10. Aspen Ecological Series

Table 10-1. Full and short names for the ecological types in the Aspen Ecological Series

Ecological Type Code	Name	Plant Association Code	Short Name
FM1	Aspen/serviceberry–Deep Argiborolls–Gentle to moderate slopes and slumps, 8,000-9,700 ft	POTR5/AMAL2-SYRO	Aspen/serviceberry–Deep dark soils
FM2	Aspen/Thurber fescue–Deep Cryoborolls–Gentle to moderate slopes and slumps, 8,100-10,400 ft	POTR5/FETH	Aspen/Thurber fescue–Deep dark soils
FM3	Aspen/meadow-rue-peavine–Argic Pachic Cryoborolls–Gentle to steep slopes, benches, and slumps, 9,100-10,100 ft	POTR5/THFE-LALE2	Aspen/meadow-rue-peavine–Deep dark clay soils

This is the *Populus tremuloides* series of Hoffman and Alexander (1980-1983), Hess (1981-1986), Hess and Wasser (1982), Steele and others (1983), Komárková (1986-1988), and Alexander (1986-1988).

Stable aspen forests in which conifers are unlikely to succeed the aspen occur on the western slope of the Continental Divide, in western Colorado, northern New Mexico, western Wyoming, eastern Utah, and southern Idaho (Morgan 1969, Reed 1971, Johnston and Hendzel 1985). In contrast, most aspen stands outside this area are seral to one or more conifer species (Marr 1961, Reed 1971, Johnston and Hendzel 1985).

Aspen stands in the UGB formerly assigned to "aspen/elk sedge" are now believed to be one or more of the following:

1. Douglas-fir-aspen/serviceberry-pachistima that has lost the Douglas-fir seed source through severe or persistent fire in the past, *or*
2. Aspen/serviceberry or Douglas-fir/serviceberry from which the shrubs have been removed by browsing herbivores, *or*
3. Spruce-fir/elk sedge from which the conifers have been removed by fire (or disease).

Stands once assigned to "aspen/pachistima" are now classified under subalpine fir-Douglas-fir/pachistima. The stands once considered part of the "aspen/snowberry plant association" are assigned to an herbivore-depleted community type within aspen/serviceberry. Stands once called "aspen/kinnikinnick" are now classified as Douglas-fir/kinnikinnick from which the Douglas-fir seed source has been removed by persistent and/or intense fires centuries ago.

Stands of this series are small to large, inversely proportional to elevation, with smaller sites occurring at lower elevations and larger sites at higher elevations. Most sites are isodiametric.

Vegetation, Climate, Soils

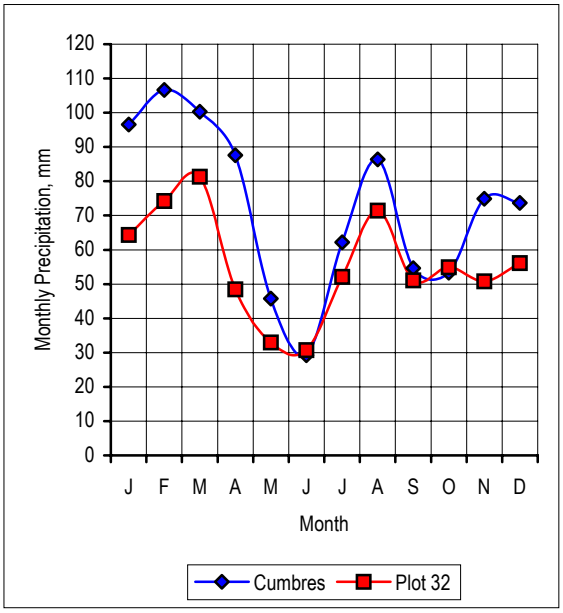

Fig. 10-1. Seasonal precipitation for an aspen stand at Cumbres, in far southern Colorado, and from Jones' Plot 32 (data from Jones 1971). Monthly average at Cumbres is 72.6 mm (2.86 in), for a total of 871.2 mm/yr (34.3 in/yr).

