B. MODERATELY-MOIST FORESTS (FL)

7. Subalpine Fir-Douglas-Fir Ecological Series

Table 07-1. Full and short names for the ecological types in the Subalpine Fir-Douglas-Fir Ecological Series

Ecological Type Code	Name	Plant Association Code	Short Name
FL01	Subalpine fir-Douglas-fir/pachistima–Thin-dark Cryoboralfs and Cryoborolls–Moderately steep slopes, 9,300-10,300 ft	ABBI2-PSME/PAMY	Fir-Douglas-fir/pachistima–Moderately cold soils
FL02	Subalpine fir/twinflower–Cryochrepts and Cryoboralfs–Steep northerly slopes, 9,100-10,100 ft	ABBI2/LIBO3	Fir/twinflower–Cold light-colored soils–Steep northerly

The *Abies bifolia-Pseudotsuga menziesii* Series is described as new here, based on the *Abies lasiocarpa* Series of Pfister and others (1977), the "lower subalpine habitat types" of Layser and Schubert (1979, in part), Steele and others (1981-1983, in part), Hess and Wasser (1982), Moir (1983, in part), Mauk and Henderson (1984, in part), Alexander (1985, in part), and Fitzhugh and others (1987, in part). This Series is also based, in part, on the *Pseudotsuga menziesii* Series of Hess and Wasser (1982), and is considered a climatic series by Moir (1983). Stands occupy sites that are usually medium to large and isodiametric in shape.

In the UGB, this Series forms an interrupted belt at the lowest elevations in the Subalpine. Because the Montane zone, below the Subalpine, is largely unforested in the UGB, this often corresponds to the lower line of continuous forest. This Series is conspicuously dominated by aspen in many stands, so a aspen lower treeline with a ragged edge is common in the UGB, especially in the high-precipitation valleys north of Gunnison. Dense aspen clones are often short-lived, and are replaced by conifers within a century (Fitzhugh and others 1987), unless fire intervenes to set the process back again.

Vegetation, Climate, Soils

Lodgepole pine is uncommon or absent in most stands. It is more common in the Subalpine Fir-Engelmann Spruce Series, which occurs adjacent to and just above these stands. Where aspen is the climax dominant (in the Aspen Ecological Series), soils are moister, have a higher pH, and more organic carbon than those in conifer stands. Air temperatures are generally higher in aspen stands, but subsurface (0-2 in) soil temperatures are lower (Hoff 1957). Soil invertebrates are generally more abundant in aspen stands, with all groups of macroinvertebrates, except beetles, significantly higher in aspen (Hoff 1957). Growing season relative humidity, air temperature, and light intensity do not differ consistently between aspen and conifer stands (Hoff 1957).

Sites are cool and generally characterized by high precipitation, but precipitation falls mostly as snow, and water is in solid form much of the year. These sites are usually moist in the summer, and the common aspen cover helps retain significant moisture. Stands have great potential for water yield, because the four species commonly present (lodgepole pine, aspen, subalpine fir, Douglas-fir) have different transpiration rates (Kaufmann 1985ab).

Table 07-2. Climate

Characteristic	Value	Reference
Precipitation zone	630-760 mm/yr 25-30 in/yr	Local data

Timber Management

Tree productivity varies from moderate to very high (Pfister and others 1977). Aspen is the species most commonly managed, but Douglas-fir can be managed if needed, usually for insect and disease control. Subalpine fir is rarely managed, since it is difficult to manage for wildlife habitat, sawlogs, or fuelwood because of the prevalence of root rot in this species and the speed of decomposition once the tree dies. Lodgepole pine is rarely present here in amounts large enough to manage. Logging and/or burning can be used to stimulate browse species where they have been depleted by big game (Steele and others 1983). Pocket gopher activity can sometimes limit tree reproduction (Mauk and Henderson 1984).

Aspen often dominates stands within this Series, and it is managed for wildlife habitat, watershed protection, and/or wood fiber (either sawtimber or fuelwood). The landforms of aspen stands in this series are more stable than landforms in the Aspen Series. Mixed aspen-conifer stands often have higher wildlife value than pure aspen stands (Komárková and others 1988). Aspen usually sprouts vigorously after disturbance (Komárková and others 1988). Clearcutting is the preferred method for regenerating an aspen stand. Burning directly after clearcutting enhances the production of

aspen sprouts to repopulate the new stand (Hoffman and Alexander 1980, Hess and Alexander 1986). Clearcutting in small patches or blocks is possible, where the clearcut patches can be protected from elk and livestock; otherwise clearcut patches should be as large as possible to lessen browsing effects (Johnston 1986). When a clearcut aspen stand is adjacent to a subalpine Thurber fescue grassland, the grassland may expand somewhat at the expense of the forest (Hoffman and Alexander 1980, Hess and Alexander 1986).

Small 3- to 5-acre patches or 400-ft wide strip cuts result in greater forage and browse production for big game and larger increases in water production. If larger openings are cut, slash should be left on the ground to create surface roughness needed to retain snowpack (Hoffman and Alexander 1983, Hess and Alexander 1986, Komárková and others 1988). Thirty years after such patch-strip cuts, average peak water equivalent increased by 9%, correlated strongly with winter precipitation and precipitation during snowmelt. Peak discharges advanced by 7.5 days and increased by 20% (Troendle and King 1985). Return to postharvest water flows is very slow (Troendle and King 1985).

