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Chapter 2

The Intermountain Setting

This book is intended to assist range managers throughout the Intermountain West (fig. 1). The areas of greatest applicability are the Middle and Southern Rocky Mountains, Wyoming Basin, Columbia and Colorado Plateaus, and much of the basin and range physiographic provinces of Fenneman (1981) or about 14° latitude, from the Mohave, Sonoran, and Chihuahuan deserts to the northern Rocky Mountains, and 15° longitude, from the Great Plains to the Sierra Nevada-Cascade Mountain axis. This large area contains diverse landforms and several major vegetational communities. Nevertheless, landform and vegetative type are repeated often enough to consider the multifaceted units. We emphasize the broad vegetation types listed in table 1. Bailey's (1978) attempt at a continental-scale treatment recognized vegetative types, but Küchler (1964), also working on a continental scale, recognized at least 28 vegetative types. Bailey's treatment, for example, doesn't map out the extensive juniper-pinyon woodlands of the Great Basin, whereas Küchler's treatment does. Holmgren (1972) recognized four floristic divisions, divided into 16 floristic sections, in an area coinciding approximately with the southwestern half of figure 1. As

Figure 1—The Interior West locations that are covered in this book, with general vegetative types of Bailey (1978):

- 3120 = Palouse Grasslands Province
- 3130 = Intermountain sagebrush Province
  - 3131 = Sagebrush-wheatgrass section
  - 3132 = Lahontan saltbush-greasewood section
  - 3133 = Great Basin sagebrush section
  - 3134 = Bonneville saltbush-greasewood section
  - 3135 = Ponderosa shrub forest section
- A3140 = Wyoming Basin Province
  - A3141 = Wheatgrass-needlegrass-sagebrush section
  - A3142 = Sagebrush-wheatgrass section
- P3130 = Colorado Plateau Province
  - P3131 = Juniper-pinyon woodland and sagebrush-saltbush mosaic section
  - P3132 = Grama-galleta steppe and juniper-pinyon woodland mosaic section
- M3110 = Rocky Mountain Forest Province
  - M3111 = Grand fir—Douglas-fir forest section
  - M3112 = Douglas-fir forest section
  - M3113 = Ponderosa pine—Douglas-fir forest section
- M3120 = Upper Gila Mountain Forest Province

Table 1—Vegetation types of the Intermountain region.

Geographic area	Characterization of vegetative types		
	Large	Small	Disturbed and depauperate
Valleys and lower mountain slopes			
Big sagebrush	*		*
Shadscale	*		*
Pinyon-juniper	*		*
Black greasewood		*	
Inland saltgrass		*	
Blackbrush		*	
Lowland annual weeds		*	*
Cheatgrass and red brome		*	*
Montane[a]			
Aspen-conifer	*		
Mountain brushlands	*		
Subalpine herblands		*	
Wet and semiwet meadows		*	
Transitional; including both mountain and valley			
Riparian		*	*

[a]Exclusive of alpine habitats.

smaller geographical areas or particular vegetation types are examined more closely, additional vegetation types or subtypes become apparent. Foster (1968) treated 23 major vegetation types in Utah. Passey and others (1982) treated nine major and 27 subservient vegetation types of sagebrush-dominated communities in western Wyoming, southern Idaho, northwestern Utah, and northeastern Nevada.

Our choice (table 1) is to (1) consider plant assemblages together that respond in a similar manner to rehabilitation practices and (2) treat those assemblages that are most in need of restoration (because of disturbance or low productivity) and that have the potential for higher productivity. Some smaller vegetative communities within the area are not considered.

The Intermountain landscape varies widely. This land of considerable topographic relief contains mountains, valleys, and plateaus that create complex patterns (fig. 2, 3, 4). Many mountain-building events occurred in the relatively recent geologic past (Axelrod 1950; Fenneman 1981). Soil types are likewise complex, and soil conditions change rapidly over just a few miles. Soils are often alkaline but may be neutral or more rarely acidic depending on parent material (Shelford 1963). Consequently, the vegetative communities form complex mosaics and islands in the Intermountain area (Fenneman 1981; Passey and others 1982; Tidwell 1972).

