2. PHYSICAL CHARACTERISTICS OF ARGONNE NATIONAL LABORATORY-WEST (WAG 9)

2.1 Surface Features and Topography

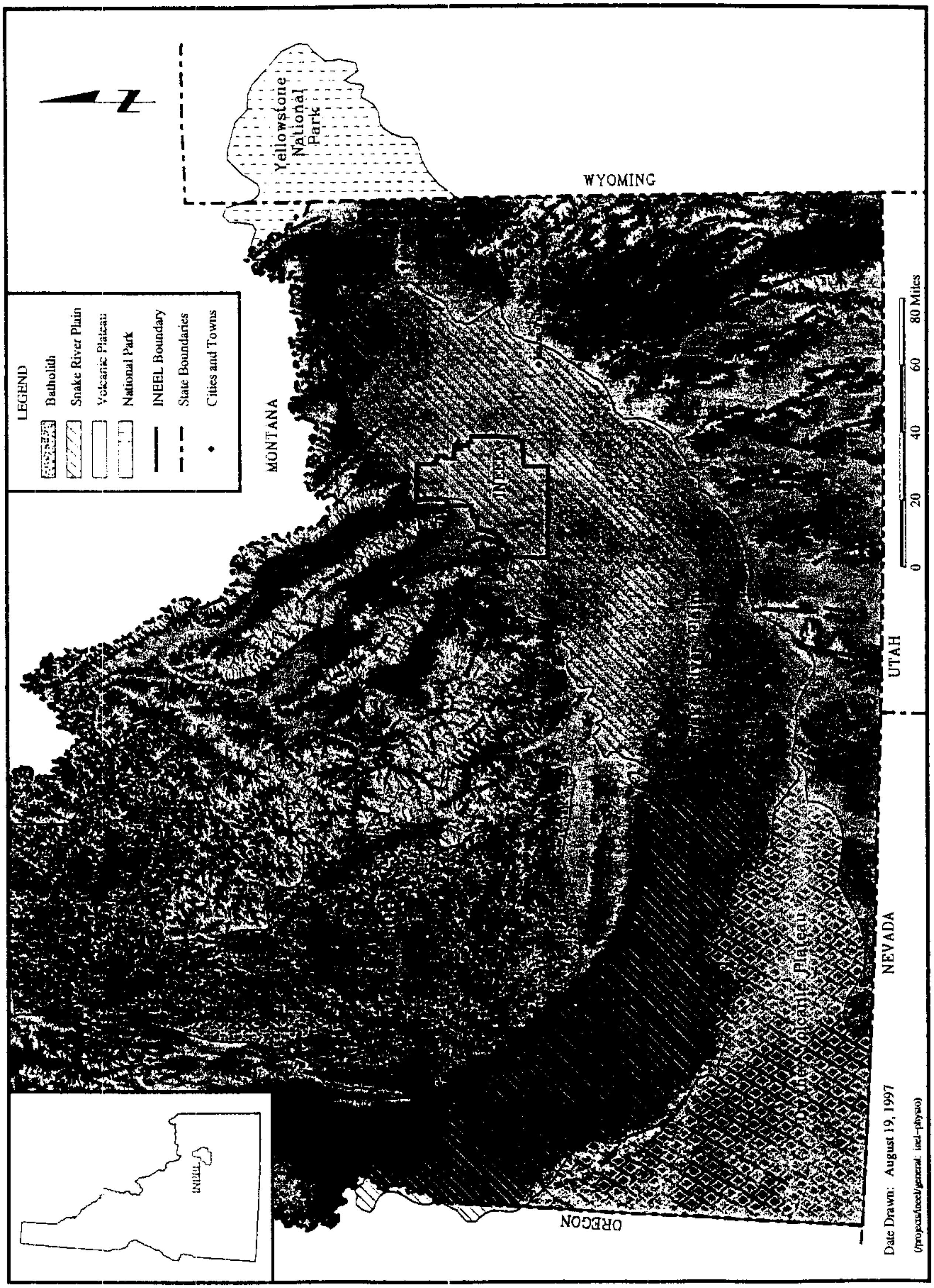
The Snake River Plain (SRP), as shown in Figure 2-1, is the largest continuous physiographic feature in southern Idaho. This large topographic depression extends from the Oregon border across Idaho to Yellowstone National Park and northwestern Wyoming. The portion of the SRP occupied by the Idaho National Engineering and Environmental Laboratory (INEEL) may be divided into three minor physical provinces: a central trough that extends to the northeast through the INEEL and two flanking slopes that descend to the trough, one from the mountains to the northwest and the other from a broad ridge on the plain to the southeast.

The ANL-W facility is found in the southeastern portion of the INEEL and is responsible for a roughly rectangular-shaped administrative area encompassing approximately 890 acres. A double security fence with largest east-west and north-south dimensions of 580 m and 765 m (1,902 ft and 2,512 ft) surrounds the major portion of ANL-W, respectively. Located inside the fenced area are more than 60 buildings and 13 temporary trailers. Located outside the security fence are six buildings that support the Transient Reactor Test Facility, three sanitary sewage lagoons, the radioactive scrap waste facility, the security area firing range, parking lot, and helicopter landing pad. Outside the perimeter of ANL-W are unpaved roads, groundwater monitoring wells, interceptor canal, industrial waste pond, three old construction rubble burn areas, and borrow excavation pits used as ANL-W facilities. All ANL-W facilities are within a local topographically closed basin. The surface of the facility slopes gradually from south to north, at approximately 30 ft per mile. Maximum topographic relief within the ANL-W administrative boundary is about 50 ft, ranging from 5,110 ft above mean sea level on the north boundary to 5,160 ft on a basalt ridge to the southeast.

The Twin Buttes are the most prominent topographic features within the INEEL and are found to the southwest of ANL-W. East and Middle Twin Buttes rise 1,100 and 800 ft, respectively, above the plain. Big Southern Butte, a composite acidic volcanic dome several miles south of the INEEL, is the most prominent single feature on the entire plain, rising approximately 2,500 ft above the level of the plain.

The ANL-W site comprises various facilities for liquid metal reactor development. The present major experimental facilities are:

- Experimental Breeder Reactor II (EBR-II), a small sodium-cooled pool-type fast reactor with a power plant capable of producing 19.5 megawatts of electrical power.
- The Transient Reactor Test Facility (TREAT), a reactor designed for high-power transient safety tests of both thermal-reactor and fast-reactor fuels.
- The Zero Power Physics Reactor (ZPPR), the only zero-power assembly in the U.S. that can provide full-size physics mockups of fast-reactor cores up to 1,000 megawatts in size.



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(projects/ineel/general: ineel-physio)

Figure 2-1. Snake River Plain.

- Fuel Conditioning Facility (FCF), originally the Fuel Cycle Facility for the on-site reprocessing and refabrication of EBR-II metallic fuel, and now under modification for an updated version of that task.

- Hot Fuel Examination Facility (HFEF), is comprised of two buildings designated as north and south. The south building serves primarily as an irradiated subassemby disassembly/inspection/assembly point, while the north building serves only as a diagnostic/inspection building.

- The Fuel Manufacturing Facility (FMF), the facility in which metal fuel subassemblies were fabricated for use in the EBR-II reactor and fuel materials stored .

- The Laboratory and Office Building (L&O), used to support ANL-W operations in the analysis of chemical and radiological samples within hot cells and laboratory hoods.

2.2 Meteorology

The U.S. Weather Bureau established a monitoring station at the Central Facilities Area (CFA) in 1949. Historical climatological observations from this area have been compiled by Clawson (1989). A 250-ft tower is also located just outside the east security fence of the ANL-W area; however, this tower has not been in continuous operation for as long as the CFA station. The longest and most complete record of INEEL meteorological observations exists for the CFA weather station. Although meteorological conditions between the ANL-W and CFA facility are similar, ANL-W site conditions will be used in this report.

2.2.1 Air Temperature

Data have been collected from both 2 m and 10 m above the ground surface at ANL-W. The 2 m data set is limited in time from August 1993 to the present. The record presented is considered typical of temperature conditions in the vicinity of the ANL-W facility. Although there is a much longer record available from the CFA station, the distance of ANL-W from that station precludes its use. Therefore, these data are presented here because they more accurately portray surface conditions at ANL-W. The maximum average monthly temperature during the time of record was 84.8°F for July and the minimum average monthly temperature of 7.9°F was recorded in December. Table 2-1 shows monthly mean, maximum, and minimum temperatures for the time of record at ANL-W.

2.2.2 Precipitation

Precipitation and humidity are not measured at the ANL-W tower. However, the National Oceanic and Atmospheric Administration (NOAA) conducted an evaluation and is of the opinion that the use of CFA data for these parameters is reasonable (Hukari 1995). Precipitation was measured as rainfall and snowfall for the period January 1950 to December 1988. During this period, most of the precipitation was received in May and June and averaged 1.2 in., while the annual total average was 8.71 in. As could be expected, most snowfall occurred during December and January. The monthly average snowfall event for December and January was 6.4 in. and 6.1 in., respectively. Wet bulb temperature humidity measurements from CFA run from 1956 to 1961. The highest average occurred in the winter at 55%; a low average of 18% was recorded in the summer.

