

## GNFAC 2019-2020 mid-winter snowpack summary: Deep and dangerous avalanches, travel cautiously.

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Every year throughout the Rocky Mountains we warn that early season snow is not good for stability. Some years are worse than others. In my experience, this year is one of the worst. We will likely be dealing with a deep slab avalanche problem for at least the next month, as long as the mountains receive more snow. There is weak snow near the base of the snowpack, and it is distributed across terrain differently throughout the advisory area. Our website is full of photos, recent avalanche activity and snowpack videos to show where persistent weak layers are most suspect and types of terrain to avoid. This summary supplements that information and suggests general travel advice.

In southwest Montana the first snow in the mountains was September 21<sup>st</sup>. 3-9" of snow was enough to create small wet loose avalanches when the sun came out ([photos](#)). In early October another round of storms increased snow depth to 1-2 feet with the deepest in Hyalite and near Cooke City. Small storms for a couple weeks at the end of October added 1-3 feet of snow with up to 5 feet in Hyalite.

November started with settled snow depths of 1-1.5 feet (30-50 cm) near West Yellowstone, Big Sky and in the Bridger Range, and 2-3 feet in Hyalite and Cooke City (60-90 cm). The mountains got 6-12" with 2 feet in Hyalite at the start of November, and then were dry with periods of warm temperatures through Thanksgiving. The shallow snowpack became weak and faceted with various crusts. Avalanches broke on these layers as the snowpack grew deeper ([photo](#), [photo](#), [photo](#)), and large avalanches are expected to break deep on these layers through the season.

The mountains got 2-4 feet of snow over the first couple weeks of December, then were mostly dry until the New Year. During the second half of December avalanche danger was Low in the mountains near Bozeman and Moderate elsewhere. Near West Yellowstone heavy snow on Christmas Day spiked danger to High for a day. To start 2020 the mountains received steady snowfall which brought danger to High and Considerable on January 2<sup>nd</sup>. Through January 20<sup>th</sup> danger was between considerable and moderate, as small storms added up and increased the snowpack by 50-80% since the first of the year.

We saw three snowmobile triggered avalanches with crowns 10-15 feet deep during the first half of January ([photo](#)). Dozens more were triggered by skiers or riders and were larger than enough to bury a person. There were more than 50 natural or human triggered avalanches reported on 17 of the first 20 days of 2020 ([info and photos](#)). Storms gradually added up and human triggered avalanches broke deeper and larger. There were eventually fewer warning signs like collapsing or natural avalanches, but snowpack structure remained poor and human triggered avalanches continued. Most avalanches were triggered on persistent weak layers near

the ground and on heavily wind loaded slopes. The biggest were on slopes where many small snowstorms were drifted into thick, heavy slabs by strong southwesterly winds.

Since daily forecasts began on November 30<sup>th</sup> we did not issue any avalanche warnings. There were six days with High danger somewhere, and 15 days with Low danger in the mountains near Bozeman. Near West Yellowstone, Big Sky and Cooke City danger was at least Moderate every day through the date of writing this (January 25<sup>th</sup>), except one day with Low danger near Cooke City. Loading events were relatively small storms followed by steady wind. This has not pushed slopes to break all at once in a widespread natural avalanche cycle, but kept weak layers sensitive to human triggers.

Currently, weak layers are buried 2-4 feet deep under hard slabs which are deeper and harder on wind loaded slopes. The fine balance of these deep slabs is like a weightlifter (weak layer) doing a bench press while increments of weight are added (slab). If weight is added slowly (small storms) the weightlifter can adjust and support the load. At some point the weightlifter will reach maximum capacity and drop the whole bar and weights (deep slab).

If weight is added quickly from a big storm, human trigger or cornice break the weak layer can break easier. Knowing exactly when and where the weak layer is holding a slab close to its breaking point is tricky, so do not jump into steep terrain without very (very) careful snowpack evaluation, if at all.

As persistent weak layers are buried deeper avalanches are more difficult to trigger, but the size and consequences are larger. Avoid avalanche terrain where buried weak layers exist, and avoid heavily wind loaded slopes. Be extra cautious for up to a week following modest storms and wind-loading events.

To determine where weak layers are buried diligently dig through the snowpack and the media on our website. Be wary of stable test results or non-representative pits. As weak layers get deeper stability tests give less reliable results and there are fewer warning signs like collapsing or natural avalanches. Multiple tracks can cross a slope before one finds the weak spot and collapses the whole hillside.

A conservative mindset is essential this season. Big objectives should probably wait until late spring or next season. I am hesitant to ski lines like the face of Saddle Peak or alpine terrain near Beehive Basin, or to sidehill across the big mountains near Big Sky, West Yellowstone and Cooke City. Not this winter. Think carefully about the terrain you plan to ride. If it is avalanche terrain, carefully assess the snowpack and consider the consequences of an avalanche. Ride safe. Come home alive.