Fire Management

Pre-settlement stand-replacing fire intervals are moderately long, on the order of 250-300 years. Surface fires may have maintained mosaics of aspen and Douglas-fir (Fitzhugh and others 1987). Douglas-fir may be maintained in the overstory by periodic ground fires which selectively remove the more susceptible subalpine-fir saplings and provide a seed bed for Douglas-fir (Fitzhugh and others 1987). Stands of this Series are considered to be in Fire Group 14, the mesic, low to mid-elevation spruce or subalpine fir (or corkbark fir) habitat types in southwest Colorado (Crane 1982).

Range and Wildlife Management

Livestock commonly use these stands, since aspen is a common subdominant or early-seral dominant. Livestock use may be great if aspen is dominant or codominant, and the stand is adjacent to open rangelands. Stands provide summer range for elk, deer, and bear, and a few lower-elevation stands are part of transitional or light-winter ranges for elk and deer.

Elk and deer browsing can have significant impacts on the cover of palatable browse, including serviceberry, chokecherry, bitterbrush, and aspen sprouts. In the UGB, tall- to medium-shrub layers in many stands have been depleted or eliminated by browsing. Overwintering moose browse these species as well as subalpine-fir seedlings in Wyoming and Idaho (Steele and others 1983). Logging and/or burning can be used to stimulate browse species where they have been depleted by big game (Steele and others 1983).

Recreation, Roads & Trails, Scenery

Sites are generally suitable for roads and trails, since sites are stable and cutbanks hold moderately well. They are also suitable for construction on gentler slopes, where aspen is not dominant (that is, where soils are not deeper and loamier).

Conifer-dominated sites are generally suitable for developed or dispersed recreation and are relatively stable for developments that disturb the soil. Where aspen is a conspicuous component of the overstory, sites are not suitable for campgrounds because damage to the aspen trees increases diseases and leads to death of the aspen component.

Revegetation and Rehabilitation

Due to high soil fertility and moisture availability, revegetation has many options (Tiedeman 1978). Plantings should be on the contour, and must be protected from herbivores both wild and domestic by fencing or other barriers (Tiedeman 1978).

Steep slopes and depth to bedrock are major limitations to use of heavy equipment. The high quality of the surface soil is a valuable resource that should be stockpiled before major excavation (Tiedeman 1978). Soils have low strength and are subject to sliding under heavy equipment. Mulching is required on slopes steeper than 15%.

Key to Ecological Types in the Subalpine fir-Douglas-fir Series

1. Twinflower (LIBO3) >3%, usually >5%. Mixed conifer and aspen dominance. Steep northerly slopes, 9,100-10,100 ft FL02
1. Twinflower absent or rarely <3%. Gentle to steep slopes, northerly or not, 9,300-12,200 ft..... (2)

2. Buffaloberry (SHCA), Thurber fescue (FETH), or serviceberry (AMAL2) >5% cover..... *See Key to Douglas-fir Series*
2. Neither buffaloberry, Thurber fescue, nor serviceberry >5% cover..... (3)

3. Subalpine fir present, >0.1% cover..... (4)
3. Subalpine fir absent..... (7)

4. Engelmann spruce (PIEN) conspicuous, >10% cover..... (5)
4. Engelmann spruce absent or minor, <3% cover ..... (6)

5. Pachistima (PAMY) >5% cover..... FL03 in Fir-Spruce Series
5. Pachistima <5% cover..... *See Key to Fir-Spruce Series*

6. Douglas-fir conspicuous, >10% cover ..... (7)
6. Douglas-fir usually absent, rarely <5% cover..... (8)

7. Pachistima (PAMY) >5% cover..... FL01
7. Pachistima absent or <5% cover..... *See Key to Douglas-fir Series*

8. Engelmann spruce (PIEN) conspicuous, >10% cover..... *See Key to Fir-Spruce Series*
8. Engelmann spruce absent or minor, <3% cover FL01

Table 07-3. Characteristics of Ecological Types within Ecological Series 7 in the Upper Gunnison Basin.
Numbers are shown in form *Average (Minimum-Maximum)*

Code Short Name	No. Samples	Elevation, ft	Avg. Aspect, °M (r) Slope, %	Soil Coarse, %	Depth, cm Mollic, cm	Surface: Coarse, % Bare, %	Cover, %: Trees Shrubs Graminoids Forbs	Total Live Cover, % No. Species TLC/NS, %
FL01 Fir-Douglas-fir/pachistima–Moderately cold soils	10	9,824 (9,320-10,235)	251 (0.36) 22 (16-38)	55 (25-77)	81 (59-101) 15 (3-33)	* *	106 (80-158) 62 (4-126) 63 (0-111) 48 (1-114)	279.0 (197.0-409.5) 21 (12-31) 14.7 (8.2-22.8)
FL02 Fir/twinflower–Cold light-colored soils–Steep northerly	8	9,775 (9,160-10,020)	351 (0.79) 50 (45-60)	63 (56-73)	75 (61-84) 13 (0-42)	6 (0-10) *	94 (67-110) 64 (11-106) 12 (0-51) 43 (4-72)	212.6 (141.1-272.5) 21 (12-30) 11.3 (4.7-19.6)

*. Not sampled.