Table 2-1. Monthly temperatures (8/93–7/95)

Month[a]	Mean[b]	Maximum[b]	Minimum[b]
January	22.5	31.6	12.9
February	25.1	36.7	13.8
March	35.1	48.4	22.1
April	42.9	56.2	27.8
May	52.1	65.2	37.1
June	59.3	73.7	41.0
July	67.2	84.8	46.5
August	65.3	83.3	44.7
September	57.0	75.7	36.2
October	41.8	56.6	27.5
November	22.7	35.4	8.9
December	19.8	29.0	7.9

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a. Time period August 1993 to July 1995.

b. All values in degrees Fahrenheit.

2.2.3 Evaporation and Infiltration

Although NOAA does not measure pan evaporation at the INEEL, adjusted Class A values have been made through regression analysis of other southeast Idaho sites. Data from 1950–51, 1958–59, 1963–64, and 1969–70 yielded an adjusted range of 40 to 46 in. per year. Other estimates for the INEEL (Hull 1989) have values of 36 in. per year from saturated ground, 32 to 36 in. per year from shallow lakes, and 6 to 9 in. per year from native vegetation. Evaporation rates calculated from the drop in level of the ANL-W Industrial Waste Pond (IWP) during 1995 yield values between 0.43 in. per day and 0.10 in. per day for summer and winter, respectively. Infiltration is calculated by using the hydrologic equation (Equation 5.1 of *Water Supply and Pollution Control, Fourth* Edition) and solving for the infiltration term. This yields values for the IWP of between 0.36 in. per day to 0.07 in. per day for summer and winter, respectively.

2.2.4 Wind

Wind measurements at ANL-W are made at 10 m and 250 ft above the ground surface. From these data, ANL-W is clearly subject to the same southwest and northeast winds as the rest of the INEEL. Winds tend to be diurnal with up-slope winds (those out of the southwest) occurring during the day and down-slope winds (those out of the northeast) occurring at night. During the 5-year time of record at

ANL-W from 1990 to 1994, winds blew from the southwest 14% of the time, from the south-southwest 11% of the time, and from the northeast 10% of the time. Winds were calm during only 2.49% of the time on record. An annual total wind rose for the period 1990 to 1994 is shown in Figure 2-2.

2.2.5 Special Phenomena

A thunderstorm is defined by the National Weather Service as a day on which thunder is heard at a given station. According to the definition, lightning, rain and/or hail are not required during this time. Following this strict definition, the ANL-W may experience two to three thunderstorm days from June to August. Thunderstorms have been observed during each month of the year, but only rarely from November to February. Thunderstorms on the INEEL tend to be less severe than in the surrounding mountains because of the high cloud base. In many instances, precipitation from a storm will evaporate before reaching the ground. Individual storms may, however, occasionally exceed long-term average rain amounts for a storm.

Local thunderstorms may also be accompanied by micro bursts. These micro bursts can produce dust storms and occasional wind damage. Thunderstorms may also be accompanied by both cloud-to-ground and cloud-to-cloud lightning.

2.3 Surface Water Hydrology

Most of the INEEL is located in a topographically closed drainage basin, commonly referred to as the Pioneer Basin, into which the Big Lost River, Little Lost River, and Birch Creek may drain. As shown in Figure 2-3, these streams drain mountain watersheds to the north and west of the INEEL, including the Pioneer, Lost River, Lemhi, and Centennial mountain ranges. Land surface elevations rise from 4,774 ft (1,456 m) in the basin to 12,656 ft (3,860 m) on Borah Peak in the Lost River Range (Bennett 1990). Rainfall and snowmelt within the upper basin contribute to surface water, mainly during spring.

Most of the water in these streams is diverted upstream of the INEEL for irrigation (Bowman et al. 1984) or is lost to the subsurface due to high infiltration rates in the channel bed (Nace et al. 1959). During periods of high flow, some surface water may reach the INEEL. This water is approximately 15 mi. west of the ANL-W facility. Because there are no permanent, natural surface water features near ANL-W, flooding is not a major concern. During rapid snowmelt events at ANL-W the Interceptor Canal and the Industrial Waste Pond have received surface water runoff. There is a diversion dam constructed south of the facility to handle these events. This dam has a headgate that, when closed, diverts water into the adjacent drainage ditch and eventually to the ANL-09 (Interceptor Canal), and from there directly into the IWP. No surface outflow leaves the INEEL, except for minor local slope runoff (Nace et al. 1959).

2.4 Geology

Much of the INEEL's surface is covered by Pleistocene and Holocene basalt flows. The second most prominent geologic feature is the flood plain of the Big Lost River. Alluvial sediments of Quaternary age occur in a band that extends across the INEEL from the southwest to the northeast. The alluvial deposits grade into lacustrine deposits in the northern portion of the INEEL, where the Big Lost River enters a series of playa lakes. Paleozoic sedimentary rocks make up a very small area of the

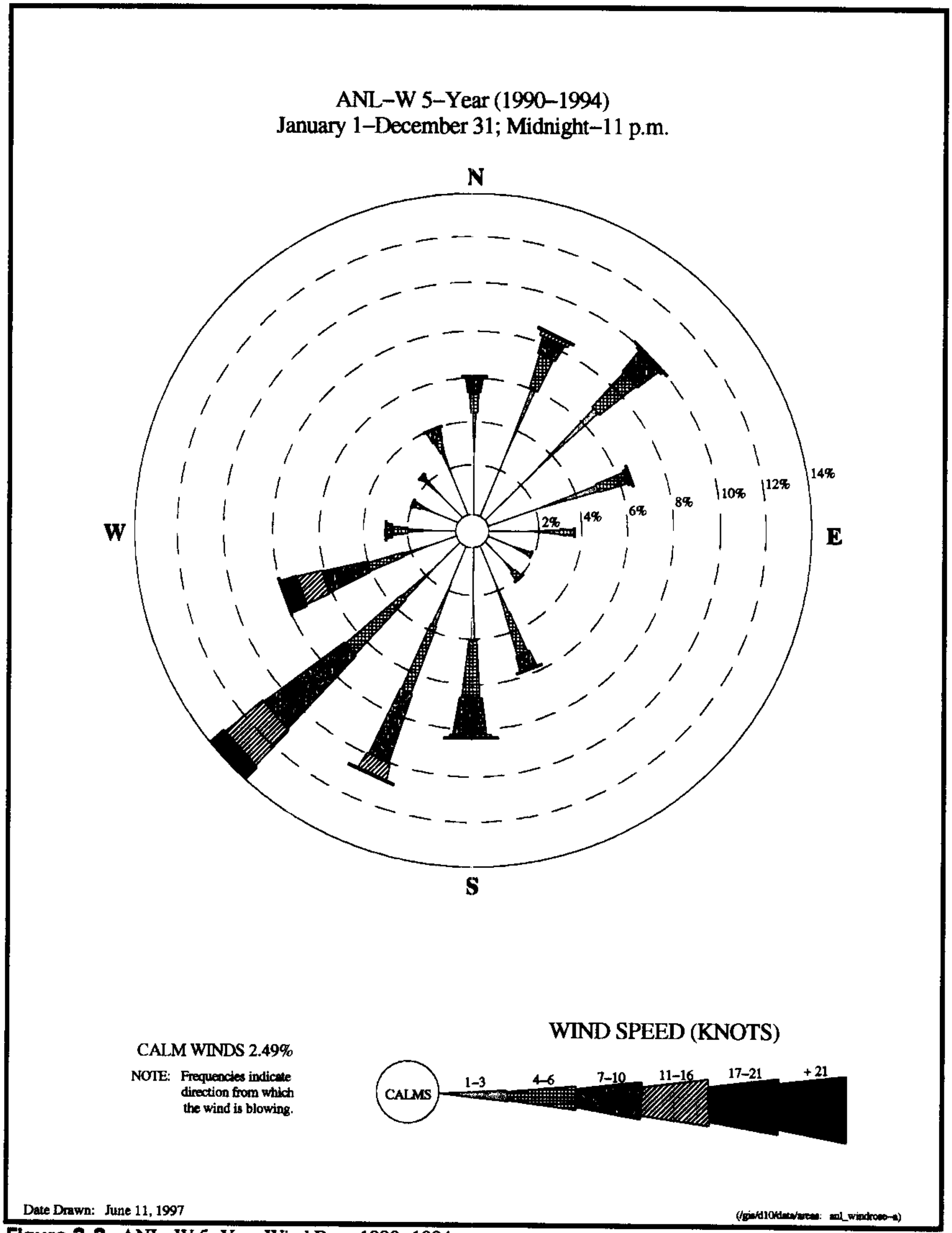

Figure 2-2. ANL–W 5–Year Wind Rose 1990–1994.