Aspen grows in genetically identical clones that form relatively distinct 1-3 ha (2-7 ac) groves of trees, all with the same genotype (Gullion 1985, Shepperd 1993a). Within such a stand, aspen reproduces entirely from root suckers. There is effectively no reproduction from seed, so clonal characteristics are more important than individual stem characteristics. Each stem is considered a ramet of the genet, embodied by the entire clone (Shepperd 1993a). Clones (genotypes) may differ in branching, stem color, phenology, and decay characteristics (Wall 1971). Differences in protein content may cause some clones to be browsed by

elk much more than others (McNamara 1973). Two components of the same clone growing on different sites may produce very different volumes and decay volumes, though they do not appear different superficially (Wall 1971). As many as 50 to 100 stems may be connected by a single root system of as much as 17 m (56 ft) radius (Tew 1969-1970, Schier 1973, Schier and Zasada 1973), and these connections may persist for at least 15 yr following a stand-replacing disturbance (Shepperd 1993a).

Table 10-2. Climate and Soils

Characteristic	Value	Reference
Precipitation zone	840 mm/yr (450-1,150 mm/yr) 33 in/yr (18-45 in/yr), usually about 2/3 as snow	Sampson 1925, Brown and Thompson 1965, Jones 1971, Bartos and Lester 1984, Hess and Alexander 1986, Greenway 1990
Growing season precipitation	135 mm (81-200 mm) 5.3 in (3-8 in)	
Average growing period	130 days	Brown and Thompson 1965
Total soil moisture (0-8 ft)	Spring: 1,163 mm (1,070-1,270 mm) 45.8 in (42-50 in) Fall: 810 mm (740-890 mm) 21.9 in (29-35 in)	
Growing season water use	4.19 mm/day (3.4-5.1 mm/day) 0.165 in/day (0.13-0.20 in/day)	
Mean July temperature	15.2°C (12-20°C) 59.4°F (53-68°F)	Brown and Thompson 1965, Morgan 1969, Cox 1968
July temperatures	Daytime: 21.8°C (15-28°C) 71.2°F (59-82°F) Nighttime: 3.3°C (-2°C–8.5°C); 37.9°F (28-47°F)	
July relative humidity	Daytime: 30.6% (20-60%) Nighttime: 91.2% (86-95%)	Cox 1968
Rooting depths	175-290 cm 65-115 in	Gifford 1966

Small sprouts in the understory of an aspen canopy are usually permanently suppressed. They are shorter, thinner, and more rotten than dominant trees all their lives (Betters and Woods 1981). Because the implications of clonal growth and vegetative reproduction of aspen were not well understood by past authors, readers must use caution when interpreting older literature. In particular, the small sprouts in the understory of a mature aspen stand were incorrectly termed "reproduction," though they will never reach the overstory. For examples of such errors, see Dayton and others (1937) and Houston (1958).

Aspen sprouting is stimulated primarily by release from hormonal suppression; clearcutting also does this nicely (Patton and Avant 1970, Hungerford 1988). Aspen typically regenerates abundantly following a fire. After a severe fire, suckers arise from a deeper level in the soil (9 cm vs. 5-6 cm for lightly burned stems; Brown and DeByle 1987). Fire stimulates aspen sprouting in part because of increased soil temperature in the fire-caused openings. July soil-surface temperatures are 20-30°F warmer in burned sites than in unburned sites (Hungerford 1988). Many complex, interrelated factors influence aspen self-regeneration, and it is often not possible to separate them or to assign events such as sprout failure to one or a few factors (Hildebrand and Jacobi 1990, Johnston 1996).

Romme and others (1995) believe that aspen stand initiation in the Rocky Mountains is a combination of factors that has not occurred here in 100 to 170 years. In the Yellowstone ecosystem, "the period 1870-1890, when the present-day aspen stands were generated, was historically unique: numbers of elk and other browsers were low, climate was relatively wet, extensive fires had recently occurred, and large mammalian predators of elk (e.g., wolf, *Canis lupus*) were present. This combination of events has not recurred since 1900" (Romme and others 1995).

The number of aspen sprouts decreases exponentially from the time of the disturbance that stimulated sprouting. Shepperd (1993a) derived an exponential equation to relate live stems per hectare (S, 1/ha) to the age of the sprout crop (a, yr):

$$S = 1{,}382{,}937a^{-1.85105}$$

Most of this exponential decline in live stems occurs when all suckers that share a root node die.