FL01 **FIR-DOUGLAS-FIR/PACHISTIMA–MODERATELY COLD SOILS** ABBI2-PSME/PAMY

Subalpine fir-Douglas-fir/pachistima–Thin-dark Cryoboralfs and Cryoborolls–
Moderately steep slopes, 9,300-10,300 ft

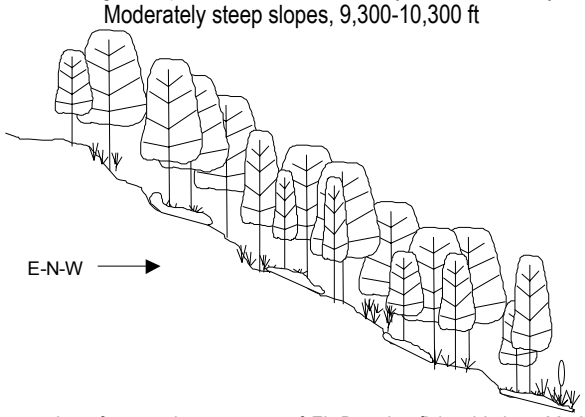

Figure 07-1. Cross-section of vegetation structure of *Fir-Douglas-fir/pachistima–Moderately cold soils*. Aspects are westerly, and slope angles average 22%.

Fir-Douglas-fir/pachistima–Moderately cold soils is a moderately common type on moderate slopes near lower treeline in the UGB, in areas with cold (Cryic) soils outside the deep rainshadows, on northerly, lower Subalpine slopes. This type has also been described from northern Utah. *Fir-Douglas-fir/pachistima–Moderately cold soils* is characterized by subalpine fir (ABBI2), Douglas-fir (PSME), aspen (POTR5), and pachistima (PAMY). Most stands have common juniper (JUCO6) and elk sedge (CAGE2) as well. See Table 07-8 for common species names and codes. Sites are also characterized by soils with a notable dark layer (shallow-Mollic). Some stands of *Fir-Douglas-fir/pachistima–Moderately cold soils* have sparse Engelmann spruce, which is always subordinate to Douglas-fir.

Fir-Douglas-fir/pachistima–Moderately cold soils is related to *Douglas-fir/elk sedge–Cold to moderately cold–Gentle to steep*, which is found on shallower, coarser soils, and lacks both pachistima and subalpine fir. *Fir-Douglas-fir/pachistima–Moderately cold soils* is the middle type in a sequence of types shown in Table 07-4. It is similar to the other two types in this table, but supports a different combination of trees. The *Pseudotsuga menziesii* phase of the plant association *Abies bifolia-Pseudotsuga menziesii/Paxistima myrsinites* is described as new here, based on the *Abies lasiocarpa-Picea engelmannii/Paxistima myrsinites* phase of Johnston (1987), which in turn is based on *Pseudotsuga menziesii-Abies lasiocarpa-Picea engelmannii/Paxistima myrsinites-Carex geyeri* of Boyce (1977), Mauk (1984), and Youngblood (1985). This plant association is considered to be different from *Picea engelmannii-Abies spp./Paxistima myrsinites* (Daubenmire 1952) and *Abies lasiocarpa/ Paxistima myrsinites* (Daubenmire 1968, Cooper 1975; but see ecological type FL03, following). *Abies bifolia-Pseudotsuga menziesii/Paxistima myrsinites* phase *Vaccinium myrtillus* ssp. *oreophilum* is described as new here.

Aspen is very common throughout this type, and is dominant in most stands. Although aspen is technically seral to Douglas-fir and subalpine fir, conifers rarely seem to achieve dominance in these stands because aspen is able to dominate the soil and soil surface. No measured stand had more than a trace of bare mineral soil. Cattle often use these stands because they are adjacent to open rangeland and afford some shade, because they are often adjacent to water sources, and because they produce some forage. Sagebrush communities adjoin this type on gentler, less-coarse slopes with darker soils. Tall willow riparian communities (blue, serviceberry, or yellow willows) are found in adjacent bottoms. Subalpine fir-Engelmann spruce/pachistima communities occur on slopes above.

Horizontal obstruction varies from moderate to very high, often at least moderately high, so hiding cover for deer and elk is considerable. Forage and browse are also available, and the stands are often close to water, so deer frequent these stands. Deer use is high in spring through fall for cover, browse and overnight stays; deer use is moderate in mild winters but low in severe winters. Elk often use the stands for transition and for cover and browse. Elk use is moderately high in summer and moderate in mild winters, but low in severe winters. Both elk and deer will use these stands in the mildest of winters; otherwise they are summer range.

Table 07-4. Three ecological types named for pachistima.			
ET	**Ecological Type Name**	**Elevation, ft Average Aspect, °M (r) % Slope**	**% Surface Coarse % Bare Surface**
FD09	Douglas-fir/pachistima–Dark Frigid soils–Northerly backslopes, 7,900-10,000 ft	9,391 (7,960-9,920) 320 (0.70) 32 (13-52)	4 (0-80) 1 (0-15)
FL01	Subalpine fir-Douglas-fir/ pachistima–Thin-dark Cryoboralfs and Cryoborolls–Moderately steep slopes, 9,300-10,300 ft	9,824 (9,320-10,235) 251 (0.36) 22 (16-38)	2 (0-7) 0 (0-0)
FL03	Subalpine fir-Engelmann spruce/pachistima–Cryoboralfs–Slopes, 9,800-10,900 ft	10,312 (9,840-10,860) 352 (0.30) 25 (3-40)	6 (0-10) 0 (0-2)

Summary of Ecological Type Characteristics

1. Explanation of symbols in Appendix A. Percentages in [brackets] indicate the percentage of plots sampled that have that characteristic.

