4 RESOURCE INVENTORY

4.1 Basin Overview

4.1.1 Location and Climate

The Little Salmon River basin is located in the central-western portion of Idaho (Fig. 1). It lies in northeastern Adams and southwestern Idaho Counties and contains all surface and ground water draining into and including the Little Salmon River. The basin encompasses 368,565 acres or about 576 square miles. Its shape is similar to the state of Illinois, but with the north-south axis being 45-miles long, and the east-west axis varying from 0.5 to 22 miles wide. With one minor exception, the basin coincides with U.S. Geological Survey Hydrologic Unit 17060210 and Idaho Department of Water Resources Administrative Basin 78. The exception lies at the basin's northern end, where the *Plan* boundaries were extended slightly to include the city of Riggins in its entirety.

The Little Salmon River basin is located 45 degrees north of the equator and about 500 miles inland from the Pacific Ocean. Warm dry summers and cold moist winters characterize the basin's climatic regime. Climate is defined as "the cumulative effect of weather over a long period of time" (Abramovich et al. 1998). In general, Idaho's climatic patterns are influenced by latitude, distance from oceanic moisture sources, presence of mountain orographic barriers, prevailing wind patterns, and variations in altitude. At a given latitude, elevation and orographic barriers are the most important factors influencing temperature and precipitation differences. In the Little Salmon River basin, semi-arid conditions are typical at lower elevations, particularly at the northern end of the basin. A sub-humid continental climate is characteristic of the basin's higher elevations. Table 1 displays selected climatologic data from the two weather stations located in the Little Salmon River basin.

Table 1. Climatological summary data, 1961-1988 (University of Idaho State Climate Services; Natural Resources Conservation Service, National Water and Climate Center (Internet site)).

Climate Factor	New Meadows	Riggins
Elevation (feet)	3,870	1,760
Annual Precipitation (inches)	24.8	16.5
Annual Snowfall (inches)	86.4	7.7
Average January Precipitation (inches)	3.4	1.2
Average July Precipitation (inches)	0.7	0.8
Average January Minimum Temperature (^{o}F)	7.4	27.4
Average January Maximum Temperature (^{o}F)	30	41.4
Average July Minimum Temperature (^{o}F)	41.7	58.4
Average July Maximum Temperature (^{o}F)	83.9	92.3
Lowest Temperature (1961-90) (^{o}F)	-45	-10
Highest Temperature (1961-90) (^{o}F)	104	115
Growing Season [1]	56	180

[1] Number of days when daily minimum temperature is greater than 32^{o} F, 5 years in 10.

Much of the precipitation that falls in the basin comes as snow, and is initiated locally by orographic lifting. Average annual precipitation in the basin's valleys ranges from 17.4 inches to nearly 25 inches (Abramovich et al. 1998). The greatest precipitation amounts fall at high elevations on the eastern side of the basin, and may exceed 50 inches annually at Brundage Reservoir and Upper Hazard Lake (Figure 3).

For a detailed account of the weather conditions that led to flooding and landslides in 1974 and 1997, refer to the *Little Salmon River Basin CSWP Supplement: Flood and Landslide Management Information*. A lack of information regarding low-elevation snowpack, soil moisture, and precipitation impaired the National Weather Service's ability to quickly determine that floods and landslides were imminent in the Little Salmon River basin (U.S. Dept. of Commerce, National Weather Service 1997). There is a need for improved information about rain-on-snow events that occur in the 3,000 to 5,000 foot elevation zone in the Little Salmon River basin (Abramovich 2001). An automated SNOTEL site in this zone would provide climatic data during rain-on-snow events. The data could also be used for potential warnings of rapid runoff from these events (Abramovich 2001).

4.1.2 Hydrologic Structure

The Little Salmon River originates at about 6,280 feet above mean sea level on Blue Bunch Ridge, in Township 17N, Range 2E, Section 6. The river flows northward 51 river miles to its confluence with the Salmon River in Township 24N, Range 1E, Section 15, on the southern border of the city of Riggins.