Between eight and 14 years of age, an aspen stand increases dramatically in biomass, leaf area, and crown stratification (Shepperd 1993a). The number of aspen stems in a stand declines with age, especially after 60-70 years. Basal area peaks at around 80 years, and declines appreciably at 100 years (Mueggler 1994). Site quality and numbers of aspen stems are inversely related in middle-aged stands (Mueggler 1994). Sixty-eight years following

a natural stand-replacing fire in an aspen stand, tree heights averaged 22.8 m (17.6-27.4 m) 74.8 ft (57.9-89.7 ft; Jones and Trujillo 1975).

Under favorable moisture conditions, an aspen stand can create a Mollic epipedon in 200 to 300 years, a relatively short time in terms of soil formation. By that time, the understory usually includes a rich assembly of tall and medium shrubs, tall grasses, and tall forbs. Also, litterfall from the deciduous aspen trees, shrubs, and herbaceous plants continues to build the upper organic-rich soil layers, effectively excluding conifer seedlings. Where aspen is the climax dominant, soils are moister, have a higher pH, and contain more organic carbon than in conifer stands. Air temperatures are generally higher in the aspen stands, but subsurface (0-2 in) temperatures are lower (Hoff 1957).

In northern Colorado, Hoff (1957) found no consistent differences in relative humidity, air temperature, or light intensity during the growing season between aspen and conifer stands. However, in southern Saskatchewan, Archibold and others (1996) found that relative humidity was higher inside an aspen stand than in an adjacent grassland. They also found that soil surface temperature was cooler in the aspen stand in summer, but warmer in winter.

The number of soil invertebrates is generally higher in aspen stands, with all groups of macroinvertebrates except beetles, significantly higher (Hoff 1957).

Equations for estimating monthly precipitation based on elevation, latitude, and relief are given in Jones (1971).

Kaufmann and others (1982) derived equations relating total leaf area (t, m²), effective projected leaf area (e, m²), tree basal area (b, cm²), and tree dbh (d, cm), for aspen:

$$t = 0.168b - 0.0000787b^2$$

$$t = 0.132d^2 - 0.0000486d^4$$

$$e = 0.0535b - 0.0000251b^2$$

$$e = 0.0420d^2 - 0.0000155d^4$$

Shepperd (1993a) derived an equation to relate dry weight of aspen stems (W, g) as a function of basal diameter (d, cm):

$$W = 59.9517d^{2.521}$$

Individual aspen stems often have poor form, due to snow damage, spring frosts (Egeberg 1963), browsing, trampling, or disease. Woods and others (1982) derived an equation relating understory production (P, kg/ha/yr) to overstory basal area (b, m²/ha). However, there are many points on their scatter diagram off the curve.

$$P = 699.4 + 1618.8e^{-0.0935b}$$

Aspen is managed for high wildlife values, watershed protection values, and for wood-fiber values (either sawtimber or fuelwood). Sites of this series are less stable than stands seral to conifers, in the Douglas-Fir or Spruce-Fir Series (Komárková and others 1988). Tree productivity varies from moderate to high.

Most aspen stands, even apparently healthy ones, are susceptible to a wide variety of insects and diseases. Summaries can be found in Hinds and Wengert (1977), Walters and Beatty (1984), and Hildebrand and Jacobi (1990).

Timber Management

Clearcutting is the preferred method for regenerating an aspen stand. Burning directly after clearcutting enhances the production of aspen sprouts (Hoffman and Alexander 1980-1983, Hess and Alexander 1986, Alexander and others 1986, Komárková and others 1988). Clearcutting in small patches or blocks is possible, where the clearcut patches can be protected from elk and livestock (Hoffman and Alexander 1983); otherwise clearcut patches should be as large as possible to lessen browsing effects (Beeson 1987, Johnston 1996). Thinning is possible, but does not increase merchantable tree volume (Alexander and others 1986). When the 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, Komárková and others 1988).

Slash management is critical in most aspen cutting areas, since slash left in the stand impedes access by livestock. This is desirable because it protects aspen sprouts from browsing animals, but is undesirable for livestock management (Beeson 1987). It is possible to leave enough slash to impede livestock and big game until the aspen sprouts grow out of the animals' reach (Beeson 1987). Growth and yield models for aspen stands are discussed in Mowrer (1987). Stand stocking after clearcutting is shown below, from Crouch (1986).

