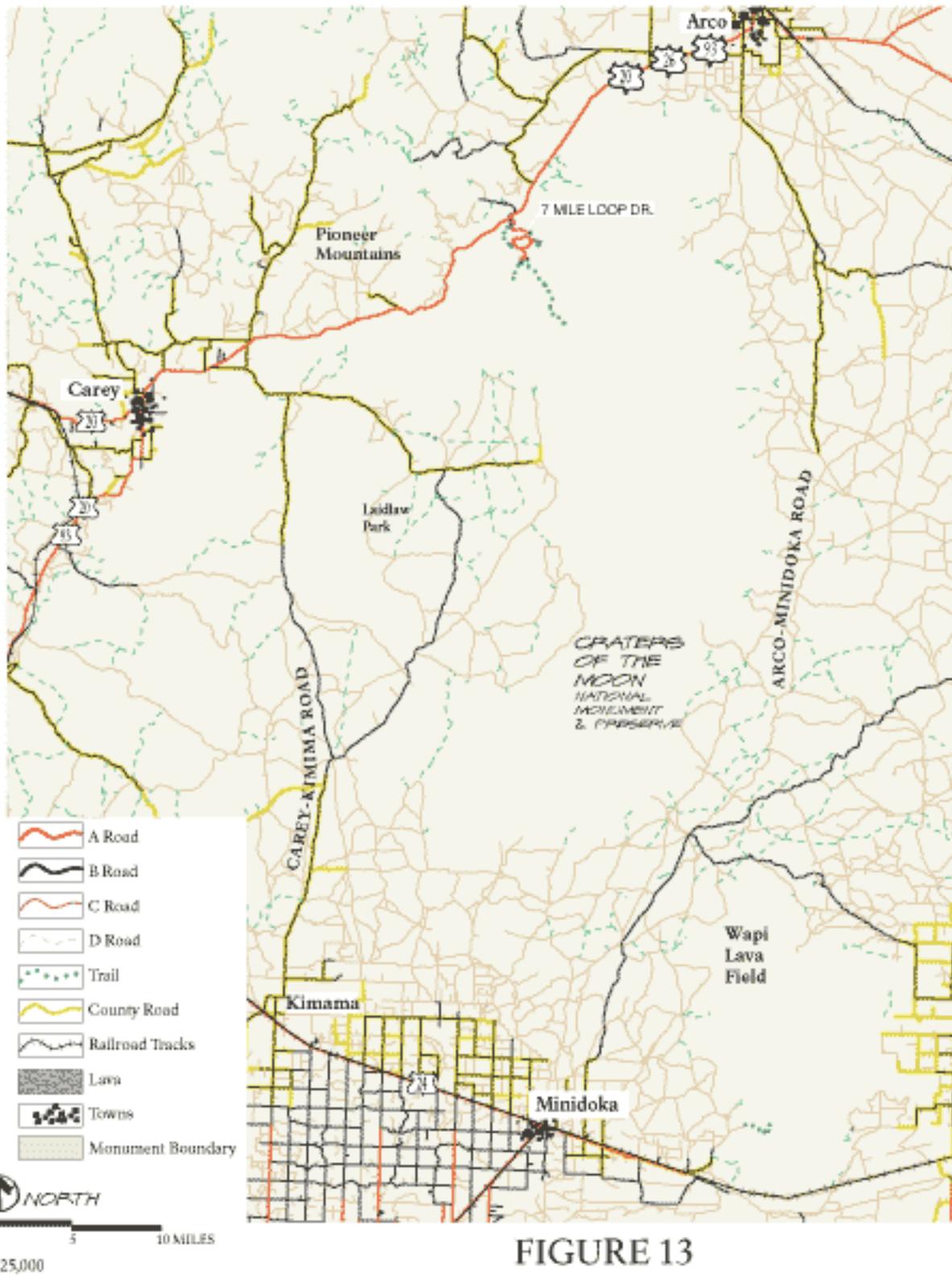
One of the most important issues to be considered in this planning effort is the amount and type of access to and through the Monument. Figure 13 depicts the current road network in the planning area.

### **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.





**FIGURE 13**  
**Transportation Network**

Craters of the Moon National Monument & Preserve  
U.S. Department of the Interior / National Park Service  
DSC • Feb 04 • 131 • 20/50

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. Property and Passage Zone polygons have been overlaid for graphic presentation and are not to scale.

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 (wheel-chairs 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.