AVALANCHE ACTIVITY ON US HIGHWAY 12

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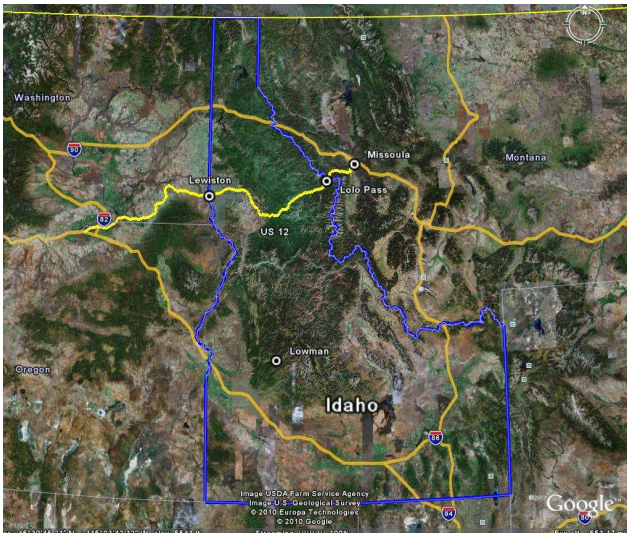

Fig. 1.US 12 as it runs through Idaho

1. Location

US route 12 is a federal highway that runs through Idaho from Lewiston on the Washington border to Lolo Pass, on the border with Montana. In Idaho highway 12 serves as the primary road for local traffic between Lewiston and Missoula, MT and as an alternate for I-90. From Lowell Id, to the Idaho-Montana border at Lolo Pass, the road follows the Lochsa River through seventy seven miles of remote, mountainous terrain in the Clearwater National Forest. Also known as the Lewis and Clark Scenic byway, it is the closest paved highway to the route taken by the explorers through this country in the early 1800's.

2. Historical Background

The US Army Expedition of Merriwether Lewis and William Clark relied on local experts when they travelled through this area in 1805 and 1806. Their native guides of Nez Perce and Shoshoni tribes used ancient trails which had been established on the ridgetops between the buffalo hunting country of western Montana, and salmon fishing rivers in central Idaho. These ridgetop trails, later known as the Lolo Historic Trail, avoided the heavy undergrowth and downed timber along the Lochsa river, but were very steep and often closed by snow in all but July and August.

In the 1930's the Civilian Conservation Corps expanded the Lolo Historic Trail for motorized travel, and it became known as the Lolo Motorway. This narrow gravel road was the travel route between the small logging towns of the upper Clearwater (Orofino, Kamiah, and Kooskia) and Missoula, but remained difficult to travel most of the year due to the lasting snows at the higher elevations. The section of Highway 12 between Lolo Pass and Lowell, Idaho was finished in 1962 bringing the main travel corridor down from the historic location at the ridgetops, to the river bottom.

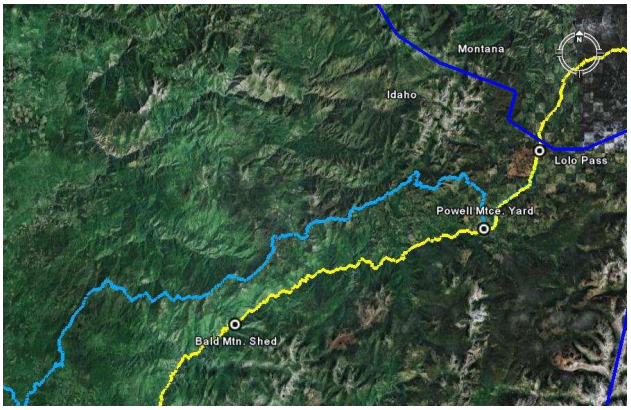

Fig. 2. Historic Lolo Trail, route of Lewis and Clark in 1805, 1806 (blue), US 12 established in 1962 (yellow)

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The New York Ti

9,051. © 1964 by The New York Times Company. Times Square, New York, N. Y. 10036 NEW YORK, THURSDAY, DECEMBER 24, 1964

Thousands Flee Floods in West; 11 Killed

Slides in California, Oregon and Idaho Add to Havoc

By United Press International

SAN FRANCISCO, Dec. 23—The worst floods in years swamped the Far West today, leaving thousands homeless or stranded. Debris-filled flood waters receded in some places, but other areas braced for possible further disaster.