NUMBER OF SAMPLES	10, soil descriptions from 5 of these; 1 plot not assigned to a CT (total 11)
ELEVATION	9,824 ft (9,320-10,235 ft); 2,994 m (2,841-3,119 m)
AVERAGE ASPECT	251°M (r = 0.36)
LITHOLOGY	Igneous: granite-gneiss [57%] or sedimentary: sandstone-siltstone-shale [43%]
FORMATIONS[1]	A variety
LANDFORMS	Soil creep slopes
SLOPE POSITIONS	Backslopes and lower backslopes
SLOPE SHAPES	Linear both horizontally and vertically
SLOPE ANGLE	22.3% (16-38%)
SOIL PARENT MATERIAL	Mostly colluvium [80%]
COARSE FRAGMENTS	2.5% (0-7%) cover on surface, 55.1% (25-77%) by volume in soil
SOIL DEPTH	81 cm (59-101 cm); 31.7 in (23-40 in)
MOLLIC THICKNESS	15 cm (3-33 cm); 6.0 in (1-13 in)
TEXTURE	Loam, organic, clay loam, or silty clay loam surface; clay, sandy clay loam, or clay loam subsurface
SOIL CLASSIFICATION	Cryoboralfs [80%] or Argic Cryoborolls
TOTAL LIVE COVER	279.0% (197.0-409.5%)
NUMBER OF SPECIES	20.6 (12-31)
TOTAL LIVE COVER/NO. SPECIES	14.7% (8.2-22.8%)
CLIMATE	Either outside rainshadow or just into a light partial rainshadow. Cool, moderately moist to moist forest.
WATER	The common aspen cover, large number of layers, and often abundant litter and duff maintain considerable moisture in these stands.

Table 07-5. Wildlife values (relative to the whole UGB) for the principal wildlife species using *Fir-Douglas-fir/pachistima–Moderately cold soils*.		
	Mule Deer	Elk
CT	Season–Preference	Season–Preference
All	Winter, Mild– Moderate (Cover, Browse, Rest) Winter, Severe– Low Spring/Fall– High (Cover, Browse, Overnight)	Winter, Mild– Moderate (Cover, Browse, Rest) Winter, Severe– Low Spring/Fall– Mod. High (Cover, Browse, Transition)

Key to Community Types

1. Douglas-fir >70%, dominant over aspen and subalpine fir. Pachistima <10% ..... **A**
1. Douglas-fir not dominant, <50% ..... (2)

2. Aspen dominant, >55%. Douglas-fir usually >5%, sometimes absent. Lodgepole pine up to 30%, sometimes absent. Subalpine fir up to 55%, sometimes sparse or absent ..... **B**
2. Lodgepole pine dominant, >40%. Aspen conspicuous subdominant, >20% ..... **C**

Community Type Descriptions

A *Douglas-fir-subalpine fir-aspen-elk sedge-pachistima-rose* is dominated by Douglas-fir at >70% cover. Aspen and subalpine fir are both present, at up to 25% cover.

B *Aspen-pachistima-lupine* is dominated by aspen, at >55% cover. Other tree species (subalpine fir, Engelmann spruce, lodgepole pine) are subordinate and sometimes one or more of them is absent.

C *Lodgepole pine-aspen-common juniper-pachistima-elk sedge* is dominated by lodgepole pine at >40% cover. One plot has Douglas-fir codominant and aspen subdominant; lodgepole pine and aspen are the only trees present in the other plot. One plot is a permanent *disclimax,* in which persistent and/or severe fires have removed seed sources of subalpine fir and Douglas-fir; perhaps disease has played a part as well.

Communities Not Assigned to a Community Type

- One community is dominated by subalpine fir, with noticeable pachistima and whortleberry. This would fall into community type A except Douglas-fir is not present. Perhaps the seed source for Douglas-fir has been eliminated.

Table 07-6. Community types within *Fir-Douglas-fir/pachistima–Moderately cold soils*.

Community Type	No. samples	Elevation, ft Slope, %	Coarse, % Depth, cm Mollic Depth, cm	Surface Coarse, % Bare, % Seral Stage	Lr	Layer Height, m	Avg Lyr Cvr %	Cover, %: Trees Shrubs Graminoids Forbs	No. Species Total Live Cover, % TLC/NS, %	Obstruction %: 1.5-2.0 m 1.0-1.5 m 0.5-1.0 m 0.0-0.5 m Total<2m
A. Douglas-fir-subalpine fir-aspen-elk sedge-pachistima-rose	2	9,590 (9,540-9,640) 19.5 (16-23)	69 (62-77) 74 (59-89) 23 (12-33)	7 0 LS	T1 T2 T3 S1 T4 S2 GF S3 M	29 (20-35) 17 (10-20) * Missing Missing 0.5 (0.3-1.2) 0.2 (0.0-0.8) 0.1 (0.0-0.3) 0.0	66.9 44.6 15.1 M M 10.3 51.9 38.1 1.3	121 (108-134) 40 (37-42) 52 (20-84) 6 (1-12)	24 (23-24) 219 (197-241) 9.3 (8.2-10.5)	73 (50-95) 58 (45-70) 30 (20-40) 58 (40-75) 54 (48-61)
B. Aspen-pachistima-lupine	6	9,941 (9,320-10,235) 23.7 (16-38)	41 (25-56) 87 (73-101) 8 (3-13)	3 * EM	T1 T2 T3 S1 T4 S2 GF S3 M	Missing 17 (12-22) 10 (4-18) 4 (2.5-7) 2.0 (0.4-5) 0.5 (0.2-1.0) 0.3 (0.0-0.8) 0.1 (0.0-0.3) 0.0	M 87.2 35.5 11.7 10.0 2.5 66.3 18.6 1.2	104 (88-158) 69 (4-126) 65 (0-111) 66 (13-114)	22 (16-31) 304 (207-410) 14.7 (9.0-22.8)	50 65 90 100 76
C. Lodgepole pine-aspen-common juniper-pachistima-elk sedge	2	* *	* * *	* * EM		*		96 (80-112) 63 (55-71) 68 (56-80) 37 (22-52)	13 (12-14) 263 (258-269) 20.3 (19.2-21.5)	*

*. Unknown: measurements were not taken in this CT.

