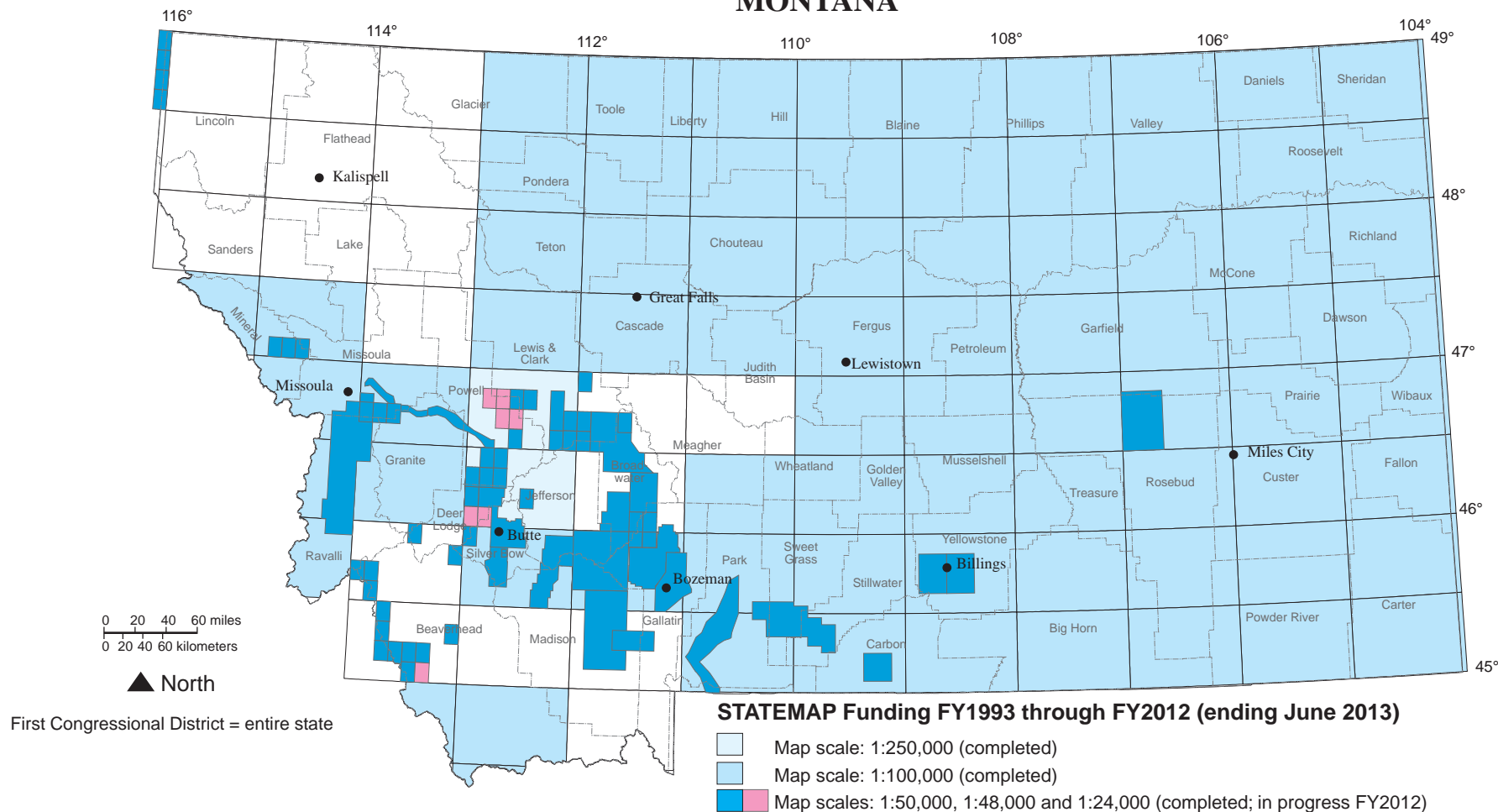




# National Cooperative Geologic Mapping Program

STATEMAP Component: States compete for federal matching funds for geologic mapping

## MONTANA



### Contact information

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**SUMMARY OF STATEMAP GEOLOGIC MAPPING PROGRAM IN MONTANA through FY 2012**