At least 11 persons have died in two days of wind and rain in Northern California, Oregon and Idaho. The storm, spawned by a rare, warm tropical air mass moving in from Hawaii, came on the heels of a blizzard that raced across the Northern prairies last week.

"In terms of totality and involvement of the entire state, this is the greatest disaster ever to hit Oregon," Gov. Mark O. Hatfield said.

New weather bulletins predicting less rain brought optimism to some areas, but elsewhere, especially in Oregon, rising rivers and streams caused increasing concern.

"At this time, it appears that the worst is over in California, but the picture could change at any time," said

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50 ARE STRANDED BY IDAHO SLIDES

Face Second Night in Cold —Copter Rescues 12

KOOSKIA, Idaho, Dec. 23 (AP)—About 50 motorists and truckers stranded in a remote mountain valley between two massive snowslides tonight faced their second—and probably coldest—night in the Idaho wilderness.

A helicopter sent to airlift the occupants of six autos and four trucks managed to fly a man and 11 women and children to comparative comfort at a ranger station before the craft was grounded by high winds and fog.

Nine children under 10 years of age were reported in the original group.

One rescue worker, John Nock, 37 years old, of Grangeville, Idaho, lost his life when the bulldozer he was operating tumbled into the Lochsa River. He was attempting to clear the slide on U.S. 12 about 60 miles east of here. His body was not recovered.

Freezing temperatures were forecast for the area tonight, but a report from the helicopter before it was grounded indicated that fires were being built by those stranded. None was reported seriously hurt, and food was thought to be available in the isolated trucks.

Another, smaller slide, farther west, trapped four more cars tonight.

An undetermined number of those caught in the slide managed to walk out over the debris. They were identified only as members of an Indian basketball team from Poplar, Mont. They were lodged at a highway department station.

Highway officials said two bulldozers reached the slide area today, but it would take at least five hours to reach the main group of marooned motorists. Numerous slides and washouts along the highway, through one of the nation's largest wilderness areas, hampered rescue crews who have been trying to free the marooned group since they were trapped late yesterday.

Earlier, officials feared to make an attempt at a helicopter rescue because the vibration might start more slides and endanger lives. The cars are trapped in a canyon with sheer walls of 2,000 feet on either side.

The cars were trapped at about 5 P.M. yesterday when rock and snow loosened by rainfall of up to two inches and temperatures in the 40's piled 100 feet wide and six feet deep on one side of the roadway, also known as the Lewis and Clark Highway.

As the vehicles backed slowly away another, bigger slide farther west tumbled onto the road, trapping them.

Fig. 3. A portion of New York Times coverage of the 1964 avalanche cycle on US 12 and related weather events in the western US

In Other Headlines
Idaho Daily Statesman
December 24-25, 1964

Avalanches close Galena Pass (near Ketchum, Idaho)

Avalanche traps 10 at a mine Fairfield Idaho

Rain on record snowfall in McCall, Idaho causes flooding

Heavy rains close Brundage Mtn, Bogus Basin ski areas

Avalanches close Snoqualmie Pass

Avalanches on Loveland Pass encase one car and sweep off another

3. Activity history

The lower elevation of the new Highway 12 corridor made winter maintenance possible; however the new travel corridor had some unanticipated characteristics. In 1964, two days before Christmas, an avalanche cycle closed the road and avalanche debris trapped 48 people in the canyon for two days. The weather preceding the cycle was very cold with record snow accumulations followed by what is commonly known as a "Pineapple Express" -- a warm, wet system tracking in from Hawaii. The storm that produced this avalanche cycle on Highway 12 also caused major flooding in California, Nevada, Oregon, and Idaho.

