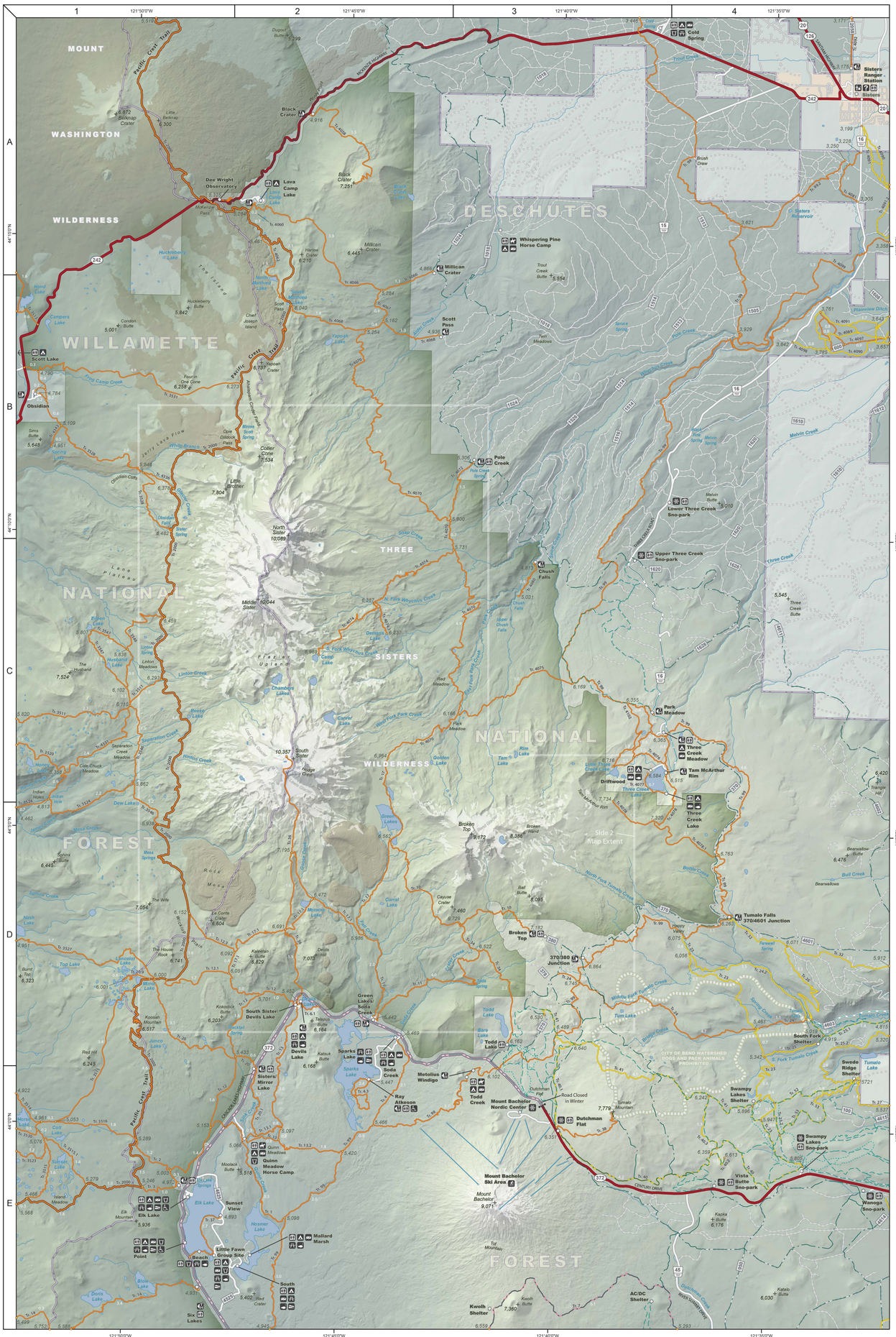


LEGEND

- Highway
- Seasonal Highway
- Improved Road
- Unimproved Road
- Trail
- Pacific Crest National Scenic Trail
- Mountain Bike Trail
- All-Terrain Vehicle / Snowmobile Trail
- Snowmobile Trail
- Cross-Country Ski Trail
- Snowshoe Trail
- Mount Bachelor Ski Lift
- Watershed Boundary
- Seasonal Gate
- U.S. Highway (20)
- Oregon State Highway (126)
- Forest Service Road (16 / 1513)
- 6,517 Lidar-Derived Elevation (feet)
- 5,936 U. S. Geological Survey Elevation (feet)
- 4,945 Trail Elevation (feet)
- Trail Number (Tr. 14)
- Trail Segment Mileage (1.2)
- Sisters City Limit
- Private Land
- National Forest
- Wilderness Area
- Exposed Lava Flow
- Information
- Ranger Station
- Universal Access
- Restroom
- Trailhead
- Drinking Water
- Campground
- RV Camping
- Horse Camp
- Picnic Area
- Boat Launch
- Fishing Area
- Sno-Park
- Alpine Ski Area

