Mule Deer Population Survey in Hells Canyon

Frank B. Edelmann
Wildlife Biologist

Von R. Pope
Wildlife Technician

Ann M. Rocklage
Wildlife Technician

Technical Report
Appendix E.3.2-30

Hells Canyon Complex
FERC No. 1971

October 2001
Revised July 2003

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

This page left blank intentionally.

ABSTRACT

Lands adjacent to Brownlee and Oxbow reservoirs in Hells Canyon support one of the largest populations of wintering mule deer (*Odocoileus hemionus*) in eastern Oregon and western Idaho. Natural resource agencies have expressed concerns that Idaho Power Company's operation and maintenance of the Hells Canyon Hydroelectric Complex (HCC) may negatively affect wintering mule deer. To respond to these concerns, in 1998 Idaho Power Company began population surveys for mule deer on lands adjacent to the HCC. Our objectives were to monitor mule deer numbers, age and sex ratios, and distribution. Data from these surveys will be useful for developing protection, mitigation, and enhancement measures for the HCC.

To facilitate surveys and analyses, we subdivided the study area from Weiser, Idaho, to Hells Canyon Dam into 103 topographically defined subunits. Of this total, 88 subunits composed the Spring Survey Area. The Fall Survey Area, a subset of the Spring Survey Area, included 69 subunits.

Surveys were conducted by helicopter with 2 observers in addition to the pilot. In the Spring Survey Area, we censused the mule deer population in March when deer concentrate at lower elevations to find rapidly greening vegetation. Spring surveys were conducted 20–26 March 1998, 10–17 March 2000, and 5–15 March 2001. We did not conduct a spring survey in 1999 because no helicopter was available. We conducted fall surveys to determine age and sex ratios and to guide the distribution of radiotransmitter collars for another study (Edelmann 2002). Fall surveys were conducted 15 November–13 December 1999 and 13 November–3 December 2000. For both spring and fall surveys, our goal was to count all deer in all subunits. However, the actual number of subunits surveyed changed among years due to logistics and our evolving understanding of mule deer distribution within the study area.

For all subunits surveyed in the Spring Survey Area, we counted 10,864 deer in 1998, 13,979 in 2000, and 14,496 in 2001. Seventy-two subunits were surveyed in all 3 years. Within these subunits, deer numbers increased from 10,536 in 1998 to 13,845 in 2000 to 13,909 in 2001. Deer densities within these 72 subunits also increased each year: we observed 7.10 deer/km^2 in 1998, 9.33 deer/km^2 in 2000, and 9.38 deer/km^2 in 2001. The maximum-recorded elevation of deer groups was 1,433 m (4,700 ft). Densities at or lower than 1,433 m were 8.25 deer/km^2 for 1998, 10.84 deer/km^2 for 2000, and 10.89 deer/km^2 for 2001. We consistently observed high concentrations of deer in Idaho along Oxbow Reservoir, the downstream reaches of Brownlee Reservoir, and the Powder River in Oregon. Spring fawn ratios fluctuated among years, with the greatest increase in 2001.

During fall, we surveyed 65 subunits in 1999 and 40 subunits in 2000. We counted 6,795 deer in 1999 and 5,375 in 2000. Thirty-seven subunits were surveyed consecutively in both years. Within those subunits, deer numbers and densities were comparable between years, with 5,137 deer in 1999 (6.15 deer/km^2) and 5,266 deer in 2000 (6.30 deer/km^2). Fawn ratios (fawns/100 does) were higher in 2000, which may indicate higher fawn production in the previous summer. As observed during spring surveys, fawn ratios were slightly higher in Idaho than Oregon. However, buck ratios (bucks/100 does) were consistently higher in Oregon.

The winter mule deer population in Hells Canyon appears to fluctuate in response to winter weather. The population increase we observed from 1998 to 2001 occurred during winters with higher-than-average temperatures and lower-than-average precipitation and snowfall. These mild winters likely resulted in higher over-winter survival for deer, particularly of fawns. Historical survey data from Hells Canyon indicated deer populations decreased in the winters of 1983−1986, 1988–1989, and 1992–1993. These decreases corresponded with extreme low temperatures and high snowfall. Thus, deer were physiologically stressed by low temperatures and were likely unable to access food beneath heavy snow cover, which may, in turn, have predisposed them to predation.

1. INTRODUCTION

1.1. State of Knowledge

Lands adjacent to the Hells Canyon Hydroelectric Complex (HCC) support one of the largest populations of wintering mule deer (*Odocoileus hemionus*) in eastern Oregon and western Idaho (Christensen 2001). The HCC winter range is unique in vegetation, elevation, and climate. Sagebrush (*Artemisia tridentata*) and bitterbrush (*Purshia tridentata*) are typically considered critical winter range components (Trout and Thiessen 1973, Austin and Urness 1983, Carson and Peek 1987, Griffith and Peek 1989). However, shrublands and shrub savannas occupy just 27% of the landscape, while grasslands, both native perennials and exotic annual grasses, dominate at least 35% (Holmstead 2001). The elevation of the winter range is one of the lowest in the region; therefore, winter weather is often relatively mild. A steep and variable topography gives deer access to south- and west-facing aspects when needed. This combination of mild winters and favorable topography results in significant fall, winter, and early spring green-up of annual grasses, which may provide the bulk of forage during these times (Edelmann 2002).

Prior to this study, the Idaho Department of Fish and Game (IDFG) and the Oregon Department of Fish and Wildlife (ODFW) conducted surveys of wintering mule deer in Hells Canyon. In Idaho, Big Game Management Units 22 and 31 intersect the HCC winter range. The IDFG counted mule deer in these units during late winter or early spring from 1962 to 1990 at an average interval of 2.4 years (Scott 1991). In 1991, IDFG began annual surveys in response to deer population declines in the winter of 1988–1989. In Oregon, ODFW has conducted annual surveys since 1965 in the Snake River, Pine Creek, and Lookout Mountain Big Game Management Units (G. Kiester, ODFW, personal communication). Survey routes were traveled on horseback until 1995, when helicopters were employed. To gain more precise information on the distribution and abundance of wintering mule deer in relation to the HCC, Idaho Power Company (IPC) has conducted mule deer population surveys in Hells Canyon since 1998.

1.2. Justification

Natural resource agencies responsible for managing wildlife populations and habitat in the region expressed concerns to the Federal Energy Regulatory Commission (FERC) that IPC's operation and maintenance of the HCC may influence the availability and quality of habitat, inhibit movements, and increase mortality for mule deer wintering in Hells Canyon. To respond to these concerns and meet FERC requirements for relicensing the HCC, IPC proposed this study as a part of a comprehensive investigation of wildlife resources in Hells Canyon. The FERC, which regulates the HCC, requires license applicants to describe important wildlife resources occurring in the affected area (Federal Energy Regulatory Commission 1990). Mule deer are an important resource under FERC regulations because of their economic and recreational qualities (Connelly and Brown 1990a, 1990b). Information about the distribution and abundance of mule deer will also be useful in addressing mitigation claims for habitat alteration due to the HCC (Scott 1991) and for developing protection, mitigation, and enhancement measures.

1.3. Objectives

Our primary objectives were to monitor winter mule deer numbers and distribution in areas adjacent to the HCC reservoirs. Specific objectives were to 1) estimate minimum population levels in late winter/early spring, 2) determine age composition, 3) monitor population trends among years, 4) obtain information on distribution within and among years, and 5) examine the spatial distribution of age and sex ratios during late fall. Data acquired from fall surveys were used to guide the allocation of radiotransmitter collars for Edelmann (2002).

2. STUDY AREA

2.1. Location

The Hells Canyon Reach of the Snake River is situated in west-central Idaho and northeastern Oregon (Figure 1). The HCC generation facilities are located on the Snake River in the southern portion of Hells Canyon and encompass 3 reservoirs—Brownlee, Oxbow, and Hells Canyon. The reach below Hells Canyon Dam is unimpounded, although the three-dam complex controls river flows. The Hells Canyon Relicensing Study Area for evaluating terrestrial resources (Idaho Power Company 1997) is located between the city of Weiser and the confluence of the Salmon and Snake rivers (from approximately river mile [RM] 351 to RM 188).

The Snake River, a major tributary to the Columbia River, is the focal point of Hells Canyon. Its generally northward flow forms part of the boundary between Idaho and Oregon. Federal agencies, including the Bureau of Land Management (BLM) and U.S. Forest Service (USFS), are responsible for managing the majority of public land in Hells Canyon. These areas fall within the jurisdictional boundaries of the Wallowa–Whitman National Forest, Oregon; Payette National Forest, Idaho; Nez Perce National Forest, Idaho; Four Rivers Field Office (FO) of the Lower Snake River District, BLM–Idaho; Cottonwood FO of the Upper Columbia-Salmon Clearwater District, BLM–Idaho; and Baker FO and Malheur FO of the Vale District, BLM–Oregon. Other agencies with natural resource jurisdiction in the greater project area include the U.S. Department of the Interior (USDI) National Marine Fisheries Service, USDI Bureau of Indian Affairs, USDI Fish and Wildlife Service, and state agencies from Idaho and Oregon.

The Terrestrial Relicensing Study Area in Hells Canyon was broadly divided longitudinally (i.e., north to south) into 5 reaches, based on distinct geomorphic features, river characteristics, and legal project boundaries:

- Upstream of Brownlee Reservoir to the Weiser Bridge (approximately 12 mi; RM 351.2 to RM 339.2).

- Brownlee Reservoir including Powder River Arm (approximately 55 mi; RM 339.2 to RM 284.6).
- Oxbow Reservoir (approximately 12 mi; RM 284.6 to RM 272.2).
- Hells Canyon Reservoir (approximately 25 mi; RM 272.2 to RM 247.0).
- Downstream of Hells Canyon Dam to the confluence of the Snake and Salmon rivers (approximately 59 mi, RM 247.0 to RM 188.2).

The lateral (i.e., east to west) extent of the reaches was also divided into 3 tiers: Intensive, Rim-to-Rim, and Extensive. The Intensive Tier includes all land within 0.5 mi of each shoreline for reaches above Hells Canyon Dam and all land within 0.25 mi of the shoreline below Hells Canyon Dam (Holmstead 2001). Watershed and topographic features within Hells Canyon defined lateral boundaries for the Rim-to-Rim Tier (Christensen 2001), which include all land within 1−10 km (depending on topography) of shorelines of the 5 reaches. The Extensive Tier extends laterally approximately 48 km from the 5 Hells Canyon reaches and was designed to include jurisdictional boundaries associated with natural resource management authority in Hells Canyon. Other lateral extents of the Terrestrial Relicensing Study Area vary depending on specific objectives for resources being studied (Idaho Power Company 1997).

In the upstream reach, the Snake River is characterized as a low-gradient (0.2 to 0.4 m/km) river, with several island complexes. Agriculture and rural development on flat to gentle topography surround this reach. Large amounts of irrigation returns cause high turbidities and increased nutrient loading. Brownlee Reservoir is a steep-sided reservoir with a maximum depth approaching 300 ft near the dam. Large rock outcrops occur throughout its entire length. Oxbow Reservoir is a relatively small and shallow re-regulating reservoir surrounded by moderate to steep topography (20% to 75% slopes). Shorelines are primarily basalt outcrops and talus, except for alluvial fans created by small tributaries. Hells Canyon Reservoir is a re-regulating reservoir with maximum depths approaching 200 ft. Shorelines in the reservoir are generally very steep, and substrates are primarily composed of basalt outcrops and talus slopes. The Snake River downstream of Hells Canyon Dam is a high-gradient river (1.8 m/km) bounded by nearly vertical cliff faces. The Snake River below Hells Canyon Dam supports a diversity of aquatic habitat, including numerous large rapids, shallow riffles, and deep pools. Substrates are also diverse, ranging from large basalt outcrops and boulders to cobble/sand bars.

2.2. Physiography

Hells Canyon is the deepest and one of the most rugged river gorges in the continental United States. It ranges between 2,000 and 3,000 ft deep from Weiser to Oxbow Dam. Below Oxbow Dam, the river enters a narrow, steep-sided chasm measuring up to 5,500 ft deep. From the confluence with the Grande Ronde River, the Snake River then flows into a lava-filled basin and through a much shallower canyon to Lewiston, Idaho (U.S. Department of Energy 1985). The elevation of the Snake River near Weiser, Idaho, is about 2,090 ft msl, descending to about 910 ft msl at the confluence of the Salmon River.

Throughout Hells Canyon, topography is generally steep and broken, with slopes often dominated by rock outcrops and talus slopes. At the deepest points, canyon walls rise almost vertically. Canyon walls are also deeply dissected by numerous side canyons with tributaries to the Snake River. The Seven Devils Mountains to the east and the Wallowa Mountains to the west form the upper reaches of the canyon walls. These mountains form a series of jagged peaks reaching almost 10,000 ft, with subalpine and alpine conditions (U.S. Department of Agriculture 1990).

2.3. Land Features and Geology

Hells Canyon consists of a series of folded and faulted metamorphosed sediments and volcanics overlain unconformably by nearly horizontal flows of Columbia River basalt. This basalt group covered much of eastern Washington, northern Oregon, and adjacent parts of Idaho (Bush and Seward 1992). The older rocks in the series are Permian to Jurassic in age and represent at least two episodes of island arc volcanism and adjacent marine sedimentation similar to those found today in the Aleutian Islands west of Alaska. These rock units represent old island arc chains that were sequentially “welded” to the west coast of North America during the late Paleozoic and early to mid-Mesozoic eras by subduction of a tectonic plate beneath the North American continental tectonic plate (Asherin and Claar 1976, U.S. Department of Agriculture 1994).

In more recent geologic time, the Snake River formed Hells Canyon through erosion of the Blue Mountains in Oregon and Seven Devils Mountains in Idaho (U.S. Department of Energy 1985). The Snake River has existed since the Pliocene and probably cut to its present level in Hells Canyon during the Pleistocene. During the Pleistocene, glacial meltwater provided abundant runoff for down-cutting, while regional uplifting created weak points in the 2,000- to 3,000-foot-thick basalt plateau that overlaid the Blue and Seven Devils mountains. Resulting erosion formed the currently observed drainage pattern that established the Snake River (U.S. Department of Energy 1985). Northeast-trending, high-angle fault patterns characterize the extensive Snake River fault system running throughout Hells Canyon (Fitzgerald 1982).

Besides basalt, other rock types are also present within the study area. Extensive limestone outcrops are found in some tributary drainage areas, and local granitic outcrops also occur.

2.4. Soils

The soils throughout Hells Canyon are derived primarily from Columbia River basalt, covered in most areas with a thin mantle of residual soils from weathered native rock. Isolated areas contain deposits of windblown silt. Unconsolidated materials include river sands and gravel deposited during the Bonneville floods 15,000 years ago, ash-loess from the Mount Mazama eruption 6,900 years ago, and colluvium and talus deposited more recently. The amount of soil cover declines northward through Hells Canyon. Near Hells Canyon Dam (RM 247), most rock faces are nearly vertical with little soil cover (U.S. Department of Agriculture 1994).

Most soil complexes are well drained and vary from very shallow to moderately deep. Loams are the dominant textural class and vary from very stony to silty, often with a clay subsoil component (Natural Resources Conservation Service 1995).

2.5. Climate

From late fall to early spring, the climate of west-central Idaho and eastern Oregon is typically influenced by cool and moist Pacific maritime air. Periodically this westerly flow is interrupted by outbreaks of cold, dry continental air from the north, which is normally blocked by mountain ranges to the east. During the summer, a Pacific high-pressure system dominates weather patterns, resulting in minimal precipitation and more continental climatic conditions overall (Ross and Savage 1967). Hells Canyon, located in the High Desert region, is significantly influenced by the rain shadow of the Cascade Mountains to the west.

Climatological information is summarized for Weiser, Richland, Brownlee Dam, and Lewiston (Figure 2). Average annual precipitation is lowest at the southern end of the study area (Weiser, 286 mm), increases northward (Richland, 298 mm), peaks around Brownlee Dam (445 mm), and declines towards Lewiston (326 mm). The average annual precipitation ranges from about 380 to 500 mm (15 to 20 inches), depending on elevation. Nearly 45% of the average annual precipitation at Brownlee Dam (445 mm [17.8 inches]) falls from November through January, which strongly contrasts with the 9% average recorded for July through September. Thus, most precipitation occurs in spring and winter (Tisdale et al. 1969,Tisdale 1986, Johnson and Simon 1987), and little or no precipitation falls during the hottest months of summer. Average annual evapotranspiration is estimated to be about 1,300 mm (52 inches).

Mean annual temperatures are similar among the four weather stations. Generally, the climate tends to become drier and warmer downstream of Brownlee Dam. Climatological information from Brownlee Dam (RM 284.6) is probably characteristic of the central section of the study area. The canyon bottom area is dry with seasonal temperatures ranging from lows of about −5 °C in January to highs of about 35 °C in July (Figure 2). Temperatures below freezing are normally experienced from mid-November through mid-April. As a rule, winters in the canyons are mild, while summers on the canyon floor may be hot. Mean temperatures above 2,000 m (6,562 ft msl) range from –9 °C in January to 13 °C in July. By contrast, mean temperatures below 1,000 m (3,281 ft msl) elevation range from 0 °C in January to between 28 °C and 33 °C in July (Johnson and Simon 1987).

2.6. Vegetation

The types of vegetation growing along the canyon slopes of the middle Snake River result from three primary ecological factors: topography, soils, and climate. Of these factors, climate exerts the strongest influence on plant life development. For instance, the relatively mild winters below the canyon rim have allowed the development of disjunct species such as hackberry (*Celtis reticulata*), which is most often found in the southwestern states, though it commonly occurs in the middle and lower Snake River area (Tisdale 1979, DeBolt 1992).

Within the context of regional climate, topography is a major influence on the development and distribution of vegetation (Tisdale et al. 1969; Tisdale 1979, 1986). The topographical complexity of Hells Canyon has produced a mosaic of vegetation types (Tisdale 1979, Bonneville Power Administration 1984, U.S. Department of the Interior 1987). Grassland, shrubland, riparian, and coniferous forest communities exist in close proximity. Interfingering of grassland and forest, for example, occurs at a number of sites throughout the canyon due to variations in aspect (Tisdale 1979).

Wetland and Riparian Communities—Information on wetland and riparian communities in Hells Canyon is limited (Huschle 1975, Asherin and Claar 1976, Miller 1976, Miller and Johnson 1976, DeBolt 1992). Emergent wetland communities are composed mostly of common cattail (*Typha latifolia*), narrowleaf cattail (*T. angustifolia*), American bulrush (*Scirpus americanus*), and common spikerush (*Eleocharis palustris*). Willows are sparsely represented, and various forbs grow on the shoreline side of these stands (Asherin and Claar 1976). A narrow band of diverse riparian communities follows the course of the Snake River and its many tributaries. Although limited in geographic area, this riparian zone is vital because of its biological diversity (U.S. Department of the Interior 1987). Predominant tree species in riparian areas include white alder (*Alnus rhombifolia*), water birch (*Betula occidentalis*), and black cottonwood (*Populus trichocarpa*). Predominant shrub species in riparian areas include syringa (*Philadelphus lewisii*), netleaf hackberry, chokecherry (*Prunus virginiana*), black hawthorn (*Crataegus douglasii*), and poison ivy (*Toxicodendron radicans*).

There is no riparian vegetation along many shoreline sections. Rather, upland vegetation on steep canyon slopes simply meets the rocky shoreline. Grassland communities are also common along the Snake River and its tributaries. Where these grassland communities occur, such as on the canyon slopes, the dominant species are bluebunch wheatgrass (*Pseudoroegneria spicata*), cheatgrass (*Bromus tectorum*), and Idaho fescue (*Festuca idahoensis*) (Asherin and Claar 1976).

Herbaceous-Dominated Vegetation Types—The dry climate and typically stony, shallow soils of the canyon have favored the development of grassland steppe communities at the lower and middle elevations (Tisdale 1979, 1986). Commonly occurring grass species in the study area include bunchgrasses such as bluebunch wheatgrass, Sandberg bluegrass (*Poa secunda*), and Idaho fescue (Garrison et al. 1977, Bonneville Power Administration 1984, Tisdale 1986, Franklin and Dyrness 1988). Sand dropseed (*Sporobolus cryptandrus*) and red threeawn (*Aristida longiseta*) are also common and, at times, dominant (Bonneville Power Administration 1984, Tisdale 1986).

Habitat types in which bluebunch wheatgrass is dominant occur throughout the study area and occupy over half of its grassland area (Tisdale 1986). Bluebunch wheatgrass flourishes on deep, loamy soils but adapts to coarser and shallower soils as well. Generally, it is associated with Idaho fescue on deeper soils and with Sandberg bluegrass on shallower soils.

Shrub-Dominated Vegetation Types—Shrub species comprise a large segment of the canyon's overall vegetation composition. Shrub-steppe vegetation types occur at mid-elevations, especially in the southern portion of Hells Canyon. For example, big sagebrush (*Artemisia tridentata*) is a dominant species in the southern sector of the study area, particularly in the area around Brownlee Reservoir (Bonneville Power Administration 1984). Commonly occurring shrubs include big sagebrush, antelope bitterbrush, hackberry, serviceberry (*Amelanchier alnifolia*), and bitter cherry (*Prunus emarginata*) (Bonneville Power Administration 1984, Tisdale 1986). Other species of sagebrush are also present, including low sagebrush (*A. arbuscula*), and stiff sagebrush (*A. rigida*) (Tisdale and Hironaka 1981, Franklin and Dyrness 1988). For the most part, sagebrush stands are limited to the area around Brownlee Reservoir. In these stands, the herbaceous layer is dominated by Sandberg's bluegrass and cheatgrass, with a variety of forbs also occurring.