Table 07-7. Resource Values for *Fir-Douglas-fir/pachistima–Moderately cold soils*.
Resource values were calculated from the numbers in Table 07-6, relative to the whole UGB.

The numbers in this table can be translated: 0 = Very Low, 1 = Low, 2 = Moderately Low, 3 = Moderate, 4 = Moderately High, 5 = High, and 6 = Very High.

	Community Type				Community Type		
Resource Value	**A**	**B**	**C**	**Resource Value**	**A**	**B**	**C**
Potential Cattle Forage Production	2-3	3-4	3	Deer & Elk Forage & Browse	3-4	3	3-4
Grazing Suitability	3	4	3	Need for Watershed Protection	4	3	2
Potential Timber Production	4-5 - PSME, POTR5	4 - POTR5	3-4 - PICO, POTR5	Soil Stability	2	2	3
Timber Suitability	4	3-4	3-4	Risk of Soil Loss-Natural	4	4	3
Developed Recreation	3	3	3	Risk of Soil Loss-Management	3	3	2
Dispersed Recreation	4	4	3	Risk of Permanent Depletion-Range	4	4	2
Scenic	4-5	4	3-4	Risk of Permanent Depletion-Wildlife	3	3	3
Road & Trail Stability	2-3	2-3	2	Risk of Permanent Depletion-Timber	2	2	2
Construction Suitability	2	2	2	Resource Cost of Management	4	4	3
Deer & Elk Hiding Cover	3-4	6	4-5	Cost of Rehabilitation	2	2	2

A somewhat later-seral subalpine fir–Douglas-fir/pachistima stand (Community Type A), with a conspicuous blanket of elk sedge visible. Douglas-fir 96% cover, elk sedge 80%, snowberry 17%, subalpine fir 8%, pachistima 6%, aspen 5%. Coarse Fragments Cover = 0%, Total Live Cover = 241%, Coarse Fragments in Soil = 44. Soil is a Mollic Cryoboralf, Clayey-Skeletal, Mixed. Sargents Quadrangle, elevation 9,640 ft, 23% 251° (WSW) slope. September 6, 1994.

Another subalpine fir–Douglas-fir/pachistima stand (Community Type A). Douglas-fir 74% cover, aspen 22%, subalpine fir 20%, lodgepole pine 17%, Rocky Mountain whortleberry 42%, pachistima 14%, elk sedge 20%. Soil sampled as a Typic Cryoboralf, Clayey-Skeletal. Crested Butte Quadrangle, elevation 9,540 ft, 16% 259° (WSW) slope. September 21, 1994.

Table 07-8. Common Species in *Fir-Douglas-fir/pachistima–Moderately cold soils*, where Characteristic cover > 10% or Constancy > 20%. "–" means that the species is not found. Dead cover is not listed. Ccv = Characteristic Cover, Con = Constancy. If Avc = Average Cover, then these are related using the formula Avc = Ccv•100%/Con.

		COMMUNITY TYPE			
		A	B	C	
		Ccv (Con)	Ccv (Con)	Ccv (Con)	
Code	Species	N = 2	6	2	Common Name
	TREES				
ABBI2	Abies bifolia	14 (100)	12 (83)	5 (50)	subalpine fir
PIEN	Picea engelmannii	– –	1 (50)	6 (50)	Engelmann spruce
PICO	Pinus contorta	17 (50)	10 (83)	50 (100)	lodgepole pine
POTR5	Populus tremuloides	14 (100)	77 (100)	21 (100)	quaking aspen
PSME	Pseudotsuga menziesii	85 (100)	11 (83)	40 (50)	Douglas-fir
	SHRUBS				
ARUV	Arctostaphylos uva-ursi	– –	25 (33)	– –	kinnikinnick
JUCO6	Juniperus communis	1 (100)	20 (67)	25 (100)	common juniper
MARE11	Mahonia repens	1 (50)	1 (17)	5 (50)	Oregon-grape
PAMY	Paxistima myrsinites	7 (100)	22 (100)	35 (100)	mountain-lover
ROWO	Rosa woodsii	6 (100)	13 (83)	1 (50)	Woods rose
SASC	Salix scouleriana	– –	17 (33)	– –	Scouler willow
SAMI15	Sambucus microbotrys	– –	10 (17)	– –	mountain red elderberry
SYRO	Symphoricarpos rotundifolius	17 (50)	– –	– –	mountain snowberry
VAMYO	Vaccinium myrtillus ssp. oreophilum	34 (50)	14 (50)	– –	Rocky Mountain whortleberry
	GRAMINOIDS				
BRCA10	Bromopsis canadensis	1 (50)	17 (83)	1 (50)	fringed brome
CAGE2	Carex geyeri	50 (100)	60 (83)	68 (100)	elk sedge
	FORBS				
ARCO9	Arnica cordifolia	– –	30 (67)	20 (100)	heartleaf arnica
CHDA2	Chamerion danielsii	T (50)	15 (50)	– –	fireweed
EREX4	Erigeron eximius	1 (50)	T (33)	– –	forest fleabane
FRVI	Fragaria virginiana	1 (100)	20 (50)	20 (50)	Virginia strawberry
FRSP	Frasera speciosa	– –	2 (50)	– –	monument plant
GASE6	Galium septentrionale	– –	1 (33)	– –	northern bedstraw
GERI	Geranium richardsonii	– –	8 (50)	– –	Richardson geranium
LALE2	Lathyrus leucanthus	– –	22 (33)	– –	aspen peavine
LUAR3	Lupinus argenteus	– –	7 (100)	5 (100)	silvery lupine
MAAM6	Maianthemum amplexicaule	– –	11 (17)	– –	feather Solomon-plume
OSDE	Osmorhiza depauperata	– –	10 (17)	– –	sweet cicely
PEPR7	Pedicularis procera	– –	2 (50)	– –	Gray's lousewort
THFE	Thalictrum fendleri	4 (50)	1 (50)	– –	Fendler meadow-rue
VIAM	Vicia americana	– –	4 (33)	– –	American vetch
	GROUND COVER				
.BARESO	bare soil	T (50)	– –	– –	
.LITTER	litter and duff	96 (100)	98 (33)	– –	
GRAVEL	gravel 0.2-10 cm	1	–	–	
.COBBLE	cobble 10-25 cm	6 (50)	– –	– –	
.STONES	stone > 25 cm	1 (50)	3 (17)	– –	
.MOSSON	moss on soil	3 (50)	2 (17)	– –	
LICHENS	lichens on soil	–	–	–	