<b>Federal FY</b>	<b>Project Titles – Scale</b>	<b>State</b>	<b>Federal</b>	<b>Total Project</b>
1993	<b>1:100,000:</b> Conrad, Chester, Lonesome Lake, Sweet Grass Hills and Winifred 30' x 60' quadrangles; <b>1:24,000:</b> Teepee Mountain 7.5' quadrangle (not digital)	\$ 159,923.00	\$ 105,000.00	\$ 264,923.00
1994	<b>1:100,000:</b> Bozeman 30' x 60' quadrangle (not digital); <b>1:48,000:</b> Metropolitan Billings area (not digital)	\$ 123,139.00	\$ 110,000.00	\$ 233,139.00
1995	<b>1:100,000:</b> Billings, Bridger, Hamilton, and Nez Perce Pass 30' x 60' quadrangles	\$ 65,492.00	\$ 40,000.00	\$ 105,492.00
1996	<b>1:250,000:</b> Butte 1x2-degree; <b>1:100,000:</b> Glendive, Plentywood, Culbertson, Scobey, Wolf Point, Lodge Grass, and Hardin 30' x 60' quadrangles; <b>1:48,000:</b> Bitterroot Valley	\$ 130,961.00	\$ 120,000.00	\$ 250,961.00
1997	<b>1:100,000:</b> Leadore, and Missoula West 30' x 60' quadrangles	\$ 129,162.00	\$ 120,000.00	\$ 249,162.00
1998	<b>1:100,000:</b> Malta, Glasgow, Winnett, Lewistown, Musselshell, Gardiner, and Wallace 30' x 60' quadrangles	\$ 151,182.00	\$ 120,000.00	\$ 271,182.00
1999	<b>1:100,000:</b> Great Falls South, Roundup, Livingston, Big Timber, and Lima 30' x 60' quadrangles	\$ 100,430.00	\$ 100,000.00	\$ 200,430.00
2000	<b>1:100,000:</b> Harlowton, Red Lodge, Forsyth, Lame Deer, Birney, Miles City, Powderville, Broadus, Baker, Ekalaka, and Alzada 30' x 60' quadrangles	\$ 100,319.00	\$ 100,000.00	\$ 200,319.00
2001	<b>1:100,000:</b> Winifred, Zortman, Dodson, Opheim, Sweet Grass Hills, Conrad, Chester, Lonesome Lake, Belt, Rocky Boy, Valier, Cut Bank, Great Falls North, and Fort Benton 30' x 60' quadrangles; <b>1:50,000:</b> Gallatin Valley East	\$ 235,105.00	\$ 234,809.00	\$ 469,914.00
2002	<b>1:100,000:</b> Whitewater, Harlem, Havre, Richey, Circle, Sidney, Wibaux, Terry, and Philipsburg 30' x 60' quadrangles; <b>1:50,000:</b> Gallatin Valley West, and Paradise Valley; <b>1:24,000:</b> Hellgate Gulch 7.5' quadrangle	\$ 220,302.00	\$ 220,000.00	\$ 440,302.00
2003	<b>1:100,000:</b> Fort Peck Lake E, Fort Peck Lake W, Hysham, Angela, and Ringling 30' x 60' quadrangles; <b>1:50,000:</b> Upper Jefferson Valley, Divide-Melrose area, and Upper Clark Fork Valley; <b>1:24,000:</b> Kelly Lake, and Dickie Hills 7.5' quadrangles	\$ 196,445.00	\$ 196,445.00	\$ 392,890.00
2004	<b>1:100,000:</b> Sand Springs, Jordan, and Melstone 30' x 60' quadrangle; <b>1:50,000:</b> Red Lodge area, and Clark Fork valley; <b>1:24,000:</b> Lozeau, and Tarkio 7.5' quadrangles, and Lost Trail Pass area	\$ 162,127.00	\$ 162,077.00	\$ 324,204.00