Stands of hackberry can be found throughout the study area, either on lower slopes with rocky residual/colluvial soil or on alluvial terraces with sandy soil (Tisdale 1986). In these stands, hackberry is often mixed with a number of other shrub and tree species, including antelope bitterbrush, blue elderberry (*Sambucus cerulea*), and ponderosa pine (Bonneville Power Administration 1984). The herbaceous layer is most often dominated by bluebunch wheatgrass, with cheatgrass and sand dropseed dominant in those areas that have been heavily disturbed by the grazing and trampling of cattle.

Tree-Dominated Vegetation Types—Although coniferous forest communities are generally restricted to the higher elevations of steep canyon slopes, they do reach down to the Snake River in certain locations of the study area. The predominant forest community is a ponderosa pine (*Pinus ponderosa*)/bluebunch wheatgrass plant association, which extends to the river on north-facing slopes at sites along Oxbow and Hells Canyon reservoirs (Asherin and Claar 1976, Bonneville Power Administration 1984). This association typically occurs as a savanna of ponderosa pine trees distributed over a grassland steppe dominated by bluebunch wheatgrass. Shrubs are almost completely absent, except for sparsely distributed, drought-resistant species such as antelope bitterbrush and serviceberry (Garrison et al. 1977, Johnson and Simon 1987). A ponderosa pine/hackberry type may also extend down to the river in this area. Hackberry dominates the shrub layer in moderate density, and poison ivy is also abundant (Asherin and Claar 1976).

Vegetation, Natural Feature, and Land-Use Cover Types—Twenty-six cover types were identified along the Snake River in Hells Canyon (Holmstead 2001). The area that was classified covered up to approximately one-half mile on both sides of the Snake River or associated reservoirs. The dominant cover types were *Grassland* (35.5%), *Shrub Savanna* (21.0%), *Lotic* (16.1%), *Shrubland* (6.6%), and *Cliff/Talus* (5.6%). Each remaining cover type covered less than 5% of the area classified.

2.7. Land Use

The study area and vicinity is still dominated by the land-use patterns established in the early 1900s: irrigated and nonirrigated agriculture, livestock grazing, mining, large areas of open space, scattered rural development, and rapidly growing recreational activities. The bottomlands adjacent to the reservoirs are generally used for grazing, some farming, and recreation.

2.8. Plant Operations

The three-dam HCC has always been a multiple-use facility. However, IPC originally constructed the project primarily for power generation. Over the past decade or so, the framework for operations at the HCC has changed quite significantly as a result of restrictions and requirements for flood control, anadromous fish spawning and protection, and recreation.

Operations of the three HCC plants are closely coordinated to ensure the most efficient operations possible within the bounds of the license and environmental restrictions. This efficiency typically involves increasing generation during the daytime hours and decreasing generation during the night to meet the daily load. Because the hydraulic capacities of the Oxbow and Hells Canyon plants are significantly less than the hydraulic capacity of the Brownlee plant, Oxbow and Hells Canyon reservoirs are often drafted at night to receive increased outflows from Brownlee Reservoir during the day.

Brownlee Reservoir, the reservoir farthest upstream within the HCC, has a usable storage capacity of 975,318 acre-ft. Because of its large storage capacity and its position at the upstream end of the HCC, operations at Brownlee Dam drive operations of the three-dam complex and make Brownlee Reservoir the focus of flood control, anadromous fish operations, and recreational issues. The HCC operates year-round under project license restrictions as well as anadromous fish protection restrictions pursuant to the 1980 Hells Canyon Settlement Agreement.

3. METHODS

3.1. Definition of Mule Deer Survey Areas

The HCC Winter Range was defined to include concentrations of wintering deer that might interact with the HCC reservoirs (Figure 1). Longitudinally (i.e., south to north) the HCC Winter Range extended from Weiser north to Hells Canyon Dam, and laterally (i.e., east to west) from the Snake River approximately to the canyon rims, including the Powder River Arm of Brownlee Reservoir (i.e., Rim-to-Rim Tier). The Winter Range included portions of IDFG's Big Game Management Units 22 and 31 and portions of ODFW's Snake River (Unit 59), Pine Creek (Unit 62), Keating (Unit 63), and Lookout Mountain (Unit 64) Big Game Management Units.

To facilitate consistency and accuracy within and among years, we subdivided the HCC Winter Range into 103 subunits with topographically defined boundaries (Figure 1) (Unsworth et al. 1994). Subunits were the smallest subdivision of the study area (mean size = 22.18 km^2, standard deviation = 11.46 km^2). They also served as spatial replicates for examining deer distribution within the study area. In Idaho, we used subunits previously delineated by IDFG. For Oregon, we divided portions of the 4 Big Game Management Units that intersect the HCC Winter Range into subunits following protocols similar to Idaho (Unsworth et al. 1994).

We conducted population surveys in fall and late winter/early spring (hereafter called fall and spring surveys). We focused our data collection efforts for these surveys within 2 subdivisions of the Winter Range (Figure 1). These areas were stepped down in elevation and extent from the overall study area to address specific objectives more effectively. The Spring Survey Area comprised 88 of the total 103 subunits. Within these 88 subunits, we surveyed late winter/early spring concentrations of mule deer adjacent to the HCC reservoirs. The Fall Survey Area included 69 of the 103 subunits. Fall surveys provided us with spatial distribution of age and sex ratios. We also used fall data from a smaller number of subunits to guide the allocation of radiotransmitter collars for another study by Edelmann (2002).

3.2. Aerial Surveys

From late winter to early spring, mule deer tend to congregate at lower elevations where they can find rapidly greening vegetation. Therefore, we attempted to conduct surveys in the Spring Survey Area at the peak of green-up. Spring surveys were conducted 20–26 March 1998, 10−17 March 2000, and 5–15 March 2001. Spring surveys did not occur in 1999, due to lack of an available helicopter. Fall surveys occurred from 15 November−13 December 1999 and 13 November−3 December 2000.

Aerial surveys were conducted with a Hiller 12E helicopter with 2 observers in addition to the pilot. Mike Shlegel, retired IDFG biologist, was the primary observer for all surveys, except in 1998 when Dick Humphrys, ODFW, and Jeff Rohlman, IDFG, served as primary observers. We practiced basic aviation safety protocols (Unsworth et al. 1994, Office of Aircraft Services 1997). Each survey required about 80 hours of helicopter time. The pilot maintained survey flight speeds of 48 to 80 kilometers per hour (30–50 mi/hr). Helicopter elevation was maintained at approximately 60 to 90 m (200–300 ft) above ground level, although actual survey elevations were often adjusted for safety considerations. Within each subunit, search paths began at the reservoir shoreline (or at the lowest elevation within the subunit) and were flown in contours of approximately 152 m (500 ft) until the top of the subunit was reached or until deep snow without deer tracks was encountered. For each deer group observed, we recorded the following data: 1) subunit number; 2) current temperature and cloud cover; 3) the number of adults, fawns, and unclassified deer; 4) deer activity (bedded, standing, or moving); 5) vegetation class (grass/aspen [*Populus tremuloides*], sagebrush, juniper [*Juniperus* spp.] /mountain mahogany [*Cercocarpus ledifolius*], mountain shrub/aspen, and conifers); and 6) vegetation cover (0–15%, 16–30%, 31−45%, 46−60%, > 60%; Unsworth et al. 1994). In addition, we also recorded locations of elk (*Cervus elaphus*) and bighorn sheep (*Ovis canadensis*) for Ryle et al. (2002). During the 2000 and 2001 surveys, we recorded the approximate elevation (± 100 ft) at which each deer group was observed. For fall surveys, we also recorded the number of bucks and categorized them by antler size (≤ 2 points, 3 points, ≥ 4 points).

3.3. Analyses

Our goal was to survey all subunits each year. Therefore, we report data as a complete census. However, deer numbers were more accurately interpreted as minimum population size because some deer were likely missed during surveys. We assumed that visibility biases (Unsworth et al.1994) were relatively insignificant and constant throughout the survey area, which is dominated by low-canopy grassland/shrub-steppe vegetation. Therefore, we did not adjust for sightability and assumed that the measured spatial and temporal patterns of population trends accurately reflected the actual mule deer population in the survey area.

We calculated total numbers and densities of all mule deer observed within each subunit each year in both spring and fall. Because bucks had not developed antlers by spring surveys, we calculated fawn ratios as number of fawns/100 adults. Similarly, buck ratios (number of bucks/100 does) were calculated for fall only. We calculated fawn ratios for fall as number of fawns/100 does. To examine deer distribution in the study area, we used a Geographic Information System (GIS) to map population numbers and ratios within each subunit.

Because deer were concentrated at lower elevations during spring surveys, we examined the elevation limits of deer distribution. We located the maximum-recorded elevation of deer groups in 2000 and 2001, and used this elevation as a limit to calculate densities within each subunit. Resulting densities may more accurately represent the distribution and abundance of mule deer in Hells Canyon in late winter and early spring. Although we recorded elevations only in 2000 and 2001, we assumed that elevation limits also applied to 1998 data. Elevation limits, however, do not apply to fall data because deer had not completely moved onto the winter range during fall surveys (Pope et al. 2002).

3.4. Weather and Historical Mule Deer Population Trends

Because mule deer populations are vulnerable to extreme winter weather, we examined long-term regional weather data and historical mule deer population data for Hells Canyon. We obtained weather data for Brownlee Dam, Richland, and Weiser from state and regional websites (Idaho State Climate Services 2001, Oregon Climate Services 2001, Western Regional Climate Center 2001). We then summarized these data by month (January, February, March, November, and December). Results of late winter/early spring mule deer surveys were provided by state agencies (G. Kiester, ODFW, personal communications; J. Rohlman, IDFG, personal communication). To understand our recent survey results in terms of weather patterns, we also summarized recent winter-weather data (November 1997–April 2001) and compared those with long-term monthly averages.

4. Results

4.1. Spring

Numbers of subunits surveyed varied among years largely due to logistics and our evolving understanding of mule deer distribution within the HCC Winter Range. For all subunits surveyed in the Spring Survey Area, we counted 10,864 deer in 1998, 13,979 in 2000, and 14,496 in 2001 (Table 1, Appendix 1). We surveyed 72 of the 88 subunits in all 3 years. Within these subunits, deer numbers increased from 10,536 in 1998 to 13,845 in 2000 to 13,909 in 2001. Deer densities within these 72 subunits also increased each year: we observed 7.10 deer/km^2 in 1998, 9.33 deer/km^2 in 2000, and 9.38 deer/km^2 in 2001 (Table 2). The maximum-recorded elevation of deer groups was 1,433 m (4,700 ft). Densities at or lower than 1,433 m were 8.25 deer/km^2 for 1998, 10.84 deer/km^2 for 2000, and 10.89 deer/km^2 for 2001 (Table 2). In the area around Brownlee Reservoir, 95% of the mule deer population was found at or below 1,128 m (3,700 ft); in the area around Oxbow and Hells Canyon reservoirs, 95% of the population was found at or below 1,097 m (3,600 ft; Figures 3–5). Full-pool elevation of Brownlee Reservoir is 633 m (2,077 ft), Oxbow Reservoir is 550 m (1,805 ft), and Hells Canyon Reservoir is 515 m (1,688 ft).

We attributed the increase in deer between 2000 and 2001 to the greater number of fawns observed. Adult populations decreased 4% from 2000 to 2001, while fawn numbers increased 29% (Table 1). Fawn ratios (fawns/100 adults) decreased from 33.6 in 1998 to 30.5 in 2000, but increased to 40.9 in 2001 (Table 3, Figures 6–8). Although fawn ratios were consistently higher in Idaho, annual trends were similar between Idaho and Oregon.

We consistently observed high concentrations of deer in Idaho from Oxbow Dam to just south of Brownlee Creek and along the Powder River in Oregon (Figures 9–14). New areas of concentration appeared as the population increased. For example, areas in the middle reaches of Brownlee Reservoir became more important in 2001 (Figure 14). Areas of concentration shifted among years along the Powder River. In 1998 and 2001, deer were concentrated near the confluence of the Powder River and Brownlee Reservoir. In 2000, high-density areas appeared further upstream along the Powder River. These shifts may be attributed to the timing of the surveys in relation to the peak of spring green-up and spring migration. This assumption was partially verified when we compared the mean elevations within each subunit for deer groups in 2000 and 2001. Deer were found at significantly higher elevations in 2000 in Oregon (2000 mean elevation = 831 m [2,725 ft], 2001 mean elevation = 793 m [2,602 ft], mean difference = 123.0 m, SE = 42.6 m, $t = 2.883$, df = 37, $P = 0.007$), but not in Idaho (2000 mean elevation = 854 m [2,802 ft], 2001 mean elevation = 849 m [2,786 ft], mean difference = 15.408 m, SE = 60.797 m, $t = 0.253$, df = 37, $P = 0.801$) (Figures 3–5). These data were also supported by Pope et al. (2002), who determined that, in spring 2000, radio-collared deer migrated 1–2 weeks earlier than in 1999 and 2001.

4.2. Fall

Due to various logistical constraints, we were unable to survey all subunits in the Fall Survey Area. We surveyed 65 subunits in 1999 and 40 in 2000. We counted 6,795 deer in 1999 and 5,375 in 2000 (Table 4). Thirty-seven subunits were surveyed in both years. Within those subunits, deer numbers and densities were comparable between years. We counted 5,137 deer in 1999 (6.15 deer/km^2) and 5,266 deer in 2000 (6.30 deer/km^2; Table 5, Figures 15–16). Fawn ratios (fawns/100 does) were higher in 2000, which may indicate higher fawn production in the previous summer (Table 6, Figures 17–18). As observed during spring surveys, fawn ratios were slightly higher in Idaho than in Oregon. However, buck ratios (bucks/100 does) were consistently higher in Oregon (Table 7, Figures 19–20).

4.3. Weather and Historical Mule Deer Population Trends

We summarized long-term and recent weather data by month for Brownlee Dam, Richland, and Weiser (Tables 8–9). During the winters of this study (November 1997–March 2001), the study area experienced higher-than-average temperatures and lower-than-average monthly precipitation and snowfall. Exceptions in all years were lower-than-average temperatures for Richland in March and November and higher-than-average precipitation for Richland in January and for Weiser in January and February. At Brownlee Dam, average daily temperatures were 0.5 to 1.8 °C (0.8–3.3 °F) higher from 1997–2001 compared to the long-term average. Minimum temperatures were 1.3 to 2.8 °C (2.3–5.0 °F) warmer and precipitation was 0.11 to 1.53 cm

(0.04–0.61 inches) lower. Monthly total snowfall was not reported in recent years for Brownlee Dam and Richland.

An examination of historical survey data indicated significant declines in mule deer numbers during the winters of 1983–1986, 1988–1989, and 1992–1993 (Tables 10 and 11). From 1983 to 1984, average daily temperatures ranged 0.4 to 3.3 °C (0.7–5.3 °F) colder than the long-term average, with extreme monthly snowfalls in December (54.1 cm [21.3 inches]) and February (26.7 cm [10.5 inches]) (Table 12). From 1984 to 1985, average temperatures were 2.5 to 4.5 °C (4.4−8.1 °F) colder, but snowfalls were likely at normal levels (2 months had missing data). November and December 1986 average temperatures were 5.01 °C (9.01 °F) and 4.36 °C (7.98 °F) colder, respectively, while the remainder of the winter, temperatures and snow levels remained normal. From 1988 to 1989, the average temperature in February was 6.8 °C (12.3 °F) colder than the long-term average. This corresponded with extreme snowfalls in November (28.2 cm [11.1 inches]), January (84.3 cm [33.2 inches]), and February (23.9 cm [9.4 inches]). From 1992 to 1993, temperatures ranged from 0.3 to 2.7 °C (0.5–5.0 °F) colder, with a monthly snowfall in December of 45.5 cm (17.9 inches) and in January of 69.1 cm (27.2 inches).

5. Discussion

The mule deer population in Hells Canyon increased from 1998 to 2001. We largely attribute this increase to the mild winters experienced during this period. Higher-than-average temperatures and lower-than-average precipitation and snowfall likely contributed to higher over-winter survival for deer, particularly for fawns (White et al. 1987, Bishop 1998, Unsworth et al. 1999). Unsworth et al. (1999) demonstrated that over-winter survival of fawns was more variable than the annual survival of adults; therefore, the annual variation in population size is largely attributed to fawns. Population increases we observed between 2000 and 2001 are the result of higher fawn ratios in fall 2000 and the following spring of 2001. These higher ratios indicate higher fawn production in summer 2000 in both states combined with higher over-winter survival in Idaho (Edelmann et al. 2002). Unfortunately, our full understanding of population patterns is hindered by the lack of 1999 survey data.

Our analysis of long-term weather data and historical deer surveys in Hells Canyon also demonstrated that mule deer populations fluctuated in response to winter weather. Deer population decreases corresponded with extreme low temperatures and high snowfall. Therefore, deer were physiologically stressed by low temperatures and were unable to access food beneath heavy snow cover. They were then likely vulnerable to a variety of mortality sources, such as predation, malnutrition, and reservoir interactions (Edelmann 2002, Ryle et al. 2002).

Fall densities were 4 to 5 deer/km^2 lower than those observed in spring. These data demonstrated that the entire wintering population does not arrive on the study area until at least late December or early January. Because deer were at higher elevations during fall, they were more likely to be in dense vegetation. This visibility bias may also have contributed to lower fall numbers (Unsworth et al. 1994). However, we assume that the ratios of fawns and bucks reflected the early winter population in Hells Canyon. The difference in buck ratios observed between Idaho and Oregon may be the result of different harvest regulations between states.

We did not observe any deer above 1,433 m (4,700 ft) during 2 years of spring surveys following relatively mild winters. We also examined the elevation extent of radio-collared deer in Edelmann (2002). Edelmann (2002) reported that, over 3 winters, the elevation of adult doe home ranges averaged 887 m and that elevation of migrant deer winter-activity areas averaged <1,000 m. Deer typically remained below 11,433 m elevation until April, when deer began spring migration. Therefore, we propose 1,433 m as the upper elevation limit of the mule deer winter range in Hells Canyon.

6. Summary and Conclusions

Numbers of wintering mule deer in Hells Canyon increased from 1998 to 2001. In the 72 subunits we surveyed consecutively each spring, deer numbers increased from 10,536 in 1998 to 13,845 in 2000 and 13,909 in 2001. Deer densities also increased each year: we observed 7.10 deer/km^2 in 1998, 9.33 deer/km^2 in 2000, and 9.38 deer/km^2 in 2001. The maximum-recorded elevation of deer groups was 1,433 m. Densities at or lower than 1,433 m were 8.25 deer/km^2 in 1998, 10.84 deer/km^2 in 2000, and 10.89 deer/km^2 in 2001. Densities at or lower than 1,433 m may more accurately represent the distribution and abundance of mule deer and delineate the upper limit of mule deer winter range in Hells Canyon. Spring fawn ratios fluctuated among years, with the greatest increase in 2001.

Fall surveys indicated that most mule deer did not reach the winter range until at least late December or early January. Fall densities were 6.15 deer/km^2 in 1999 and 6.30 deer/km^2 in 2000. Fawn ratios were higher in 2000, which may indicate higher production in the previous summer. Fawn ratios in both seasons were higher in Idaho. Buck ratios, however, were consistently higher in Oregon, which likely reflects different harvest regulations between states.

The population increase observed during the period of this study can be largely attributed to mild winter weather. The winters of December 1997–March 2001 had higher-than-average temperatures and lower-than-average precipitation and snowfall. These mild winters likely resulted in higher over-winter survival for deer, particularly for fawns. Not only were deer less exposed to weather extremes, they were also able to access green-up of grasses throughout winter. Deer population decreases in the winters of 1983–1986, 1988–1989, and 1992–1993 corresponded with extreme low temperatures and high snowfall. These data emphasize that mule deer populations respond to extremes of winter weather.

7. Acknowledgments

We thank Chris Huck and Mike Butler of IPC for their extensive GIS analyses and map preparation. In addition to tirelessly leading data collection efforts, Mike Schlegel of IDFG assisted with survey design and implementation. We also thank Aaron Foster, Rick Harmon, Dick Humphrys, and Roy Churchwell for assisting with data collection. Jonas Cabbage of IPC processed weather data. Chavez Writing and Editing provided helpful comments on earlier drafts

of this report. This study was conducted in cooperation with the Idaho Department of Fish and Game and Oregon Department of Fish and Wildlife.

8. LITERATURE CITED

Asherin, D. A., and J. J. Claar. 1976. Inventory of riparian habitats and associated wildlife along the Columbia and Snake Rivers. Volume IIIA. College of Forestry, Wildlife and Range Sciences, University of Idaho, Moscow, ID, USA.

Austin, D. D., and P. J. Urness. 1983. Overwinter forage selection by mule deer on seeded big sagebrush-grass range. Journal of Wildlife Management 47(4):1203-1206.

Bishop, C. J. 1998. Mule deer fawn mortality and habitat use, and the nutritional quality of bitterbrush and cheatgrass in southwest Idaho. Thesis, University of Idaho, Moscow, ID, USA.

Bonneville Power Administration. 1984. Hells Canyon environmental investigation. Prepared by CH2M-Hill, Boise, ID, USA.

Bush, J. H., and W. P. Seward. 1992. Geologic field guide to the Columbia River Basalt, northern Idaho and southeastern Washington. Information Circular 49. Idaho Geographical Survey, University of Idaho, Moscow, ID, USA.

Carson, R. G., and J. M. Peek. 1987. Mule deer habitat selection patterns in northcentral Washington. Journal of Wildlife Management 51(1):46-51.

Christensen, A. 2001. Delineation and assessment of big game winter range associated with the Hells Canyon Hydroelectric Complex: mule deer, elk, mountain goats, and Rocky Mountain bighorn sheep. *In*: Technical appendices for the Hells Canyon Hydroelectric Project. Technical Report E.3.2-31. Idaho Power Company, Boise, ID, USA.