Subalpine fir/twinflower–Cryochrepts and Cryoboralfs–Steep northerly slopes, 9,100-10,100 ft

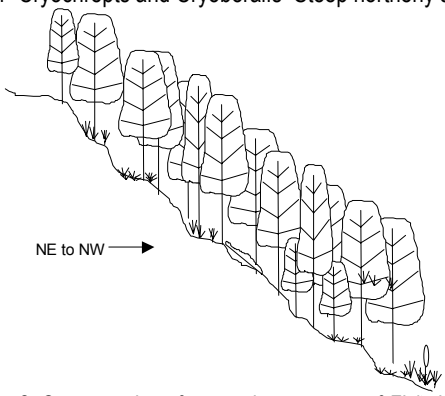

Figure 07-2. Cross-section of vegetation structure of *Fir/twinflower–Cold light-colored soils–Steep northerly*. Aspects are northerly, and slope angles average 50%.

Fir/twinflower–Cold light-colored soils–Steep northerly is an uncommon type on steep northerly slopes in the lower Subalpine, in areas with cold (Cryic) soils, outside the deep rainshadows. This type has also been described from Montana, Idaho, northwestern Wyoming, throughout Colorado, and in northern New Mexico. *Fir/twinflower–Cold light-colored soils–Steep northerly* is characterized by subalpine fir (ABBI2), Engelmann spruce (PIEN), lodgepole pine (PICO), aspen (POTR5), and twinflower (LIBO3), on steep slopes. Snowberry (SYRO) and Rocky Mountain whortleberry (VAMYO) are often present as well. See Table 07-12 for common species names and codes.

Fir/twinflower–Cold light-colored soils–Steep northerly is typically a dense to very dense stand of mixed subalpine fir, Engelmann spruce, aspen, lodgepole pine, and sometimes Douglas-fir (PSME). The understory is usually highly shaded, dense, and relatively lush for the Southern Rockies, although it is not rich in species. The low mat-forb, twinflower, is conspicuous. No one tree species is constant in all stands of this type; subalpine fir is used in the name largely for tradition's sake.

This Ecological Type probably includes two closely-related plant associations. Community Type A probably represents an association more properly called "Douglas-fir/twinflower," while Community Type B might be called "subalpine fir-Engelmann spruce/twinflower." Community type C is dominated by lodgepole pine and aspen, and is probably a *disclimax* to one of these.

This is the plant association *Abies bifolia/Linnaea borealis* of Moir (1979), and De Velice (1985), and is also based on *Abies lasiocarpa-Picea engelmannii/Linnaea borealis* of Johnston (1987). It is considered to be a different plant association from *Abies lasiocarpa/Linnaea borealis (*Cooper 1975, Pfister 1977, Steele 1981). *Abies bifolia/Linnaea borealis* phase *Pseudotsuga menziesii* is described as new here.

Little is known about the succession of these stands. These sites are rarely used by livestock, since they are deeply shaded and steep. Serviceberry communities adjoin this type on upper leeward (easterly) slopes. Mountain big sagebrush communities are found on adjacent southerly slopes or ridgetops, and tall willow (yellow, Pacific, blue) communities adjacent in bottoms.

Horizontal obstruction is high to very high, but these stands are used principally by deer because of their steepness. Access is unavailable to deer and elk in most winters due to snow accumulation. Deer use of all community types is moderate for cover and browse during spring through fall; elk use is low in all seasons. Wildlife use is very low in the winter.

Summary of Ecological Type Characteristics

1. Explanation of symbols in Appendix A. Percentages in [brackets] indicate the percentage of plots sampled that have that characteristic.