The landscape and present climatic patterns are relatively new, and the flora and plant associations, especially in lowland areas, have not been in place for more than 10,000 years. Therefore, plants have been quite active in evolving new forms and establishing equilibria (Axelrod 1950). Plants in many cases have not reached their maximum area of adaptation. The current high mountains trap precipitation and cast rain shadows. Examples of the role of topography and attendant moisture trapping are illustrated in figures 4 and 5. Formerly, the precipitation was more evenly distributed and the tree species of the mountains were continuous over much of the area. The woody *Artemisia* and *Atriplex* shrubs that dominate much of the lowland landscape were either minor fringe components of the vegetation or were substantially displaced from their area of present distribution.

We treat 13 vegetative types in this book (table 1). The more widespread types cover much greater land areas than the restricted types. Some of the listed types are disclimax communities (lowland annual weeds and cheatgrass-red brome grass) brought about by human activities. Others have a substantially different vegetative makeup (for example, the big sagebrush communities) because of human actions such as grazing programs. We have excluded consideration of the creosotebush vegetative type, which occurs on the southwestern periphery of the Intermountain area

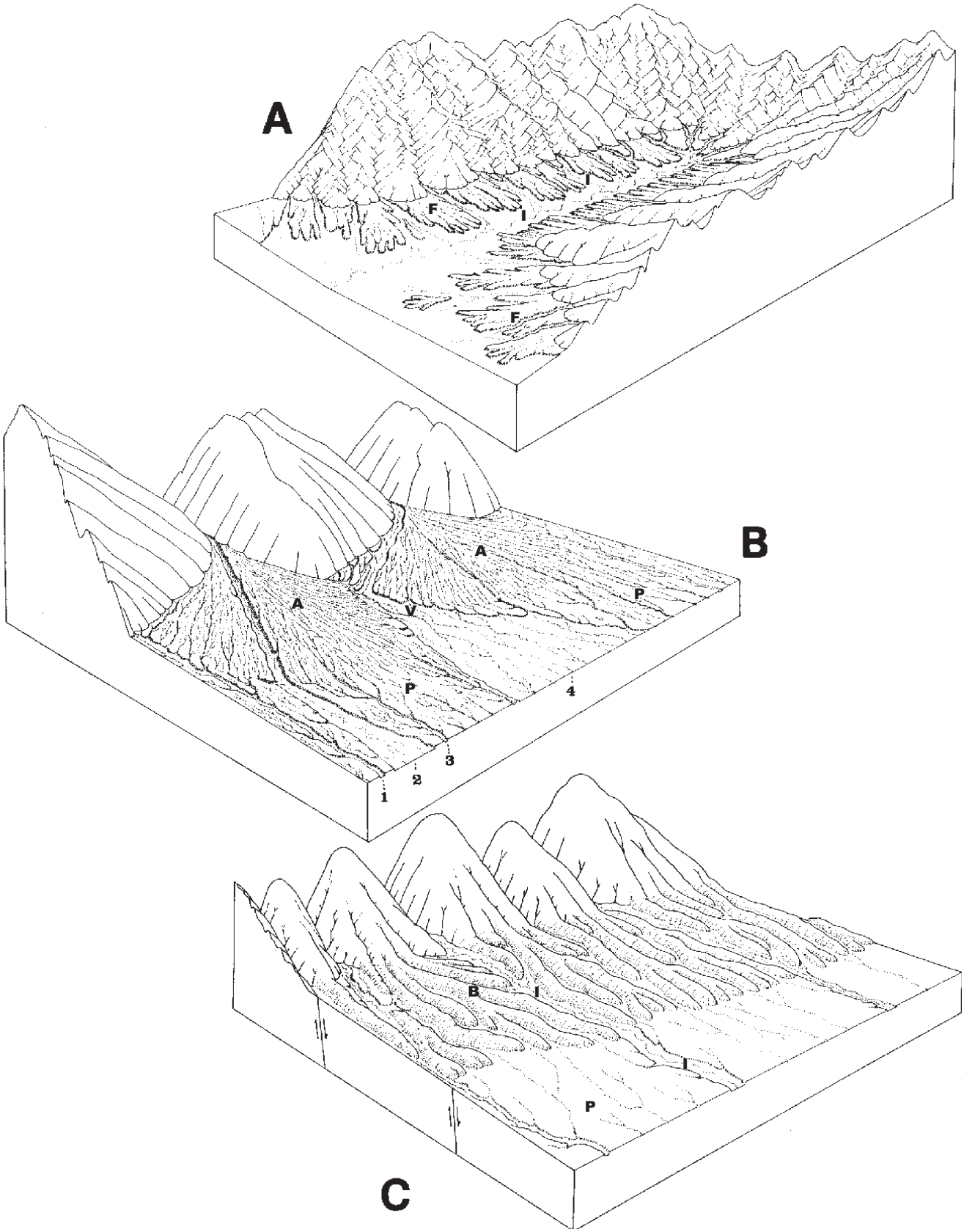


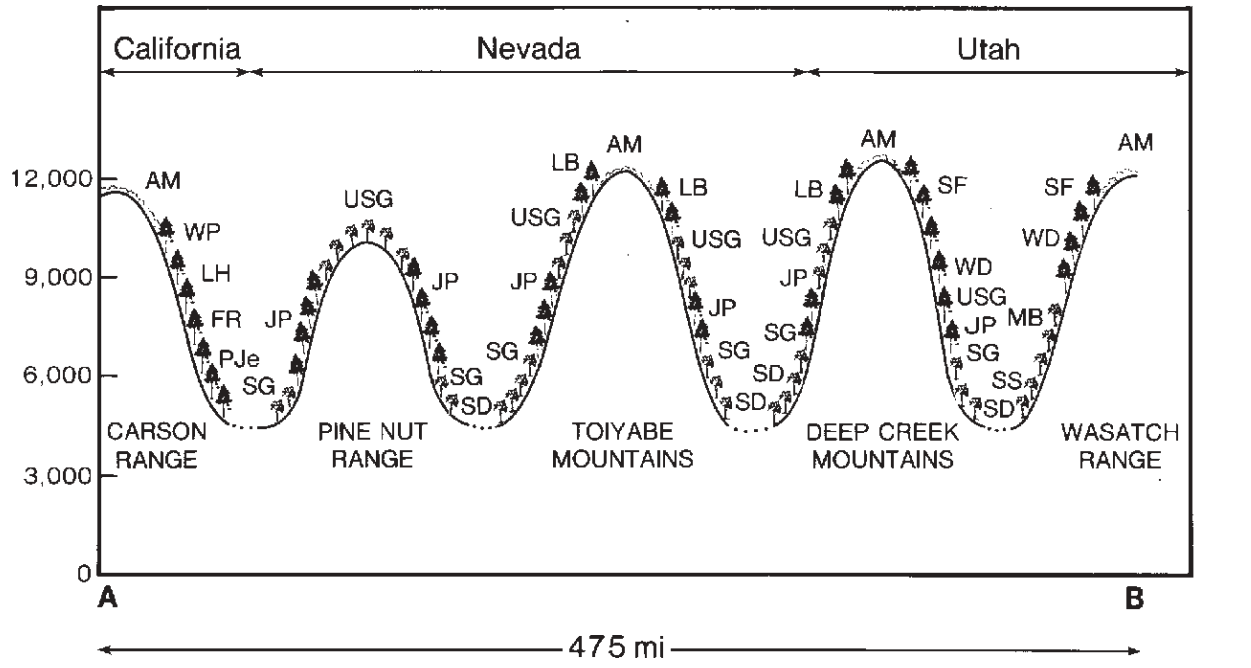
Figure 2—Topographical examples of the Intermountain area from Peterson (1981). (A) Mountain-valley fan with fan remnants [f] and inset fans [I]. (B) Mountain from alluvial fans with alluvial fans [A], interfan valley [V], and fan piedmont [P]. (C) Mountain front topography with ballenas [B], inset fans [I], and fan piedmont [P].

Figure 3—Map locating positions of vegetative types shown in topographic cross section in figure 4.

(fig. 1), because that area is essentially warm desert (Holmgren 1972) and that ecosystem behaves radically differently from the cooler areas that are the subject of this book.

The Intermountain region, with the notable exception of a few metropolitan areas, is sparsely settled. Communities occupy a relatively small portion of the land. Agriculture, other than grazing, is restricted by water availability and rough topography, although there are some notable agricultural tracts in several Intermountain valleys and on the Snake River and Columbia River plains. In Utah, for example, only 1,436,000 acres (581,000 ha) (2.6 percent of the State) is currently irrigated, and only 5,629,000 acres (2,278,000 ha) (10.4 percent of the State) is arable or potentially arable (Wahlquist 1981).