Connelly, N. A., and T. L. Brown. 1990*a*. Estimates of the use of Forest Service lands for hunting. Department of Natural Resources, New York College of Agriculture and Life Sciences, Cornell University, Ithaca, NY, USA.

_____, and _____. 1990*b*. Estimates of the use of Bureau of Land Management lands of hunting. Department of Natural Resources, New York College of Agriculture and Life Sciences, Cornell University, Ithaca, NY, USA.

DeBolt, A. 1992. The ecology of *Celtis reticulata* Torr. (netleaf hackberry) in Idaho. Thesis, Oregon State University, Corvallis, OR, USA.

Edelmann, F. B., editor. 2002. Wintering mule deer ecology in the reservoir reach of the Hells Canyon Hydroelectric Complex. *In*: Technical appendices for Hells Canyon Complex Hydroelectric Project. Technical Report E.3.2-32. Idaho Power, Boise, ID, USA.

_____, V. R. Pope, and A. M. Rocklage. 2002. Survival and cause-specific mortality. Chapter 6 *in* F. B. Edelmann, editor. Wintering mule deer ecology in the reservoir reach of the Hells Canyon Hydroelectric Complex. *In*: Technical appendices for Hells Canyon Complex Hydroelectric Project. Technical Report E.3.2-32. Idaho Power, Boise, ID, USA.

Federal Energy Regulatory Commission. 1990. Hydroelectric project relicensing handbook. Federal Energy Regulatory Commission, Office of Hydropower Licensing, Washington, D.C., USA.

Fitzgerald, J. F. 1982. Geology and basalt stratigraphy of the Weiser embayment, west-central Idaho. Pages 103-128 *in* B. Bonnichsen, R. M. Breckenridge, editors. Cenozoic geology of Idaho. Idaho Bureau of Mines and Geology, Moscow, ID, USA.

Franklin, J. F., and C. T. Dyrness. 1988. Natural vegetation of Oregon and Washington. Oregon State University Press, Corvallis, OR, USA.

Garrison, G. A., A. J. Bjugstad, D. A. Duncan, M. E. Lewis, and D. R. Smith. 1977. Vegetation and environmental features of forest and range ecosystems. U.S. Forest Service Agricultural Handbook. No. 475.

Griffith, B., and J. M. Peek. 1989. Mule deer use of seral stage and habitat type in bitterbrush communities. Journal of Wildlife Management 53(3):636-642.

Holmstead, G. 2001. Vegetation of the Snake River corridor in Hells Canyon—Weiser, Idaho to the Salmon River. *In*: Technical appendices for the Hells Canyon Complex Hydroelectric Project. Technical Report E.3.3-1. Idaho Power, Boise, ID, USA.

Huschle, G. 1975. Analysis of the vegetation along the middle and lower Snake River. Thesis, University of Idaho, Moscow, ID, USA.

Idaho Power Company. 1997. Formal consultation package for relicensing the Hells Canyon Hydroelectric Project, FERC No. 1971. Idaho Power Company, Boise, Idaho, USA.

Idaho State Climate Services. 2001. <http://snow.ag.uidaho.edu/Climate/default.htm>. Accessed on: August 14, 2001.

Johnson, C. G. Jr., and S. A. Simon. 1987. Plant associations of the Wallowa-Snake province, Wallowa-Whitman National Forest. U.S. Forest Service PNR. R-6 ECOL-TP-225A-86.

Miller, T. B. 1976. Ecology of riparian communities dominated by white alder in western Idaho. Thesis, University of Idaho, Moscow, ID, USA.

_____, and F. D. Johnson. 1976. Ecology of riparian communities dominated by white alder in western Idaho. Pages 11-123 *in* Proceedings Terrestrial and Aquatic Vegetation, Eastern Washington State College, Cheney, WA, USA.

Natural Resources Conservation Service. 1995. Soil survey for Adams and Washington counties. Idaho. Draft. Weiser, ID, USA.

Office of Aircraft Services. 1997. Basic aviation safety. National Interagency Fire Center, Boise, Idaho, USA.

Oregon Climate Services. 2001. <http://www.ocs.orst.edu/>. Accessed on: August 7, 2001.

Pope, V. R., D. Bates, F. B. Edelmann, and A. M. Rocklage. 2002. Seasonal and cross-reservoir movements. Chapter 3 *in* F. B. Edelmann, editor. Wintering mule deer ecology in the reservoir reach of the Hells Canyon Hydroelectric Complex. *In*: Technical appendices for Hells Canyon Complex Hydroelectric Project. Technical Report E.3.2-32. Idaho Power, Boise, ID, USA.

Ross, S. H., and C. N. Savage. 1967. Idaho earth science: geology, fossils, climate, water, and soils. Idaho Bureau of Mines and Geology, Earth Science Series No. 1, Moscow, ID, USA.

Ryel, R., N. Mesner, and S. Jensen. 2002. Ice formation on Brownlee Reservoir and potential effects on big game populations. *In*: Technical appendices for the Hells Canyon Hydroelectric Project. Technical Report E.3.2-35. Idaho Power Company, Boise, ID, USA.

Scott, M. D. 1991. Mule deer management plan: 1991-1995. Idaho Department of Fish and Game, Boise, ID, USA.

Tisdale, E. W. 1979. A preliminary classification of Snake River canyon grasslands in Idaho. Forest, Wildlife, and Range Experiment Station, University of Idaho, Moscow, ID, USA.

_____. 1986. Canyon grasslands and associated shrublands of west central Idaho and adjacent areas. Forest, Wildlife, and Range Experiment Station Bulletin No. 40, University of Idaho, Moscow, ID, USA.

_____, and M. Hironaka. 1981. The sagebrush-grass region: a review of the ecological literature. Forest, Wildlife, and Range Experiment Station, University of Idaho, Moscow, ID, USA.

_____, _____, and M. A. Fosberg. 1969. The sagebrush region in Idaho: a problem in range resource management. University of Idaho Agriculture Experiment Station Bulletin 512. Moscow, ID, USA.

Trout, L. E., and J. L. Thiessen. 1973. Physical condition and range relationships of the Owyhee deer herd. Idaho Department of Fish and Game, Federal Aid to Wildlife Restoration, Job Completion Report, Project W-141-R-2.

Unsworth, J. W., F. A. Leban, D. J. Leptich, E. O. Garton, and P. Zager. 1994. Aerial survey: user's manual. Idaho Department of Fish and Game, Boise, ID, USA.

_____, D. F. Pac, G. C. White, and R. M. Bartmann. 1999. Mule deer survival in Colorado, Idaho, and Montana. Journal of Wildlife Management 63(1):315-326.

U.S. Department of Agriculture. 1990. Final environmental impact statement, land and resource management plan. U.S. Forest Service, Pacific Northwest Region, Wallowa-Whitman National Forest, Baker, OR, USA.

_____. 1994. Final environmental impact statement: Wild and Scenic Snake River recreation management plan. U.S. Forest Service, Hells Canyon National Recreation Area, Pacific Northwest Region, Wallowa-Whitman National Forest, Baker, OR, USA.

U.S. Department of Energy. 1985. Hells Canyon environmental investigation. Final report. U.S. Department of Energy, Bonneville Power Administration, Office of Power and Resource Management. DOE/BP-11548-1.

U.S. Department of the Interior. 1987. Proposed resource management plan and final environmental impact statement: Cascade Resource Area. U.S. Bureau of Land Management, Boise District, Boise, ID, USA.

Western Regional Climate Center. 2001. <http://www.wrcc.dri.edu>. Accessed on August 17, 2001.

White, G. C., R. A. Garrott, R. M. Bartman, L. H. Carpenter, and A. W. Alldredge. 1987. Survival of mule deer in northwest Colorado. Journal of Wildlife Management 51(4):852-859.

This page left blank intentionally.

Table 1. Numbers of adults, fawns, and total mule deer observed for all subunits surveyed during spring for the Mule Deer Population Study, 1998, 2000, and 2001.

	Idaho			Oregon			Grand Total		
Year	Adults	Fawns	Total [a]	Adults	Fawns	Total [a]	Adults	Fawns	Total [a]
1998	4,566	1,648	6,220	3,560	1,084	4,644	8,126	2,732	10,864
2000	5,373	1,822	7,215	5,297	1,435	6,764	10,670	3,257	13,979
2001	5,270	2,480	7,811	4,973	1,710	6,685	10,243	4,190	14,496

[a] Totals include unclassified individuals.

Table 2. Mean densities (deer/km^2) of mule deer for subunits (n = 72) surveyed in all years during spring for the Mule Deer Population Study, 1998, 2000, and 2001. Densities are for entire subunit areas and area ≤ 1,433 m.

	Idaho		Oregon		Total	
Year	Entire Subunits	≤ 1,433 m	Entire Subunits	≤ 1,433 m	Entire Subunits	≤ 1,433 m
1998	8.08	9.74	6.16	6.91	7.10	8.25
2000	9.88	11.90	8.81	9.89	9.33	10.84
2001	10.05	12.12	8.72	9.79	9.38	10.89

Table 3. Fawn ratios (fawns/100 adults) observed for all subunits surveyed during spring for the Mule Deer Population Study, 1998, 2000, and 2001.

Year	Idaho	Oregon	Total
1998	36.1	30.4	33.6
2000	33.9	27.1	30.5
2001	47.2	34.4	40.9

Table 4. Numbers of fawns, does, bucks, and total mule deer observed for all subunits during fall for the Mule Deer Population Study, 1999 and 2000.

	Idaho				Oregon			
Year	**Fawns**	**Does**	**Bucks**	**Total[a]**	**Fawn**	**Does**	**Bucks**	**Total[a]**
1999	928	1,929	195	3,058	1,078	2,294	365	3,737
2000	808	1,455	129	2,401	895	1,771	271	2,974

[a] Totals include unclassified individuals.

Table 5. Densities (deer/km^2) of mule deer for subunits (n = 37) surveyed in both years during fall for the Mule Deer Population Study, 1999 and 2000.

Year	Idaho	Oregon	Total
1999	5.85	6.50	6.15
2000	5.05	7.79	6.30

Table 6. Fawn ratios (fawns/100 does) observed for all subunits surveyed during fall for the Mule Deer Population Study, 1999 and 2000.

Year	Idaho	Oregon	Total
1999	48.1	47.0	47.5
2000	55.5	50.5	52.8

Table 7. Buck ratios (bucks/100 does) observed for all subunits surveyed during fall for the Mule Deer Population Study, 1999 and 2000.

Year	Idaho	Oregon	Total
1999	10.1	15.9	10.5
2000	8.9	15.3	9.6

Table 8. Long-term and recent winter-weather data by month for the Brownlee Dam (ID), Richland (OR), and Weiser (ID) weather stations.

Station	Months	Years	Min. Temp (F)	Max. Temp (F)	Avg. Temp (F)	Total Monthly Precipitation (in)	Total Monthly Snowfall (in)
Brownlee	November	1966–2001	33.59	49.86	40.56	1.83	0.90
	December	1966–2001	25.92	39.88	31.96	2.16	4.25
	January	1966–2001	24.23	38.32	31.30	2.15	6.93
	February	1966–2001	27.93	45.33	36.66	1.64	1.84
	March	1966–2001	34.28	55.57	44.95	1.73	0.29
	November	1997–2000	37.58[a]	50.05	43.85[a]	2.05	No data
	December	1997–2000	29.15[a]	39.63	34.43[a]	1.55[b]	No data
	January	1998–2001	29.20[a]	39.78[a]	34.53[a]	1.76[b]	No data
	February	1998–2001	31.35[a]	45.03	38.20[a]	1.60	No data
	March	1998–2001	36.58[a]	54.88	45.75	1.47	No data
Richland	November	1961–2000[c]	26.73	50.84	38.79	1.37	2.99
	December	1961–2000	22.04	40.53	31.29	1.39	4.78
	January	1961–2000	21.16	39.01	30.09	1.37	6.41
	February	1961–2000	24.97	46.56	36.83	0.92	3.45
	March	1961–2000	29.43	56.35	42.89	0.83	0.32
	November	1997–2000	24.84[b]	48.65[b]	36.75[b]	0.40[b]	No data
	December	1997–2000	23.13	39.77	31.45	0.08[b]	No data
	January	1998–2001	25.79[a]	41.74[a]	33.77[a]	1.81[a]	No data
	February	1998–2001	27.38[a]	46.08	36.73	1.04	No data
	March	1998–2001	24.85[b]	54.80	41.32[b]	0.60[b]	No data
Weiser	November	1931–2001[d]	27.61	49.35	38.49	1.47	16.08
	December	1931–2001	21.69	38.32	30.02	1.64	16.11
	January	1931–2001	18.69	35.71	27.22	1.65	17.66
	February	1931–2001	23.53	44.00	33.18	1.29	13.05
	March	1931–2001	30.17	55.71	42.94	1.06	15.02
	November	1997–2000	30.50[a]	48.95	39.75[a]	1.35	2.00[b]
	December	1997–2000	22.98	36.10[b]	29.58	1.69	9.03[b]
	January	1998–2001	23.55[a]	37.28[a]	30.43[a]	2.17[a]	10.68[b]
	February	1998–2001	27.20[a]	43.93	35.58[a]	2.47[a]	4.48[b]
	March	1998–2001	32.63[a]	55.50	44.08[a]	1.13	0.33[b]

[a] Recent data are above the 95% confidence intervals of the long-term data.
[b] Recent data are below the 95% confidence intervals of the long-term data.
[c] Richland station: 1910–2000 for precipitation data with several missing years, 1971–2000 for snow data.
[d] Weiser station: 1917–2001 for precipitation data.

Table 9. Monthly averages of winter-weather data at Brownlee Dam for each year of the Mule Deer Population Study, 1997−2001. Snow data were not available for these years.

Month	Year	Min. Temp (F)	Max. Temp (F)	Avg. Temp (F)	Total Monthly Precipitation (in)
November	1997	37.57	50.90	44.23	1.09
December	1997	28.16	40.00	34.08	1.29
January	1998	30.13	42.39	36.26	2.62
February	1998	33.54	47.93	40.73	0.84
March	1998	37.26	54.50	46.00	2.25
November	1998	39.77	51.13	45.45	2.97
December	1998	28.03	39.13	33.58	2.26
January	1999	31.19	41.61	36.40	1.19
February	1999	29.50	42.71	36.11	2.92
March	1999	35.77	54.29	45.03	0.75
November	1999	40.07	54.03	47.05	3.24
December	1999	30.65	39.55	35.10	1.35
January	2000	28.77	39.48	34.13	2.28
February	2000	34.10	47.90	41.00	1.99
March	2000	36.26	53.87	45.06	1.81
November	2000	32.77	44.17	38.47	0.88
December	2000	29.84	39.87	34.85	1.30
January	2001	26.71	35.58	31.15	0.96
February	2001	28.32	41.64	34.98	0.64
March	2001	36.90	56.84	46.87	1.07

Table 10. Historical late winter/early spring survey data[a] for mule deer in Hells Canyon.

Biological Year[b]	Idaho Unit 22	Oregon Lookout Mountain	Oregon Pine Creek
1962	2,390	No Data	No Data
1963	No Data	No Data	No Data
1964	No Data	No Data	No Data
1965	No Data	No Data	No Data
1966	2,339	No Data	No Data
1967	No Data	No Data	3,600
1968	No Data	No Data	3,075
1969	No Data	5,000	3,450
1970	2,818	4,700	3,000
1971	No Data	3,400	2,400
1972	No Data	2,900	2,650
1973	No Data	2,600	2,325
1974	2,304	3,200	1,800
1975	No Data	1,700	1,375
1976	No Data	1,800	1,900
1977	No Data	3,000	2,300
1978	2,116	2,800	2,300
1979	No Data	2,600	2,000
1980	No Data	3,700	1,800
1981	No Data	3,000	1,700
1982	2,335	2,600	1,900
1983	No Data	2,600	1,900
1984	No Data	2,600	900
1985	No Data	1,200	800
1986	No Data	1,600	1,500
1987	3,608	2,500	1,600
1988	3,756	2,400	2,500
1989	2,914	600	1,400
1990	No Data	1,800	1,400
1991	2,844	1,500	1,500
1992	No Data	1,600	1,200
1993	1,803	1,200	1,200
1994	1,439	500	300
1995	2,373	1,000	700
1996	2,804	No Data	No Data
1997	No Data	No Data	No Data

[a] Idaho data provided by J. Rohlman, Idaho Department of Fish and Game. Oregon data provided by G. Kiester, Oregon Department of Fish and Wildlife.

[b] Biological year is 1 June-31 May (e.g., biological year 1987 is 1 June 1987 to 31 May 1988).

Table 11. April count data, population estimates, and percent change between years for mule deer in the Lookout Mountain Big Game Management Unit, Oregon. Data were provided by G. Kiester, Oregon Department of Fish and Wildlife.

Biological Year[a]	April Count Data	Population Estimate	Percent Change
1981	3,000	9,719	
1982	2,600	8,615	-11.36
1983	2,600	6,850	-20.49
1984	2,600	5,616	-18.01
1985	1,200	4,648	-17.24
1986	1,600	5,708	22.81
1987	2,500	5,341	-6.43
1988	2,400	2,998	-43.87
1989	600	3,013	0.50
1990	1,800	3,174	5.34
1991	1,500	3,058	-3.65
1992	1,600	1,912	-37.48
1993	1,200	1,962	2.62
1994	500	2,201	12.18
1995	1,000	2,450	11.31
1996	No data	2,840	15.92
1997	No data	2,845	0.18

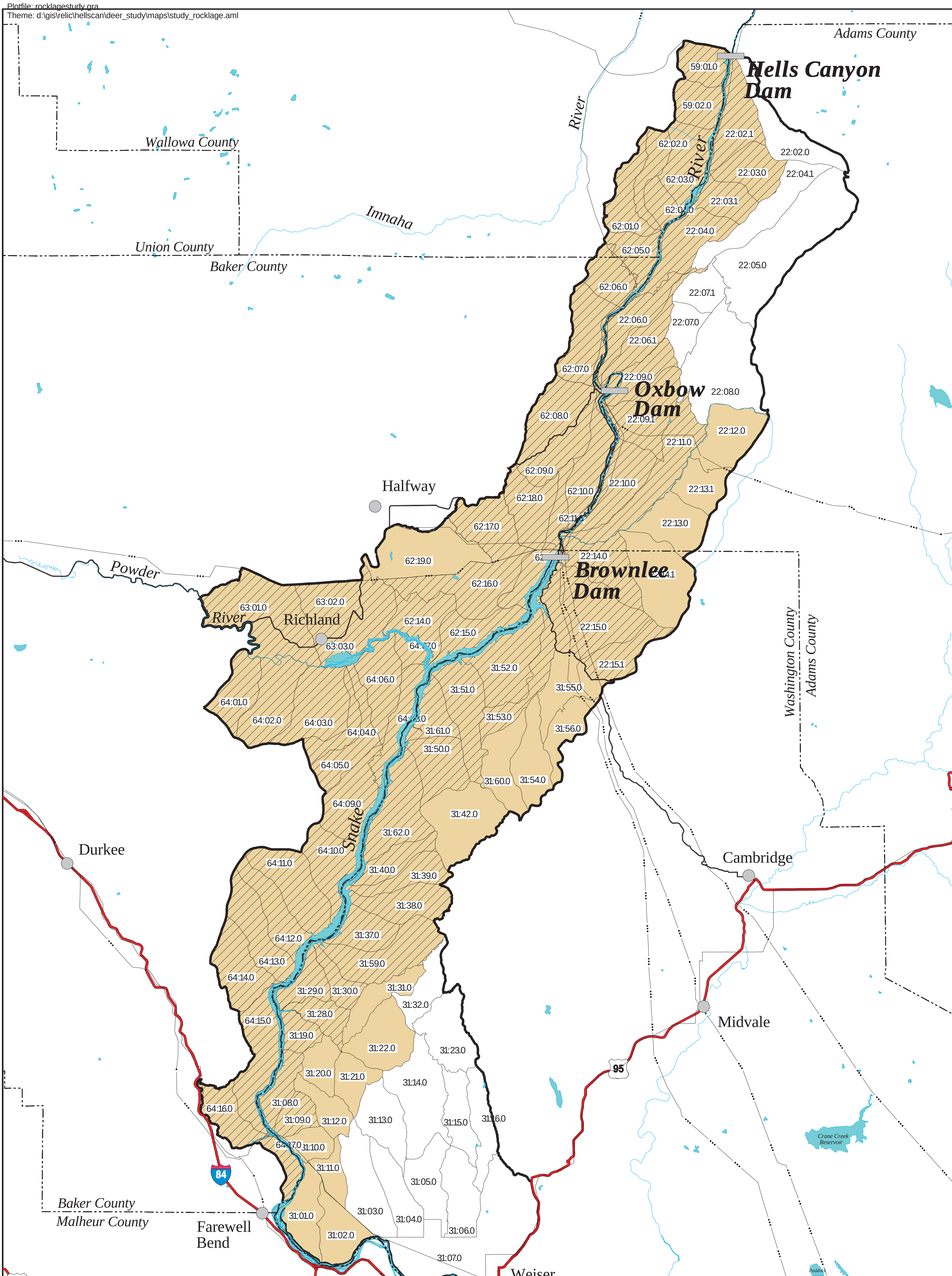
[a] Biological year is 1 June-31 May (e.g., biological year 1987 is 1 June 1987 to 31 May 1988).

Table 12. Weather data for extreme winters at Brownlee Dam.