Figure 4 shows the surface water drainages in the Little Salmon River basin. At the southern end of the basin, several major tributaries enter the Little Salmon near the city of New Meadows. Mud Creek and its tributaries originate between 4,600 and 5,600 feet elevation on Brush Mountain, along the western edge of the basin and join the Little Salmon River approximately three miles southwest of New Meadows. In addition, Big Creek, which begins nearly 13 miles south of New Meadows at an elevation of 6,600 feet, meets the Little Salmon River about a mile southwest of town. The east and west Branches of Goose Creek join the Little Salmon River about two and one miles, respectively, north of New Meadows.

Further to the north, the Little Salmon is joined from the east by Threemile Creek, Fourmile Creek, Sixmile Creek, and Martin Creek, and from the west by Round Valley Creek. Still further north, Hazard Creek joins the Little Salmon from the east side of the basin, and Boulder Creek from the west, both with headwaters above 7,000 feet in elevation. Three miles above its mouth, the waters of the Rapid River drainage, which start above the 9,000-foot elevation level in the Seven Devils area, join the Little Salmon River. Numerous smaller tributaries from both the east and west sides are located throughout the basin.

Surface water and ground water appear to be intertwined in the Little Salmon River basin, but little research has been completed to help understand the relationships. Water stored in the snowpack at higher elevations is critical for maintaining summer-time streamflow throughout Idaho (Abramovich 2001). Ground water aquifers are recharged principally by mid and upper elevation precipitation flowing through streams and numerous irrigation ditches (Bendixsen 2000). Some NRCS water supply prediction products are not currently produced (such as monthly volumetric streamflow forecasts, peak snowmelt streamflow forecasts, etc.) for the Little Salmon River basin, but may assist in managing water, or in understanding better, precipitation-runoff relationships (Abramovich 2001).

4.1.3 Geology and Soils

The geology of the Little Salmon River basin is illustrated in Figure 5. The basin lies