In subsequent years, avalanche activity was relatively minor, primarily small bank releases and a semi-annual small avalanche near Lolo Pass

known to the maintenance crew as 'Old Faithful'. Maintenance foremen and crews made informal assessments of the weather and snowpack conditions, and were able to anticipate and appropriately respond to activity on the small, frequent bank slides and 'Old Faithful', but no formal avalanche forecasting program existed for this road. This informal system seemed adequate for over forty years, until another large avalanche cycle affected Highway 12 in February 2008.

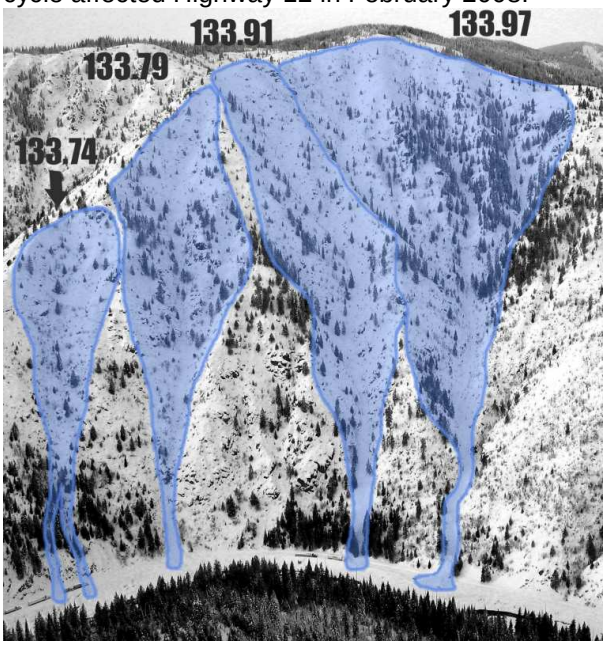


Fig. 4. The numbers above identify the avalanche paths (highlighted in blue) by highway mileage. The first path to slide in this cycle was 133.97, effectively closing the road. The semi pushed into the river was parked at 133.79. February 2, 2008.

On January 31, 2008 a large snowstorm arrived in the Clearwater and Bitterroot Mountains. Maintenance crews on Highway 12 were unable to keep the road clear due to the high precipitation rate, and the decision was made to close the road. During the process of closing and sweeping the 77 miles of roadway between the closure gates, the first of four large avalanches blocked the road, trapping eleven tractor-trailer rigs. The consensus among the truck drivers was that since a good turn-around spot was a number of miles behind them, they'd spend the night there near the avalanche and be ready to get on their way in the morning when the maintenance crews pushed the road open. Maintenance workers stuck on the far side of the avalanche debris suggested to some of the truck drivers that their rigs were parked in a poor spot and that they should back the rigs around the corner to a better location. For some reason, the trucks remained parked where they were through the night. Snowfall continued and several more avalanches released into the roadway. Two of the trucks were bumped by avalanche debris during the night, and one of the drivers chose to spend the night in a different truck back down the road. In the morning he returned to his truck, took some photos of the avalanche debris there, and got back inside. It continued to snow. A short time later another release from this path pushed his loaded tractor-trailer into the Lochsa River. The driver reported that the truck rolled 1 ¼ times ending up on its side. He kicked out a window and pulled some snow into the cab, and was able to escape uninjured.

Fig. 5. Crews excavating the truck for removal from the Lochsa River.

All the truck drivers were evacuated, and the road remained closed as there were large debris piles at several other locations in the travel corridor.

As it always does, the snow eventually stopped and cleanup began. Once it was safe to work in the runout zones, heavy equipment removed the

Fig. 6. Heavy equipment removing avalanche debris. February 7, 2008

debris and the trucks rolled out. Several fifty year old trees were found in the dirty debris, which also contained rocks and slowed opening the road. Investigations at the ridgetop starting zones found a buried surface hoar layer at the failure plane under 4-9 feet of windblown snow on the lee side of the ridge, in addition to high precipitation rates likely causing the slides. By the time the road was cleaned up and ready to open, another large snowstorm was forecast for the area. Knowing that a deeply buried weak layer was present in the snowpack, the road was left closed through this second storm. This system was warm and wet, and caused three more large avalanches, the largest leaving 22 feet of debris on the roadway, again containing several fifty year old trees.