Months	Year	Min. Temp (F)	Max. Temp (F)	Avg. Temp (F)	Total Monthly Precipitation (in)	Total Monthly Snowfall (in)
November	1983	35.50	51.57	43.53	2.75	No data
December	1983	20.84	33.77	27.31	4.19	21.30
January	1984	19.74	35.00	27.37	0.78	6.50
February	1984	23.10	39.66	31.38	1.81	10.50
March	1984	34.35	54.13	44.24	2.96	0.00
November	1984	34.73	49.87	42.30	2.46	0.00
December	1984	20.23	34.90	27.56	3.15	No data
January	1985	16.30	31.58	24.02	0.32	1.00
February	1985	18.79	38.26	28.56	1.16	No data
March	1985	29.71	51.13	40.42	1.11	2.00
November	1985	24.63	38.47	31.55	2.04	No data
December	1985	16.90	31.45	24.18	1.31	0.00
January	1986	20.23	37.26	28.74	2.51	5.10
February	1986	32.25	46.79	39.52	3.75	1.50
March	1986	39.39	61.39	50.39	1.34	0.00
November	1988	36.57	50.20	43.38	3.51	11.10
December	1988	26.23	38.77	32.50	1.03	1.40
January	1989	21.58	35.19	28.39	2.54	33.20
February	1989	14.93	33.79	24.36	1.70	9.40
March	1989	34.52	53.32	43.92	3.41	1.50
November	1992	33.23	46.83	40.03	1.26	0.00
December	1992	24.65	38.10	31.37	2.38	17.90
January	1993	22.42	35.13	28.77	3.05	27.20
February	1993	24.79	38.79	31.79	0.81	8.20
March	1993	35.23	51.61	43.42	3.33	0.00

This page left blank intentionally.

Plotfile: rocklagestudy.gra
Theme: d:\gis\relic\hellscan\deer_study\maps\study_rocklage.aml



Vicinity Map

Features Legend

- Primary Route
- Secondary Route
- Transmission Lines
- County Boundary
- Idaho Power Facility
- City or Town

Study Area Boundaries

- Spring Survey Area
- Fall Survey Area
- Winter Range

N

Hells Canyon Complex

Tech. Report E.3.2- 30 Figure 1

Study Area for Spring & Fall Mule Deer Population Surveys

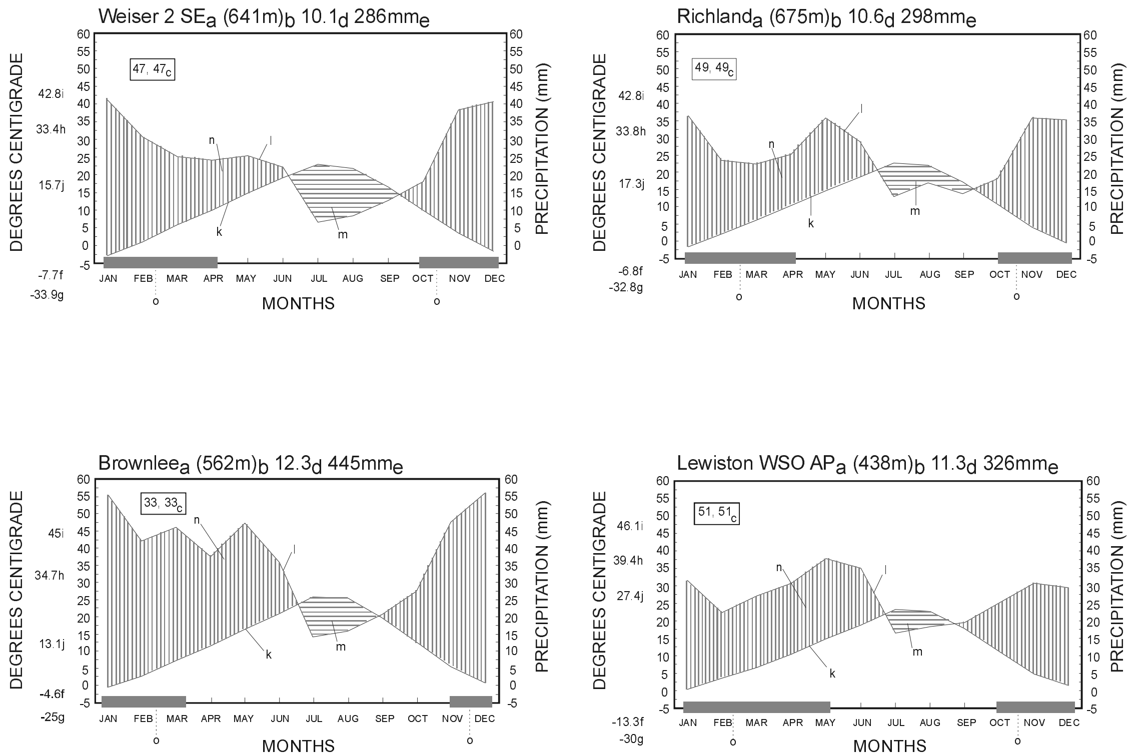
IDAHO POWER COMPANY
BOISE, IDAHO

5 2.5 0 MILES

Scale = 1:325000

IDAHO POWER
An IDACORP Company

This page left blank intentionally.



a: Station
b: Elevation
c: Number of years of observation (temperature, precipitation)
d: Mean annual temperature in °C
e: Mean annual precipitation in millimeters
f: Mean daily minimum of the coldest month
g: Lowest recorded temperature
h: Mean daily maximum of the hottest month
i: Highest recorded temperature
j: Mean daily temperature range
k: Monthly means of temperature in °C
l: Monthly means of precipitation in millimeters
m: Arid period (horizontal hatched)
n: Humid period (vertical hatched)
o: Months with an absolute minimum below 0 °C

Figure 2. Köppen climate diagrams for the Weiser, Richland, Brownlee, and Lewiston weather stations, Hells Canyon Study Area, Idaho–Oregon border.

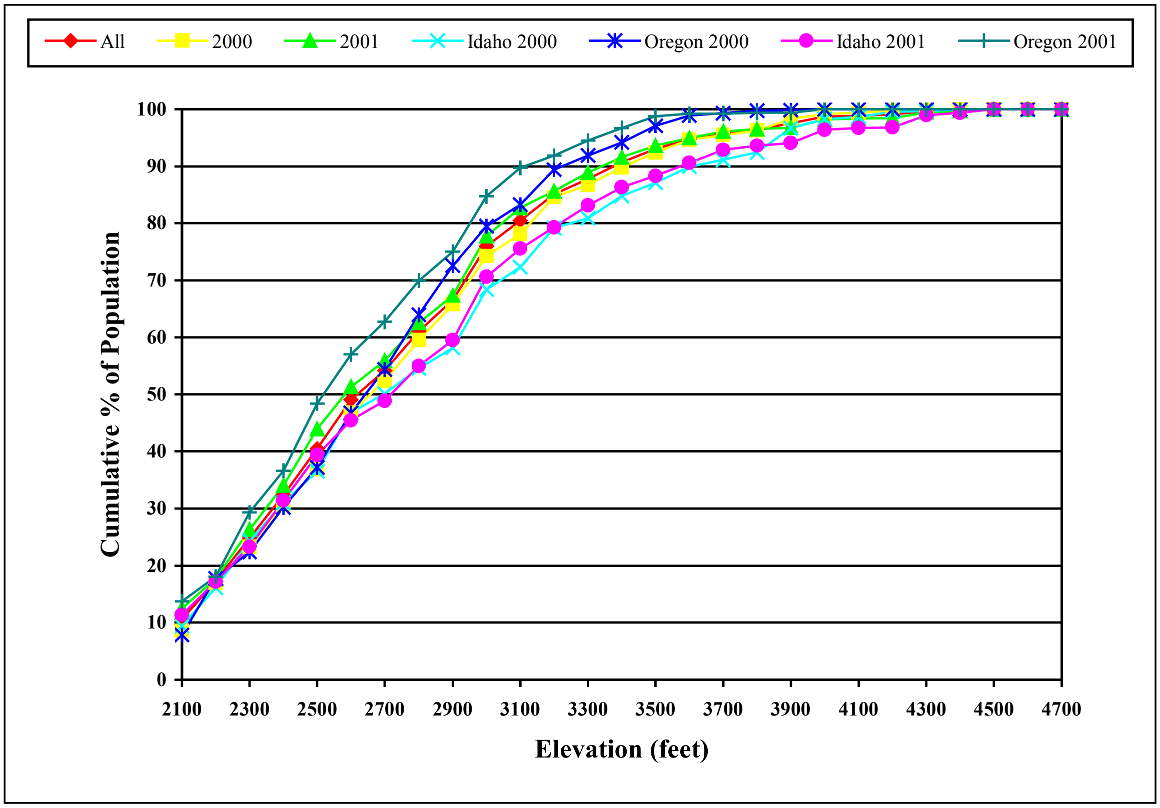


Figure 3. Cumulative distribution of mule deer groups by elevation relative to Brownlee Reservoir (full-pool elevation = 2,077 ft) for all years (*n* = 19,276), 2000 (*n* = 9,453), 2001 (*n* = 4,451), and by state and year (Idaho 2000, *n* = 4,451; Oregon 2000, *n* = 5,002; Idaho 2001, *n* = 4,863; Oregon 2001, *n* = 4,960).

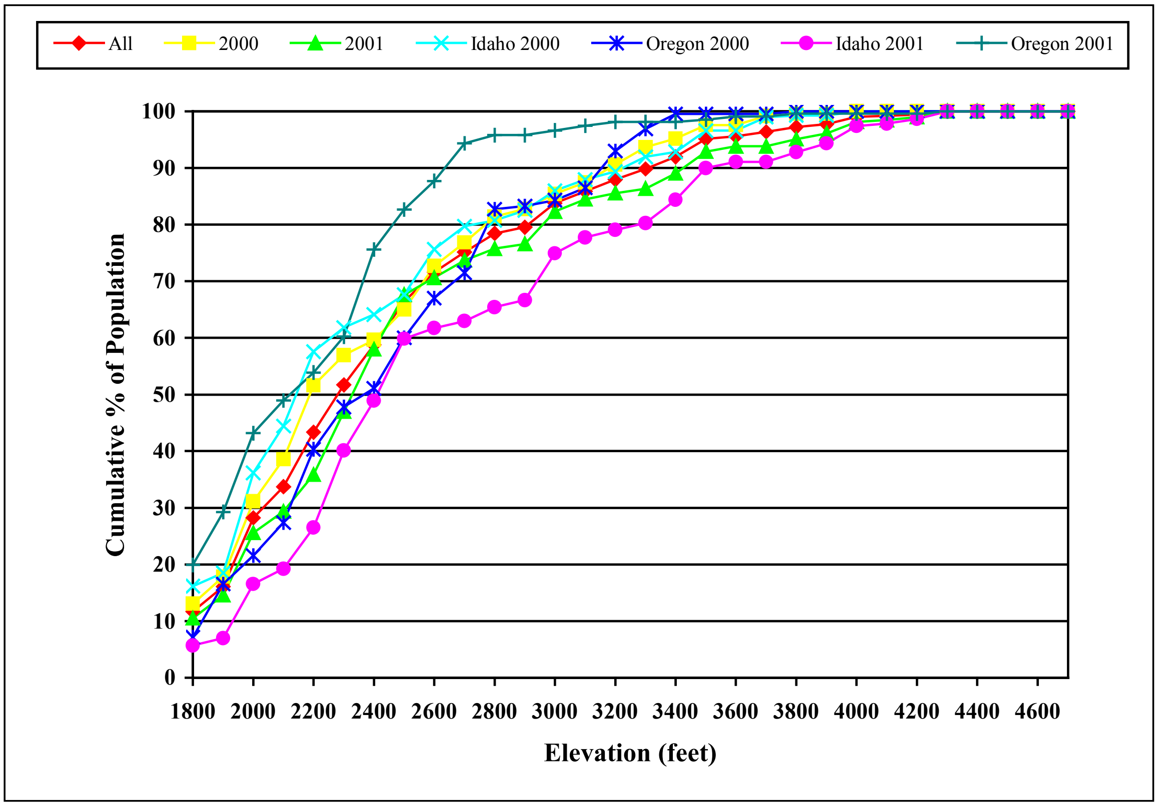


Figure 4. Cumulative distribution of mule deer groups by elevation relative to Oxbow Reservoir (full-pool elevation = 1,805 ft) for all years (*n* = 5,310), 2000 (*n* = 2,523), 2001 (*n* = 2,787), and by state and year (Idaho 2000, *n* = 1,650; Oregon 2000, *n* = 873; Idaho 2001, *n* = 1,837; Oregon 2001, *n* = 950).

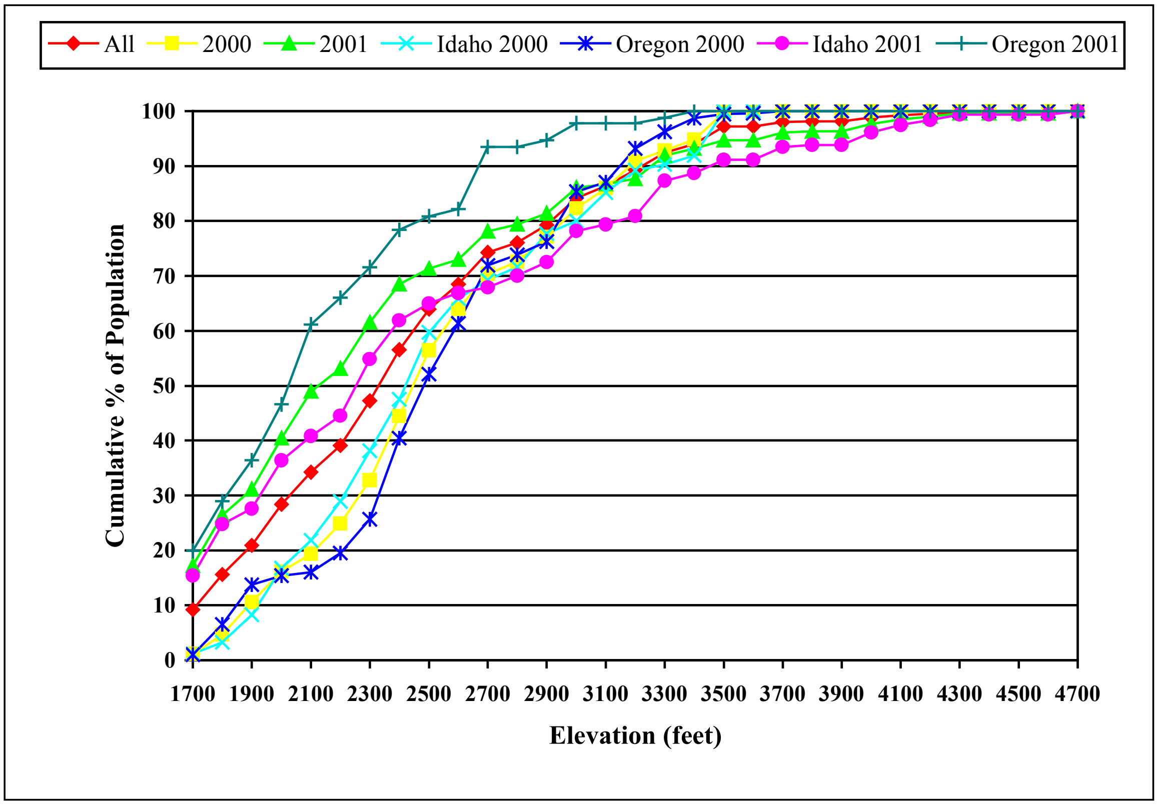
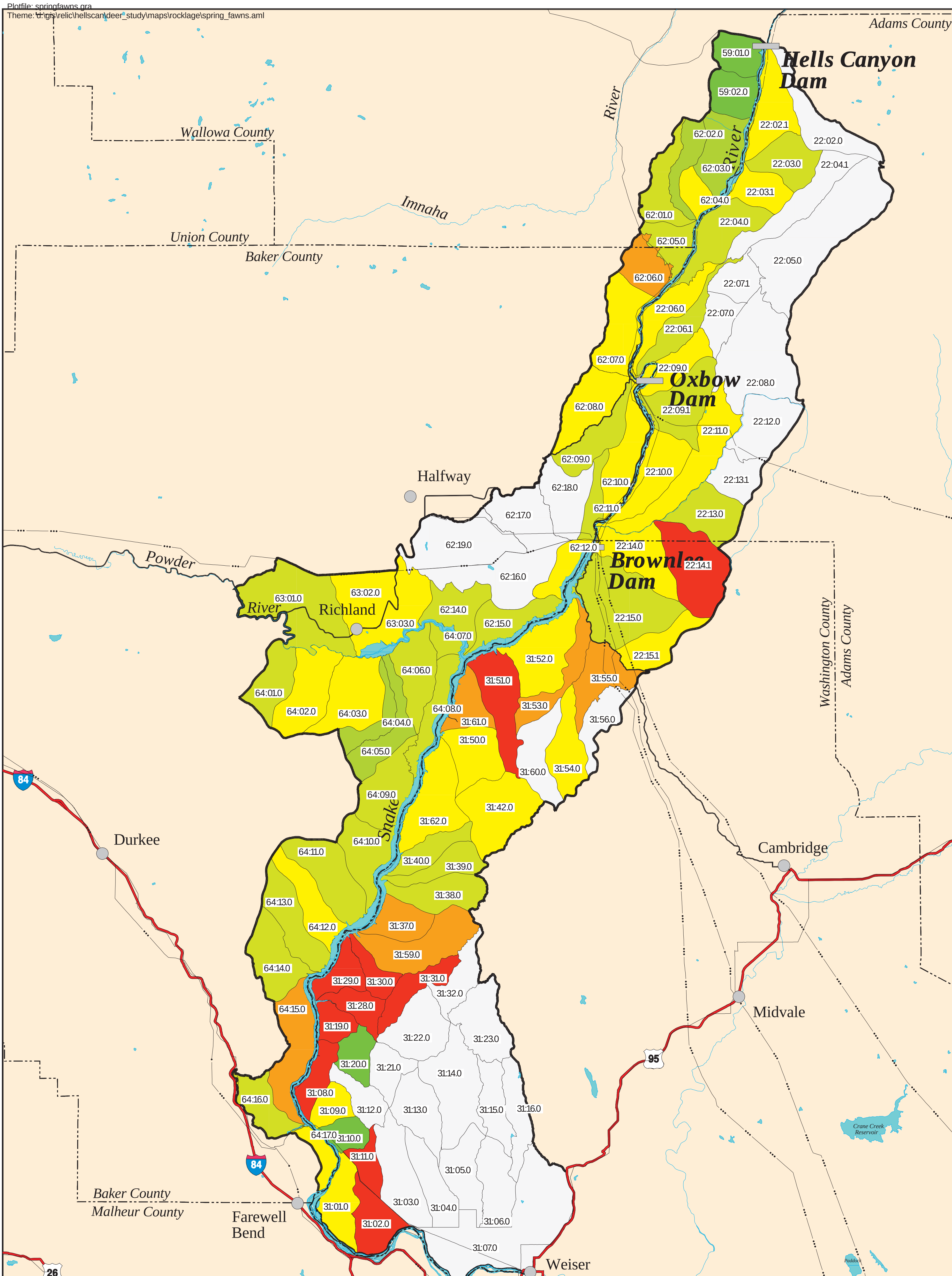


Figure 5. Cumulative distribution of mule deer groups by elevation relative to Hells Canyon Reservoir (full-pool elevation = 1,688 ft) for all years (*n* = 3,660), 2000 (*n* = 1,819), 2001 (*n* = 1,841), and by state and year (Idaho 2000, *n* = 1,040; Oregon 2000, *n* = 779; Idaho 2001, *n* = 1,105; Oregon 2001, *n* = 736).

