

2. LANDSCAPE HABITATS

C.L. Simmons
Natural Resource Ecology Laboratory
Colorado State University, Fort Collins, Colorado

This landscape habitat description is based on a ground reconnaissance of the Lost Lake, West Glacier Lake, and East Glacier Lake portions of GLEES conducted during 10 days in July-September 1986 and on subsequent photo interpretation of 1:6000 scale color-infrared photographs. A ground check was conducted in July-August 1987. The classification used is a physiognomic classification of vegetation/landscape types in the study area. As such, it is based on the structural, rather than floristic, characteristics of the vegetation. Preliminary information on the floristic composition of the vegetation was obtained in the initial field reconnaissance. A detailed floristics description is presented in Chapter 3.

Methods

The ground reconnaissance located areas of apparent homogeneity on the aerial photographs, noted the physiognomic character of the vegetation as well as the amount of rock and vegetative cover, and listed the predominant vascular plant taxa present. No effort was made in the initial habitat classification to conduct a comprehensive survey of the taxa present in the study area, to characterize plant communities or associations, or to list all taxa in a given location. Such information is useful for studies of ecosystem processes and was gathered after the initial vegetation/landscape physiognomic classification and mapping (see Chapter 3). A second goal of the initial ground reconnaissance was to determine whether alpine species were present in the watersheds; therefore, particular attention was paid to areas with herbaceous vegetation where alpine taxa were deemed likely to occur.

The information obtained from the ground reconnaissance was used for the subsequent interpretation of 1:6000 color-infrared aerial photographs. Twelve vegetation/landscape types were recognized (table 2.1). For mapping purposes, two of these vegetation types, krummholz conifer and coniferous forest, were subdivided based upon percent cover. Two other vegetation types (willow shrub outside of wet meadows, and tall forb wet meadow) occurred rarely within these watersheds and were not mapped independently. The photographs were viewed in stereo, and map units were delimited on the photographs on the basis of ground information, the spectral appearance of the unit, and the topographic position of the unit relative to the general landscape. The unit boundaries were then transferred to a 1:6000 scale topographic base map with the assistance of a zoom

Table 2.1.—Vegetation/landscape types in the Lost Lake, West Glacier Lake, and East Glacier Lake watersheds. Vegetation/landscape type areas differ from calculated watershed areas (Chapter 1) since the vegetation survey extended beyond watershed boundaries.

Vegetation/landscape type	Area (ha)
1. Meadow	40.4
2. Krummholz conifer	36.9
3. Coniferous forest	30.5
4. Cushion plants/stone pavement	11.9
5. Wet meadow/willow shrub	9.4
6. Scree/meadow	6.2
7. Willow shrub	1.1
8. Tall forb wet meadow	0.7
9. Scree	22.7
10. Rock outcrop	16.5
11. Water	13.0
12. Snowfield	9.4
Total area	198.7

transferscope. To correct for photographic distortion, care was taken during the transfer to align distinctive topographic features and relate control points on the photographs to those on the base map. Despite this effort, some inaccuracies likely exist, particularly in the locations of unit boundaries on the steep cirque walls in the NW portion of the map where the photographic images were most distorted.

The areal extent of each vegetation/landscape type was estimated by cutting and weighing the units from the completed map. This method is similar to a planimetric measurement in that it tends to underestimate the area of inclined surfaces. These areas are primarily the krummholz conifer, scree, rock outcrop, and snowfield areas near the top of the map.

Vegetation/Landscape Descriptions

Twelve vegetation/landscape types are listed in table 2.1 with the estimated areal extent of each type in the study area. The vegetation map is presented in figure 2.1.