Fig. 7. This pile was 22' deep on the roadway. Rocks and trees in the debris made clean up difficult. This slide occurred during the second avalanche cycle, 2008. February 14, 2008

4. ITD Avalanche Hazard Mitigation

Because the route of Highway 12 is relatively new and there are only forty years of recorded history for the avalanche terrain adjacent to the road, it is difficult to judge the return interval for major avalanche activity. Most of the slide paths are not visible from the road due to the dense forest. The dense timber in the area does provide distinct trimlines, which have been useful for identifying much of the avalanche terrain that affects the road.

The close call in February 2008 was an effective reminder that large avalanche cycles are possible on Highway 12 when weak a snowpack is subject to extreme weather events. The corridor has been re-evaluated for avalanche terrain and an atlas for the area is being developed. Sections of road

Fig. 8. Most of this path is not visible from the road. Distinct trimlines show the historic reach of this avalanche path. It is possible that many of the paths on US 12 are regularly active, only debris does not reach the road and so the activity has gone undocumented.

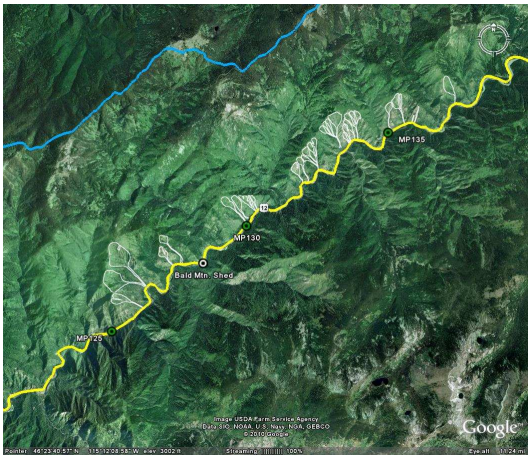
under high hazard terrain have been marked so that maintenance workers can become familiar with locations of avalanche terrain which is typically veiled by heavy timber. Training classes for the maintenance workers on Highway 12 have been improved to include specific information about avalanche terrain affecting the highway, increased attention to weather trends, and the use of rescue equipment and techniques.

Avalanche Hazard on Highway 12 remains mitigated primarily through forecasting and closure, however the forecasting program has seen some changes. The remote location of this section of Highway 12 has very little for automated weather stations, so plow operators stationed at Powell record daily weather observations of temperature, water weight of precipitation, and wind. The data is then posted to a site on the Department computer network. This information is pulled up in the ITD Avalanche Forecast Office in Lowman, Idaho (300 miles from the Powell

Fig. 7. Re-opening a road closed due to avalanche hazard.

Maintenance Shed), where avalanche forecasters review and plot the weather information. The National Weather Service now produces a daily site-specific weather forecast for the US 12 corridor, similar to that produced for Idaho State Highway 21, and Big and Little Cottonwood Canyons in Utah. Avalanche forecasters in Lowman develop a daily avalanche hazard forecast for US 12 using this daily weather history at Powell, the site-specific National Weather Service forecast, and snowpack information gathered during regular visits to US 12. Avalanche forecasters make additional trips as needed to be present for large storm cycles, and communicate with the maintenance foreman and crews through regular conference calls.

US 12 Avalanche Terrain



The paths outlined in the map above represent the avalanche terrain that has the highest potential to affect US 12.

Some, but not all of these paths were active in the cycles of 1964 and 2008. Most were identified from the air by historic trim lines, which are easily apparent in this densely timbered area. The road elevation (in yellow above) rises from 2100' to 2700'. Starting zones for these paths vary in elevation from 3000' to 5000'; paths run 800-2400' vertical drop. Aspect varies but is largely from east through southwest.

A portion of the historic travel route, the Lolo Trail or Lolo Motorway is visible on this map (in blue), on a ridgetop north of the current highway location. The elevation of this section of historic road is 5000-7000'.