Plotfile: springfawns.gra
Theme: d:\gis\relic\hellscan\deer_study\maps\rocklage\spring_fawns.aml



Features Legend

Primary Route
Secondary Route
Transmission Lines
County Boundary
Idaho Power Facility
City or Town
Winter Range

FAWN / 100 ADULT
- > 50 / 100
- 41 - 50 / 100
- 31 - 40 / 100
- 21 - 30 / 100
- 11 - 20 / 100
- 0 - 10 / 100
- Not Surveyed

Vicinity Map

IDAHO POWER
An IDACORP Company

Hells Canyon Complex

Tech. Report E.3.2 - 30 Figure 6

Spring Fawn Ratios (Fawns/100 Adults), 1998

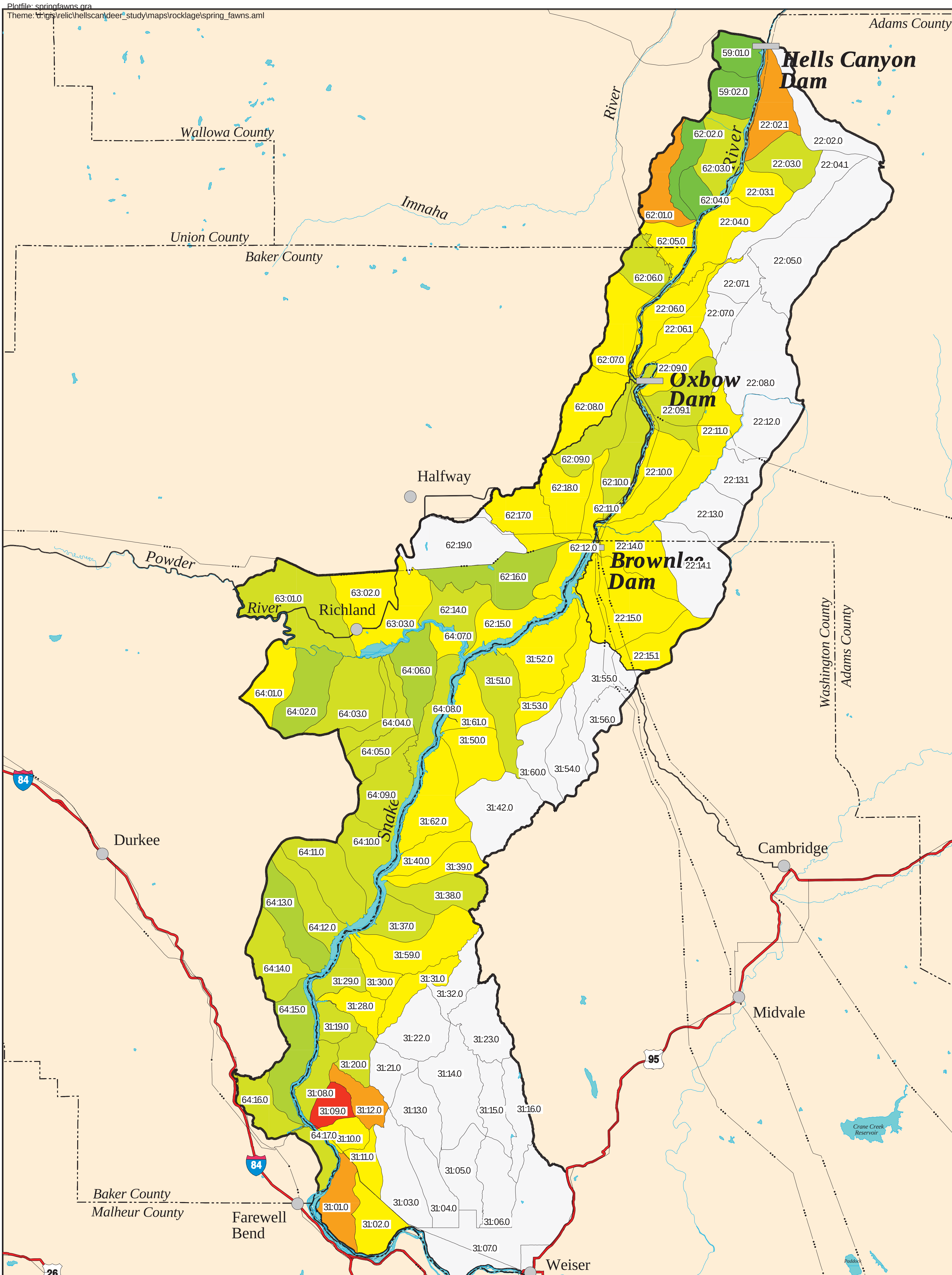
IDAHO POWER COMPANY
BOISE, IDAHO

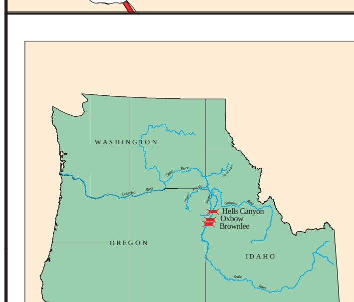
5 2.5 0 MILES

Scale = 1:325000

This page left blank intentionally.

Plotfile: springfawns.gra
Theme: d:\gis\relic\hellscan\deer_study\maps\rocklage\spring_fawns.aml





Vicinity Map

Features Legend

Red line	Primary Route
Black line	Secondary Route
Dotted line	Transmission Lines
Dash-dot line	County Boundary
Grey bar	Idaho Power Facility
Grey circle	City or Town
Heavy black line	Winter Range

FAWN / 100 ADULT

- > 50 / 100
- 41 - 50 / 100
- 31 - 40 / 100
- 21 - 30 / 100
- 11 - 20 / 100
- 0 - 10 / 100
- Not Surveyed

N

Hells Canyon Complex

Tech. Report E.3.2 - 30 Figure 7

Spring Fawn Ratios (Fawns/100 Adults), 2000

IDAHO POWER COMPANY
BOISE, IDAHO

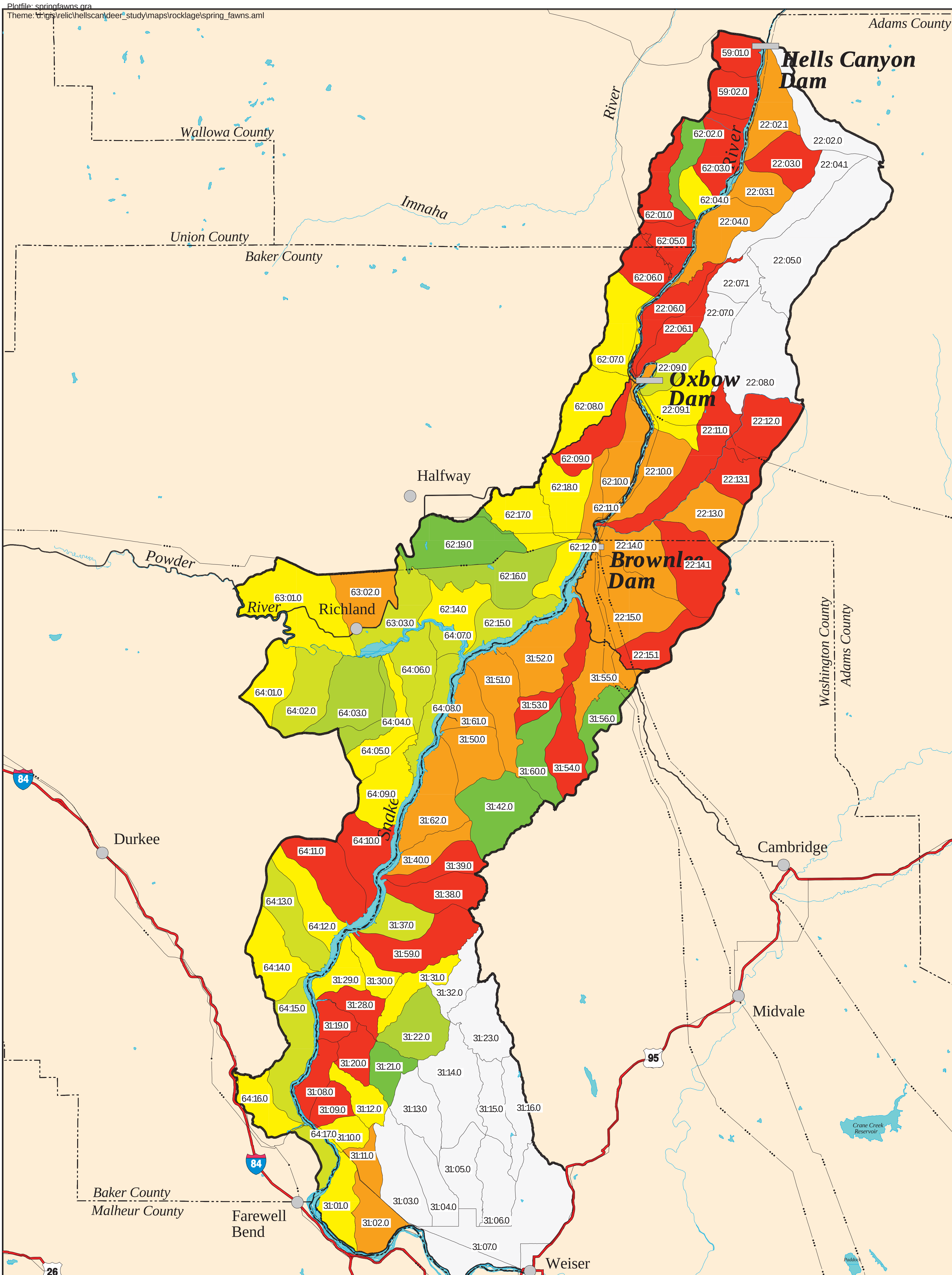
5 2.5 0 MILES

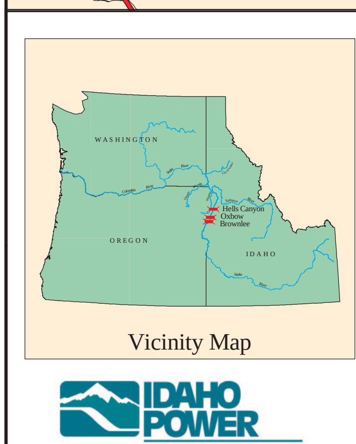
Scale = 1:325000

IDAHO POWER
An IDACORP Company

This page left blank intentionally.

Plotfile: springfawns.gra
Theme: d:\gis\relic\hellscan\deer_study\maps\rocklage\spring_fawns.aml





Vicinity Map

Features Legend

- Primary Route
- Secondary Route
- Transmission Lines
- County Boundary
- Idaho Power Facility
- City or Town
- Winter Range

FAWN / 100 ADULT

- > 50 / 100
- 41 - 50 / 100
- 31 - 40 / 100
- 21 - 30 / 100
- 11 - 20 / 100
- 0 - 10 / 100
- Not Surveyed

N

Hells Canyon Complex

Tech. Report E.3.2 - 30 Figure 8

Spring Fawn Ratios (Fawns/100 Adults), 2001

IDAHO POWER COMPANY
BOISE, IDAHO

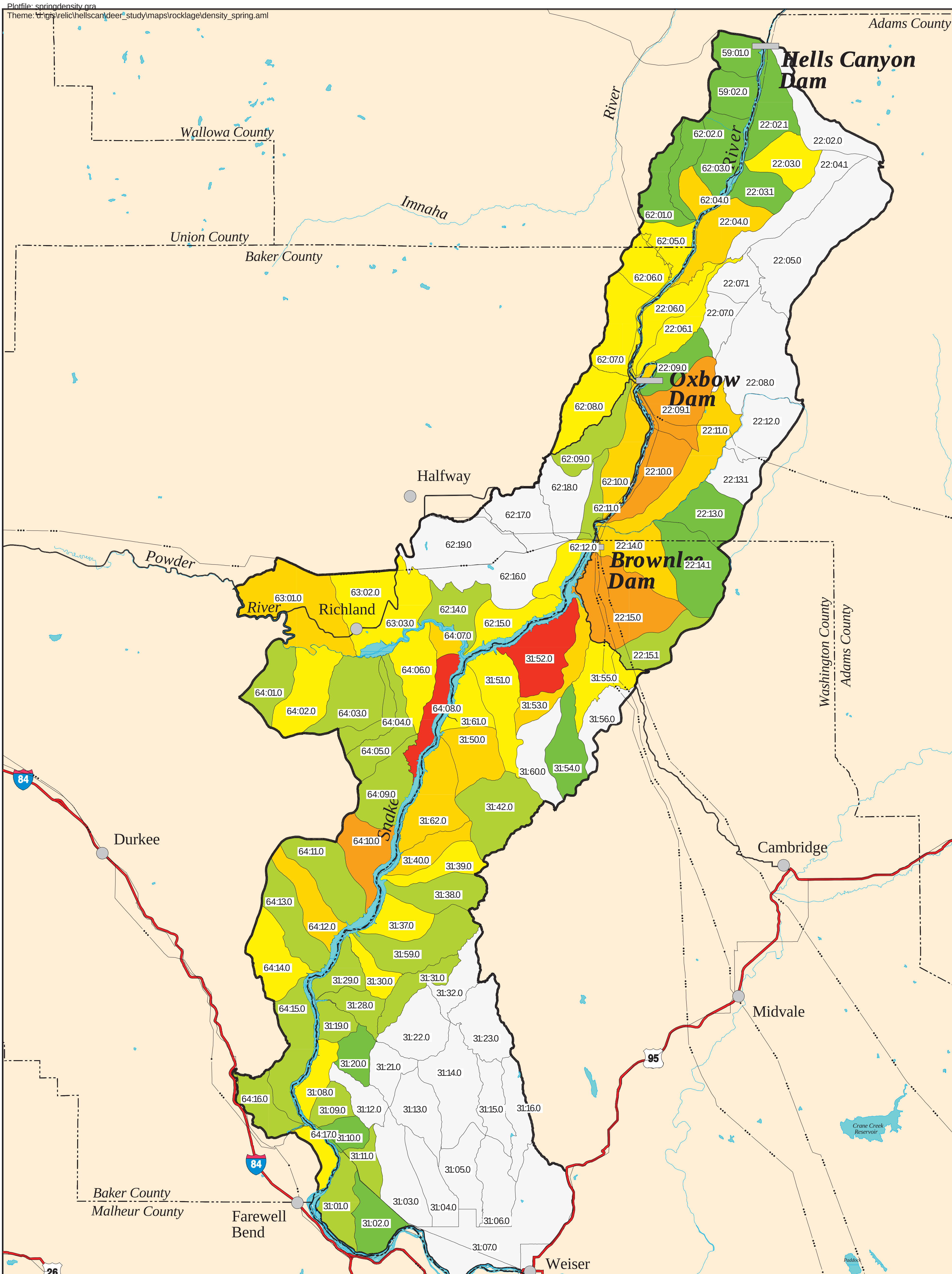
5 2.5 0 MILES

Scale = 1:325000

IDAHO POWER
An IDACORP Company

This page left blank intentionally.

Plotfile: springdensity.gra
Theme: d:\gis\relic\hellscan\deer_study\maps\rocklage\density_spring.aml



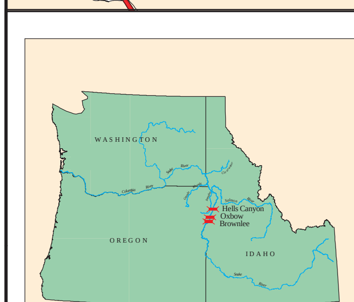
Features Legend

- Primary Route
- Secondary Route
- Transmission Lines
- County Boundary
- Idaho Power Facility
- City or Town
- Winter Range

DEER / SQ-KILOMETER

- > 20
- 16 -20
- 11 - 15
- 6 - 10
- 1 - 5
- < 1
- Not Surveyed

N



Vicinity Map

IDAHO POWER
An IDACORP Company

Hells Canyon Complex

Tech. Report E.3.2 - 30 Figure 9

Spring Mule Deer Densities (deer/km2), 1998

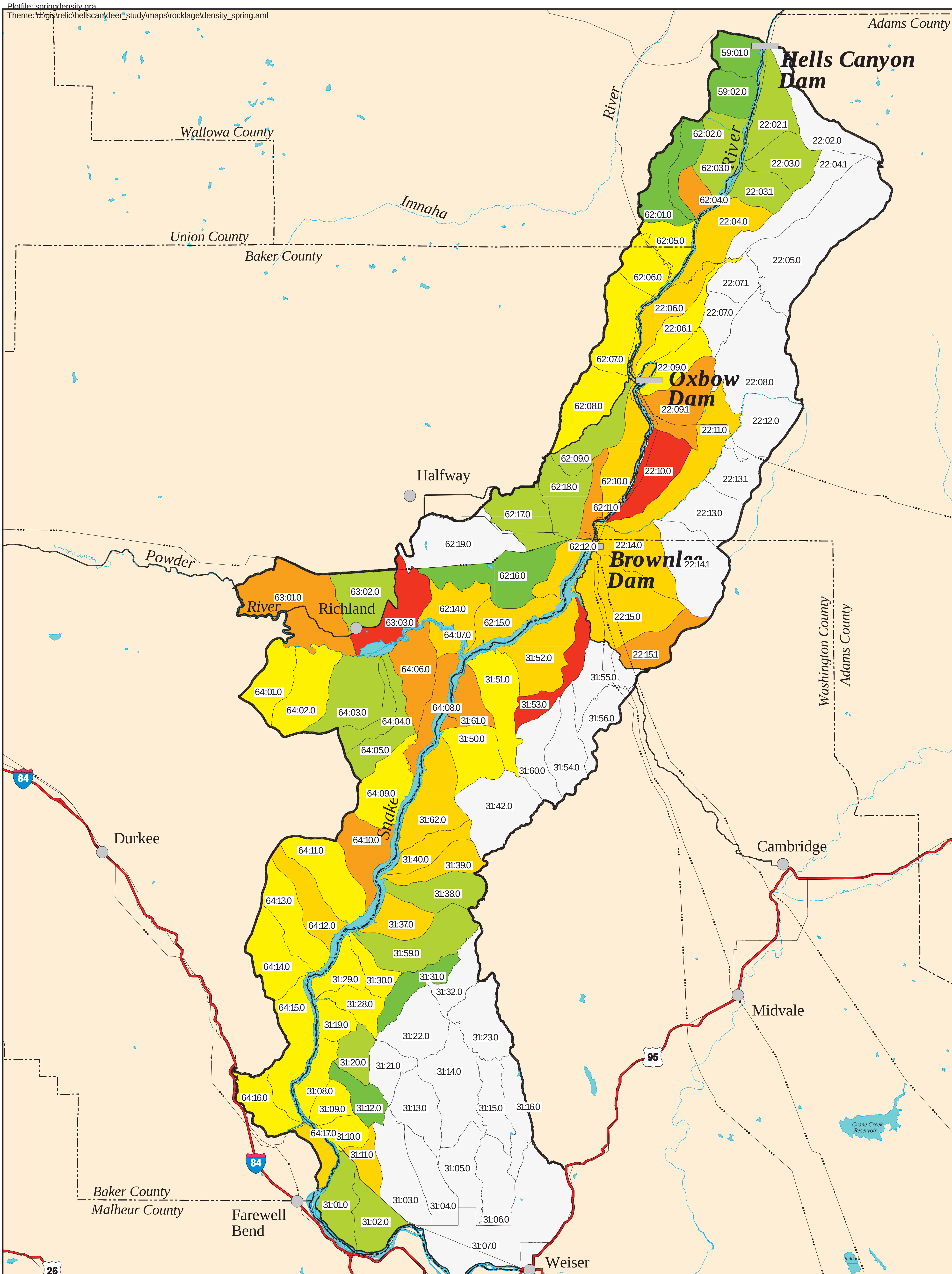
IDAHO POWER COMPANY
BOISE, IDAHO

5 2.5 0 MILES

Scale = 1:325000

This page left blank intentionally.

Plotfile: springdensity.gra
Theme: d:\gis\relic\hellscan\deer_study\maps\rocklage\density_spring.aml



Features Legend

Primary Route
Secondary Route
Transmission Lines
County Boundary
Idaho Power Facility
City or Town

DEER / SQ-KILOMETER

> 20
16 -20
11 - 15
6 - 10
1 - 5
< 1
Not Surveyed

Winter Range

N

IDAHO POWER
An IDACORP Company

Hells Canyon Complex

Tech. Report E.3.2 - 30 Figure 10

Spring Mule Deer Densities (deer/km2), 2000

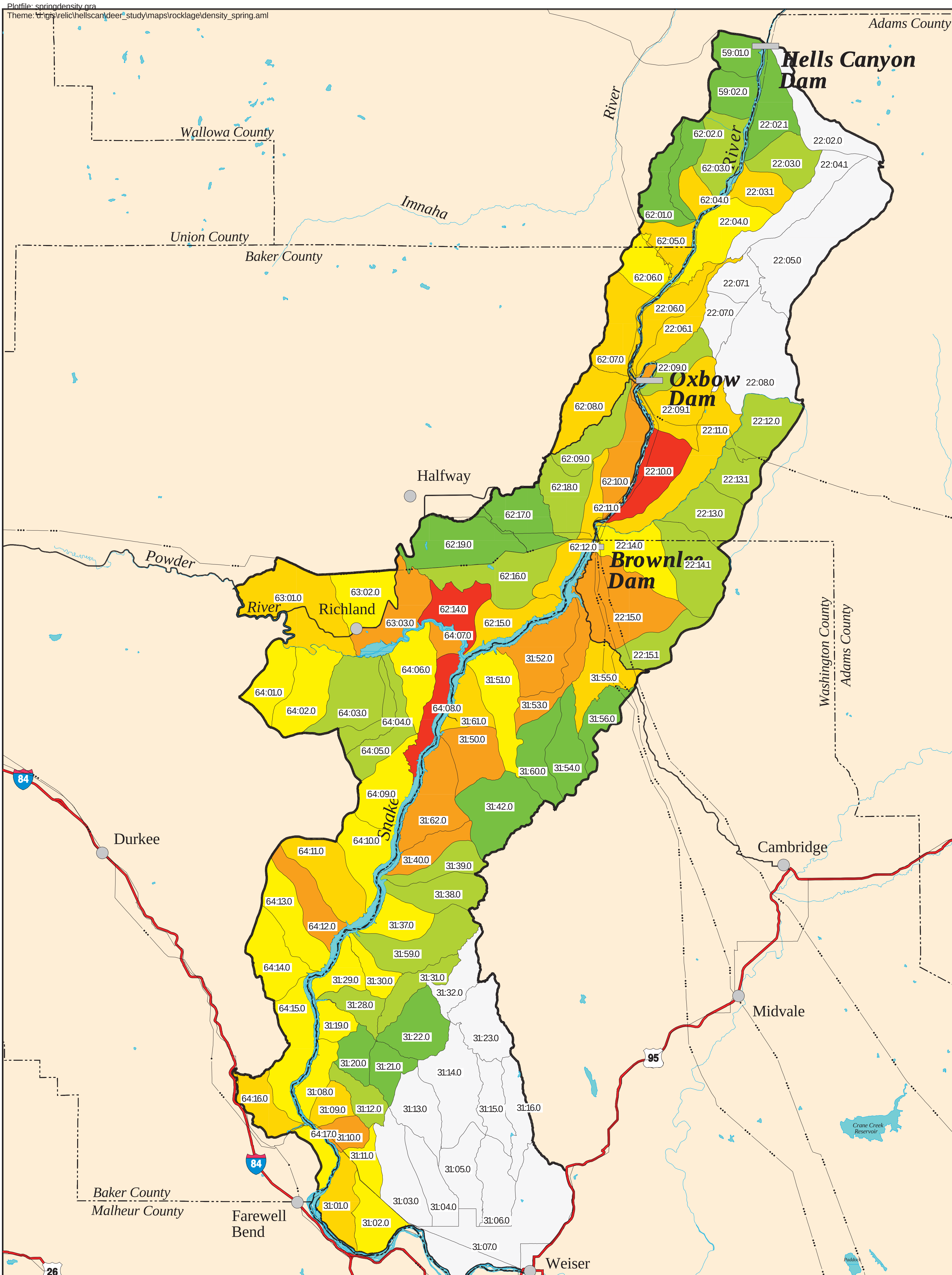
IDAHO POWER COMPANY
BOISE, IDAHO

5 2.5 0 MILES

Scale = 1:325000

This page left blank intentionally.