NUMBER OF SAMPLES	8, soil descriptions from 4 of these (total 8)
ELEVATION	9,775 ft (9,160-10,020 ft); 2,979 m (2,792-3,054 m)
AVERAGE ASPECT	351°M (r = 0.79)
LITHOLOGY	Granite, tuff, or rhyolite
FORMATIONS[1]	Tmi, Taf, Tpl
LANDFORMS	Soil creep slopes [75%]
SLOPE POSITIONS	Backslopes
SLOPE SHAPES	Undulating, convex, or concave horizontally, Linear to undulating vertically
SLOPE ANGLE	50.3% (45-60%)
SOIL PARENT MATERIAL	Colluvium
COARSE FRAGMENTS	4.3% (0-10%) cover on surface, 63.3% (56-73%) by volume in soil
SOIL DEPTH	75 cm (61-84 cm); 29.4 in (24-33 in)
MOLLIC THICKNESS	13 cm (0-42 cm); 4.9 in (0-17 in)
TEXTURE	Clay loam, sandy clay loam, or loam surface; sandy clay loam, sandy loam, clay loam, or loamy sand subsurface
SOIL CLASSIFICATION	Cryochrepts [50%] or Cryoboralfs
TOTAL LIVE COVER	212.6% (141.1-272.5%)
NUMBER OF SPECIES	20.9 (12-30)
TOTAL LIVE COVER/NO. SPECIES	11.3% (4.7-19.6%)
CLIMATE	In deep rainshadow or partial rainshadow. Cool, moist, not exposed to sun, not exposed to wind.
WATER	The highly shaded understory, number of layers, and copious litter and duff retain much moisture through the growing season.

Table 07-9. Wildlife values (relative to the whole UGB) for the principal wildlife species using *Fir/twinflower–Cold light-colored soils–Steep northerly*.

	Mule Deer	Elk
CT	Season–Preference	Season–Preference
All	Winter, Mild– Low Winter, Severe– Very Low Spring/Fall– Moderate (Cover, Browse)	Winter, Mild– Very Low Winter, Severe– Very Low Spring/Fall– Low (Cover, Browse)

Key to Community Types

1. Douglas-fir >15%; whortleberry sometimes absent ..... **A**
1. Douglas-fir absent; whortleberry always present ..... (2)

2. Lodgepole pine dominant, >60%. Engelmann spruce absent ..... **C**
2. Fir or spruce dominant, >35%, Lodgepole pine subordinate ..... **B**

Description of Community Types

A *Douglas-fir-aspen-common juniper-twinflower* Douglas-fir cover is >15% in a mixed stand of Douglas-fir, aspen, Engelmann spruce, subalpine fir, and lodgepole pine. Twinflower cover is >15%.

B *Engelmann spruce-subalpine fir-lodgepole pine-whortleberry-twinflower* is dominated by subalpine fir or Engelmann spruce, one or both of which has >35% cover. Douglas-fir is absent. Lodgepole pine is always present, with as much as 35% cover. Aspen is uncommonly present. Twinflower cover is 3-20%. Rocky Mountain whortleberry is conspicuous at 30-90% cover. Elk sedge is absent to conspicuous.

C *Lodgepole pine-aspen-common juniper-whortleberry-kinnikinnick-twinflower* is dominated by lodgepole pine, at >60% cover. Engelmann spruce, subalpine fir, and Douglas-fir may be absent or as much as 1% cover. Aspen is always present, and varies from minor to codominant. Twinflower cover is 5-25%. Rocky Mountain whortleberry is conspicuous, at >30% cover. Elk sedge cover is >10%.

Table 07-10. Community types within *Fir/twinflower–Cold light-colored soils–Steep northerly*.

Community Type	No. samples	Elevation, ft Slope, %	Coarse, % Depth, cm Mollic Depth, cm	Surface Coarse, % Bare, % Seral Stage	Lr	Layer Height, m	Avg Lyr Cvr %	Cover, %: Trees Shrubs Graminoids Forbs	No. Species Total Live Cover, % TLC/NS, %	Obstruction %: 1.5-2.0 m 1.0-1.5 m 0.5-1.0 m 0.0-0.5 m Total<2m
A. Douglas-fir-aspen-common juniper-twinflower	3	9,530 (9,160-9,900) 55.7 (52-60)	61 (56-66) 80 (75-84) 21 (0-42)	5 (0-10) * LS	T1 T2 T3 S1 GF S2 M L	19 (16-21) 11 (9-15) 1.8 (0.6-2.5) 0.3 (0.2-0.6) 0.5 (0.0-0.8) 0.1 (0.0-0.1) 0.0 0.0	82.6 16.9 T 11.1 36.3 17.4 15.9 7.4	100 (93-104) 41 (11-90) 3 (0-7) 55 (27-72)	27 (25-30) 200 (141-273) 7.5 (4.7-10.5)	65 75 60 75 69
B. Engelmann spruce-subalpine fir-lodgepole pine-whortleberry-twinflower	3	10,020 45	65 (58-73) 70 (61-79) 4 (0-8)	7 1 LS-LM	T1 T2 T3 S1 GF S2 M L	23 6 (2.0-10) 1.0 (0.0-2.0) * 0.3 (0.0-0.4) 0.1 (0.0-0.3) 0.0 0.0	67.5 27.6 13.4 15.0 13.6 82.8 40.7 10.9	92 (76-110) 80 (51-106) 17 (0-51) 25 (4-47)	19 (14-22) 215 (201-241) 11.8 (10.0-14.5)	70 85 70 90 79
C. Lodgepole pine-aspen-common juniper-whortleberry-kinnikinnick-twinflower	2	* *	* * *	* * EM		*		86 (67-105) 73 (65-81) 20 (15-25) 51 (40-61)	15 (12-18) 229 (224-235) 16.0 (12.4-19.6)	*

*. Unknown: measurements were not taken in this CT.

Table 07-11. Resource Values for *Fir/twinflower–Cold light-colored soils–Steep northerly*. Resource values were calculated from the numbers in Table 07-10, relative to the whole UGB.