The land provides habitat for many animal species (Shelford 1963). In the sagebrush areas are three important ungulates (elk, mule deer, pronghorn antelope), 13 carnivores (badger, coyote, bobcat, skunks, weasels, foxes, and others), 50 small mammals (chipmunks, grasshopper mice, deer mice, pocket mice, kangaroo mice and rats, woodrats, jackrabbits, cottontail rabbits, pocket gophers, voles, squirrels, prairie dogs, marmot, porcupines, and others), four game birds (grouse, dove, chukar, and quail), and 15 raptors (McArthur 1983a). Numerous songbirds inhabit the region. In a shadscale community in Utah's Uinta Basin, for example, 35 species of birds, many of them songbirds, were observed over a 2-year study (McArthur and others 1978b). Several of these species are managed for hunting and constitute a major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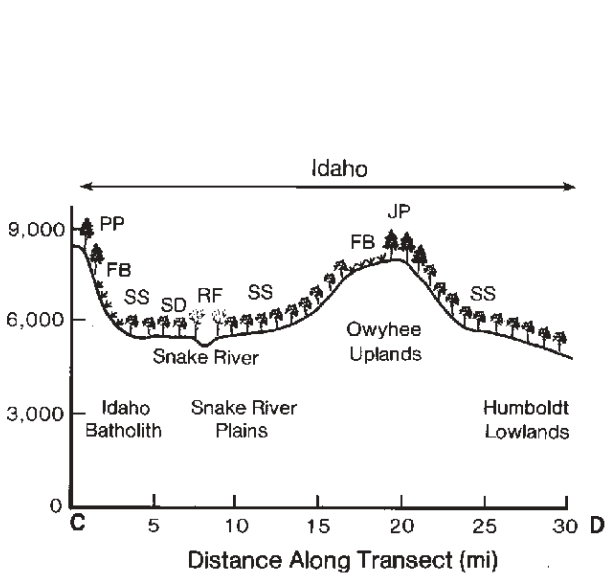
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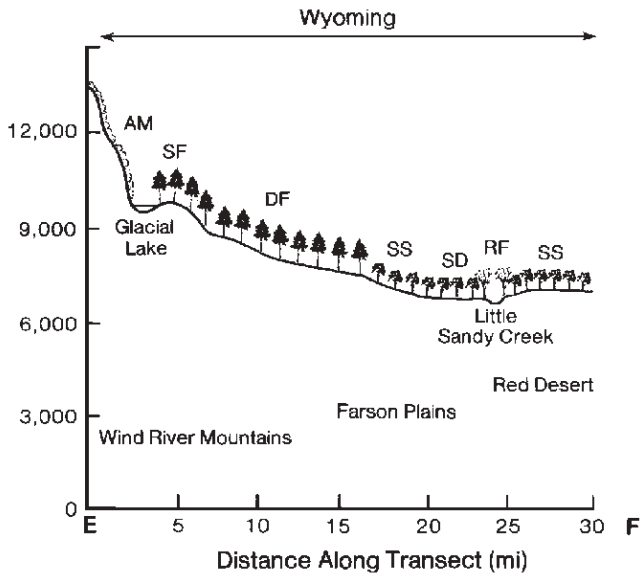
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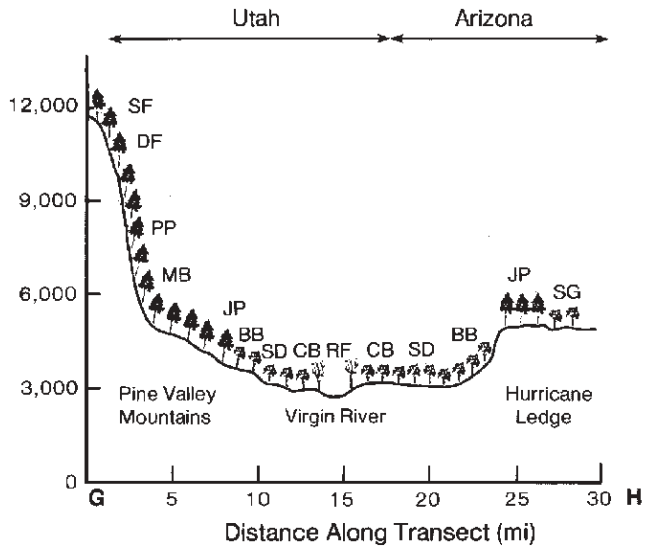
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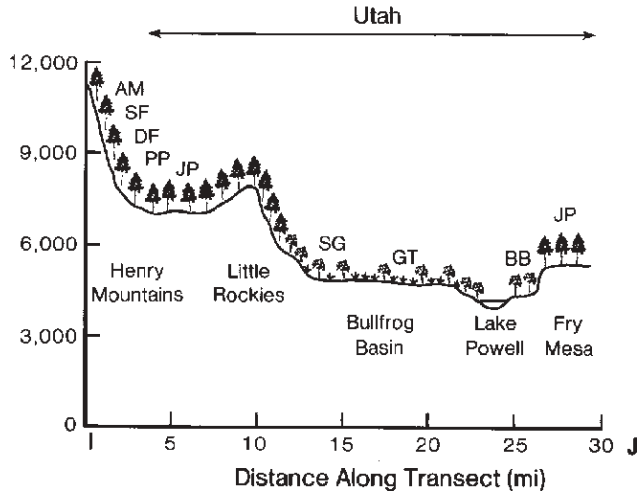
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Distance Along Transect (mi)