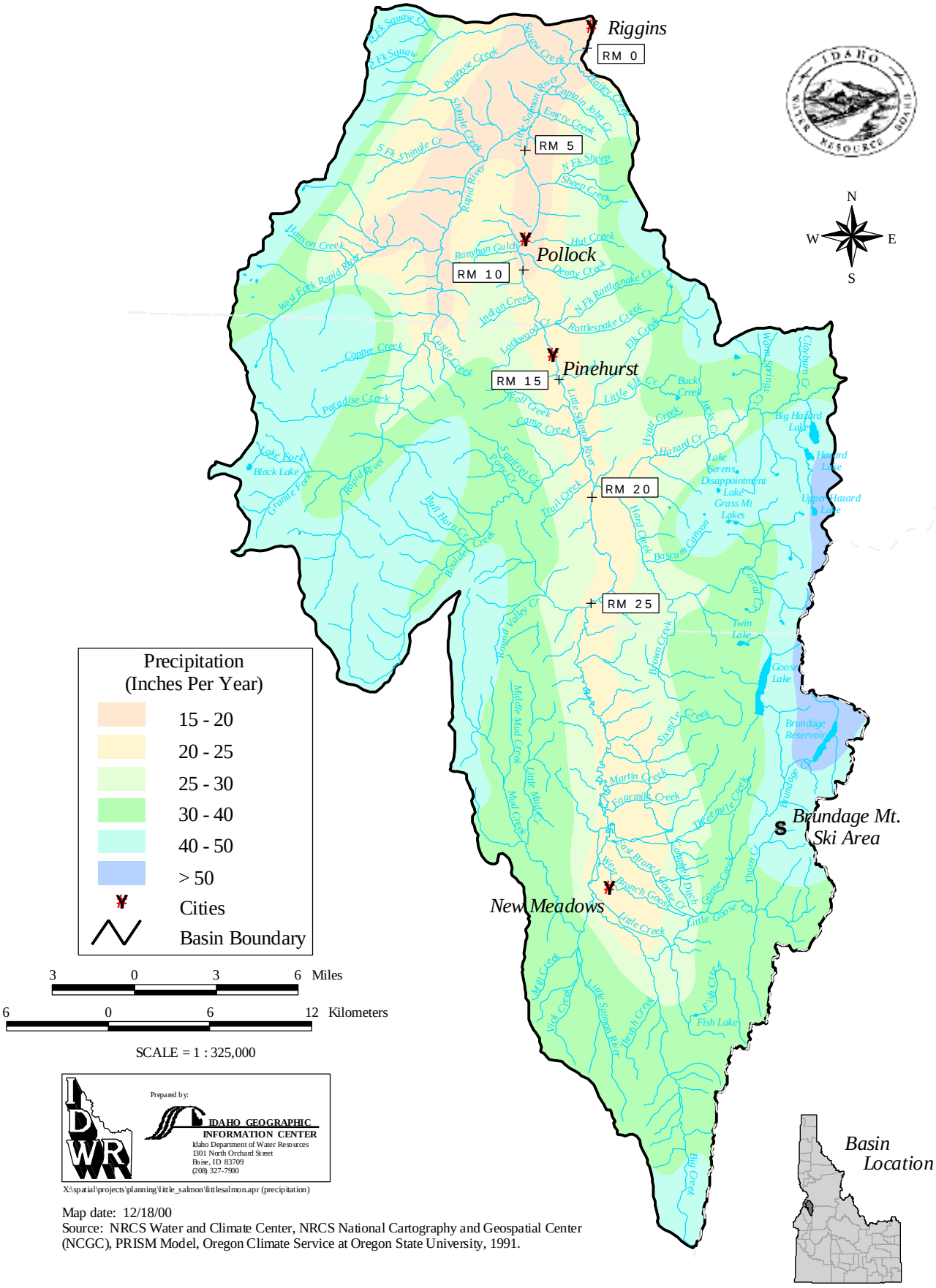

Figure 3. Precipitation contours for the Little Salmon River basin.