Scale 1:63,360

0 0.5 1 1.5 2 Miles

0 0.5 1 1.5 2 Kilometers

N MN 2012 15.5° Magnetic Declination

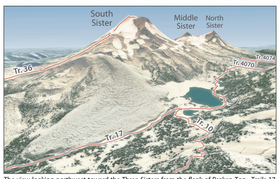
Map coordinates in degrees, minutes, seconds

SELECTED TRAILS

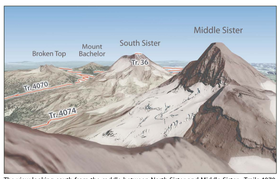
Trail No.	Trail Name	Mileage	Map Location
2	Horse Lake	1.5	E1
8	Island Meadow	1.0	E1
10	Broken Top	4.9 *	D2, D3
11	Soda Creek	4.0 *	D2, D3
12	Elk Devils	5.6 *	D2, E1
12.1	Wickiup Plains	2.7 *	D1, D2
12.3	Lava Cast	1.3 *	D1
14	Six Lakes	5.3	E1
17	Green Lakes (South)	6.3 *	C2, D2
17.1	Moraine Lake	4.3 *	D1, D2
20	Mirror Lakes	3.7 *	D1
20.1	Sink Lake	2.0 *	D2, E2
20.9	Mirror Lakes Uper	0.8 *	D1
34	Todd	3.2 *	D3
36	South Sister	5.9 *	C2, D2
2000	Pacific Crest Trail	39.1 *	A-E1, A2, B2
3511	Foley Ridge	8.5	C1
3515	Red Hill	5.8	D1, E1
3515.1	Sunset Lake	1.4	E1
3516	Horse Lake	1.8	E1
3520	Louise Creek	9.2	C1
3524	Separation Creek	7.2	C1, D1
3527	Nash Lake	8.5	D1
3528	Obsidian	5.5	B1
3531	Scott	5.2	B1
3546	James Creek	6.1 *	C1
3547	Eileen Lake	2.4 *	C1
4058	Black Crater	3.5 *	A2
4062	North Matthieu Lake	1.9 *	A2, B2
4066	Millican Crater	5.0 *	A2, B2
4068	Scott Pass	3.5 *	B2
4070	Green Lakes (North)	14.3 *	B2, C2
4072	Pole Creek	1.5 *	B3
4074	Camp Lake	4.9 *	C2
4074.1	Demaris Lake	0.7 *	C2
4075	Park Meadow	3.0 *	C3
4078	Tam McArthur Rim	2.7 *	C3, C4, D3, D4
4080	Chush Falls	0.9 *	C3
4331	Separation Meadow	2.4	C1
4336	Glacier Way	0.8 *	B1
4343	Substitute Point	0.5	B1
1	Quinn Creek	3.3 *	E2
4	Sparks Lake	2.1 *	D2, E2
4.3	Ray Atkeson Memorial	2.4 *	E2
6.1	Devils Lake	0.6 *	D2
13	Katsuk Pond	4.0 *	D2, E2
13.1	Quinn Springs	0.8 *	E2
13.2	Appaloosa	1.8 *	E2
23	Swampy Lakes	7.8 *	D4, E4
23.2	Swampy Lakes Loop	1.3 *	E4
24	Bridge Creek	6.3 *	D3, E3, E4
24.2	North Fork	3.5 *	D4
25	South Fork	1.8 *	D4
25.1	Tumalo Creek	2.2	D4
25.2	Tumalo Ridge	4.7	D4, E4
26	Farewell	3.3 *	D4
32	Mwank	11.5	D4
37	Elk Lake	1.7 *	E1
38	Tumalo Mountain	2.1 *	E3
40	Swampy Dutchman	7.1 *	E3, E4
40.1	Flagline Access	2.1 *	E3
40.2	Vista Butte	0.5 *	E4
40.3	Flagline Tie	1.3 *	E4
41	Flagline	6.6 *	D3, D4, E4
52	Swede Ridge	1.8 *	E4
53	Swede Ridge Loop	.41 *	E4
99	Metolius-Windigo	46.7 *	A-E3, A-D4, E2
99.2	Whychus Creek Met.-Wind.	2.8 *	A4
4076	Little Three Creek Lake	1.4 *	C3
4077	Three Creek Lake	0.7 *	C3
4081	Whychus Creek Foot Trail	1.4 *	A4
4102	Park Meadow Tie	1.9 *	C3