Figure 4—Cross sections of physiographic provinces showing elevation and topographic positioning of vegetative types located in figure 3. A and B are after Shelford (1963), C through J are after West (1983). Legend:

- AM = Alpine meadow and fellfield
- BB = Blackbrush (*Coleogyne ramosissima*), semidesert
- CB = Creosotebush (*Larrea tridentata*) desert
- DF = Douglas-fir (*Pseudotsuga menziesii*) forest
- FR = Red fir (*Abies magnifica*) forest
- FB = Wheatgrass (*Agropyron*), bluegrass (*Poa*) grassland
- GT = Galleta (*Hilaria jamesii*), threeawn (*Aristida*) shrub steppe
- JP = Juniper (*Juniperus osteosperma - J. occidentalis*), pinyon (*Pinus monophylla - P. edulis*) woodland
- LB = Limber pine (*Pinus flexilis*), bristlecone pine (*Pinus longaeva*) forest
- LH = Lodgepole pine (*Pinus contorta*), mountain hemlock (*Tsuga mertensiana*) forest
- MB = Mountain brush shrubland
- PJe = Ponderosa pine (*Pinus ponderosa*)-Jeffery pine (*Pinus jeffreyi*) forest
- PP = Ponderosa pine forest
- RF = Riparian forest
- SD = Salt desert shrubland
- SF = Spruce (*Picea engelmannii*)-fir (*Abies concolor*, *A. lasiocarpa*) forest
- SG = Sagebrush (*Artemisia*) semidesert
- SS = Sagebrush steppe
- WD = White fir—Douglas-fir forest
- USG = Upper sagebrush shrubland
- WP = Whitebark pine (*Pinus albicaulis*) forest.