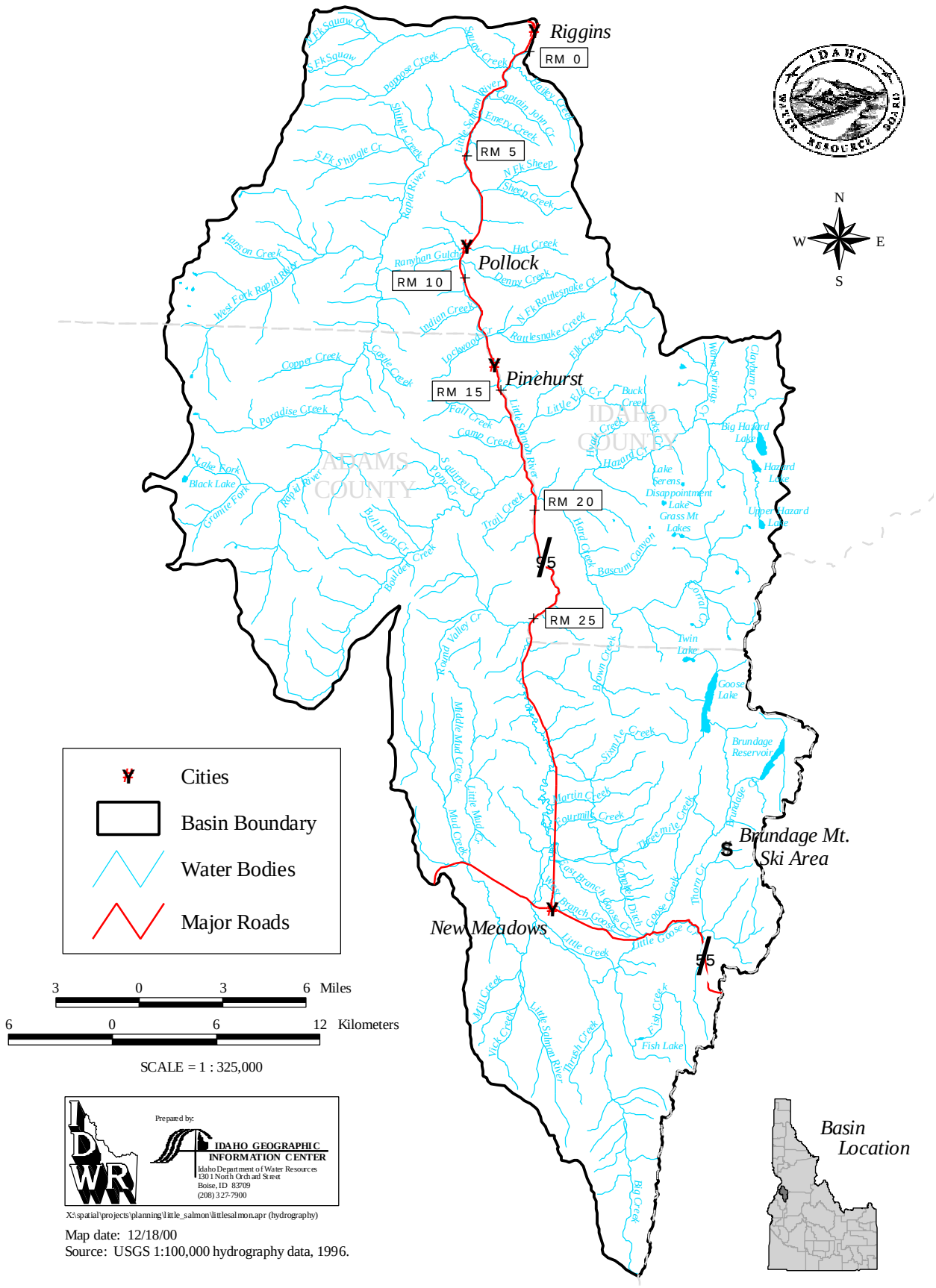

Figure 4. Surface water drainage (hydrography) of the Little Salmon River basin.