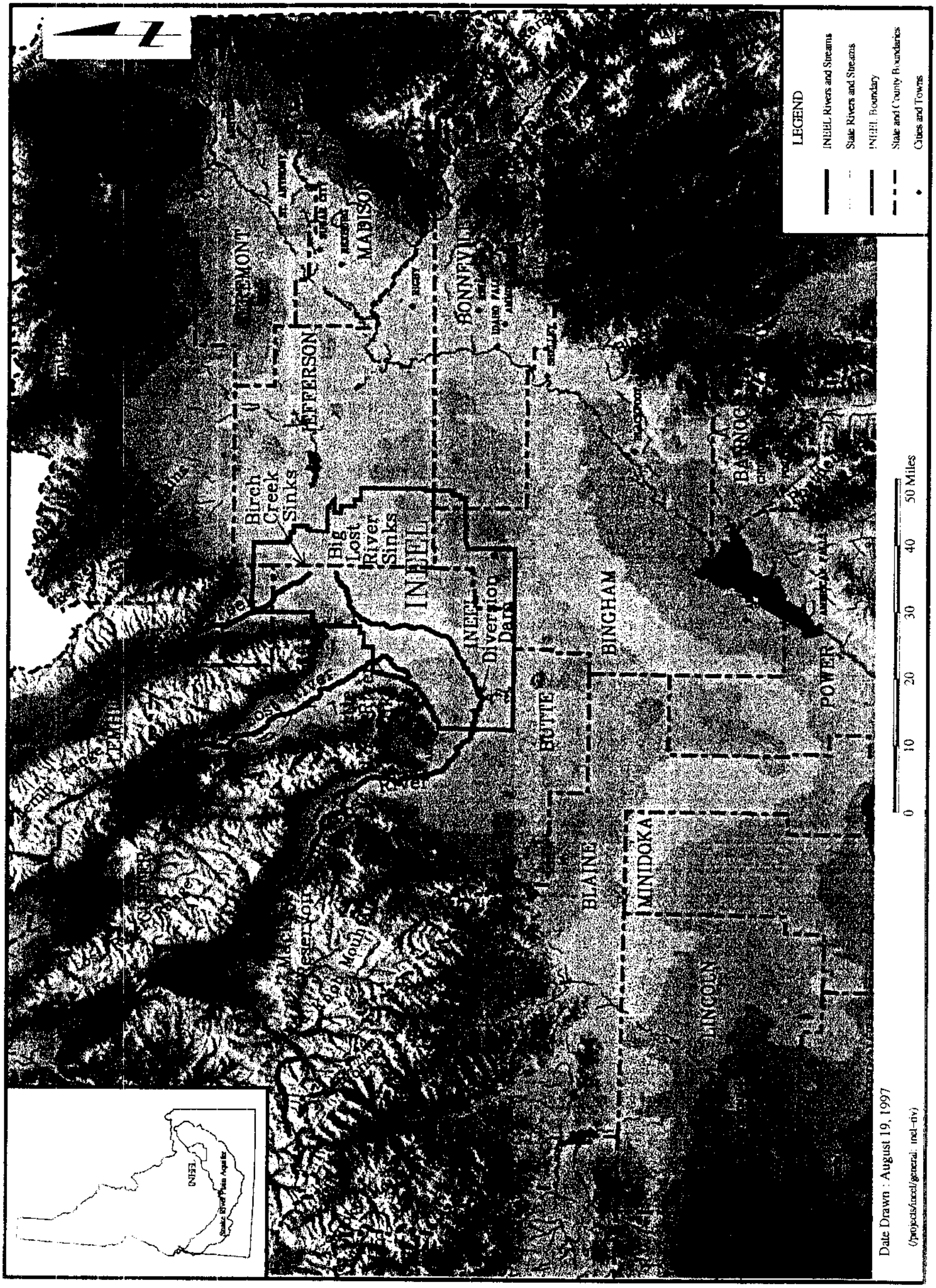

Figure 2-3. Locations of the Big Lost River, Little Lost River, and Birch Cree

INEEL along the northwest boundary. Three large silicic domes and a number of smaller basalt cinder cones occur on the INEEL and along the southern boundary. The basalt thickness, calderas, and thermal springs of the INEEL area are shown in Figure 2-4. The regional contour map that shows the elevation of the top of basalt near the ANL-W facility is shown in Figure 2-5.

2.4.1 Surface Geology

Surficial materials at ANL-W facilities are found within a topographically closed basin. Low ridges of basalt found east of the area rise as high as 100 ft above the level of the plain. Surficial sediments cover most of the underlying basalt, except where pressure ridges form basalt outcrops. Thickness of these surficial sediments ranges from zero to 20 ft (Northern Engineering and Testing, Inc. 1988).

Test borings at ANL-W have revealed two distinct layers in the surface sediments. The uppermost layer, from zero to several feet below land surface (BLS), consists of a light brown silty loam. The upper 1 to 2 ft. of this silty loam layer contains plant roots. This silty loam layer may also contain basalt fragments in areas where it directly overlies basalt.

The lower layer is a sandy-silt (loess) that extends to the underlying basalt. The loess of this layer was probably transported by wind from other parts of the plain. The windblown loess is calcareous and light buff to brown in color. Small discrete lenses of well-sorted sands that occur within the loess are probably the result of reworking by surface runoff into local depressions. The lower portion of this loess layer often contains basalt fragments of gravel to boulder size. The surface of the underlying basalt, whether it is in contact with the upper or lower layer, is highly irregular, weathered, and often very fractured.

2.4.2 Subsurface Geology

The subsurface lithology presented in this section is based on information gathered from past and recent borings around the ANL-W facility. Information gathered from recent borings (i.e., those drilled after 1992) have lead to a better understanding of the subsurface geology around ANL-W. The deep geology around ANL-W is dominated by basaltic lava flows. Minor discontinuous sedimentary interbeds occur at various depths, overlying the tops of basalt flows.

The subsurface geology at ANL-W is similar to that on the rest of the INEEL. The most striking difference is the lack of continuous sedimentary interbeds beneath the facility. Those sedimentary interbeds intercepted during drilling appear to be discontinuous stringers, deposited in low areas on basalt surfaces. These interbeds are generally composed of calcareous silt, sand, or cinders. Rubble layers between individual basalt flows are composed of sand and gravel to boulder sized material. The interbeds range in thickness from less than 1 in. to 15 ft. In 1988, drilling near the IWP an interbed was encountered between 40 to 50 ft BLS. This interbed is not continuous across the ANL-W area and does not appear west of the IWP. More aerially extensive interbeds have been identified above the regional water table, at approximately 400, 550, and 600 ft. BLS (Northern Engineering and Testing, Inc. 1988). The depth to the SRPA below the ANL-W facility is approximately 640 ft. BLS. The nature of these sedimentary interbeds and rubble zones does not appear to cause perching, but may retard the downward movement of water and produce preferred flow paths.

The thickness and texture of individual basalt lava flows are quite variable. Individual basalt flows range in thickness from 10 to 100 ft. The upper surfaces of the basalt flows are often irregular and

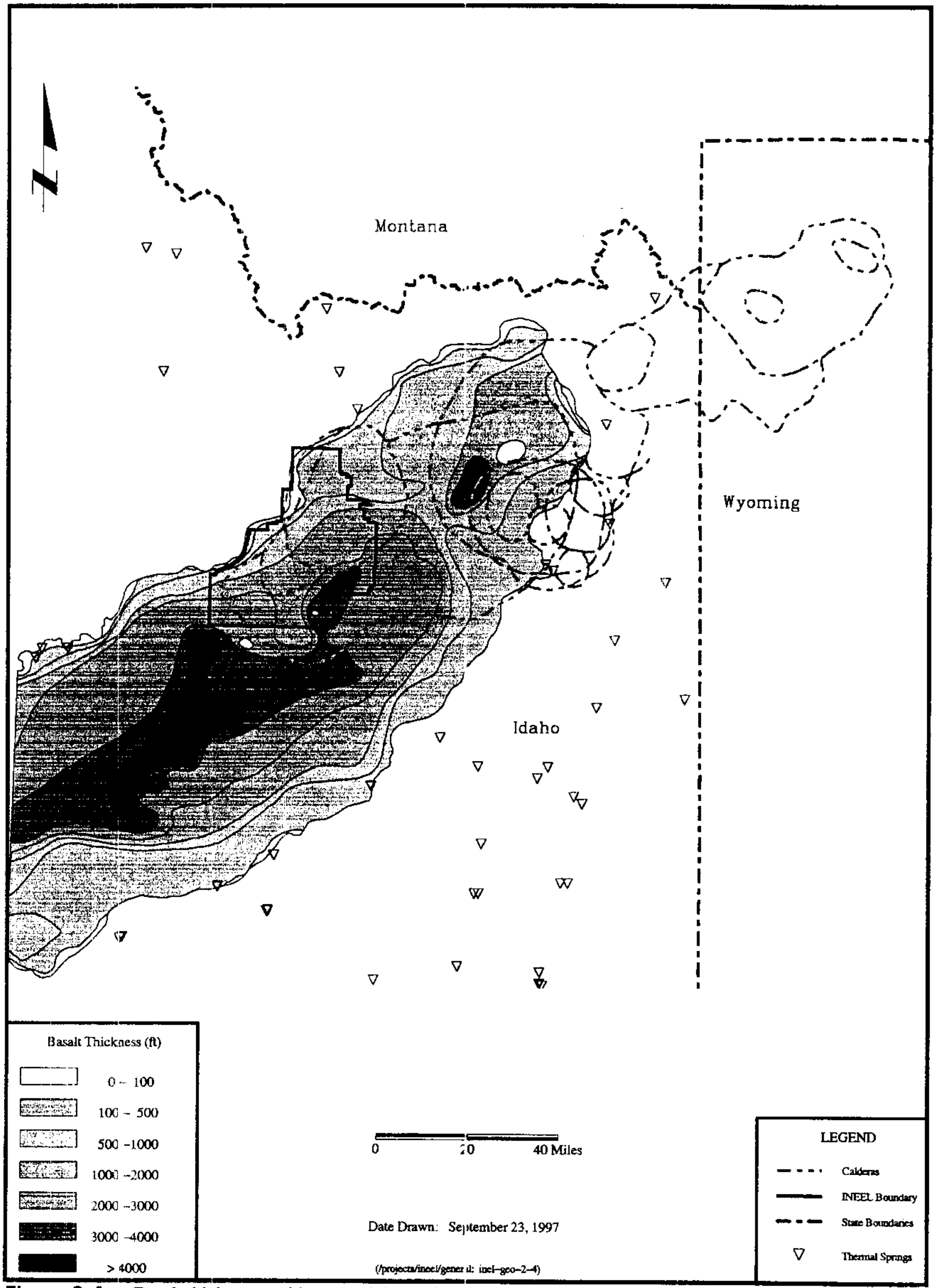

Figure 2-4. Basalt thickness, calderas, and thermal springs.