2005	<b>1:50,000:</b> Lower Jefferson Valley, Central Madison Valley, and Lower Clark Fork Valley; <b>1:24,000:</b> Stark South 7.5' quadrangle, and Goldstone Pass area	\$ 121,100.00	\$ 121,034.00	\$ 242,134.00
2006	<b>1:100,000:</b> north half of Choteau, and Plains 30' x 60' quadrangles; <b>1:50,000:</b> Radersburg-Toston Basin; <b>1:24,000:</b> south half of Missoula SE and north half of Davis Point 7.5' quadrangles	\$ 122,110.00	\$ 122,037.00	\$ 244,147.00
2007	<b>1:100,000:</b> Choteau 30' x 60' (completion); <b>1:48,000:</b> Porcupine Dome area, <b>1:24,000:</b> Fan Mtn- Lone Mtn- Gallatin Peak 7.5' quadrangles, Homer Youngs Peak 7.5' quadrangle, and Davis Point-Elk Mountain 7.5' quadrangles.	\$ 141,536.00	\$ 141,531.00	\$ 283,067.00
2008	<b>1:48,000:</b> Laurel area; <b>1:24,000:</b> Black Mountain, Iris Point, Bohannon Spring, Kitty Creek 7.5' quadrangles + four 7.5' quadrangles in south Townsend basin	\$ 161,974.00	\$ 162,031.00	\$ 324,005.00
2009	<b>1:100,000:</b> Bozeman (new digital) and Missoula East 30' x 60' quadrangles; <b>1:50,000:</b> Canyon Ferry Lake area; <b>1:24,000:</b> Austin, Silver City, Selway Mountain, and Dickie Peak 7.5' quadrangles. USGS Legacy: <b>1:100,000:</b> Circle 30' x 60' quadrangle; <b>1:24,000:</b> Candle Mountain 7.5' quadrangle.	\$ 237,485.00	\$ 237,265.00	\$ 474,750.00
2010	<b>1:100,000:</b> Butte South 30' x 60', Dearborn River 30' x 60' (new digital); <b>1:24,000:</b> Peterson Lake 7.5', Avon 7.5', Stillwater Complex area (all or parts of fifteen 7.5' quadrangles).	\$ 217,609.00	\$ 217,604.00	\$ 435,213.00
2011	<b>1:50,000:</b> Helena valley (all or parts of four 7.5' quadrangles); <b>1:24,000:</b> Clarkston valley (all or parts of four 7.5' quadrangles); <b>1:24,000:</b> Polaris 7.5', Nevada Mountain 7.5', Granite Butte 7.5', Anaconda North 7.5', Mount Powell 7.5', and Lockhart Meadow 7.5' quadrangles.	\$ 203,638.00	\$ 203,997.00	\$ 407,634.00
2012	<b>1:24,000:</b> Anaconda South 7.5', Coyote Ck 7.5', Finn 7.5', Gravely Mtn 7.5', Jumbo Mtn 7.5', Nevada Lake 7.5', Ophir Ck 7.5', and Opportunity 7.5' quadrangles	\$ 199,487.00	\$ 198,755.00	\$ 398,242.00
<b>TOTALS</b>	One at 1:250,000 scale; seventy-nine at 1:100,000 scale; fourteen at 1:50,000 scale; four at 1:48,000 scale; forty-four at 1:24,000 scale = <b>141 digital maps</b>	<b>\$ 3,179,526.00</b>	<b>\$ 3,032,585.00</b>	<b>\$ 6,212,110.00</b>