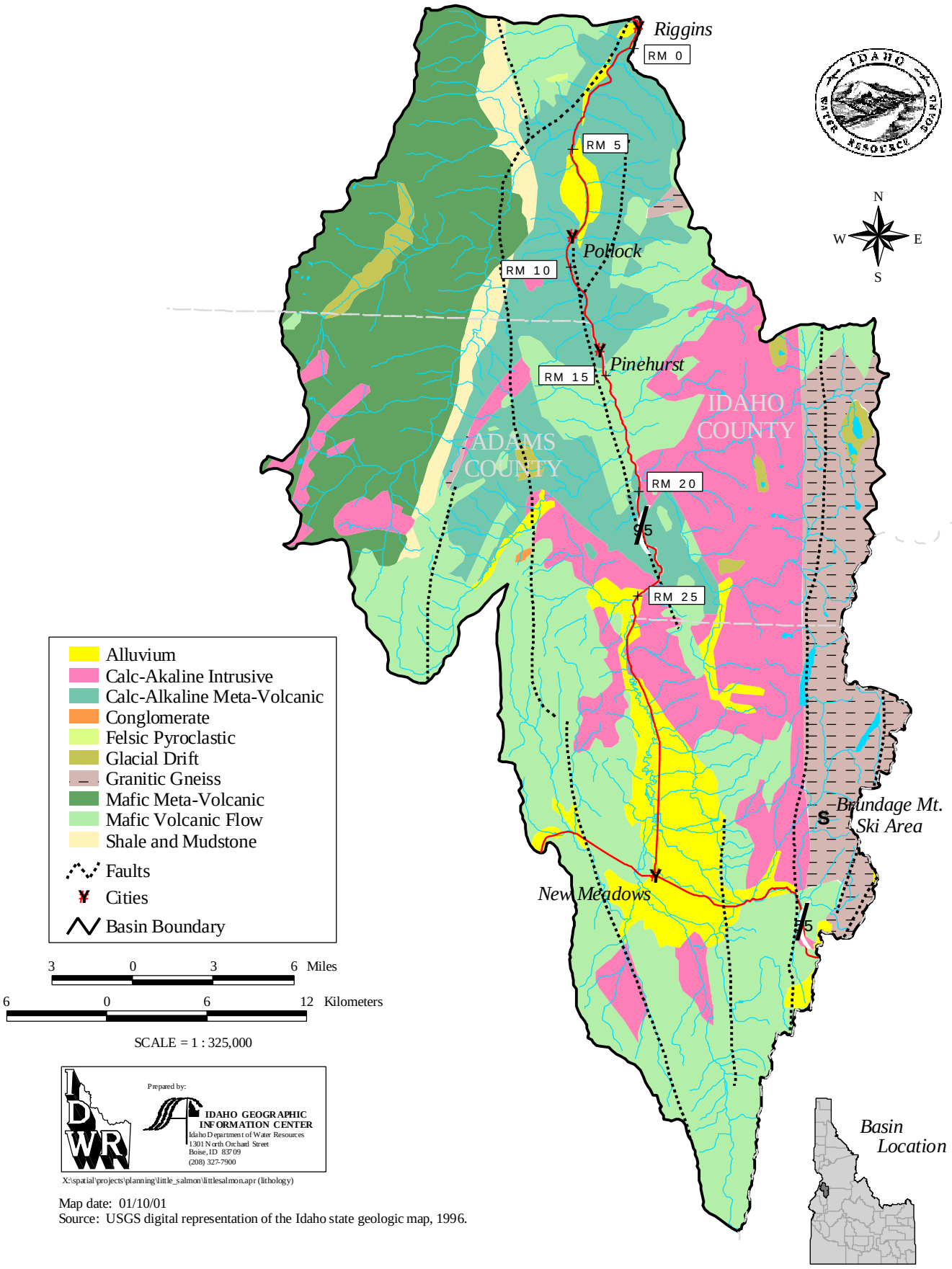

Figure 5. Major geologic features of the Little Salmon River basin.

astride two major physiographic provinces: the Northern Rocky Mountain physiographic province on the east side and the Columbia Intermontane physiographic province on the west side (Ross and Savage 1967). The boundary between the provinces roughly corresponds to the axis of the Little Salmon River, which is also the boundary between an ancient North American continental plate and an oceanic plate. The Idaho Batholith is a Cretaceous (75-100 million years ago) rock formation formed by up-welling magma that cooled as granite. The Idaho Batholith forms a foundation for portions of central Idaho and western Montana. However, it is not solid or contiguous in many locations due to numerous variations in faulting, sheared-zones, and other igneous intrusions.

Many smaller granitic masses are scattered around the Idaho Batholith. The smaller batholiths were emplaced during Eocene time, about 50 million years ago. Other parent materials are also present, such as much older Precambrian metamorphic rock (1.5 billion years old), typically found near the Cretaceous batholith margins (Alt and Hyndman 1989), and Columbia Basin basalt flows (14-17 million years old) that recently capped some of the granitic and metamorphic materials.

Terrain on the eastern portion of the Little Salmon drainage is characterized by high, massive mountains and deep intermontane valleys, a result of magma intrusion, faulting, and erosion. Elevations range from nearly 8,500 feet on Granite Mountain to about 1,760 feet at the city of Riggins. Alluvial sediments and gravels (water-carried) fill the fault valleys, notably Meadows Valley and most of the Little Salmon River canyon. Upland features are predominantly steep, deeply incised slopes with gradients in excess of 60 percent. Mid-slope landscapes are steep to moderately steep, with V-shaped drainages. Flood plains are generally narrow and confined by adjacent valley walls. Glacial outwash deposits of varying ages are identifiable in drainages at higher elevations, such as near Hazard and Big Hazard Lakes.

On the western side of the basin, the topography reflects block faulting and glacial erosion (Ross and Savage 1967). Elevations exceed 9,300 feet in the Seven Devils Range. In the higher mountain areas, streams have deeply dissected the ancient sedimentary and volcanic rocks. These rocks are of marine origin and were joined to the North American land mass around 100 million years ago along the suture zone between the continental and oceanic crusts (or plates). Much of the central portion of the area is filled with sheets of Columbia Basin basalt. Folding and faulting has worked at reshaping these basalt sheets as well. During the Pleistocene (8,000-1.8 million years ago), some of the highest valleys were sites of glaciers, and glacial deposits have been identified along the West Fork of Rapid River and on Pollock Mountain. Meadows Valley formed when a fault block dropped below the adjacent terrain. It has since been filling with alluvial sediments.