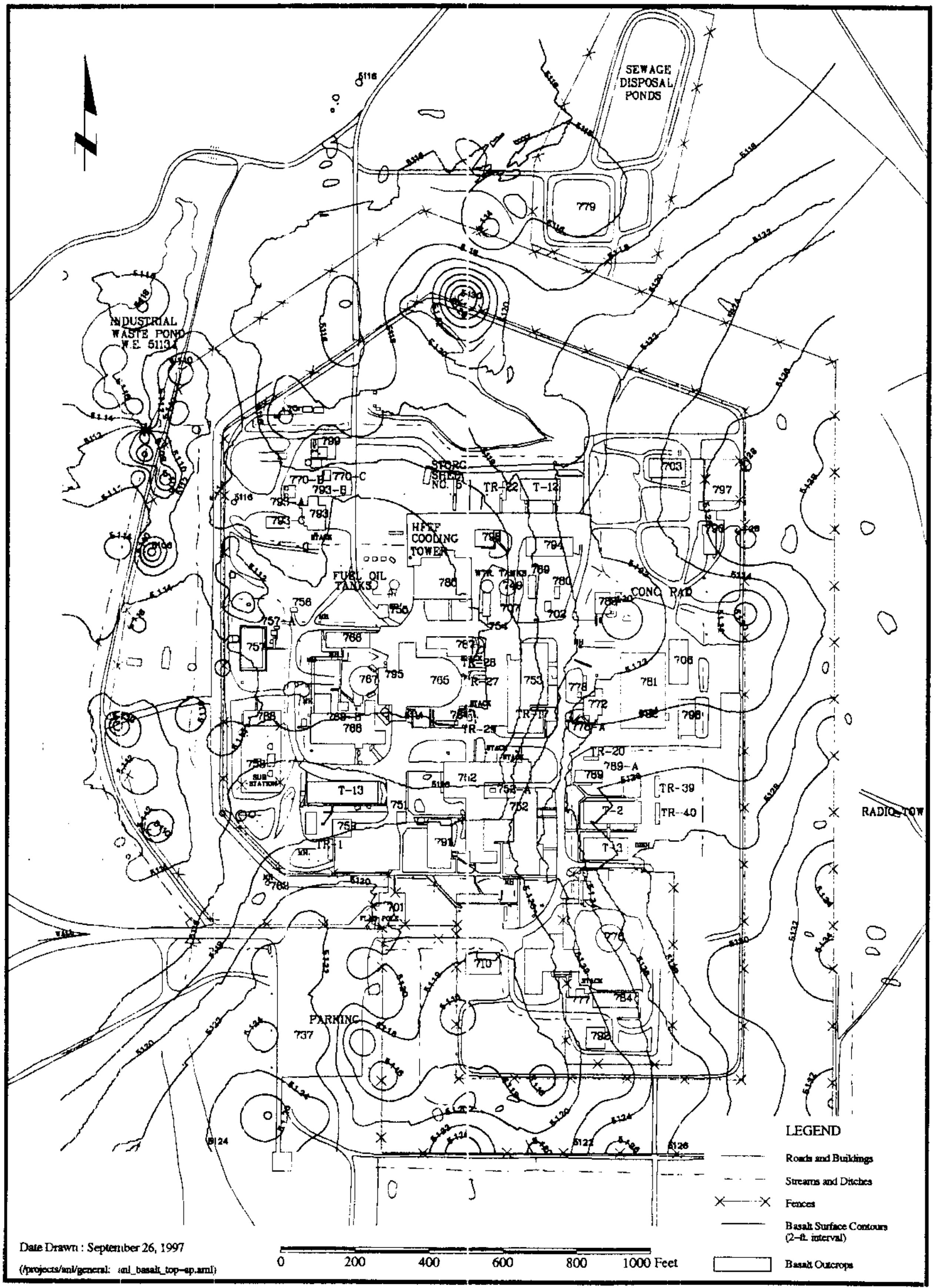

Figure 2-5. Regional top of basalt contour map at ALN–W.

contain many fractures and joints that may be filled with sediment. The existence of rubble zones at variable depths and extents are shown from caliper logs of hole diameter that reveal zones of blocky or loose basalt. Exposed fractures commonly have silt and clay infilling material. The outer portions of a flow (both top and bottom) tend to be highly vesicular. The middle portions of the flow typically have few vesicles and are dominated by vertical fractures formed during cooling.

The variability of basalt thickness and fracturing also plays an important role in well response to changes in the snake river plain aquifer (SRPA). This effect is most notable in well responses to barometric pressure changes. These responses to the barometric pressure changes result in groundwater elevation data that has to be corrected for barometric pressures in order to plot the contour of the water surface. Most of the wells at ANL-W act as water table wells with a rapid response to barometric fluctuations. However, wells ANL-MON-A-11 and the new well ANL-MON-A-14 are very slow to respond to barometric changes, often taking many hours to reequilibriate to barometric shifts. Review of the driller's log for these wells shows that a thick, apparently massive basalt, rests just above the water table. This thick flow acts as a confining layer and restricts free air exchange near the well bore. Discussions with the INEEL field office of USGS suggest this is common on the INEEL and that the local area of such effects tends to be on the order of hundreds of feet. Neither the USGS nor ANL-W believes that this effect influences the wells' ability to intercept upgradient contaminants from ANL-08 (Leach Pit) and ANL-01A (MCTBD). Furthermore, placement of the well away from the immediate downgradient edge of the source area allows for any lateral spreading of contaminants that may occur above this dense basalt before entry into the aquifer.

The sequence of interbedded basalt and sediments, discussed above, continues to well below the regional water table. The regional water table is typically encountered at an elevation of about 4,483 ft above mean sea level (MSL) near the ANL-W facility. A deep corehole was drilled in 1994 in an attempt to locate the effective base of the aquifer. This base is a layer below which the hydraulic conductivites drop by orders of magnitude. A large sedimentary interbed (up to 100 ft thick) and a marked change in the alteration of the basalts characterize the contact of the effective base. This contact was encountered at a depth of 1,795 ft BLS in the deep corehole at ANL-W. The sedimentary layer was approximately 15 ft thick.

2.5 Soils

2.5.1 Soil Types Survey

The ANL-W site is located on an alluvial plain of the Big Lost River. The thickness of the surficial sediment in the vicinity of the ANL-W site is shown in Figure 2-6. These depths range from outcroppings at the surface to depths of 4.2 m (14 ft). In general, the depths of the surface soils above the basalt tend to increase from approximately 60 cm (2 ft) on the east side of the facility to a depth of 4.2 m (14 ft) near the west side of the security fence.

The general soil types for the ANL-W facility are shown in Figure 2-7. The two types of soils shown in the figure for ANL-W are 425-Bondfarm-Rock outcrop-Grassy Butte complex and 432-Malm-Bondfarm-Matheson complex. As shown in the figure, the soil type 425-Bondfarm-Rock outcrop-Grassy Butte complex is found over all the sites in OU 9-04. This soil consists of 40% Bondfarm loamy sand, 30% rock outcrop, and 20% Grassy Butte loamy sand. The Bondfarm soil is on the concave and convex side slopes and is surrounded by areas of the Grassy Butte soils, rock outcrop is in the areas of slightly higher than areas of Bondfarm soils, and the Grassy Butte soil is in hummocky