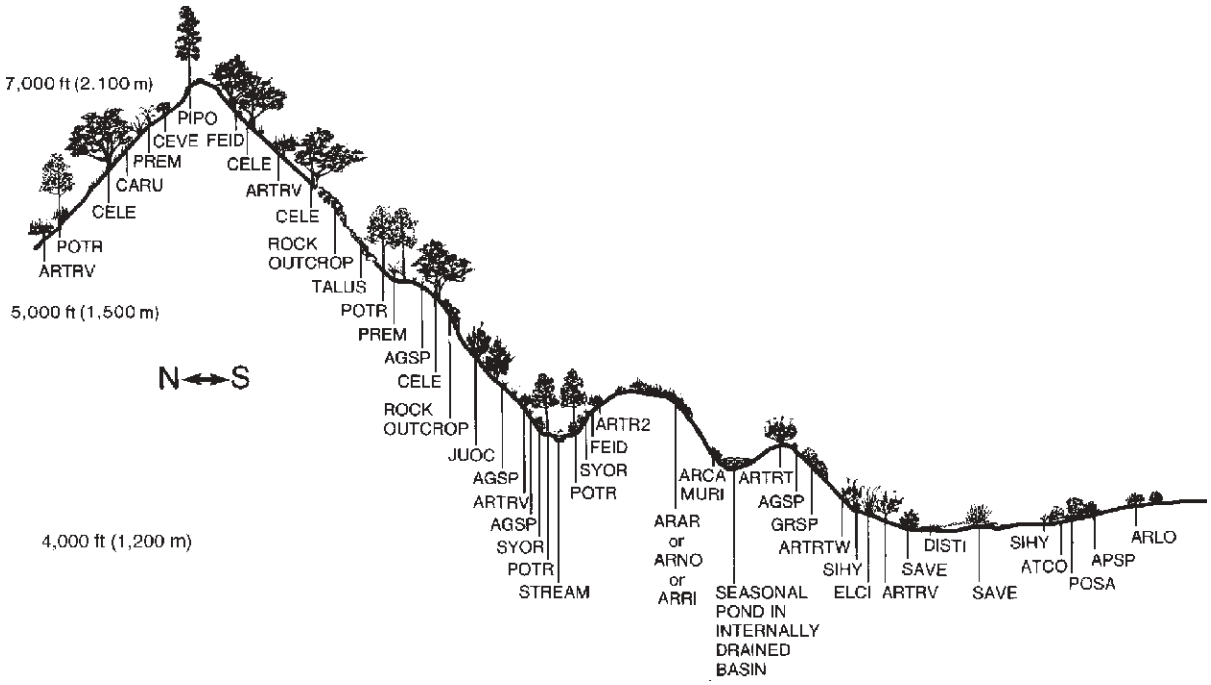

Figure 5—Elevation and site relationships among dominant plant species in the Great Basin of southeastern Oregon. Plant symbols are:

Plant symbol	Scientific name	Plant symbol	Scientific name
AGSP	*Agropyron spicatum*	ARAR	*Artemisia arbuscula*
ARCA	*Artemisia cana*	ARLO	*Artemisia longiloba*
ARNO	*Artemisia nova*	ARRI	*Artemisia rigida*
ARSP	*Artemisia spinescens*	ARTR2	*Artemisia tripartita*
ARTRT	*A. tridentata* ssp. *tridentata*	ARTRV	*A. t.* ssp. *vaseyana*
ATCO	*Atriplex confertifolia*	CARU	*Calamagrostis rubescens*
CELE	*Cercocarpus ledifolius*	CEVE	*Ceanothus velutinus*
DISTI	*Distichlis* spp.	ELCI	*Elymus cinereus*
FEID	*Festuca idahoensis*	GRSP	*Grayia spinosa*
JUOC	*Juniperus occidentalis*	MURI	*Muhlenbergia richardsonis*
PIPO	*Pinus ponderosa*	POSE	*Poa secunda*
POTR	*Populus tremuloides*	PREM	*Prunus emarginata*
SAVE2	*Sarcobatus vermiculatus*	SIHY	*Sitanion hystrix*
SYOR	*Symphoricarpos oreophilus*		

(Diagram from Dealey and others 1981).

recreational resource (Wallmo 1975). Other recreation includes camping, hiking, photography, nature appreciation, and harvesting food such as berries or roots.

Two additional major uses of Intermountain lands are for grazing of domestic livestock and for mining. The livestock industry in the Intermountain area was historically, and is currently, a sustaining source of regional income. Thomas (1973) gave a livestock value of nearly $2 billion for over 16 million head of livestock in Idaho, Wyoming, Colorado, New Mexico, Arizona, Utah, and Nevada. The mining industry was important historically, as well as currently. The Interior West is endowed with vast deposits of fuels and minerals. These resources are being exploited at an increasingly rapid rate as the Nation's mineral and energy needs expand. Many of these fuel and mineral resources are amenable to surface mining, which disturbs large land areas. The most prominent resources currently surface-mined or with such potential are coal, oil shale, phosphate, and uranium. Other mineral resources of the area include copper, lead, zinc, molybdenum, gold, nickel, iron, silver, gypsum, clay, vermiculite, pearlite, talc, flagstone, flourspar, sands, and gravel (Copeland and Packer 1972).

Intermountain lands are multiple use lands. Some uses impact on other uses as, for example, mining and livestock grazing on wildlife habitat. Virtually all uses have some impact on the premier value of the land as a stabilized productive watershed. Keeping the land productive, useful, and stable should be a universal goal, and to that end we dedicate the principles, procedures, and information you will discover in this book.