Several longitudinal-oriented fault “swarms” have modified the basin topography and indicate past seismic instability in the area. One series of faults marks the eastern side of the basin, approximating the Adams-Valley County line, and passes through Brundage Mountain and the Brundage Reservoir area. Another major fault passes through the Rock Flat and Thorn Creek area just west of Little Ski Hill in the southern end of the basin, and continues along Goose Creek, Goose Lake, and the large rift valley west of the Hazard lakes. A third fault corresponds with the eastern edge of Meadows Valley and marks the Little Salmon River canyon (Alt and Hyndman 1989).

Soils of the basin reflect the landform parent materials and processes from which they were formed (e.g., glaciation, volcanic action, alluviation, regional uplift, and faulting) along with the influences of distinctive microclimates and vegetation. Soils descriptions are useful for land use planning and management, unfortunately, detailed soils information is lacking for much of the Little Salmon River basin. However, published or preliminary detailed

soil survey information is available from the U.S. Dept. of Agriculture - Natural Resources Conservation Service (USDA-NRCS) for small areas principally used for agriculture.

In general, shallow soils in the valley bottoms are alluvial gravels, clays, and boulders. Alluvial soils range in depth from a few feet to about 30 feet. Under the alluvial soils is bedrock material, most often composed of basalts (Bendixsen 2000).

Figure 6 shows the location of major soils in the basin. Table 2 provides general soil component descriptions. The map and table were adapted from the State Soil Geographic (STATSGO) database for Idaho, which was made by generalizing soil survey data from remote sensing methods (e.g., aerial and satellite photos). The mapping scale for this STATSGO coverage is 1:250,000. Therefore, site-specific recommendations based on this map are not appropriate.

Table 2. Selected attributes for soil map unit components (adapted from STATSGO, U.S. Dept. of Agriculture-Soil Conservation Service 1994).

Component Name	Texture[1]	Drainage[2]	Infil[3]	PermL[4]	PermH[5]
Andic Cryochrepts	SIL	W	B	0.6	2.0
Archabal	L	W	B	0.6	2.0
Blackwell	CL	VP	D	0.2	0.6
Bluebell	CB-L	W	C	0.2	0.6
Bluesprin	CBV-L	W	C	0.2	0.6
Demast	L	W	B	0.2	0.6
Dystic Cryochrepts	GR-L	W	B	0.6	2.0
Gaib	GRV-L	W	D	0.2	0.6
Gestrin	L	MW	B	0.6	2.0
Jugson	COSL	SE	C	2.0	6.0
Klickson	CB-L	W	B	0.06	0.2
Lithic Haploxerolls	GR-LS	W	D	2.0	20.0
McCall	CBV-SL	SE	B	2.0	6.0
Naz	SL	W	B	2.0	6.0
Quartzburg	COSL	SE,E	C	6.0	20.0
Rock Outcrop	UWB	[6]	D	0.0	0.0
Suloaf	CB-SIL	W	B	0.6	2.0
Swede	L	W	B	0.2	0.6
Tannahill	CB-L	W	B	0.2	0.6
Ticanot	CBV-L	W	D	0.06	0.2
Typic Dystrochrepts	L	W	[6]	0.6	2.0
Vay Family	SIL	W	B	0.6	2.0

[1] **Texture**: CB-cobbly, CBV-very cobbly, CL-clay loam, COSL-coarse sandy loam, GR-gravelly, GRV-very gravelly, L-loam, LS-loamy sand, SIL-silt loam, SL-sandy loam, UWB-unweathered bedrock.

[2] **Drainage**: Excessively, SE-somewhat excessively, W-well, MW-moderately well, P-poor, VP-very poor.

[3] **Infiltration** Rate: B-moderate, C-slow, D-very slow.

[4] **Permeability Low**: Lowest permeability rate found in soil horizon (inches/hour).

[5] **Permeability High**: Highest permeability rate found in soil horizon (inches/hour).