* Indicates lidar-derived mileage. Non-lidar-derived mileage may include parts of trails that extend beyond the extent of the map. Mileages for trails 99 and 2000 are from the north map extent to the south map extent.

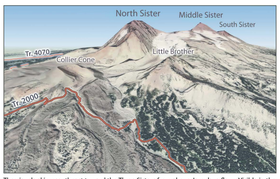
LIDAR-DERIVED IMAGERY



The view looking northwest toward the Three Sisters from the flank of Broken Top. Trails 17 (Green Lakes South), 36 (South Sister), 10 (Broken Top), and 4070 (Green Lakes North) are visible from this vantage point. The massive lava flow left of center in the image is approximately 2,000 years old.



The view looking south from the saddle between North Sister and Middle Sister. Trails 4070 (Green Lakes North), 4074 (Camp Lake), and the terminus of trail 36 (South Sister) at the summit of South Sister are visible from this vantage point. Hayden Glacier is right of center in the image on the eastern face of Middle Sister.



The view looking southeast toward the Three Sisters from above Jerry lava flow. Visible in the image are trail 2000 (Pacific Crest Trail) and trail 4070 (Green Lakes North) as well as Collier Cone and its associated lava flows. Collier Glacier can be seen above Little Brother in the image.

THREE SISTERS REGION

from USFS (www.fs.usda.gov/centraloregon/)

Major Cascade Range peaks in the Three Sisters region include the North, Middle, and South Sisters (all above 10,000 feet elevation), Broken Top (9,172 ft elev.), and Mount Bachelor (9,071 ft elev.). This region is home to 17 of Oregon's named glaciers. Other geologic features include massive lava fields such as Rock Mesa (D1, D2) and smaller volcanoes such as Collier Cone (B2), Black Crater (A2), and Yapoah Crater (B2).

Forest in this region consists mainly of Douglas fir, silver fir, subalpine fir, mountain hemlock, western hemlock, lodgepole pine, and ponderosa pine. Alpine meadows, waterfalls, lava fields, and glacial lakes are abundant. Fish populations include brook and rainbow trout.

The Three Sisters Wilderness area, in Deschutes and Willamette National Forests, covers 286,708 acres. There are approximately 260 miles of trail within the wilderness. The Pacific Crest National Scenic Trail traverses the wilderness for about 40 miles. Most trails entering the wilderness begin in dense forests of Douglas fir on the western slopes of the Cascades or in ponderosa pine on the eastern slopes.

Please contact the U.S. Forest Service (www.fs.usda.gov/centraloregon/) for current information regarding national forest and wilderness rules, regulations, and trail conditions.

Recreation

Popular recreational pursuits in the Deschutes and Willamette National Forests include hiking, backpacking, mountaineering, mountain biking, cross-country and downhill skiing, snowboarding, snowshoeing, horseback riding, snowmobiling, hunting, fishing, and canoeing.

A snowboarder takes a break on the slopes of Mount Bachelor. The Three Sisters and Broken Top can be seen in the background.

Scenery

With picturesque volcanoes and alpine lakes, the peaks of the Three Sisters Wilderness are a photographer's dreamland. In late summer wildflower meadows brighten the mountains; in autumn bright yellow larches and fiery-red vine maples light up the forests.

A meadow of lupine in the Three Sisters Wilderness.

Flora and Fauna

The Deschutes and Willamette National Forests are home to many subalpine and alpine plant and animal species. Many of these species are adapted to living in the harsh microclimates of the sparsely vegetated high-elevation zones.

Whitebark pine, foreground, is common in the higher elevations of the Three Sisters Wilderness. Middle Sister and North Sister can be seen in the background.

GEOLOGY

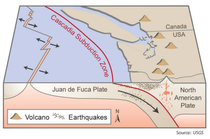
Lava bombs along a ridge overlooking the Three Sisters. From left: South Sister, Middle Sister, and North Sister.