### **Geologic Mapping in Montana**

The availability of geologic information for Montana has been significantly advanced by Montana Bureau of Mines & Geology's (MBMG) participation in the STATEMAP part of the National Cooperative Geologic Mapping Program (NCGMP).

Water has always been a primary issue in Montana. Assessment, management and protection of both surface and ground water require good geologic maps. As the state undergoes major demographic changes and the related major shifts in land use, the need for adequate geologic information is even more critical for all the state's resources, land area, and citizens. Modern geologic maps, at a useful scale, are in great demand—by state and federal agencies responsible for management of Montana's water, energy, timber, and minerals; by county and municipal agencies responsible for land-use planning decisions on such matters as residential sites, highway routing, and waste disposal; and by economic-resource developers who must delineate and produce commodities in an environmentally acceptable manner. The maps are being used in ground-water characterization, earthquake hazard evaluation, burn-area remediation, abandoned-mines assessment, location of sand and gravel resources, and many other land- and resource-use issues across the state. Because of the universal need for new maps, MBMG has focused its efforts first at generating coverage for the entire state at a scale of 1:100,000 (1 in. = 1.6 mi.). A second effort, also underway, focuses more locally on the state's urban centers and western valleys that are facing immediate concerns at the interface of available resources and increasing population.

MBMG's production of geologic maps is about 50% dependent upon the funding received through the National Cooperative Geologic Mapping Program. In this 1:1 matching program, MBMG contributes the salary dollars of the geologists; NCGMP dollars provide the geologists' field expenses and the digital expertise to produce the work.

Because MBMG's geologic maps are available online, state and federal agencies, private companies, drillers, ranchers, attorneys, and others have immediate access to the information. Thus, MBMG may have no knowledge of many additional map uses and outcomes.

### **Outcome Statement**

A STATEMAP Advisory Committee member who was serving on the Madison County Planning Board indicated at a committee meeting that a geologic map was needed in the Madison Range, particularly in the area of the Big Sky and Moonlight Basin ski resort areas where increasing human

impact was occurring. Steep mountain slopes, steeply dipping planes of weakness, and moisture from heavy annual snowfall coupled with human activities provide conditions conducive to landslide development in the area. Weak, Cretaceous bentonitic mudstone and shale that underlie much of the area are most prone to failure. The area is proximal to the Yellowstone region, the most seismically active part of the entire Intermountain seismic belt and therefore is within a zone of potential strong to very strong ground shaking which could trigger landslides.

Existing geologic maps did not show the extensive landslide deposits in the area, so planners did not have access to maps that would help their planning decisions. Property sold on undisclosed landslide deposits in the upscale Spanish Peaks development resulted in a recent lawsuit trial with over \$1 million in damages awarded to the two couples who purchased the land.

The STATEMAP Advisory committee recommended mapping three adjacent 7.5' quadrangles that span the Madison Range, with particular attention to geologic hazards in the areas under development. A derivative map for the general public that emphasizes landslide hazards was also prepared on a LiDAR hillshade base. Recent business transactions have combined Big Sky and Moonlight Basin's operations with the goal of creating "one of the largest and most compelling mountain resort experiences in North America" so publication of the STATEMAP geologic map and derivative map of this area is timely.

Bacaj, Jason, 2013, CrossHarbor and Boyne partner to purchase Moonlight: Bozeman Chronicle, August 14, 2013, [http://www.bozemandailychronicle.com/news/economy/article\\_2547e9ba-0564-11e3-93f5-001a4bcf887a.html](http://www.bozemandailychronicle.com/news/economy/article_2547e9ba-0564-11e3-93f5-001a4bcf887a.html) Accessed 9-20-13.

Bermes, Whitney, 2012, Two couples awarded damages in Spanish Peaks landslide trial: Bozeman Chronicle, April 6, 2012, updated May 22, 2013, [http://www.bozemandailychronicle.com/news/crime/article\\_defeddc8-7fa0-11e1-b52e-001a4bcf887a.html](http://www.bozemandailychronicle.com/news/crime/article_defeddc8-7fa0-11e1-b52e-001a4bcf887a.html) Accessed 9-20-13.

Vuke, S.M., 2013, Geologic map of the Fan Mountain, Lone Mountain, and Gallatin Peak 7.5' quadrangles, Madison Range, Madison and Gallatin Counties, Montana: Montana Bureau of Mines and Geology Open-File Report 633, 27 p., scale 1:24,000. [http://www.mbmgt.mtech.edu/mbmgcat/public/ListCitation.asp?pub\\_id=31605&](http://www.mbmgt.mtech.edu/mbmgcat/public/ListCitation.asp?pub_id=31605&)

Vuke, S.M., 2013, Landslide map of the Big Sky area, Gallatin and Madison Counties, Montana: Montana Bureau of Mines and Geology Open-File Report 632, scale 1:24,000. [http://www.mbmgt.mtech.edu/mbmgcat/public/ListCitation.asp?pub\\_id=31603&](http://www.mbmgt.mtech.edu/mbmgcat/public/ListCitation.asp?pub_id=31603&)