One hundred twenty-three vascular plant taxa were identified in the study area in the initial reconnaissance. Of these taxa, 100 have also been reported for the Indian Peaks alpine area in Colorado (Komarkova 1979). According to Komarkova (1979), 37 of the 100 taxa are primarily montane or boreal-montane in their geographic distribution, 17 are arctic-alpine, and the remaining 46 are primarily alpine. In the study area, the alpine and arctic-alpine taxa occur primarily in the

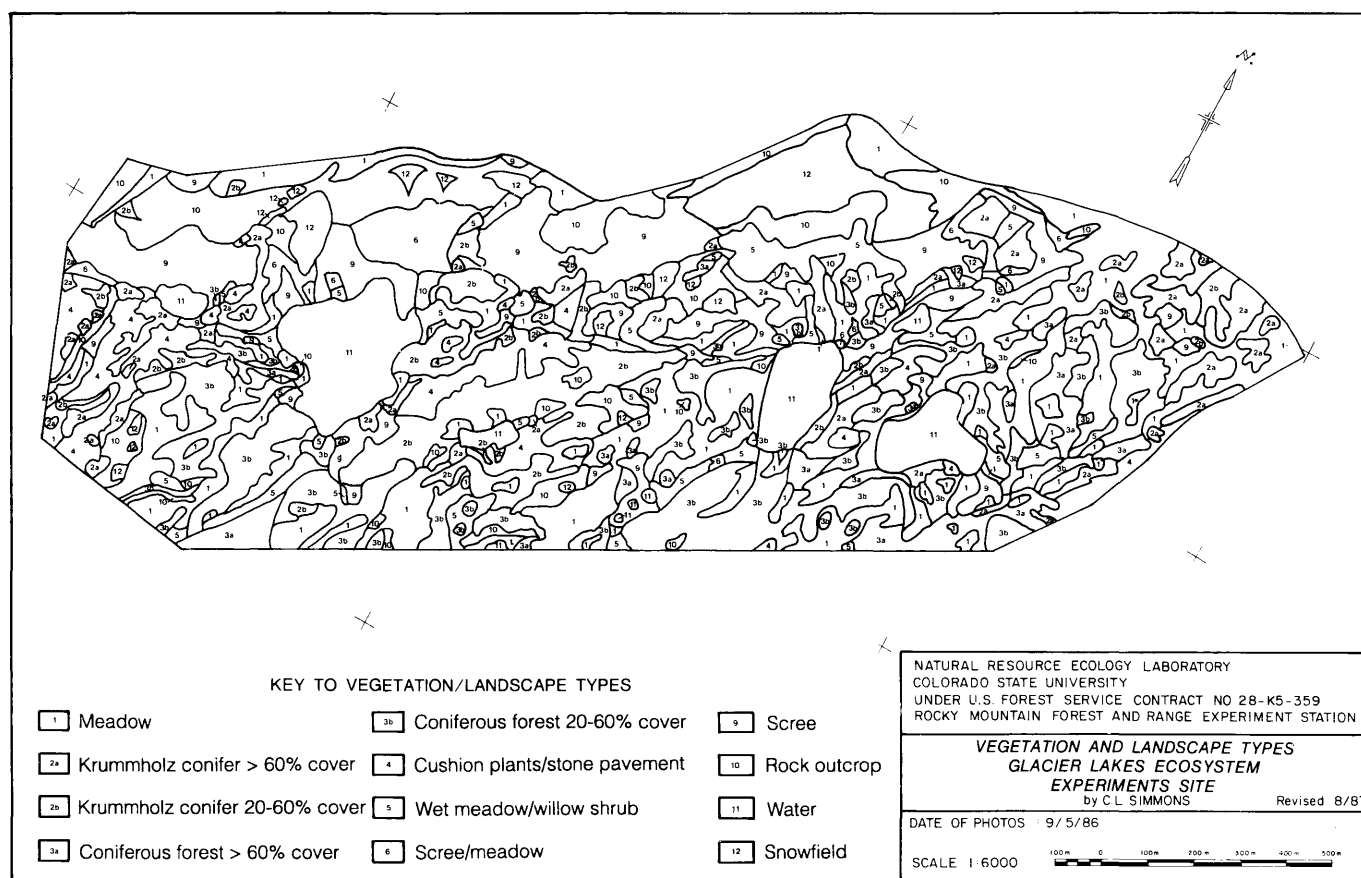


Figure 2.1.—Vegetation/landscape types map of the GLEES. Vegetation types 7 (willow shrub) and 8 (tall forb wet meadow) are included with vegetation type 5.

meadow and cushion plant vegetation/landscape types. It should be noted that this initial species checklist for the study area represented only 10 days of field observation. However, it identified a large number of alpine and arctic-alpine taxa in the study area.