Introduction

The Three Sisters region of the Cascade Range contains many of Oregon's more prominent volcanic peaks, including the Three Sisters, Broken Top, and Mount Bachelor. The Three Sisters volcanoes, rising to more than 10,000 feet above sea level, were originally named Mount Faith (North Sister), Mount Hope (Middle Sister), and Mount Charity (South Sister), by members of Salem's Methodist Mission in the mid-1800s. This spectacular mountain terrain, shaped by volcanism and glacial ice, is a haven for outdoor enthusiasts from all parts of Oregon. While the Three Sisters region presents an abundance of recreational opportunities, the volcanic processes that built the landscape present a suite of potential hazards for travelers and nearby communities. Periodic eruptions have occurred in the region in the past tens of thousands of years and are likely to inundate parts of the region in the future.

Cascade Volcanoes

The Three Sisters region is home to a large concentration of major volcanoes in the Cascade Range, a north-south trending mountain range extending from southern British Columbia to northern California. The glacier-covered volcanic peaks of the Cascades commonly stand a mile or more above the surrounding land, making them distinctive among mountains in the contiguous United States. These volcanoes are often isolated from each other, allowing individual peaks to visually dominate the landscape for 50 to 100 miles in every direction. The chain of volcanoes that makes up the Cascade Range is the result of long-lived plate tectonic interactions in the region. The Cascade volcanoes lie to the east of and parallel to the offshore Cascadia subduction zone, which marks the collisional boundary between the Juan de Fuca plate on the west and the North American plate on the east. As the eastward moving Juan de Fuca plate plunges, or "subducts," beneath the westward moving North American plate at rates of 1 to 4 inches per year, melting of crustal rocks occurs above the subducting plate at a depth of about 25 miles. The resulting pockets of magma may ascend through weak zones such as fractures and faults. Magma that reaches shallow parts of the Earth's surface may erupt explosively (pyroclastic eruptions) or ooze quietly (lava flows) depending on magma chemistry, gas content, temperature, and pressure conditions.



Source: USGS

Broken Top (elev. 9,172 ft), a composite volcano southwest of Sisters, Oregon.

The type of volcano produced by an eruption is generally controlled by the silica content of the lava it erupts. Silica or silicon dioxide is the same chemical compound that occurs naturally as quartz. Lava with low silica content is relatively fluid and can spread out over large distances to produce a very broad volcanic cone, or shield volcano, whereas lava with intermediate and higher silica content is more viscous and tends to accumulate around the volcanic vent and produce a steep volcanic cone. The tall volcanic peaks in the Cascades are predominantly composed of lavas with an intermediate composition called andesite and dacite. In addition to being more viscous, lavas of this type have a tendency to trap gas. This trapped gas can produce violent explosions as the molten rock nears the surface and pressure decreases. The released gas propels lava and preexisting rock into the air, producing pyroclastic (literally "fire fragments") material. Because volcanoes of intermediate silica composition can produce both lava flows and explosive eruptions, they are typically composed of alternating layers, or strata, of these materials. Volcanoes built by these eruptions are called composite volcanoes.

The Three Sisters region has the largest concentration of glaciers in the Central Oregon Cascades, with 17 named glaciers on the Three Sisters and Broken Top. Many glaciers in the Cascade Range have lost both volume and surface area in the past century. Collier Glacier, between Middle Sister and North Sister, was once Oregon's largest glacier. It now covers less than half of the surface area it did 100 years ago.

South Sister (elev. 10,357 ft), a composite volcano southwest of Sisters, Oregon.

Volcanic Deposits and Hazards

Source: USGS

LAVA FLOWS and DOMES — Lava is molten rock that flows onto the Earth's surface. Lava flows move downslope away from a vent and bury or burn everything in their paths. Lava domes form when lava piles up over a vent.

PYROCLASTIC FLOWS — Pyroclastic flows are high speed avalanches of hot rock, gas, and volcanic ash that are formed by the collapse of lava domes or eruption columns. They can move up to 100 miles per hour and have temperatures to 1,500 °F. They are lethal, burning, burying, or asphyxiating all in their paths.

TEPHRA — Explosive eruptions blast lava fragments (tephra) and gas into the air. Tephra can also be carried aloft in billowing volcanic ash clouds above pyroclastic flows. Large fragments fall to the ground close to the volcano, but smaller fragments (volcanic ash) can travel hundreds to thousands of miles downwind.