Plotfile: springdensity.gra
Theme: d:\gis\relic\hellscan\deer_study\maps\rocklage\density_spring.aml



Vicinity Map

Features Legend

Primary Route	DEER / SQ-KILOMETER
Secondary Route	> 20
Transmission Lines	16 -20
County Boundary	11 - 15
Idaho Power Facility	6 - 10
City or Town	1 - 5
	< 1
	Not Surveyed
Winter Range	

N

Hells Canyon Complex

Tech. Report E.3.2 - 30 Figure 11

Spring Mule Deer Densities (deer/km2), 2001

IDAHO POWER COMPANY
BOISE, IDAHO

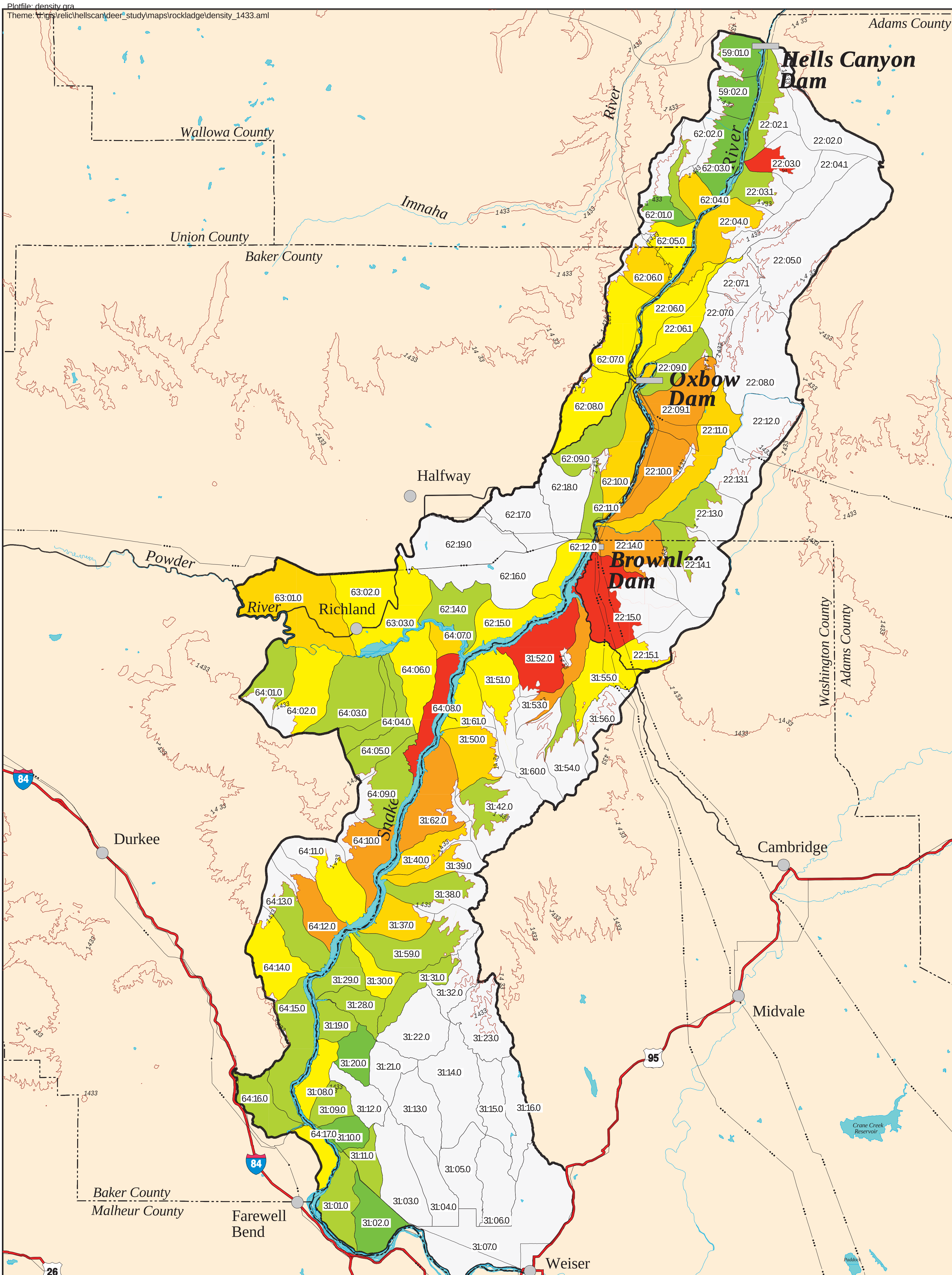
5 2.5 0 MILES

Scale = 1:325000

IDAHO POWER
An IDACORP Company

This page left blank intentionally.

Plotfile: density.gra
Theme: d:\gis\relic\hellscan\deer_study\maps\rockladge\density_1433.aml



Vicinity Map

IDAHO POWER
An IDACORP Company

Features Legend

- Primary Route
- Secondary Route
- Transmission Lines
- County Boundary
- Idaho Power Facility
- City or Town

DEER / SQ-KILOMETER

- > 20
- 16 -20
- 11 - 15
- 6 - 10
- 1 - 5
- < 1
- Not Surveyed

- Elevation at 1433m
- Winter Range

N

Hells Canyon Complex

Tech. Report E.3.2 - 30 Figure 12

Spring Mule Deer Densities (deer/km2) < 1433m, 1998

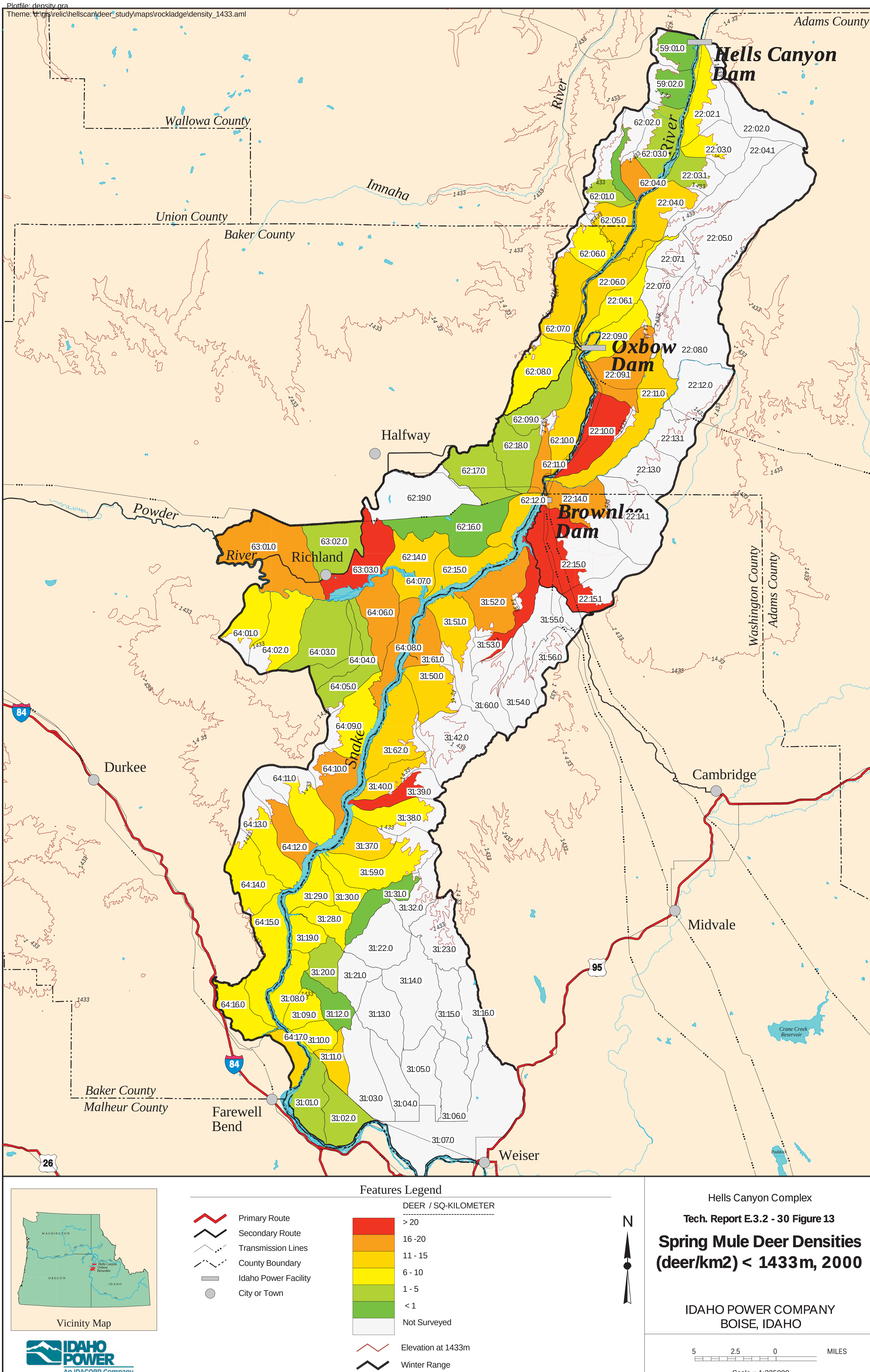
IDAHO POWER COMPANY
BOISE, IDAHO

5 2.5 0 MILES

Scale = 1:325000

This page left blank intentionally.

Plotfile: density.gra
Theme: d:\gis\relic\hellscan\deer_study\maps\rockladge\density_1433.aml



Hells Canyon Complex

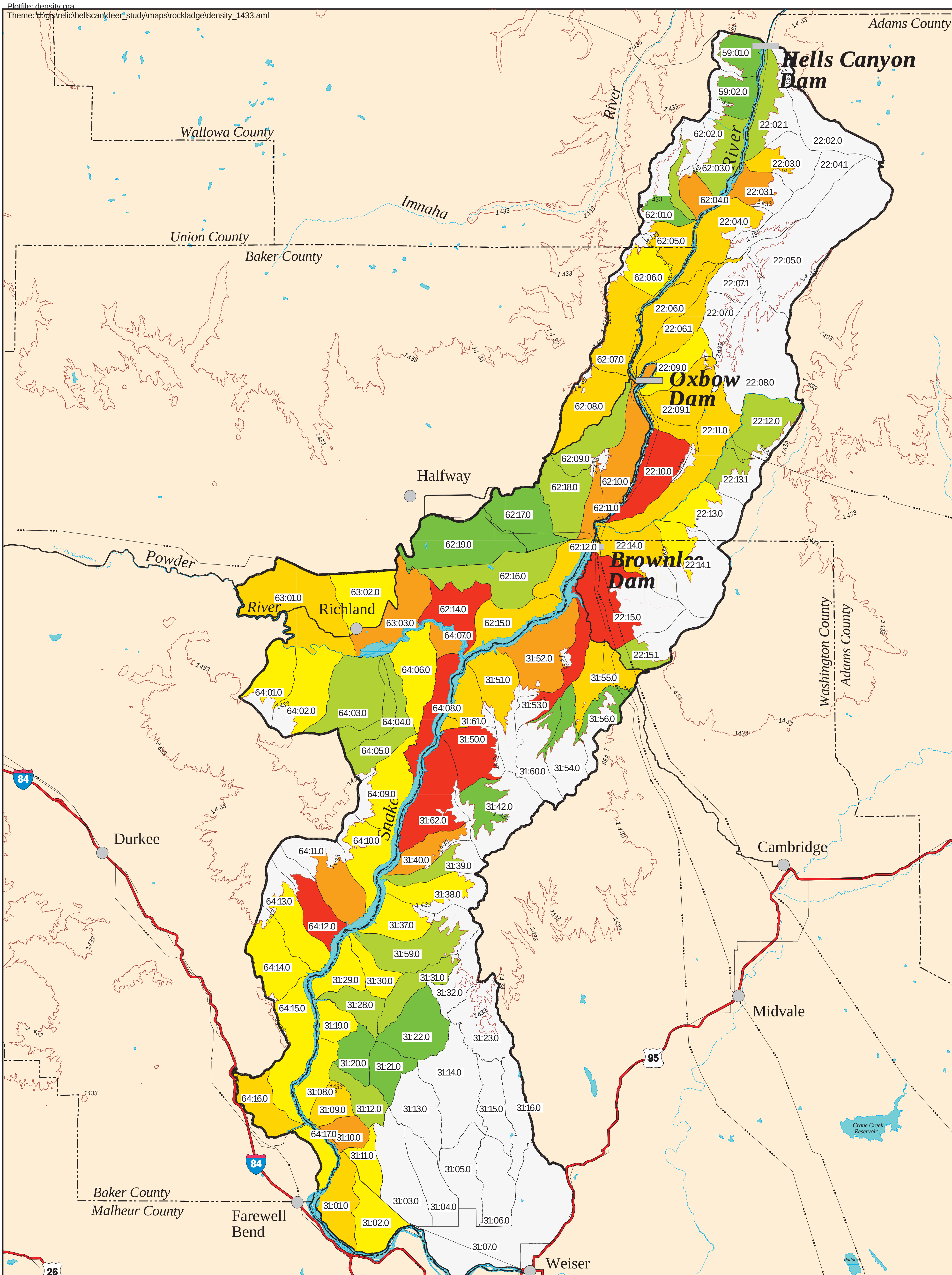
Tech. Report E.3.2 - 30 Figure 13

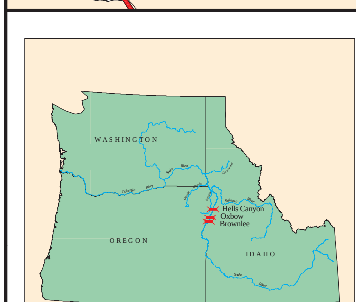
Spring Mule Deer Densities (deer/km2) < 1433m, 2000

IDAHO POWER COMPANY
BOISE, IDAHO

This page left blank intentionally.

Plotfile: density.gra
Theme: d:\gis\relic\hellscan\deer_study\maps\rockladge\density_1433.aml





Vicinity Map

IDAHO POWER
An IDACORP Company

Features Legend

- Primary Route
- Secondary Route
- Transmission Lines
- County Boundary
- Idaho Power Facility
- City or Town

DEER / SQ-KILOMETER

- > 20
- 16 -20
- 11 - 15
- 6 - 10
- 1 - 5
- < 1
- Not Surveyed

- Elevation at 1433m
- Winter Range

N

Hells Canyon Complex

Tech. Report E.3.2 - 30 Figure 14

Spring Mule Deer Densities (deer/km2) < 1433 m, 2001

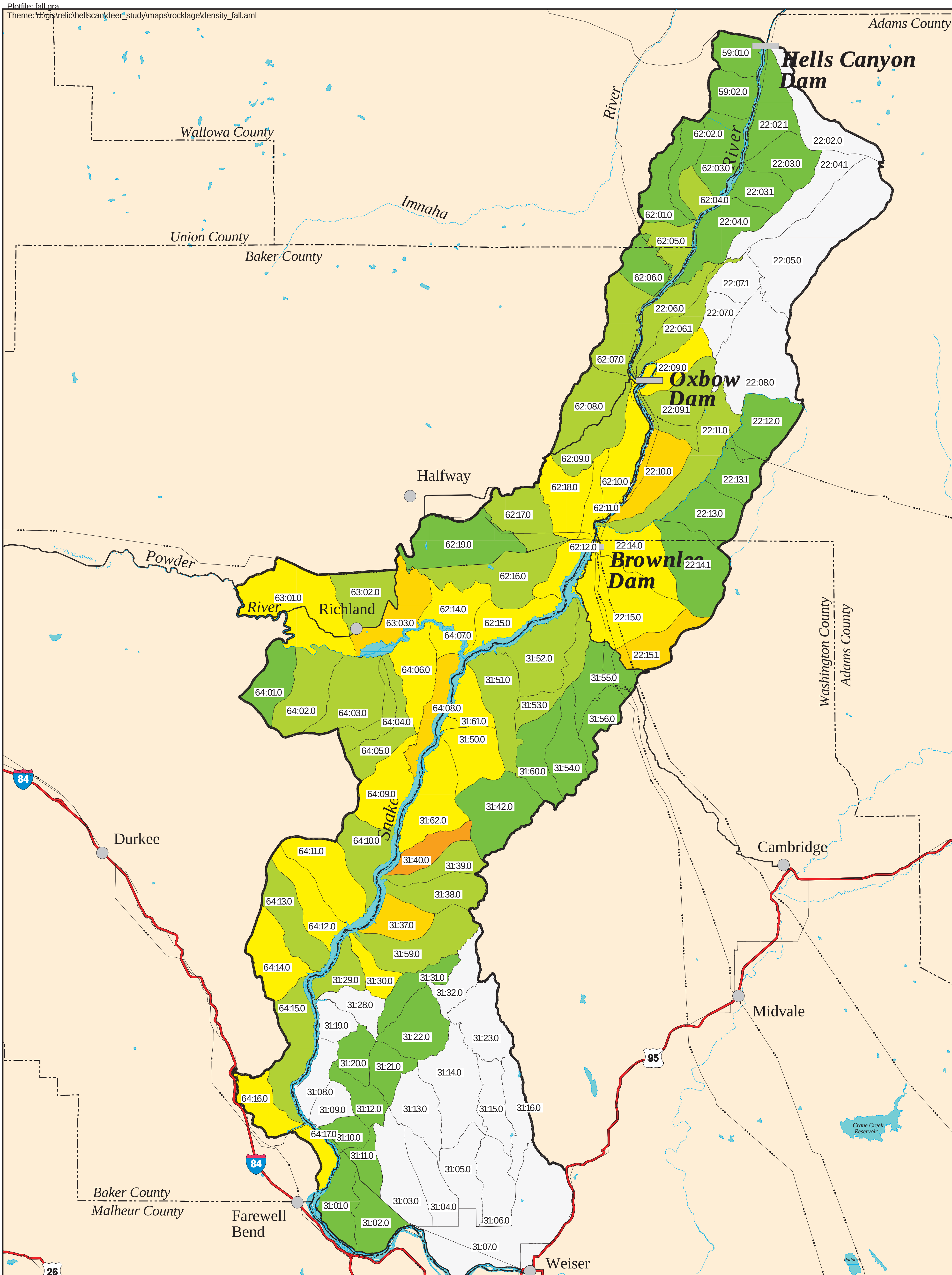
IDAHO POWER COMPANY
BOISE, IDAHO

5 2.5 0 MILES

Scale = 1:325000

This page left blank intentionally.

Plotfile: fall.gra
Theme: d:\gis\relic\hellscan\deer_study\maps\rocklage\density_fall.aml

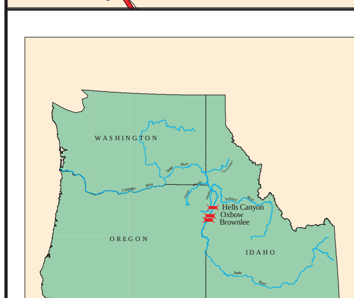


Features Legend

	Primary Route
	Secondary Route
	Transmission Lines
	County Boundary
	Idaho Power Facility
	City or Town
	Winter Range

DEER / SQ-KILOMETER

- > 20
- 16 -20
- 11 - 15
- 6 - 10
- 1 - 5
- < 1
- Not Surveyed



Vicinity Map

IDAHO POWER
An IDACORP Company

N

Hells Canyon Complex

Tech. Report E.3.2 - 30 Figure 15

Fall Mule Deer Densities (deer/km2), 1999

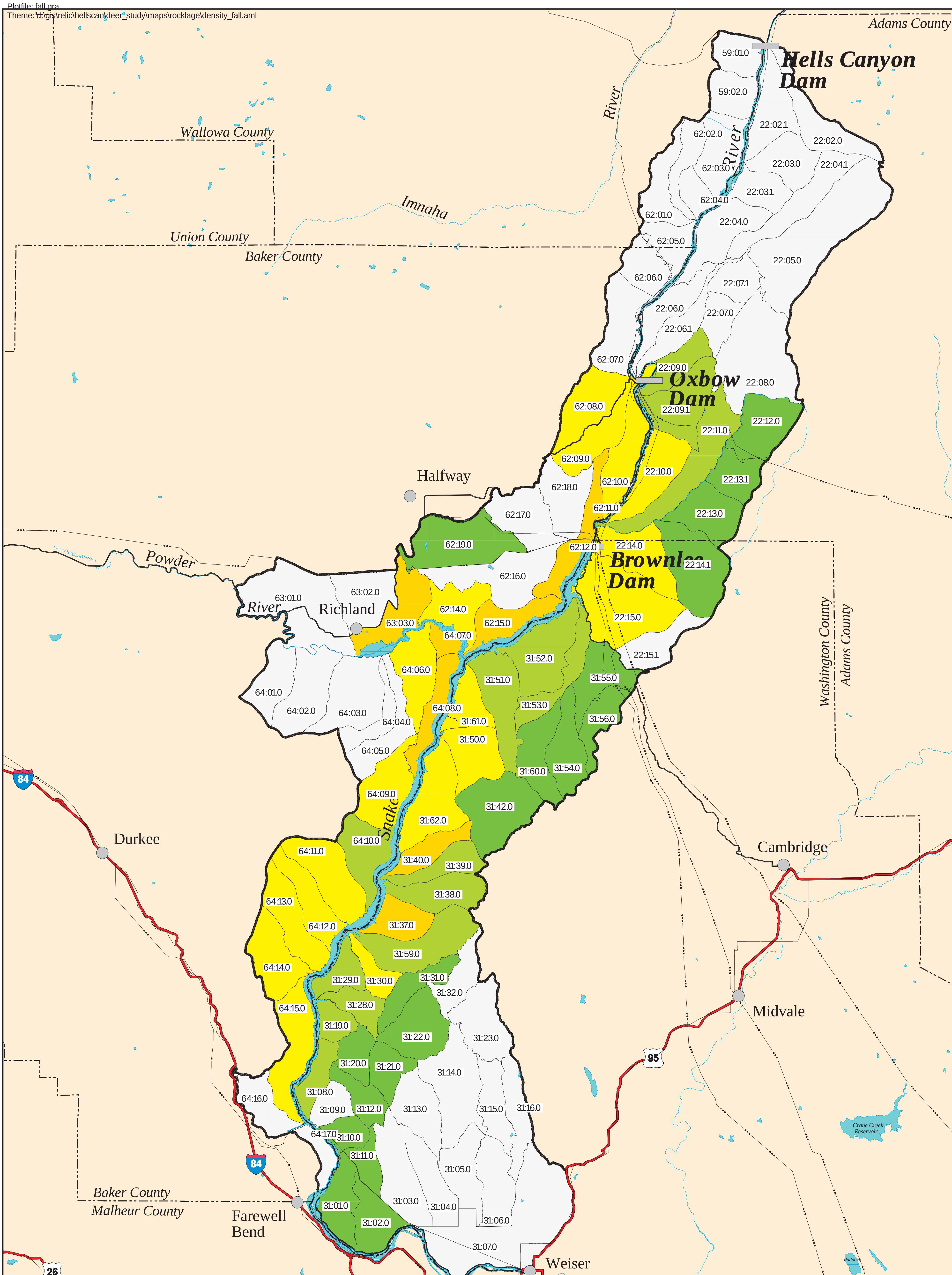
IDAHO POWER COMPANY
BOISE, IDAHO

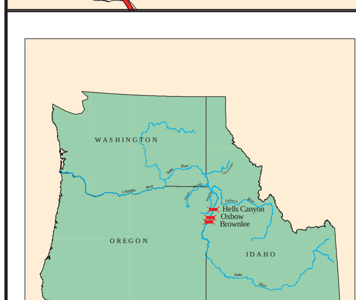
5 2.5 0 MILES

Scale = 1:325000

This page left blank intentionally.