A large part of the study area (34%) supports coniferous vegetation (coniferous forest and krummholz conifer). Herbaceous vegetation types (meadows, cushion plant-dominated ridge tops, and partially vegetated scree) comprise 30% of the study area, and willow shrub types (willow shrub and wet meadow/willow shrub) comprise an additional 5%. The remainder of the study area is largely unvegetated, consisting of rock outcrop (8%), scree (11%), snowfield (5%), and water (7%). Although the rock outcrops and scree are only sparsely vegetated, other workers have described plant associations specific to these habitats (e.g., Komarkova 1979). The 12 vegetation/landscape types are described below. The common plant names used in the text are identified by botanical names in Appendix A.

Meadow

The vegetation included in this category is highly diverse. The floristic composition varies greatly over short distances (meters or less), depending on a variety

of factors including moisture, duration of snow cover, and degree of animal disturbance (Billings and Bliss 1959, Komarkova 1979). The term *meadow* is used here in a broad sense to describe a wide range of herbaceous plant communities including grass-sedge turf, tallgrass, late-lying snowpatch, and dry- and moist-meadow subtypes. Areas mapped as meadow may also support scattered trees, willows, or krummholz conifers, but the cover of these woody plants is less than 20%.

Krummholz Conifer

With increasing elevation and exposure to wind, trees in the watershed assume a deformed or "krummholz" form. Spruce and fir layer at the base, often forming dense mats. Limber pine does not layer, but assumes a prostrate form in response to the wind. Matlike stands have little or no understory, but more open stands often contain the understory species listed for the coniferous forest. Willows, particularly shortfruited willow, are frequently associated with the krummholz conifers; common juniper is often present as well. At the top of the watershed above East Glacier Lake, shortfruited willow is abundant on the leeward side of the krummholz conifers. The krummholz conifer type is divided into two estimated cover classes. Openings in the lower cover

class are in many cases occupied by rock or scree, but they may also contain meadow or cushion plant vegetation. At the low end of the range of canopy cover, this type grades into rock outcrop, cushion plant, scree, or meadow types.

Coniferous Forest

Coniferous forest occurs primarily at lower elevations in the watershed and in more protected sites at intermediate elevations. At higher elevations and on more exposed ridges the same conifer species occur in wind-deformed or krummholz form (see above). The forest consists primarily of Engelmann spruce and subalpine fir with occasional limber pine. Stands are generally narrow and discontinuous, in some areas forming "ribbons" of forest with meadow in between. Many of the trees are "flagged" or entirely devoid of branches on their upper trunks from wind desiccation or snow abrasion. Important understory taxa include broom huckleberry, currants, bracted lousewort, sickletop lousewort, and hairycap moss (*Polytrichum* sp.), as well as scattered bluegrasses and sedges. Snow duration is an important regulator of understory composition. Knight and co-workers (1975) found that broom huckleberry, the predominant understory species, was intolerant of snow cover past the first week in July. The two forest classes shown on the map are separated on the basis of estimated canopy cover. The taxa listed occur in both canopy classes. The more open forest usually has more herbaceous cover and may have large amounts of hairycap moss, broom huckleberry, bearberry, arnica, subalpine daisy, and dwarf bilberry in the openings. At the low end of the range of canopy cover (approximately 20%) the open forest grades into the meadow type.

Cushion Plants/Stone Pavement

Rocky ridgetops that are presumably blown free of snow in winter support cushion plant vegetation. There is little soil visible on the surface and a lag surface of gravel. The plants mostly have a cushion form, although junipers, bearberry, and willows may establish on the leeside of boulders and in depressions. Patches of dry meadow vegetation generally occur in more protected sites within these units. The vegetation in this type is very diverse and varies over short distances. Common species include rock selaginella, sandworts, creeping sibbaldia, whiprooot clover, moss campion, thickleaved candytuft, Parry lousewort, alpine bistort, cushion phlox, curly sedge, and bentgrasses. Lichens and mosses are also major components of this vegetation type. This type grades into meadow, open krummholz conifer, and rock outcrop types.