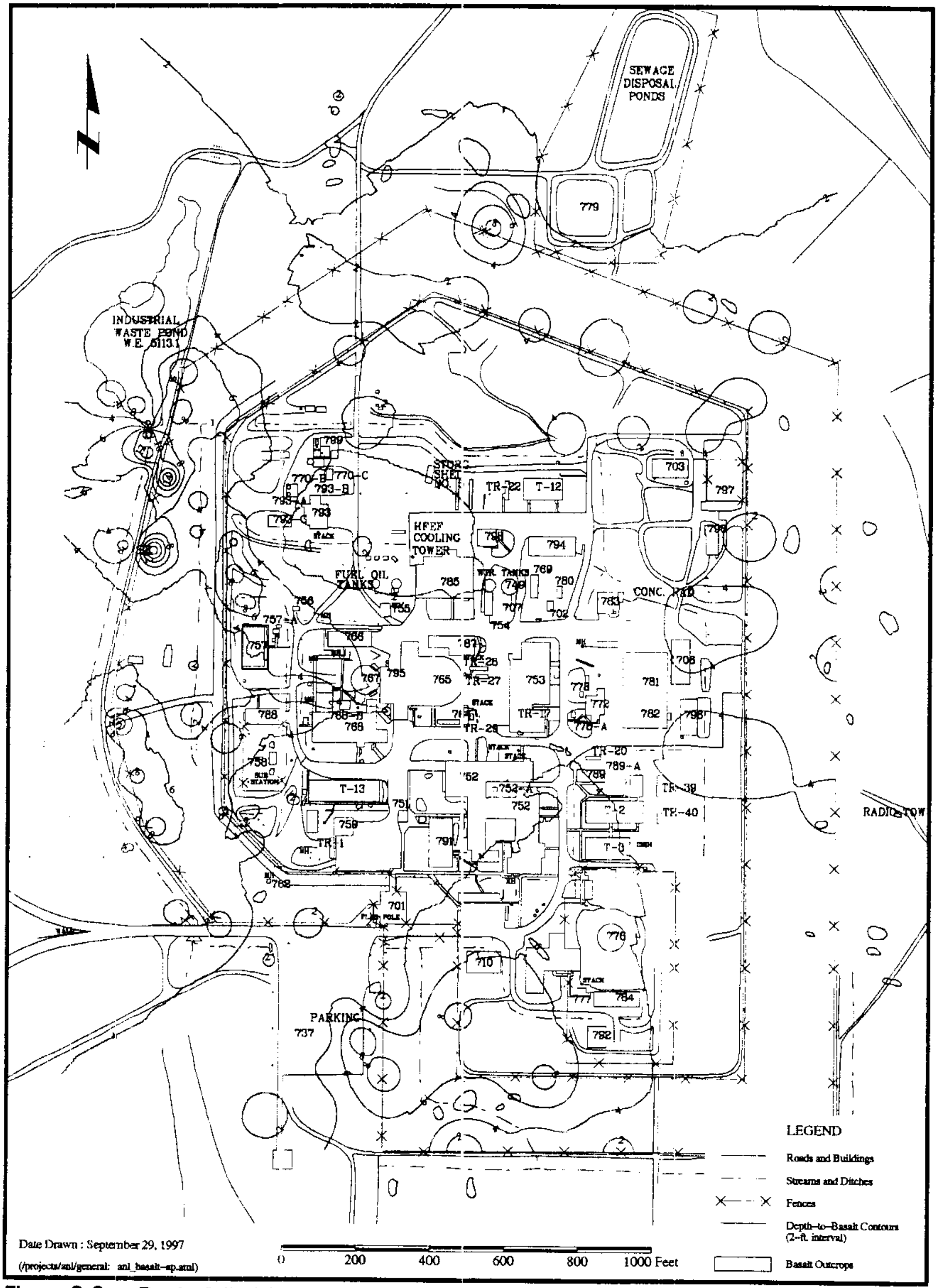

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Figure 2-6. Depth of alluvial material on top of basalt at ANL-W.

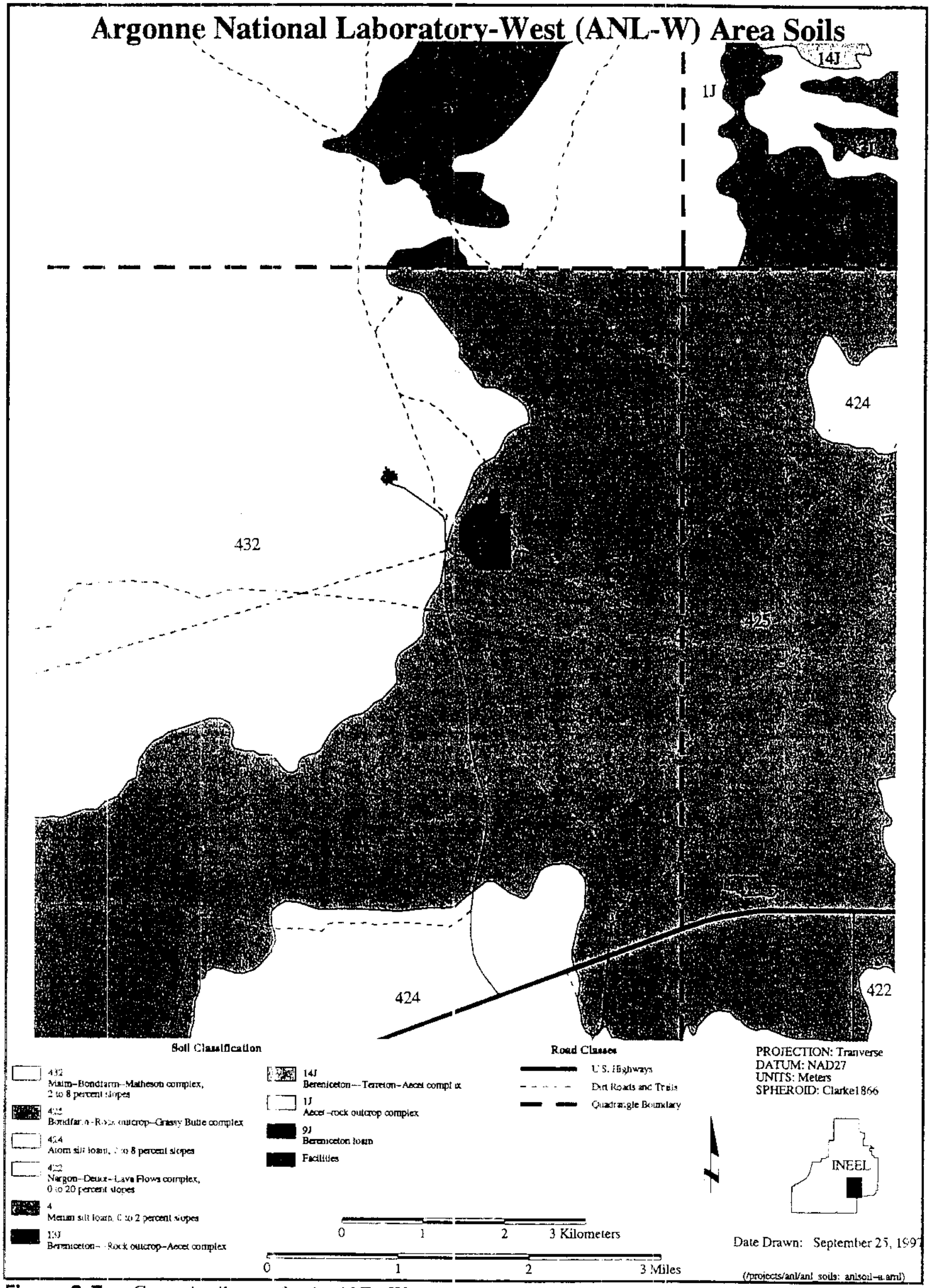

Figure 2-7. General soils type for the ANL–West area.

areas. Also included in this complex are about 10% Matheson loamy sand, a soil that is similar to the Grassy butte soils but that is less than 40 inches deep to bedrock, and Terreton loamy sand. The Bondfarm soil is shallow and well drained. It formed in eolian material. Typically, the surface layer is light brownish gray loamy sand about 10 cm (4 in.) thick. The subsoil and substratum are very pale brown sandy loam 35 cm (14 in.) thick. Basalt is at a depth of 45 cm (18 in.). The soil is calcareous throughout and has a layer of lime accumulation at a depth of 4 in. The permeability of the soil is moderately rapid. Effective rooting depth is 25 to 50 cm (10 to 20 in.). Available water capacity is low. Surface runoff is slow or medium, and the hazard of erosion is slight or moderate. The hazard of soil blowing is very slight.

Rock outcrop consists of exposed basalt rock. Crevices in the rock contain some soil material that supports a sparse stand of grasses, forbs, and shrubs.

The Grassy Butte soil is very deep and somewhat excessively drained. It formed in sandy eolian material. The underlying material to the depth of 152 cm (60 in.) or more is grayish brown and gray loamy sand. The soil is calcareous throughout and has a layer of lime accumulation at a depth of 48 cm (19 in.). The permeability of the soil is rapid. Effective rooting depth is 152 cm (60 in.) or more, and the available water capacity is low or moderate. Surface runoff is very slow or slow. The hazard of soil blowing is very high.

2.5.2 Soil Physical Properties

Physical properties for soils at ANL-W are limited to general information such as cation exchange capacity (CEC), pH, grain size, and acid/base potential. Soils collected for a 1989 background study from two separate areas analyzed for pH, specific conductance, cation exchange capacity, and acid-base potential form the basis for these data (Chen-Northern, Inc. 1989). Samples were collected in 1.5-ft increments to 7.5 ft or the top of basalt, whichever was encountered first. Sample locations are shown in Appendix A. Sample STF1-2 is from an undisturbed site east of the ANL-W facility. NWC1-2 is located east of the IWP. Table 2-2 below shows the results of those analyses for the upper 3 ft of soil.

Table 2-2. Background soil sample analysis.