The numbers in this table can be translated: 0 = Very Low, 1 = Low, 2 = Moderately Low, 3 = Moderate, 4 = Moderately High, 5 = High, and 6 = Very High.

	Community Type				Community Type		
Resource Value	**A**	**B**	**C**	**Resource Value**	**A**	**B**	**C**
Potential Cattle Forage Production	0	1-2	2-3	Deer & Elk Forage & Browse	2	3	3
Grazing Suitability	0	0	0	Need for Watershed Protection	4-5	4	4
Potential Timber Production	4-5	4-5	4-5	Soil Stability	1	1	1
Timber Suitability	ns[1]	ns[1]	ns[1]	Risk of Soil Loss-Natural	5	5	5
Developed Recreation	0	0	0	Risk of Soil Loss-Management	5	4-5	5
Dispersed Recreation	1	1	1	Risk of Permanent Depletion-Range	0	0	0
Scenic	1-2	1-2	1-2	Risk of Permanent Depletion-Wildlife	2	2	2
Road & Trail Stability	1	1	1	Risk of Permanent Depletion-Timber	ns[1]	ns[1]	ns[1]
Construction Suitability	0	0	0	Resource Cost of Management	5	5	5
Deer & Elk Hiding Cover	5	6	5-6	Cost of Rehabilitation	4	4	4

1. Not suitable.

An unusual lower-elevation spruce fir stand in the Engelmann spruce/twinflower type (Community Type A). At the warm, moist end of the spruce-fir gradient. Douglas-fir 69% cover, common juniper 17%, twinflower 16%, aspen 14%, Engelmann spruce 10%. Coarse Fragments Cover = 10%, Total Live Cover = 141%, Coarse Fragments in Soil = 28. Soil sampled as a Typic Glossoboralf, Loamy-Skeletal, Mixed. North Pass Quadrangle, elevation 9,900 ft, 60% 320° (NW) slope. August 25, 1992.

Another stand of Douglas-fir/twinflower (Community Type A). Aspen 85% cover, Douglas-fir 19% , twinflower 13%, rose 11%. Soil sampled as a Pachic Haploboroll, Loamy-Skeletal, Mixed. West Elk Peak SW Quadrangle, elevation 9,160 ft, 52% 004° (N) slope. June 23, 1994.

Table 07-12. Common Species in *Fir/twinflower–Cold light-colored soils–Steep northerly*, where Characteristic cover > 10% or Constancy > 20%. "–" means that the species is not found. Dead cover is not listed. Ccv = Characteristic Cover, Con = Constancy. If Avc = Average Cover, then these are related using the formula Avc = Ccv•100%/Con.

		COMMUNITY TYPE						
		A		B		C		
		Ccv	(Con)	Ccv	(Con)	Ccv	(Con)	
Code	Species	N =	3		3		2	Common Name
	TREES							
ABBI2	Abies bifolia	6	(67)	33	(100)	1	(50)	subalpine fir
PIEN	Picea engelmannii	20	(67)	34	(100)	–	–	Engelmann spruce
PICO	Pinus contorta	11	(67)	18	(100)	63	(100)	lodgepole pine
POTR5	Populus tremuloides	37	(100)	20	(33)	23	(100)	quaking aspen
PSME	Pseudotsuga menziesii	40	(100)	–	–	–	–	Douglas-fir
	SHRUBS							
ARUV	Arctostaphylos uva-ursi	T	(33)	–	–	15	(100)	kinnikinnick
DIIN5	Distegia involucrata	–	–	T	(33)	1	(50)	bush honeysuckle
JUCO6	Juniperus communis	9	(100)	10	(33)	13	(100)	common juniper
PAMY	Paxistima myrsinites	16	(67)	5	(100)	–	–	mountain-lover
ROWO	Rosa woodsii	5	(67)	3	(67)	15	(50)	Woods rose
SHCA	Shepherdia canadensis	1	(67)	25	(33)	–	–	russet buffaloberry
SYRO	Symphoricarpos rotundifolius	T	(67)	–	–	–	–	mountain snowberry
VAMYO	Vaccinium myrtillus ssp. oreophilum	50	(33)	62	(100)	38	(100)	Rocky Mountain whortleberry
	GRAMINOIDS							
BRCA10	Bromopsis canadensis	2	(33)	1	(33)	5	(50)	fringed brome
CAGE2	Carex geyeri	3	(67)	50	(33)	15	(100)	elk sedge
	FORBS							
ARCO9	Arnica cordifolia	15	(67)	2	(67)	25	(50)	heartleaf arnica
CHDA2	Chamerion danielsii	1	(33)	–	–	1	(50)	fireweed
FRVI	Fragaria virginiana	3	(33)	10	(33)	–	–	Virginia strawberry
LALE2	Lathyrus leucanthus	29	(33)	1	(33)	–	–	aspen peavine
LIBO3	Linnaea borealis	20	(100)	11	(100)	13	(100)	American twinflower
LUAR3	Lupinus argenteus	11	(67)	14	(67)	20	(100)	silvery lupine
ORSE	Orthilia secunda	T	(33)	1	(67)	–	–	one-sided wintergreen
	GROUND COVER							
.BARESO	bare soil	–	–	1	(33)	–	–	
.LITTER	litter and duff	90	(67)	95	(67)	–	–	
GRAVEL	gravel 0.2-10 cm	3		–		–		
.COBBLE	cobble 10-25 cm	T	(33)	4	(33)	–	–	
.STONES	stone > 25 cm	–	–	3	(33)	–	–	
.MOSSON	moss on soil	16	(67)	41	(67)	–	–	
LICHENS	lichens on soil	15		11		–		