DEBRIS AVALANCHES and LAHARS — Debris avalanches are rapidly moving landslides of rock, soil, and overlying vegetation, snow, or ice. They can bury or smash objects in their path. All or some portion of debris avalanches can transform into lahars. Lahars are fast-moving slurries of rock, mud, and water that move down river valleys. They can bury, move, or smash objects in their path. Lahars form when pyroclastic flows melt snow or ice, or by the transformation of debris avalanches, or by mobilization of loose debris on the flanks of volcanoes.

Eruptive History of the Three Sisters Region

The Three Sisters region has five large volcanic cones of Quaternary age (2.58 million years ago to present) — North Sister (10,089 ft. elev.), Middle Sister (10,044 ft. elev.), South Sister (10,357 ft. elev.), Broken Top (9,172 ft. elev.), and Mount Bachelor (9,071 ft. elev.). This area has been a center of volcanic activity for at least the past 700,000 years. Its cluster of large composite cones makes it different from other areas of the High Cascades, where these types of volcanoes are more distant from one another.

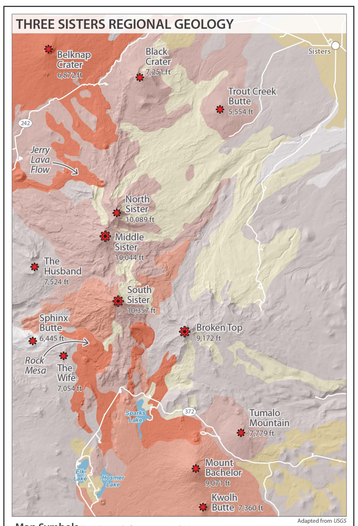
Broken Top and North Sister have likely been inactive for the last 100,000 years. Heavily eroded Broken Top is a complex composite cone, made up mostly of basaltic andesite. In the past, however, it also erupted andesite, dacite, and rhyolite as lava flows, pyroclastic flows, and pyroclastic falls. North Sister, the oldest of the Three Sisters, is a shield volcano made up mostly of basaltic andesite. Middle Sister, a complex composite volcano similar in composition to South Sister, last erupted about 14,000 years ago. Mount Bachelor, another shield volcano, originally formed 15,000–18,000 years ago and last erupted 8,000–10,000 years ago. South Sister, a basaltic andesite composite cone, is more than 25,000 years old but has had rhyolite eruptions from its southern side as recently as 2,000 years ago. The evidence of these eruptions can be seen today in the many lava domes south of the mountain, including massive Rock Mesa (see Figure A).

This region has experienced much greater eruptions in the past 700,000 years. During this period, four massive eruptions sent pyroclastic flows over a large area, including the present-day communities of Sisters and Bend. Deposits from these events are up to 43 feet thick in areas close to the volcano and have been traced as far away as northern California. Volcanic events like these could be catastrophic today but, fortunately, do not occur very often. For more information on volcanic activity in this region, see the "Future Volcanic Activity" section below the map.

Hikers in the Three Sisters Wilderness with Ball Butte (elev. 8,095 ft), in the background.

Mount Bachelor (elev. 9,071 ft), a shield volcano west of Bend, Oregon.

View from the Tam McArthur Rim Trail #4078. From left: Broken Top (elev. 9,172 ft), South Sister (elev. 10,357 ft), Middle Sister (elev. 10,044 ft), and North Sister (elev. 10,089).



Adapted from USGS

Figure A. Lidar-derived imagery. View looking to the northeast over Rock Mesa lava flow toward South Sister. Rock Mesa, a rhyolite lava flow, is a result of the most recent eruptive events in this region. It erupted about 2,000 years ago from a vent on the southwestern flank of South Sister.

FUTURE VOLCANIC ACTIVITY

As part of the public education program at the Oregon Department of Geology and Mineral Industries, this map and guide have been prepared for the Three Sisters region. The topographic base is from high-resolution lidar (light detection and ranging) data collected from airborne platforms. The lidar data were used to produce a bare-earth digital elevation model (DEM) that removes the effects of vegetation and human-made structures. The topographic and geologic features in this guide are based on lidar interpretation — a new, highly accurate way to map volcanoes. Lidar data are available online through the OregonGeo Clearinghouse (http://oregongeo.oregon.gov/clearinghouse.htm). Lidar is a mapping technique that uses laser light to measure the distance between the sensor and the ground surface. Lidar data are used to produce digital elevation models (DEMs) that can be processed to remove the effects of vegetation and human-made structures. The DEMs can be processed to produce shaded relief images that show the topography of the ground surface.