Sample No.	Depth (ft)	pH (s.u.)	Sp. Cond. (μmhos/cm)	CEC (meq/100 g)	Acid/Base Potential (tons $CaCO_3$/1,000 tons)
STF1-2	0 to 1.5	7.4	4.68	20	97
	1.5 to 3.0	7.5	10.9	16	164
NWC1-2	0 to 1.5	7.4	0.66	36	47
	1.5 to 3.0	7.6	0.68	30	92

2.5.3 Soil Chemical Properties

As mentioned previously, soil sampling at ANL-W has been conducted to support specific investigations. Samples collected in the 1989 background study (Chen-Northern, Inc. 1989) were also composited by depth and analyzed for 40 CFR 261, Appendix VIII inorganics. Table 2-3 shows those results from 0 to 1.5 and 1.5 to 3.0 ft depths. These values are shown compared to the INEEL averages as given in Rood

(1995). An additional ANL-W specific background sampling event occurred in 1994 as part of the OU 9-03 sampling. Appendix K of this RI/FS contains a map showing these background sampling locations along with the calculation of the ANL-W specific arsenic levels. The INEEL background values will be used for screening purposes at WAG 9, while ANL-W will use site specific background data for arsenic found in Appendix K in the risk uncertainty and risk management sections of chapter 5.

2.6 Hydrogeology

Recharge to the SRPA in the vicinity of ANL-W occurs as snowmelt or rain. During rapid snowmelt in the spring, moderate recharge to the aquifer can occur. However, high evapotranspiration rates during the summer and early fall prevents significant infiltration from rainfall during this period. Because of the distance from the surrounding mountains and permanent surface water features (i.e., the Big Lost River), the SRPA beneath ANL-W is unaffected by underflow or recharge from these sources.

2.6.1 Surface Water

No permanent, natural surface water features exist near the ANL-W site. The existing surface water features (e.g., drainage ditches and discharge ponds) were constructed for ANL-W operations for the collection of intermittent surface runoff. A natural drainage channel has been altered to discharge to the IWP via the Interceptor Canal. Under the unusual conditions when the air temperature has been warm enough to cause snow-melt, but the ground has remained frozen, precluding infiltration, surface runoff along this channel has discharged to the IWP. This condition most recently occurred during the spring of 1995. During this time, flow was visible from the surrounding basin into the IWP for approximately 4 days. However, at no time did any water discharge from the pond to the downstream channel. Before 1995, the most recent occurrence of this situation was in 1976.

2.6.2 Perched Water

Perched water is defined as a discontinuous saturated lens with unsaturated conditions existing both above and below the lens (Freeze and Cherry 1979). Classical conceptualization of a perched water body implies a large, continuous zone of saturation capable of producing some amount of water. These perched zones can occur over dense basalts that exibit low hydraulic conductivity in addition to sediment interbeds that have low permeability. It is unknown which conceptual model is more prevalent at the INEEL. However, in the subsurface basalts at ANL-W, the "perched water" appears as small, localized zones of saturated conditions above some interbeds and within basalt fractures, which are incapable of producing any significant amount of water (Chen-Northern, Inc. 1988).

2.6.3 Snake River Plain Aquifer

Estimates show that nearly 2×10^9 acre-feet of water exist in the SRPA with water usage within the boundaries of the INEEL being approximately 5.6×10^3 acre-feet per year. From 1979 to 1994, the ANL-W withdrew an average of 138 million gallons of water per year from the SRPA. Principal uses of the water are for plant cooling water operations, boiler water, and potable water. On average, 85% of the water is discharged to either the sanitary ponds (ANL-04) or Industrial Waste Pond (ANL-01), 13% is discharged to the air via cooling towers, and 2% is discharged to subsurface septic systems.

Table 2-3. Results of 1989 background soil sampling.

Parameter	BG-S-1 (0 to 1.5 ft)	BG-S-2 (1.5 to 3.0 ft)	INEEL 95/95 [a,b]
Aluminum[c]	13,300	13,000	24,000
Antimony	<1.1	<1.1	7.4
Arsenic	13	16	7.4
Barium	191	237	440
Beryllium	3.7	3.6	3.0
Cadmium	2.0	2.7	3.7
Cerium	15,606	77,066	ND
Chromium	20	22	50
Copper	22	29	32
Iron	15,900	14,300	35,000
Lead	14	14	23
Mercury	<0.1	<0.1	0.074
Nickel	26	29	55
Potassium	4,630	3,630	6,300
Selenium	<0.5	<0.6	0.34
Silver	<0.5	<0.6	6.0
Sodium	577	1,700	520
Thallium	<0.6	<0.7	0.68
Vanadium	28	38	70
Zinc	67	60	220
Cyanide	<1.3	<1.4	ND
Strontium	49	76	ND
Phenols	0.4	< 0.1	ND
Sulfide	<11.0	<11.0	ND

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a. From Rood et al. (1995).

b. INEEL values will be used for contaminant screening.

c. All values are in mg/kg.

ND = No data.

Regional flow in the SRPA is from northeast to southwest. Depth to the SRPA near the ANL-W facility is approximately 640 ft BLS, based on 1995 water level measurements. Transmissivities of the SRPA range from 29,000 to 556,000 ft squared per day, based on aquifer test data from two production wells at the ANL-W (Martin et al. 1993).

2.7 Land Use

2.7.1 Current Land Use

The Bureau of Land Management (BLM) has currently classified the acreage within the INEEL as industrial and mixed use (DOE-1995). The INEEL is used as a nuclear research, materials, and development facility. The INEEL was designated as a National Environmental Research Park in 1975. As such, it is used as a controlled outdoor laboratory where scientists can study changes in the natural environment caused by human activities. The developed area within the INEEL is surrounded by a 500-mi^2 (1,295 km^2) buffer zone of grazing land for cattle and sheep (DOE-ID 1995). Grazing areas at the INEEL, shown in Figure 2-8, are administered by the BLM. The grazing boundary is 2.5 mi (4.0 km) east of ANL-W. Hunting of game animals (antelope, deer, and elk) is permitted 0.5 mi inside the INEEL boundary as stated in the Idaho Department of Fish and Game (IDFG) regulations. The nearest hunting boundary is the standard INEEL boundary, which is approximately 3.0 mi (4.8 km) southeast of ANL-W.

Figure 2-9 shows State Highways 22, 28, and 33 crossing the northeastern portion of the Site, and U.S. Highways 20 and 26 crossing the southern portion. There are a total of 90 mi (145 km) of paved highways used by the general public that pass through the INEEL (DOE-ID 1995). There are 14 mi (22.5 km) of Union Pacific Railroad that traverse the southern portion of the Site. A Government-owned railroad passes from the Union Pacific Railroad through CFA to the Naval Reactors Facility (NRF), and a spur runs from the Union Pacific Railroad to the Radioactive Waste Management Complex (RWMC).

In the counties surrounding the INEEL, approximately 45% of the land is used for agriculture, 45% is open land, and 10% is urban (DOE-ID 1995). Sheep, cattle, hogs, poultry, and dairy cattle are produced (Bowman et al. 1984) and potatoes, sugar beets, wheat, barley, oats, forage, and seed crops are cultivated. Most of the land surrounding the INEEL is owned by private individuals or the U.S. Government. The Government land is administered by the BLM.

2.7.2 Future Land Use

The document, *Long-Term Land Use Future Scenarios for the INEL* (DOE-ID 1995) was prepared by and for Department of Energy (DOE) to facilitate decisions regarding environmental restoration activities at the INEEL and to assist the DOE in understanding issues regarding probable future land use. The Department of Energy-Idaho Operations Office (DOE-ID) conducted analyses to project reasonable future land use scenarios at the INEEL for the next 100 years. The methodology for generating these scenarios included review of existing DOE plans, policy statements, and missions statements pertaining to the INEEL; review of surrounding land use characteristics and county development policies; solicitation of input from local, county, State, and Federal planners, policy specialists, environmental professionals, and elected officials; and review of environmental and developmental constraints at the INEEL that could influence future land use. These analyses resulted in the development of specific issues and assumptions that guided the generation of 25–, 50–, 75–, and 100--year future land use scenarios of the INEEL. These scenarios project (a) no change to the present INEEL boundaries within the 100-year period, and (b) future industrial development most likely concentrated in the central portion of the INEEL and within