Wet Meadow/Willow Shrub

In the study area, large patches of willow occur primarily in drainages where they are associated with tall forb wet meadows and sedge meadow vegetation. This type is found in most of the major drainages entering the lakes and along the outlet streams of Lost Lake and West Glacier Lake. Shortfruited willow and plane-leaved willow are the predominant willow species. The herbaceous taxa are those listed below for tall forb wet meadows.

Scree/Meadow

Areas with well-stabilized scree support larger patches of meadow vegetation and grade into the meadow type. Areas mapped as scree appear unvegetated from a distance, while areas mapped as scree/meadow have 20–60% of their surface covered by herbaceous vegetation types. Meadows with large amounts of scree on the surface are similar in general appearance to the scree/meadow type but are more stabilized and generally occur on more gentle slopes.

Willow Shrub

In a few areas, patches of willows occur with little or no wet meadow vegetation. These areas are primarily on the steep faces of the cirque headwalls along snowmelt drainages. Krummholz conifer and common juniper are often associated with the willow thickets on the cirque walls. In the single example of this type that was visited, shortfruited willow was the main willow species. The extent of this type may have been overestimated, particularly for the steeper slopes, because the taller willows may have obscured the tall forbs on the aerial photographs. Scattered patches of willow shrubs, usually of low stature, may also occur sporadically in the other vegetation/landscape types, particularly the meadow, krummholz conifer, rock outcrop, and scree types.

Tall Forb Wet Meadow

Tall forb wet meadows occur primarily with willow thickets along streams and snowmelt drainages; however, they also occur along streams and in seeps where willows are locally absent. Common taxa include arrowleaf groundsel, mountain bluebell, brook saxifrage, bluejoint, rosecrown, elk marshmarigold, American globeflower, Holm's Rocky Mountain sedge, Drummond rush, small-flowered woodrush, and American alpine speedwell. This type grades into the meadow and wet meadow/willow shrub types.

Scree

Scree generally forms steep slopes at the bases of the cirque headwalls in the study area. Many of these scree slopes hold patches of snow well into the summer. A few fairly level scree units occur on the edges of the lakes. The scree supports small, widely scattered patches of vegetation in areas where soil has formed in its interstices. The vegetation varies greatly from patch to patch, but is predominantly herbaceous.

Rock Outcrop

Rock outcrops occur primarily along the upper parts of the cirque headwalls and on the ridge dividing Lost Lake and West Glacier Lake. The generally vertical rock faces support little vascular vegetation; however, patches of krummholz conifer, willow, and meadow vegetation occur in crevices and on benches. The units mapped as rock outcrop may include scree, meadow, and krummholz components that are too small to map individually; however, rock outcrops predominate.

Water

This landscape type includes the area occupied by East Glacier, West Glacier, and Lost Lake surfaces. The

water level in the smaller ponds fluctuates seasonally. The area of these smaller ponds and streams were not included in this landscape type.

Snowfield

The areas mapped as snow were snow-covered on the September 5, 1986, aerial photographs. The largest snowfield is permanent, but the smaller snowpatches melt out in most years.

References

- Billings, W.D.; Bliss, L.C. 1959. An alpine snowbank environment and its effects on vegetation, plant development, and productivity. *Ecology*. 40(3): 388-397.
- Knight, D.M.; Kyte, C.; Rogers, B.; Starr, C.R. 1975. The impact of snow on herbaceous and shrubby vegetation. In: *Final Report: The Medicine Bow Ecology Project*. Laramie, WY: University of Wyoming Press: 175-214.
- Komarkova, V. 1979. Alpine vegetation of the Indian Peaks Area. Vaduz, Germany: J. Cramer. 591 p.