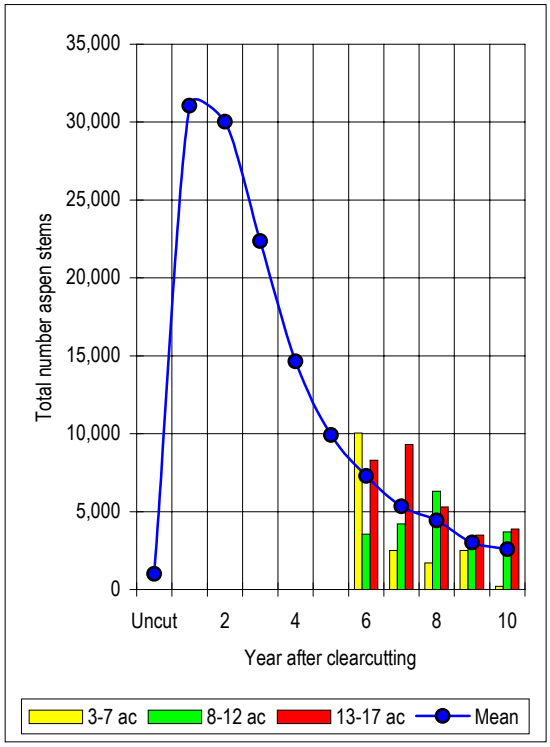

Fig. 10-2. Aspen stocking after clearcutting in various size blocks. Number of aspen sprouts each year for ten years following clearcutting in patches of several sizes (Crouch 1983b and 1986).

Fire Management

Aspen trees are sensitive to fire because of their thin bark. Most stems will be killed by a fire (Hungerford 1988), though burning at the base kills small stems preferentially. The probability of aspen stem mortality from fire is strongly related to dbh, which determines bark thickness, char height, and the amount of circumference of the stem charred. Trees are killed when the circumference charred exceeds 75%; live trees were typically charred on less than 50% of their circumference. Char heights of 30 cm have a 90% probability of killing aspen which are less than 25-cm dbh. Minimum flame heights required to kill aspen vary from 10 cm for trees 10-cm dbh, to 60 cm for a 25-cm dbh tree (Brown and DeByle 1987). Fire intensity largely determines suckering depth (Brown and DeByle 1987).

Stands of this series are classified as Fire Group 10 – Quaking aspen habitat types (Crane 1982).

Prescribed burning of aspen stands can improve forage production and stimulate aspen sprouting (Bartos and Mueggler 1979). Aspen suckers can easily be eliminated by cattle, sheep, elk, or deer grazing (Sampson 1919, K. Jones 1983, Fitzgerald and others 1984-1986), but not by very hot surface fire (Horton and Hopkins 1965). Patton and Jones (1977) recommend a timber rotation of 20-30 years to increase browse for big game. Girdling aspen trees to stimulate sprouting is usually not successful (Smith and others 1972). Soils in these stands are susceptible to compaction from heavy equipment or vehicles (Komárková and others 1988, Shepperd 1993b). Bulk density increases in the upper 20 cm of the soil persist up to 12 years following compaction, with consequent aspen root damage (Shepperd 1993b). Aerial spraying of an aspen stand with 2,4-D also stimulates sprouting (Bartos and Lester 1984).