[6] **Values** not available or not applicable.

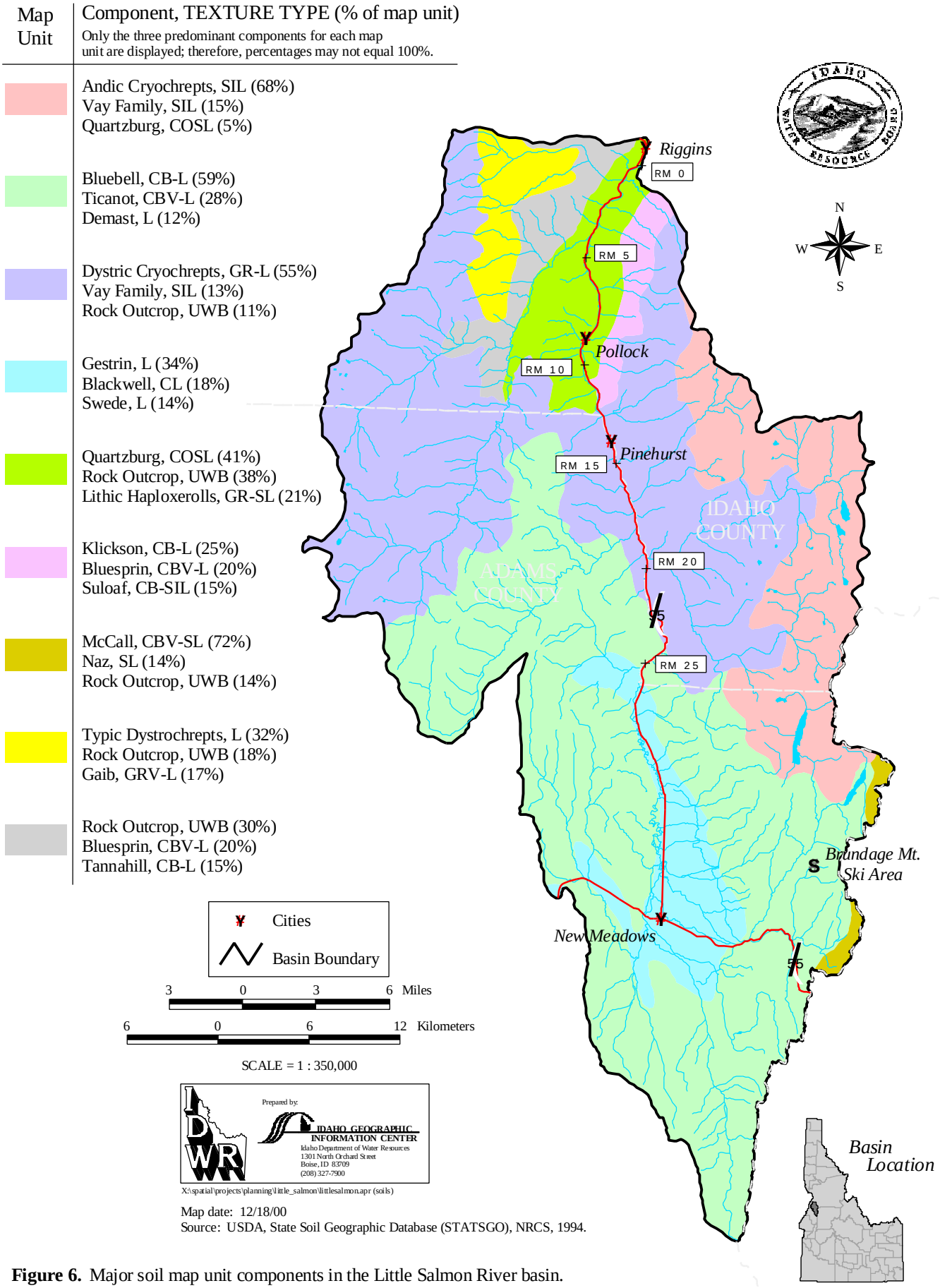

Figure 6. Major soil map unit components in the Little Salmon River basin.