Plotfile: fall.gra
Theme: d:\gis\relic\hellscan\deer_study\maps\rocklage\density_fall.aml





Vicinity Map

Features Legend

	Primary Route
	Secondary Route
	Transmission Lines
	County Boundary
	Idaho Power Facility
	City or Town
	Winter Range

DEER / SQ-KILOMETER
> 20
16 -20
11 - 15
6 - 10
1 - 5
< 1
Not Surveyed

IDAHO POWER
An IDACORP Company

N

Hells Canyon Complex

Tech. Report E.3.2 - 30 Figure 16

Fall Mule Deer Densities (deer/km2), 2000

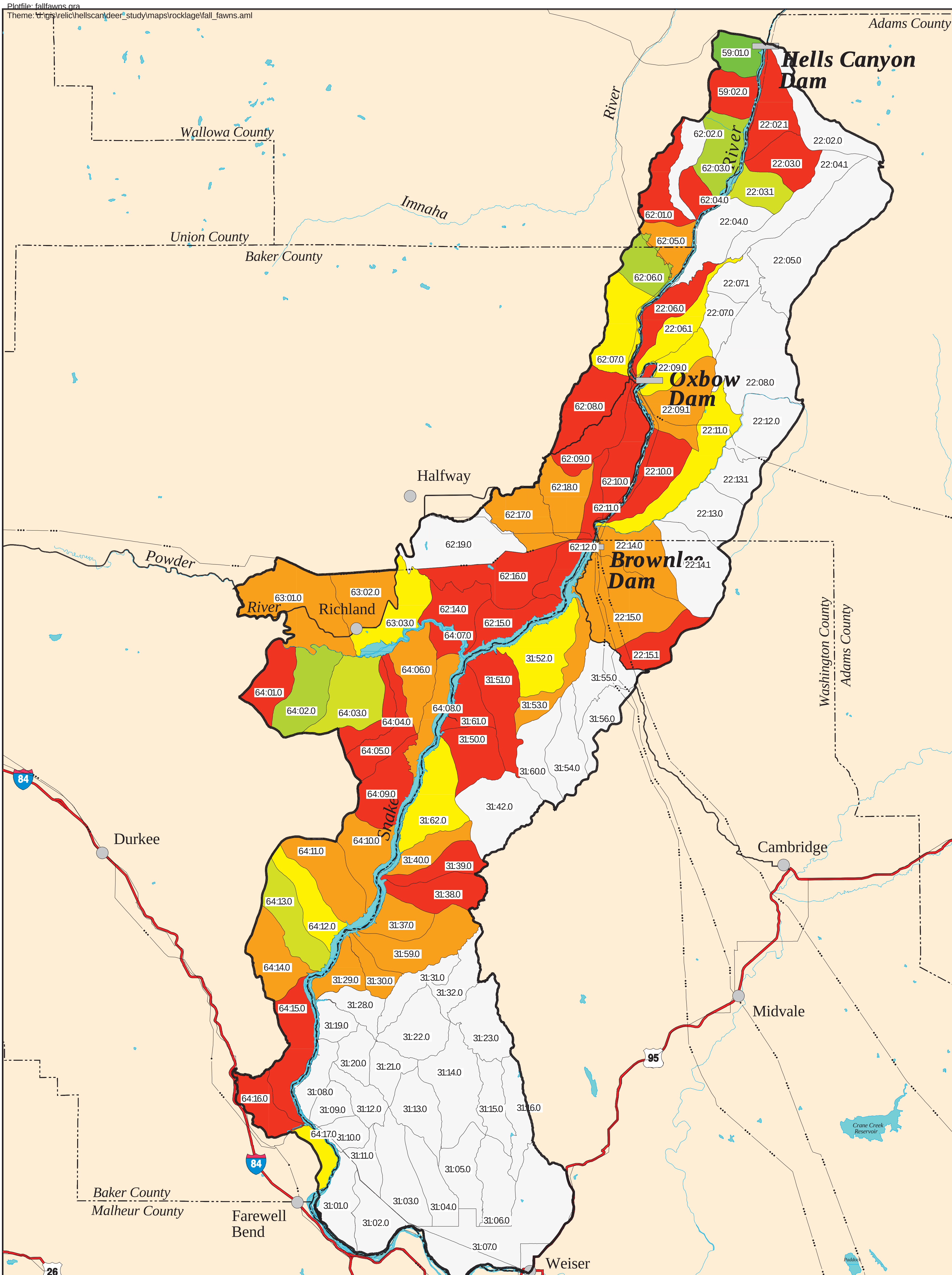
IDAHO POWER COMPANY
BOISE, IDAHO

5 2.5 0 MILES

Scale = 1:325000

This page left blank intentionally.

Plotfile: fallfawns.gra
Theme: d:\gis\relic\hellscan\deer_study\maps\rocklage\fall_fawns.aml



Vicinity Map

Features Legend

- Primary Route
- Secondary Route
- Transmission Lines
- County Boundary
- Idaho Power Facility
- City or Town

FAWN / 100 ADULT

- > 50 / 100
- 41 - 50 / 100
- 31 - 40 / 100
- 21 - 30 / 100
- 11 - 20 / 100
- 0 - 10 / 100
- Winter Range

N

Hells Canyon Complex

Tech. Report E.3.2 - 30 Figure 17

Fall Fawn Ratios (Fawns/100 Does), 1999

IDAHO POWER COMPANY
BOISE, IDAHO

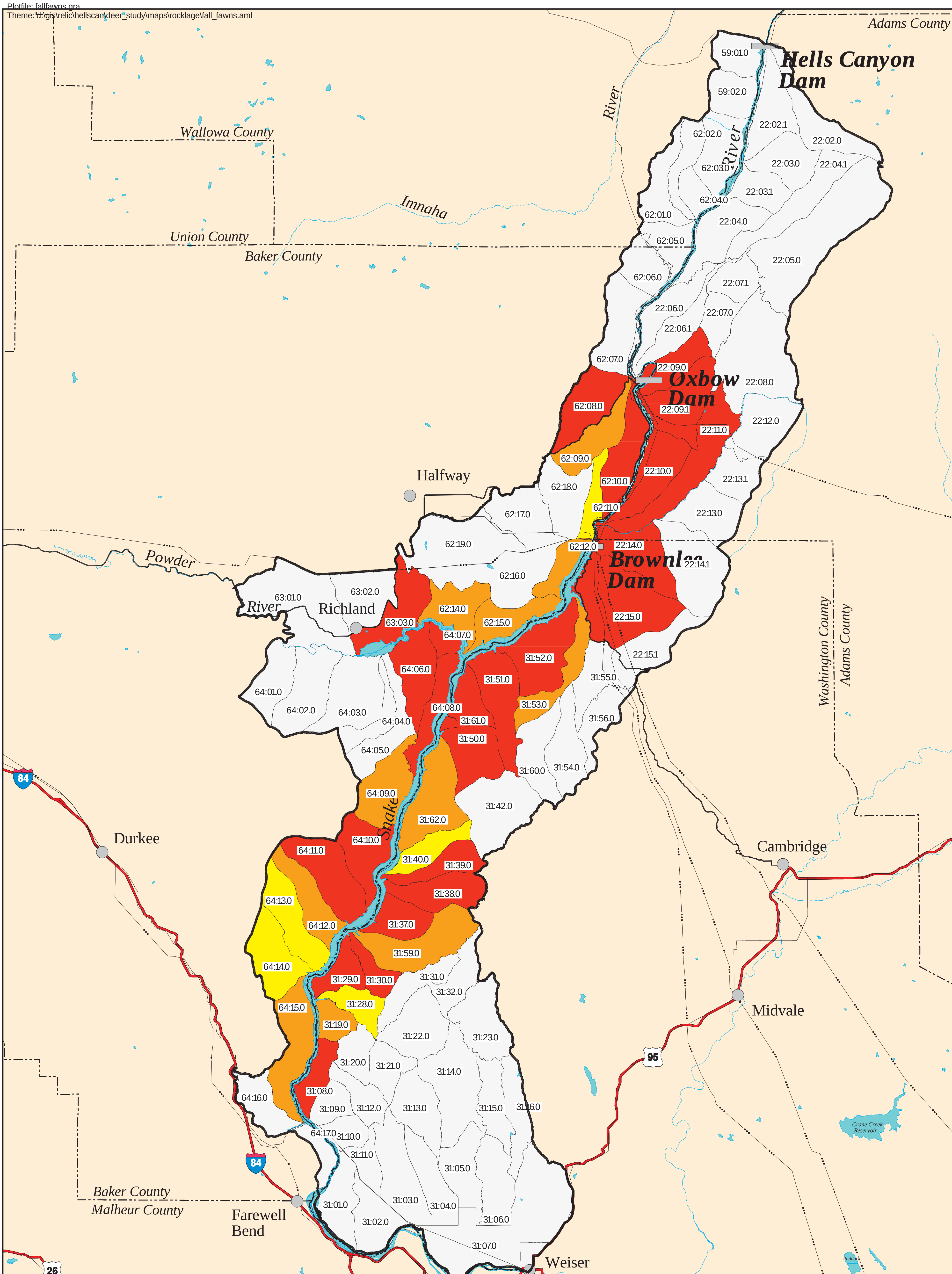
5 2.5 0 MILES

Scale = 1:325000

IDAHO POWER
An IDACORP Company

This page left blank intentionally.

Plotfile: fallfawns.gra
Theme: d:\gis\relic\hellscan\deer_study\maps\rocklage\fall_fawns.aml



Vicinity Map

Features Legend

Primary Route	FAWN / 100 ADULT
Secondary Route	> 50 / 100
Transmission Lines	41 - 50 / 100
County Boundary	31 - 40 / 100
Idaho Power Facility	21 - 30 / 100
City or Town	11 - 20 / 100
	0 - 10 / 100
	Winter Range

N

IDAHO POWER
An IDACORP Company

Hells Canyon Complex

Tech. Report E.3.2 - 30 Figure 18

Fall Fawn Ratios (Fawns/100 Does), 2000

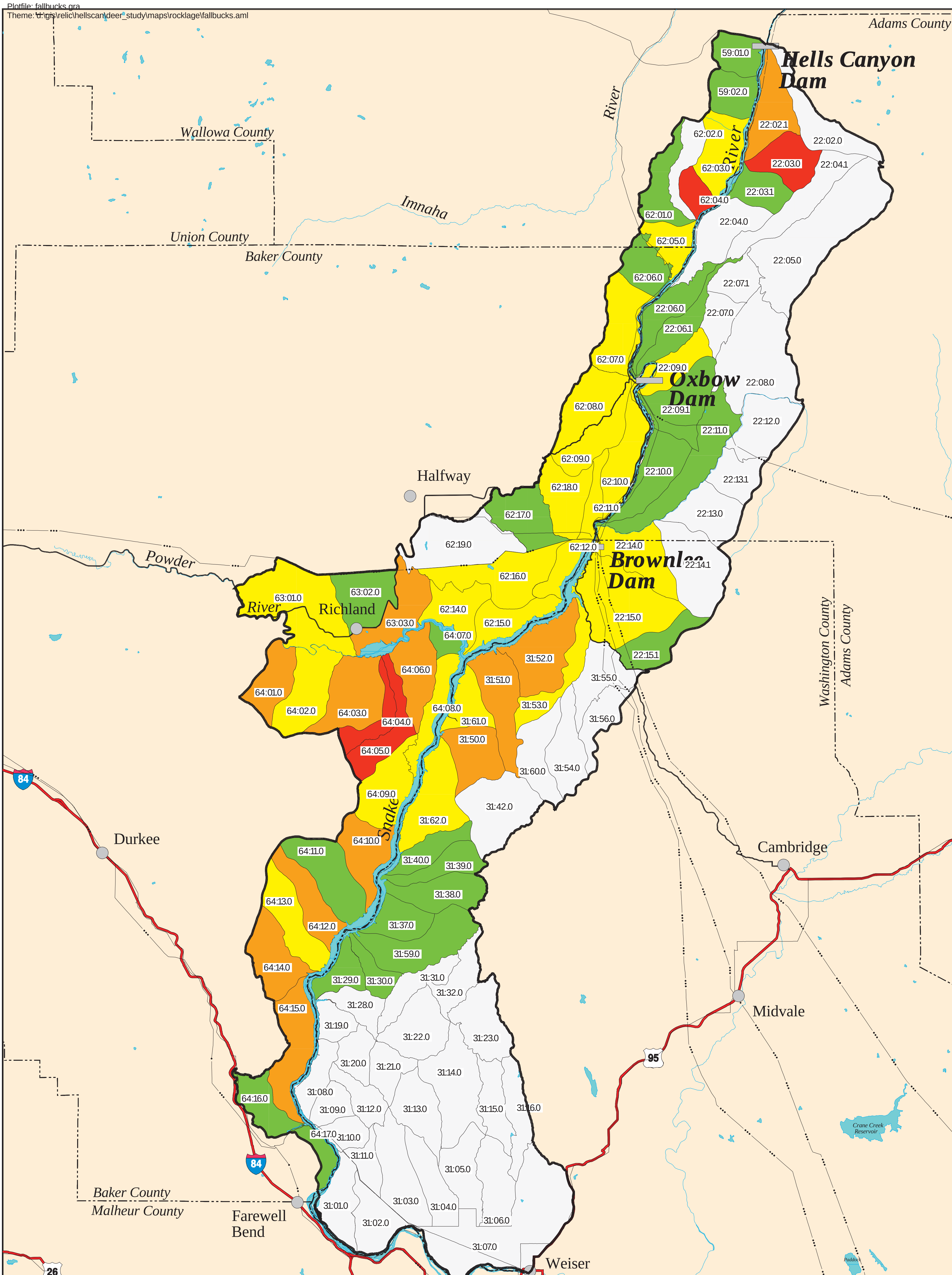
IDAHO POWER COMPANY
BOISE, IDAHO

5 2.5 0 MILES

Scale = 1:325000

This page left blank intentionally.

Plotfile: fallbucks.gra
Theme: d:\gis\relic\hellscan\deer_study\maps\rocklage\fallbucks.aml



Vicinity Map

Features Legend

- Primary Route
- Secondary Route
- Transmission Lines
- County Boundary
- Idaho Power Facility
- City or Town

Fall Buck / 100 Does

- > 30
- 21 - 30
- 11 - 20
- 0 - 10
- Not Surveyed

Winter Range

N

Hells Canyon Complex

Tech. Report E.3.2 - 30 Figure 19

Fall Buck Ratios (Bucks/100 Does), 1999

IDAHO POWER COMPANY
BOISE, IDAHO

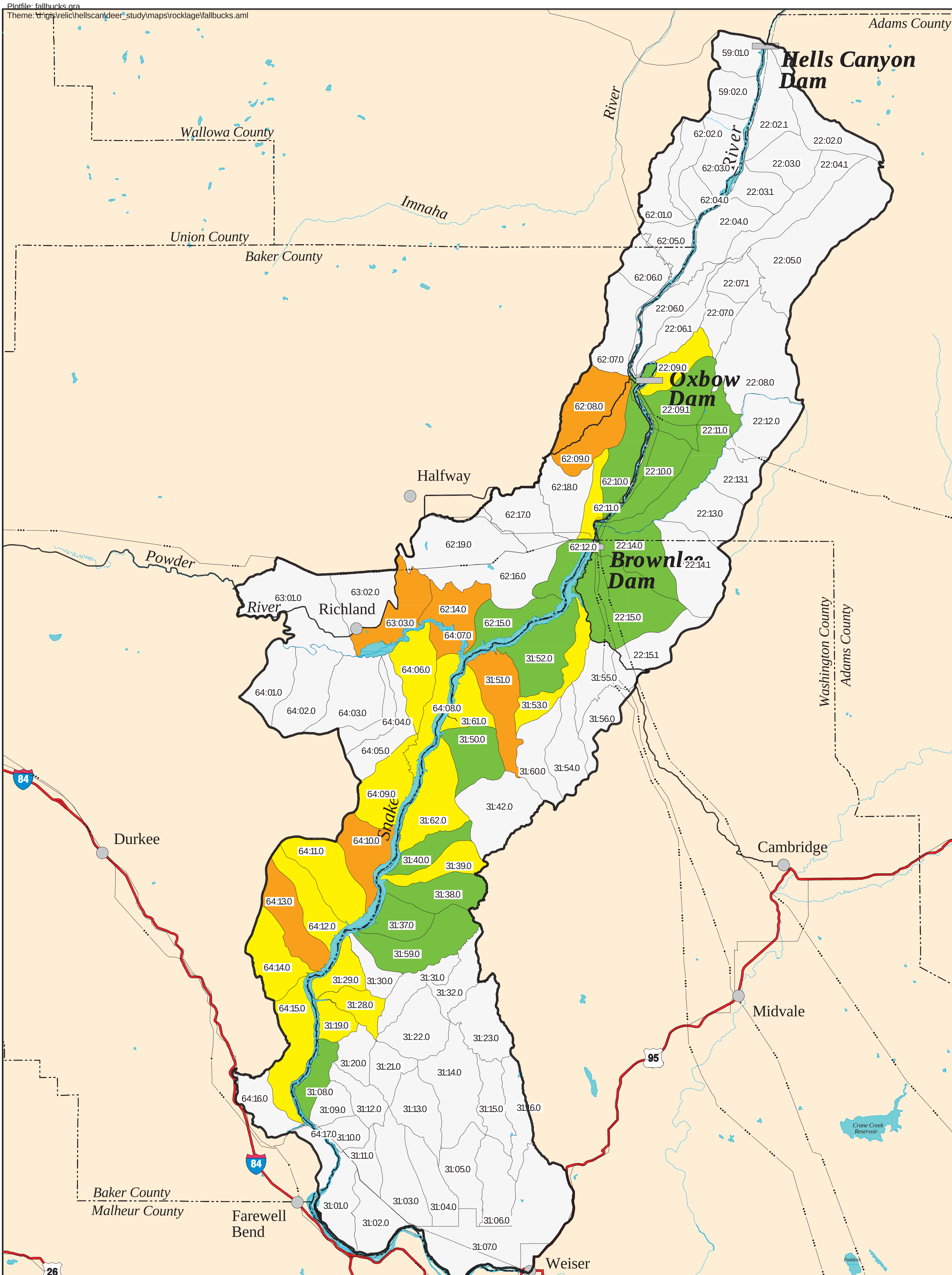
5 2.5 0 MILES

Scale = 1:325000

IDAHO POWER
An IDACORP Company

This page left blank intentionally.

Plotfile: fallbucks.gra
Theme: d:\gis\relic\hellscan\deer_study\maps\rocklage\fallbucks.aml



Features Legend

Primary Route	
Secondary Route	
Transmission Lines	
County Boundary	
Idaho Power Facility	
City or Town	

Fall Buck / 100 Does

- > 30
- 21 - 30
- 11 - 20
- 0 - 10
- Not Surveyed

Winter Range

N

Vicinity Map

IDAHO POWER
An IDACORP Company

Hells Canyon Complex

Tech. Report E.3.2 - 30 Figure 20

Fall Buck Ratios (Bucks/100 Does), 2000

IDAHO POWER COMPANY
BOISE, IDAHO

5 2.5 0 MILES

Scale = 1:325000

This page left blank intentionally.

Appendix 1. Spring survey data for mule deer in Hells Canyon, Idaho and Oregon, 1998, 2000, and 2001.