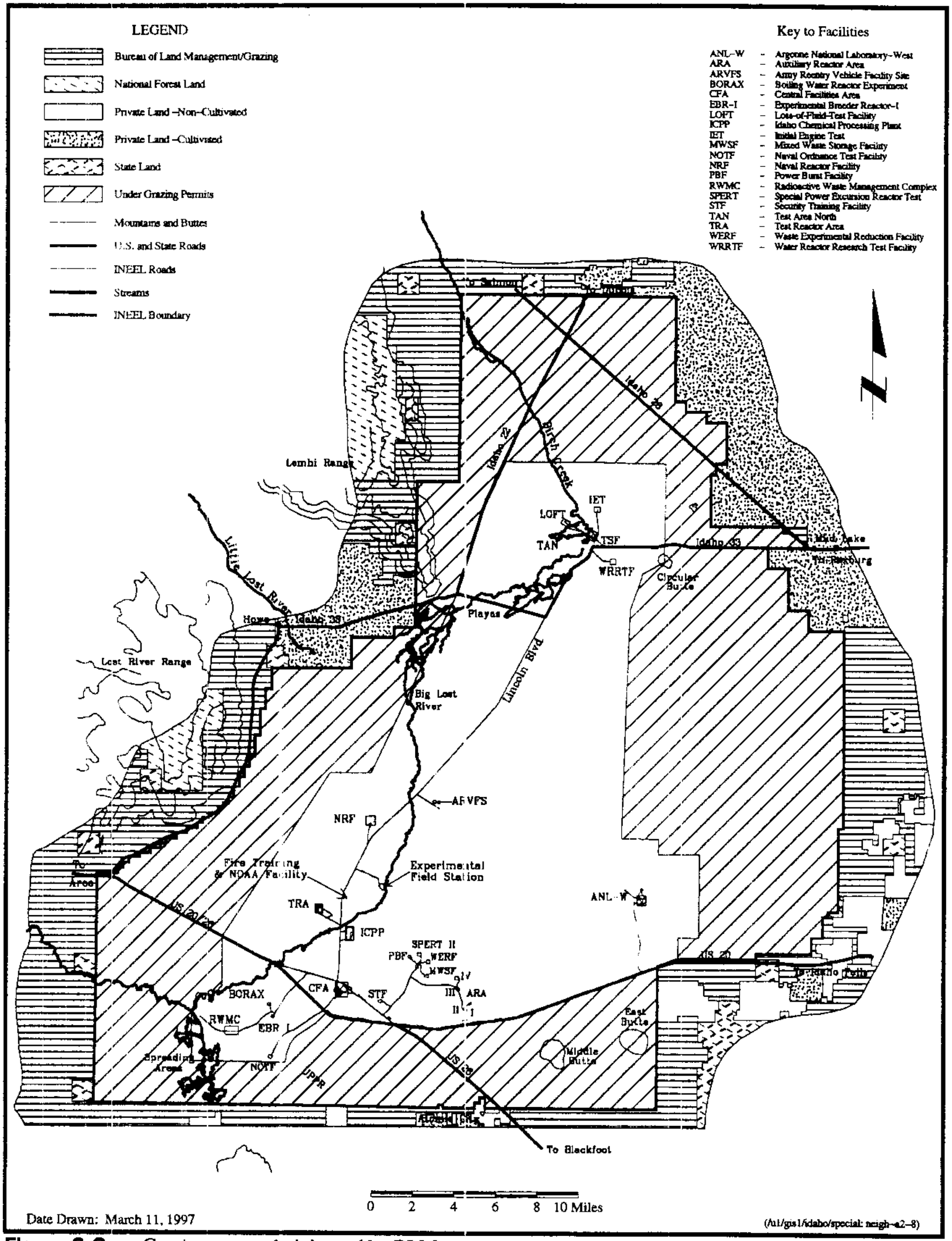
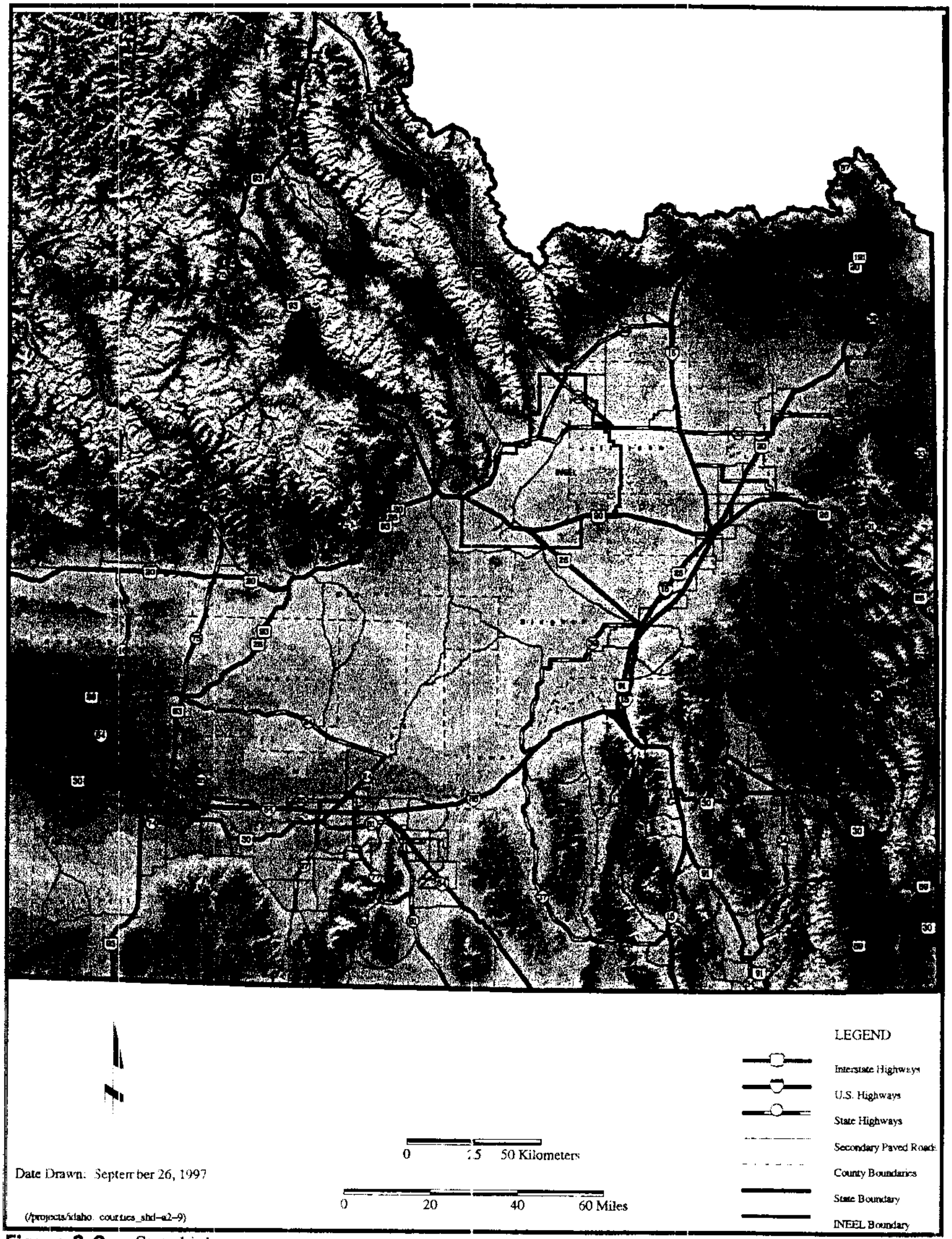


Figure 2-8. Grazing areas administered by BLM.



Date Drawn: September 26, 1997

(/projects/idaho_counties_shd-a2-9)

Figure 2-9. State highways.

existing major facility areas, as compared to other portions of the site. Additionally, the Site Environmental Management Site-Specific Citizens Advisory Board of the INEEL (EM SSAB-INEEL) has reviewed this document and provided the following recommendation regarding future land use assumption:

> The INEEL will remain under government management for the next 100 years and the implementation of this management and control becomes increasingly uncertain after this time.

Future land use at the ANL-W will most likely remain essentially the same as current use—an industrial facility. The INEEL is expected to experience minimal growth for the next 20 years. The EBR-II at ANL-W has been defueled. After the EBR-II primary and secondary sodium systems are drained, the system will be placed in an industrially and radiologically safe condition by the end of fiscal year 2000. The ultimate decontamination and decommissioning (D&D) will be completed under the Office of Environmental Management. The summary of the scenario for Waste Area Group (WAG) 9 shows the following present and projected scenarios for ANL-W (DOE-ID 1995; Table 5-1):

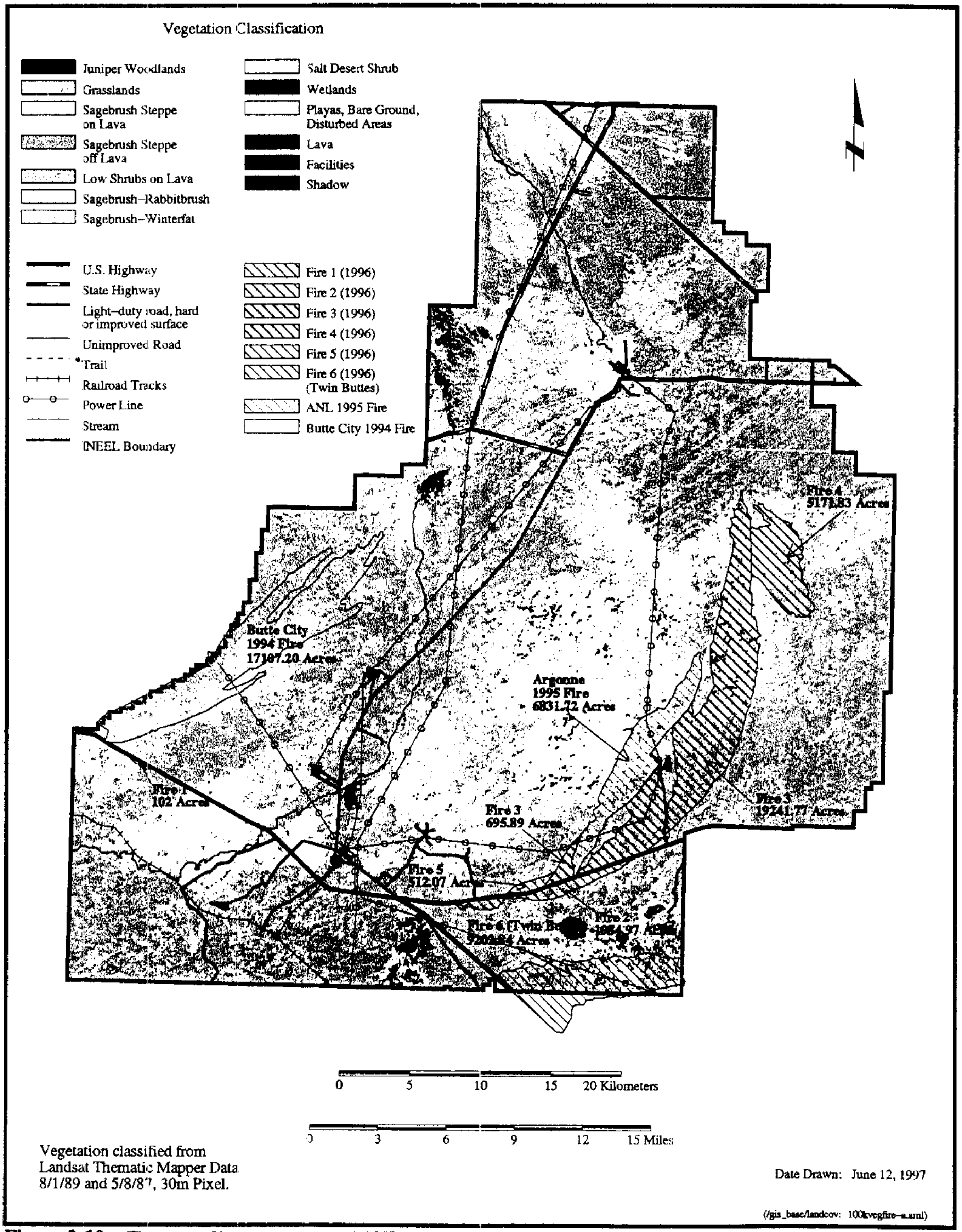
- Present: industrial land use; support the EBR-II reactor R&D
- 25-year: industrial land use; continue operations of facilities
- 50-year: industrial land use; begin D&D process to dismantle for unrestricted use
- 75-year: industrial land use; anticipated reuse as DOE or non-DOE industrial use
- 100-year: industrial land use, establish area of new development.

Other potential but less likely, INEEL land uses include agriculture and the return of areas onsite to an undeveloped state for open grazing and farming.

2.8 Ecology

The INEEL is located in a cool desert ecosystem characterized by shrub-steppe vegetation communities typical of the northern Great Basin and Columbia Plateau Region. The surface of the INEEL is relatively flat, with several prominent volcanic buttes and numerous basalt flows that provide important habitat for small and large mammals, reptiles, and some raptors. Juniper woodlands occur near the buttes and in the northwest portion of the INEEL; these woodlands provide important habitat for raptors and large mammals. Limited riparian communities exist along intermittently flowing waters of the Big Lost River and Birch Creek drainages.

Major range fires in the summer of 1995 and 1996 have burned most of the natural vegetation around the ANL-W facility. Figure 2-10 shows the extent of these range fires around the ANL-W facility. Reseeding efforts were conducted in the summer of 1996 to establish new growth in the areas upwind of the access road to ANL-W. It is not known at this time what impacts these range fires will have with the flora and fauna around the ANL-W facility. The populations of wildlife using the nonburned portions of flora around ANL-W may increase with the heavy demand for food, or the wildlife may relocate to areas where more food is present.



Vegetation classified from Landsat Thematic Mapper Data 8/1/89 and 5/8/87, 30m Pixel.

Date Drawn: June 12, 1997

(/gis_base/landcov: 100kvegfire–a.aml)

Figure 2-10. Fire map of burn areas around ANL–W.

Wildlife species present in and around ANL-W include birds, mammals, and reptiles that are associated with facilities, sagebrush-steppe, rock outcroppings, deciduous trees and shrubs, grasslands, and water (e.g., Industrial Waste Pond, Sewage Lagoons, and drainage ditches). The flora and fauna present within the WAG 9 assessment area are combined into a simplified food web model as presented in Figure 2-11. Both terrestrial and aquatic species are potentially present. Sagebrush communities surrounding ANL-W typically support a number of species including sage grouse (*Centrocercus urophasianus*), sage sparrow (*Amphispiza belli*), and pronghorn (*Antilocapra americana*). Rock outcroppings associated with these communities also provide habitat for species such as bats, woodrats (*Neotoma cinerea*), and sensitive species such as the pygmy rabbit (*Brachylagus idahoensis*). Nearby grasslands serve as habitat for species including the western meadowlark (*Sturnella neglecta*) and mule deer (*Odocoileus hemionus*). ANL-W facility structures also provide important wildlife habitat. Buildings, lawns, ornamental vegetation, and ponds are utilized by a number of species such as waterfowl, raptors, rabbits, and bats. Lawns can be an important resource to species at WAG 9 (the source of the water for these lawns is from the ANL-W deep wells). Currently, no surface hydrology exists to support fish. Current and future aquatic invertebrates are, however, supported by habitat provided by the Sewage Lagoons while they are receiving wastewaters from the facility.

The WAG 9 screening-level ecological risk assessment (SLERA) has also been conducted. Oxytheca (*Oxytheca dendroidea)* typically supports a number of species including sage grouse was listed as a sensitive species with the U.S. BLM and the Idaho Native Plant Society (INPS)/Idaho Fish and Game Conservation Data Center [(CDC) 1994]. It has since been dropped from the INPS and BLAME lists (INPS 1996). Recently, the Environmental Science and Research Foundation conducted a biological assessment for WAG 9, which was published organized by species groups (Environmental Science and Research Foundation, Inc. 1996).

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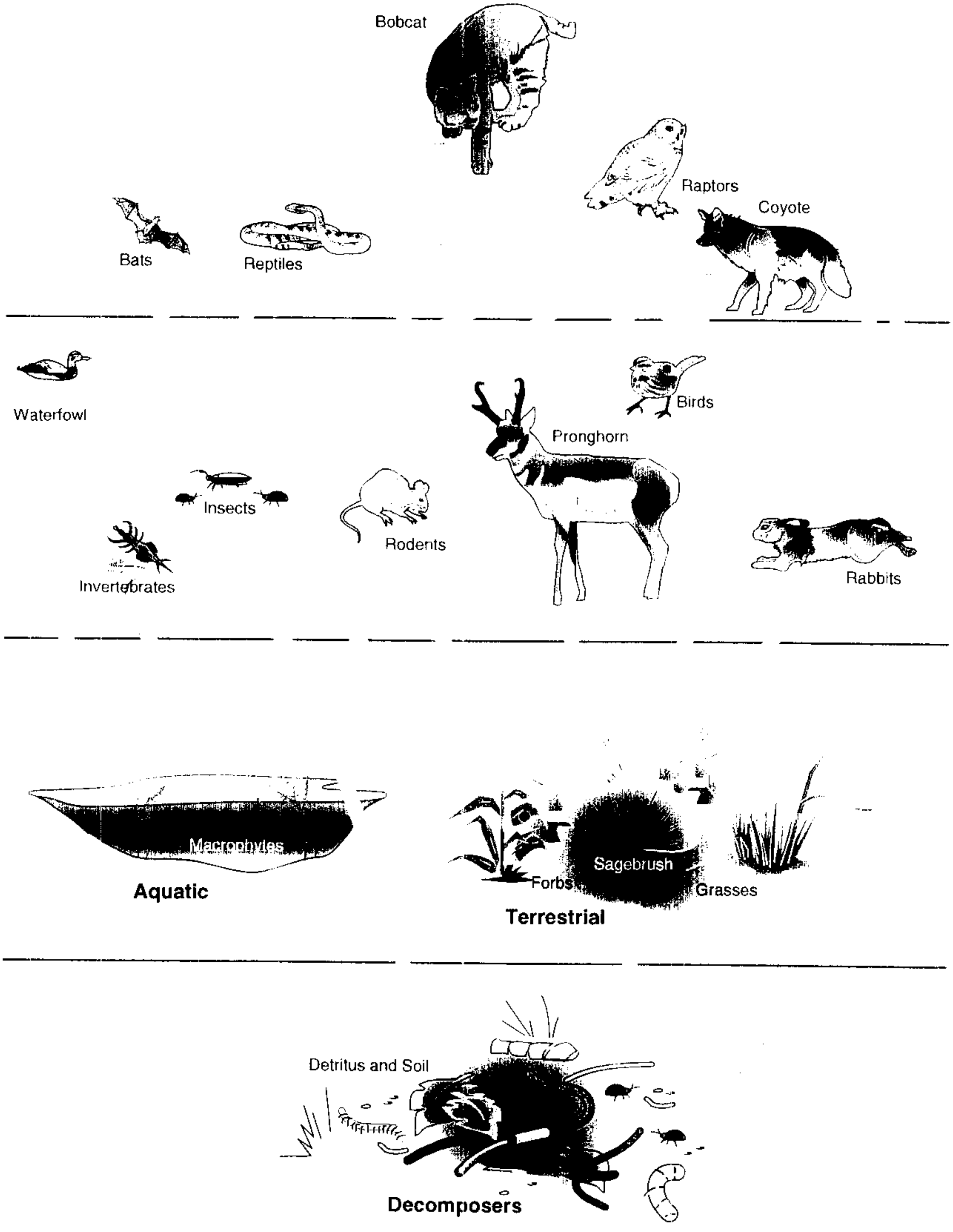

Figure 2-11. Food web for fauna at WAG-9.

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