OREGON												
	2001				2000				1998			
Subunit	Date	Total[a]	Adults	Fawns	Date	Total[a]	Adults	Fawns	Date	Total[a]	Adults	Fawns
Snake River												
59:01	031501	10	6	4	031700	7	7	0	032398	1	1	0
59:02	031501	2	1	1	031700	0	0	0	032398	0	0	0
Total		12	7	5		7	7	0		1	1	0
Pine Creek												
62:01	031401	3	1	2	031700	12	8	4	032398	5	4	1
62:02	031401	6	6	0	031700	5	5	0	032398	7	6	1
62:03	031501	55	34	21	031700	70	54	16	032398	6	5	1
62:04	031401	126	91	35	031700	156	144	12	032398	109	83	26
62:05	031401	143	93	50	031700	136	101	35	032398	77	60	17
62:06	031401	93	61	32	031700	117	90	27	032198	157	106	51
62:07	031401	298	221	77	031600	276	209	67	032198	205	151	54
62:08	031401	281	216	65	031600	236	175	61	032098	232	175	57
62:09	031301	29	18	11	031000	59	48	11	032098	25	20	5
62:10	031201	470	318	152	031100	370	280	84	032098	291	217	74
62:11	031201	141	98	43	031000	162	119	43	032098	17	13	4
62:12	031001	138	99	39	031100	153	117	36	032098	85	63	22
62:14	030901	438	328	110	031200	243	189	44	032298	73	57	16
62:15	031001	185	143	42	031100	254	190	64	032098	183	143	40
62:16	030901	78	66	12	031100	23	4	3	NS	NS	NS	NS
62:17	030901	4	3	1	031100	47	36	11	NS	NS	NS	NS
62:18	031001	25	18	7	031000	51	38	13	NS	NS	NS	NS
62:19	030901	0	0	0	NS[b]	NS	NS	NS	NS	NS	NS	NS
Total		2513	1814	699		2370	1807	531		1472	1103	369
Keating												
63:01	030901	693	523	170	031200	808	622	186	032198	615	481	134
63:02	030901	129	90	39	031200	114	83	31	032198	142	103	39
63:03	030901	376	294	82	031200	538	410	128	032198	226	171	55
Total		1,198	907	291		1,460	1,115	345		983	755	228

Appendix 1. (Cont.)

OREGON												
	2001				2000				1998			
Subunit	Date	Total	Adults	Fawns	Date	Total	Adults	Fawns	Date	Total	Adults	Fawns
Lookout Mtn.												
64:01	030901	156	114	42	031200	129	98	31	032298	48	38	10
64:02	030901	199	161	38	031200	180	155	25	032298	158	120	38
64:03	030801	123	106	17	031300	160	129	31	032298	41	31	10
64:04	030801	20	18	2	031300	26	21	5	032298	60	51	9
64:05	030801	32	24	8	031300	26	21	5	032298	40	34	6
64:06	030801	215	169	46	031300	400	334	66	032298	203	160	43
64:07	030801	103	84	19	031300	87	64	23	032298	83	64	19
64:08	030801	323	252	71	031400	301	235	66	032298	328	266	62
64:09	030701	167	127	40	031400	162	128	34	032298	39	32	7
64:10	030701	149	85	64	031400	367	290	77	032298	353	272	81
64:11	030701	344	224	120	031400	162	131	31	032298	113	88	25
64:12	030601	311	239	72	031400	224	181	43	032298	294	215	79
64:13	030601	182	145	35	031400	135	119	16	032298	56	46	10
64:14	030601	181	139	42	031400	154	122	32	032298	183	146	37
64:15	030501	215	172	43	031400	200	168	32	032298	66	45	21
64:16	030501	192	145	47	031400	128	102	26	032398	45	36	9
64:17	030501	50	41	9	031400	86	70	16	032398	78	57	21
Total		2,962	2,245	715		2,927	2,368	559		2,188	1,701	487
Oregon Grand Total		6,685	4,973	1,710		6,764	5,297	1,435		4,644	3,560	1,084

IDAHO												
	2001				2000				1998			
Subunit	Date	Total	Adults	Fawns	Date	Total	Adults	Fawns	Date	Total	Adults	Fawns
Unit 31												
31:01	030501	199	143	56	031500	80	57	23	032698	93	69	24
31:02	030501	101	72	29	031500	39	29	10	032698	17	11	6
31:08	030601	91	60	31	031500	124	96	28	032698	83	52	31
31:09	030501	112	74	38	031500	58	36	22	032698	12	9	3
31:10	030501	158	115	43	031500	70	51	19	032698	2	2	0
31:11	030501	49	34	15	031500	109	83	26	032698	27	17	10
31:12	030501	32	24	8	031500	13	9	4	NS	NS	NS	NS
31:19	030601	81	52	29	031500	58	45	13	032698	26	17	9
31:20	030601	2	1	1	031500	15	12	3	032698	0	0	0

Appendix 1. (Cont.)

IDAHO												
	2001				2000				1998			
Subunit	Date	Total	Adults	Fawns	Date	Total	Adults	Fawns	Date	Total	Adults	Fawns
31:21	030601	0	0	0	NS	NS	NS	NS	NS	NS	NS	NS
31:22	030601	7	6	1	NS	NS	NS	NS	NS	NS	NS	NS
31:28	030601	17	10	7	031500	88	66	22	032698	30	19	11
31:29	030601	91	67	24	031500	86	70	16	032698	36	21	15
31:30	030601	51	39	12	031500	90	69	21	032698	55	36	19
31:31	030601	22	16	6	031500	11	8	3	032698	21	14	7
31:37	030601	121	96	25	031500	207	164	43	032698	154	108	46
31:38	030701	75	49	26	031600	78	60	18	032598	25	20	5
31:39	030701	46	26	20	031600	222	167	55	032598	136	104	32
31:40	030701	208	145	63	031400	158	113	45	032598	161	124	37
31:42	031001	0	0	0	NS	NS	NS	NS	032598	56	41	15
31:50	031001	403	283	120	031300	221	162	59	032598	242	172	70
31:51	031101	230	160	70	031200	234	181	53	032598	152	100	52
31:52	031101	531	379	152	031200	467	350	117	032598	656	469	187
31:53	031101	306	197	109	031100	365	264	101	032598	195	134	61
31:54	031101	4	2	2	NS	NS	NS	NS	032598	7	5	2
31:55	031101	225	155	70	NS	NS	NS	NS	032498	185	131	54
31:56	031101	0	0	0	NS	NS	NS	NS	NS	NS	NS	NS
31:59	030601	77	48	29	031500	132	101	31	032698	84	57	27
31:60	031101	0	0	0	NS	NS	NS	NS	NS	NS	NS	NS
31:61	031001	153	109	44	031300	222	160	62	032598	105	74	31
31:62	030701	618	434	184	031300	365	273	92	032598	475	347	128
Total		4,010	2,796	1,214		3,512	2,626	886		3,035	2,153	882
Unit 22												
22:02.1	031501	20	14	6	031700	107	76	31	032498	24	18	6
22:03.0	031501	74	38	36	031700	48	37	11	032498	188	149	39
22:03.1	031401	194	136	58	031700	43	32	11	032498	11	8	3
22:04.0	031401	264	179	85	031700	337	248	89	032498	278	219	59
22:06.0	031401	285	169	116	031700	268	203	65	032498	119	90	29
22:06.1	031401	193	121	72	031700	162	119	43	032498	97	75	22
22:09.0	031301	75	58	17	031000	76	56	20	032498	15	5	
22:09.1	031301	372	245	101	031000	440	339	101	032498	450	357	
22:10.0	031301	523	358	165	031000	511	373	118	032498	421	313	

Appendix 1. (Cont.)

IDAHO												
	2001				2000				1998			
Subunit	Date	Total	Adults	Fawns	Date	Total	Adults	Fawns	Date	Total	Adults	Fawns
22:11.0	031301	485	311	174	031000	450	335	115	032498	359	256	103
22:12.0	031301	44	24	20	NS	NS	NS	NS	NS	NS	NS	NS
22:13.0	031301	81	56	25	NS	NS	NS	NS	032498	22	17	5
22:13.1	031201	33	19	14	NS	NS	NS	NS	NS	NS	NS	NS
22:14.0	031201	245	172	73	031100	316	234	82	032398	308	228	80
22:14.1	031201	54	33	21	NS	NS	NS	NS	032498	27	18	9
22:15.0	031201	839	530	274	031100	626	457	169	032398	791	604	187
22:15.1	031201	20	11	9	031100	319	238	81	032398	44	32	12
Sum		3,801	2,474	1,266		3,703	2,747	936		3,185	2,413	766
Idaho Grand Total		7,811	5,270	2,480		7,215	5,373	1,822		6,220	4,566	1,648

[a] Totals include unclassified individuals.
[b] NS = Not surveyed.

Appendix 2. Fall survey data for mule deer in Hells Canyon, Idaho and Oregon, 1999 and 2000.

OREGON, Fall 2000												
Subunit	**Total**	**Adults**	**Does**	**Fawns**	**Bucks**	**≤ 2-Point**	**3-Point**	**≥ 4-Point**	**Unclass.**	**Fawns/ 100 Adults**	**Fawns/ 100 Does**	**Bucks/ 100 Does**
Snake River												
59:01	NS[a]	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
59:02	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Total	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Pine Creek												
62:01	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
62:02	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
62:03	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
62:04	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
62:05	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
62:06	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
62:07	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
62:08	141	96	80	45	16	10	2	4	0	46.88	56.25	20.00
62:09	102	76	61	26	15	7	4	4	0	34.21	42.62	24.59
62:10	243	149	141	93	8	3	0	5	1	62.42	65.96	5.67
62:11	113	87	78	26	9	4	2	3	0	29.89	33.33	11.54
62:12	136	94	87	42	7	6	0	1	0	44.68	48.28	8.05
62:14	192	137	113	55	24	11	6	7	0	40.15	48.67	21.24
62:15	219	158	144	61	14	8	2	4	0	38.61	42.36	9.72
62:16	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
62:17	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
62:18	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Total	1,146	797	704	348	93	49	16	28	1	43.66	49.43	13.21
Keating												
63:01	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
63:02	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
63:03	339	204	170	99	34	23	5	6	36	48.53	58.24	20.00
Total	339	204	170	99	34	23	5	6	36	48.53	58.24	20.00
Lookout Mtn.												
64:01	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
64:02	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
64:03	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
64:04	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
64:05	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
64:06	220	146	129	74	17	0	0	0	0	50.68	57.36	13.18

Appendix 2. (Cont.)

OREGON, Fall 2000												
Subunit	**Total**	**Adults**	**Does**	**Fawns**	**Bucks**	**≤ 2-Point**	**3-Point**	**≥ 4-Point**	**Unclass.**	**Fawns/ 100 Adults**	**Fawns/ 100 Does**	**Bucks/ 100 Does**
64:07	70	48	40	22	8	5	2	1	0	45.83	55.00	20.00
64:08	183	127	110	56	17	12	2	3	0	44.09	50.91	15.45
64:09	144	101	89	43	12	6	2	4	0	42.57	48.31	13.48
64:10	84	59	47	25	12	5	3	4	0	42.37	53.19	25.53
64:11	170	103	92	67	11	7	1	3	0	65.05	72.83	11.96
64:12	138	97	84	41	13	7	1	5	0	42.27	48.81	15.48
64:13	152	118	94	34	24	7	6	11	0	28.81	36.17	25.53
64:14	144	109	93	35	16	7	5	4	0	32.11	37.63	17.20
64:15	184	133	119	51	14	3	2	9	0	38.35	42.86	11.76
64:16	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
64:17	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Total	1,489	1,041	897	448	144	59	24	44	0	43.04	49.94	16.05
Grand Total	2,974	2,042	1,771	895	271	131	45	78	37	43.83	50.54	15.30

OREGON, Fall 1999												
Subunit	**Total**	**Adults**	**Does**	**Fawns**	**Bucks**	**≤ 2-Point**	**3-Point**	**≥ 4-Point**	**Unclass.**	**Fawns/ 100 Adults**	**Fawns/ 100 Does**	**Bucks/ 100 Does**
Snake River												
59:01	2	0	0	2	0	0	0	0	0	no adults	0.00	0.00
59:02	2	1	1	1	0	0	0	0	0	100.00	100.00	0.00
Total	4	1	1	3	0	0	0	0	0	300.00	300.00	0.00
Pine Creek												
62:01	12	7	7	5	0	0	0	0	0	71.43	71.43	0.00
62:02	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00
62:03	10	9	8	1	1	0	0	0	0	11.11	12.50	12.50
62:04	11	8	5	3	3	0	0	0	0	37.50	60.00	60.00
62:05	60	43	39	17	4	0	0	0	0	39.53	43.59	10.26
62:06	8	7	7	1	0	0	0	0	0	14.29	14.29	0.00
62:07	57	44	37	13	7	0	0	0	0	29.55	35.14	18.92
62:08	57	33	28	24	5	0	0	0	0	72.73	85.71	17.86
62:09	72	47	41	25	6	0	0	0	0	53.19	60.98	14.63
62:10	213	131	114	82	17	0	0	0	0	62.60	71.93	14.91
62:11	49	34	30	15	4	0	0	0	0	44.12	50.00	13.33
62:12	87	59	51	28	8	0	0	0	0	47.46	54.90	15.69
62:14	123	84	75	39	9	0	0	0	0	46.43	52.00	12.00

Appendix 2. (Cont.)

OREGON, Fall 1999

Subunit	Total	Adults	Does	Fawns	Bucks	≤ 2-Point	3-Point	≥ 4-Point	Unclass.	Fawns/ 100 Adults	Fawns/ 100 Does	Bucks/ 100 Does
62:15	138	92	82	46	10	0	0	0	0	50.00	56.10	12.20
62:16	42	27	24	15	3	0	0	0	0	55.56	62.50	12.50
62:17	93	64	60	29	4	0	0	0	0	45.31	48.33	6.67
62:18	224	163	140	61	23	0	0	0	0	37.42	43.57	16.43
Total	1256	852	748	404	104	0	0	0	0	47.42	54.01	13.90
Keating												
63:01	322	232	202	90	30	0	0	0	0	38.79	44.55	14.85
63:02	66	46	42	20	4	0	0	0	0	43.48	47.62	9.52
63:03	329	248	206	81	42	0	0	0	0	32.66	39.32	20.39
Total	717	526	450	191	76	0	0	0	0	36.31	42.44	16.89
Lookout Mtn.												
64:01	13	9	7	4	2	0	0	0	0	44.44	57.14	28.57
64:02	51	44	38	7	6	0	0	0	0	15.91	18.42	15.79
64:03	62	51	41	11	10	0	0	0	0	21.57	26.83	24.39
64:04	14	8	5	6	3	0	0	0	0	75.00	120.00	60.00
64:05	30	20	15	10	5	0	0	0	0	50.00	66.67	33.33
64:06	151	114	90	37	24	0	0	0	0	32.46	41.11	26.67
64:07	57	33	30	24	3	0	0	0	0	72.73	80.00	10.00
64:08	190	140	121	50	19	0	0	0	0	35.71	41.32	15.70
64:09	208	137	120	71	17	0	0	0	0	51.82	59.17	14.17
64:10	92	68	55	24	13	0	0	0	0	35.29	43.64	23.64
64:11	178	124	120	54	4	0	0	0	0	43.55	45.00	3.33
64:12	150	117	97	33	20	0	0	0	0	28.21	34.02	20.62
64:13	101	83	71	18	12	0	0	0	0	21.69	25.35	16.90
64:14	153	110	89	43	21	0	0	0	0	39.09	48.31	23.60
64:15	132	94	76	38	18	0	0	0	0	40.43	50.00	23.68
64:16	95	64	61	31	3	0	0	0	0	48.44	50.82	4.92
64:17	83	64	59	19	5	0	0	0	0	29.69	32.20	8.47
Total	1,760	1,280	1,095	480	185	0	0	0	0	37.5	43.84	16.89
Grand Total	3,737	2,659	2,294	1,078	365	0	0	0	0	40.54	46.99	15.91

IDAHO, Fall 2000

Subunit	Total	Adults	Does	Fawns	Bucks	≤ 2-Point	3-Point	≥ 4-Point	Unclass.	Fawns/ 100 Adults	Fawns/ 100 Does	Bucks/ 100 Does
Unit 31												
31:08	54	34	31	20	3	0	1	2	0	58.82	64.52	9.68

Appendix 2. (Cont.)

IDAHO, Fall 2000												
Subunit	**Total**	**Adults**	**Does**	**Fawns**	**Bucks**	**≤ 2-Point**	**3-Point**	**≥ 4-Point**	**Unclass.**	**Fawns/ 100 Adults**	**Fawns/ 100 Does**	**Bucks/ 100 Does**
31:09	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
31:19	28	20	17	8	3	3	0	0	0	40.00	47.06	17.65
31:28	27	20	18	7	2	2	0	0	0	35.00	38.89	11.11
31:29	16	10	9	6	1	1	0	0	0	60.00	66.67	11.11
31:30	71	43	43	28	0	0	0	0	0	65.12	65.12	0.00
31:37	194	129	119	65	10	6	2	2	0	50.39	54.62	8.40
31:38	62	42	39	20	3	1	0	2	0	47.62	51.28	7.69
31:39	71	41	35	30	6	5	1	0	0	73.17	85.71	17.14
31:40	148	110	104	38	6	4	0	2	0	34.55	36.54	5.77
31:50	121	80	74	41	6	4	2	0	0	51.25	55.41	8.11
31:51	55	32	26	23	6	5	1	0	0	71.88	88.46	23.08
31:52	89	59	55	30	4	3	1	0	0	50.85	54.55	7.27
31:53	61	45	40	16	5	5	0	0	0	35.56	40.00	12.50
31:59	81	56	52	25	4	3	1	0	0	44.64	48.08	7.69
31:61	101	66	56	35	10	6	3	1	0	53.03	62.50	17.86
31:62	173	123	108	50	15	11	2	2	0	40.65	46.30	13.89
Total	1,352	910	826	442	84	59	14	11	0	48.57	53.51	10.17
Unit 22												
22:02.1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
22:03.0	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
22:03.1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
22:04.0	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
22:06.0	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
22:06.1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
22:09.0	51	31	28	20	3	2	0	1	0	64.52	71.43	10.71
22:09.1	135	86	80	49	6	5	1	0	0	56.98	61.25	7.50
22:10.0	250	158	148	89	10	6	3	1	3	56.33	60.14	6.76
22:11.0	137	87	81	50	6	5	1	0	0	57.47	61.73	7.41
22:14.0	199	130	120	66	10	8	0	2	3	50.77	55.00	8.33
22:15.0	277	182	172	92	10	8	2	0	3	50.55	53.49	5.81
22:15.1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Total	1,049	674	629	366	45	34	7	4	9	54.30	58.19	7.15
Grand Total	2,401	1,584	1,455	808	129	93	21	15	9	51.01	55.53	8.87

Appendix 2. (Cont.)

IDAHO, Fall 1999												
Subunit	**Total**	**Adults**	**Does**	**Fawns**	**Bucks**	**≤ 2-Point**	**3-Point**	**≥ 4-Point**	**Unclass.**	**Fawns/ 100 Adults**	**Fawns/ 100 Does**	**Bucks/ 100 Does**
Unit 31												
31:08	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
31:09	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
31:19	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
31:28	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
31:29	30	21	20	9	1	0	0	0	0	42.86	45.00	5.00
31:30	55	38	35	17	3	0	0	0	0	44.74	48.57	8.57
31:37	236	162	151	74	11	0	0	0	0	45.68	49.01	7.28
31:38	42	27	26	15	1	0	0	0	0	55.56	57.69	3.85
31:39	56	36	35	20	1	0	0	0	0	55.56	57.14	2.86
31:40	217	152	145	65	7	0	0	0	0	42.76	44.83	4.83
31:50	119	83	69	36	14	0	0	0	0	43.37	52.17	20.29
31:51	82	54	43	28	11	0	0	0	0	51.85	65.12	25.58
31:52	91	71	59	20	12	0	0	0	0	28.17	33.90	20.34
31:53	71	51	46	20	5	0	0	0	0	39.22	43.48	10.87
31:59	136	97	93	39	4	0	0	0	0	40.21	41.94	4.30
31:61	133	88	76	45	12	0	0	0	0	51.14	59.21	15.79
31:62	295	224	196	71	28	0	0	0	0	31.70	36.22	14.29
Total	1,563	1,104	994	459	110	0	0	0	0	41.58	46.18	11.07
Unit 22												
22:02.1	7	5	4	2	1	0	0	0	0	40.00	50.00	25.00
22:03.0	5	3	2	2	1	0	0	0	0	66.67	100.00	50.00
22:03.1	5	4	4	1	0	0	0	0	0	25.00	25.00	0.00
22:04.0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00
22:06.0	37	19	18	18	1	0	0	0	0	94.74	100.00	5.56
22:06.1	81	60	56	21	4	0	0	0	0	35.00	37.50	7.14
22:09.0	81	56	50	19	6	0	0	0	6	33.93	38.00	12.00
22:09.1	145	102	97	43	5	0	0	0	0	42.16	44.33	5.15
22:10.0	322	205	188	117	17	0	0	0	0	57.07	62.23	9.04
22:11.0	122	94	87	28	7	0	0	0	0	29.79	32.18	8.05
22:14.0	163	118	105	45	13	0	0	0	0	38.14	42.86	12.38
22:15.0	261	183	161	78	22	0	0	0	0	42.62	48.45	13.66
22:15.1	266	171	163	95	8	0	0	0	0	55.56	58.28	4.91
Total	1,495	1,020	935	469	85	0	0	0	6	45.98	50.16	9.09
Grand Total	3,058	2,124	1,929	928	195	0	0	0	6	43.69	48.11	10.11

[a] NS = Not surveyed.

This page left blank intentionally.