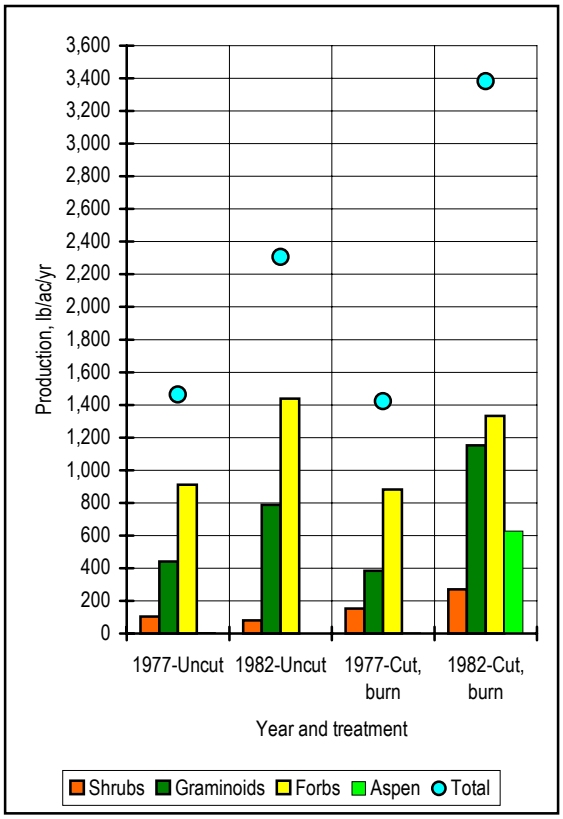

Fig. 10-3. Response of stand productivity five years after stands were cut, stacked, and burned (Crouch 1981)

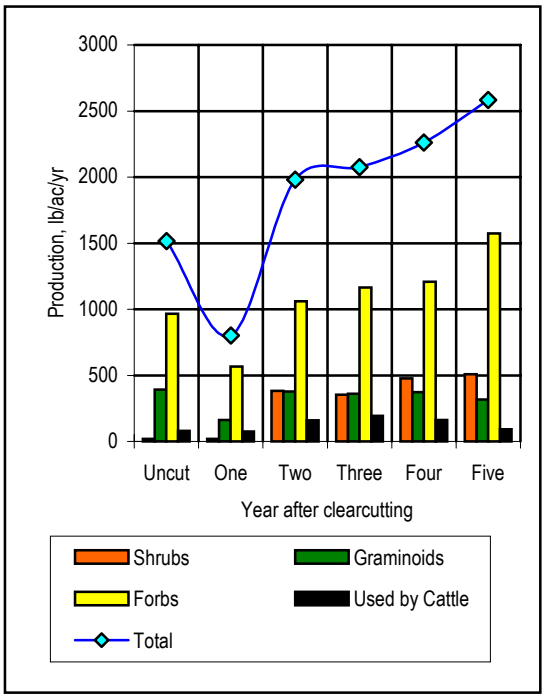

Fig. 10-4. Changes in cover after clearcutting an aspen stand (Crouch 1983a).

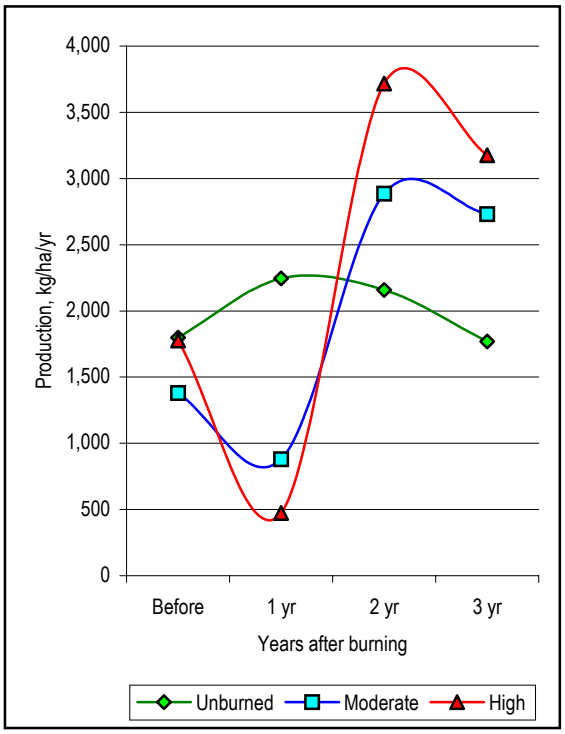

Fig. 10-5. Changes in understory production after burning at two intensities (Bartos and Mueggler 1979).

Range and Wildlife Management

Forage production ranges from moderate to high when stands are in good condition, undepleted by continual herbivore use. Continued grazing reduces productivity significantly. Live understory vegetation production on aspen range in good, undepleted condition varies from 2,500 to 3,500 lb/ac/yr; in poor condition, 900 to 1,200 lb/ac/yr, and in depleted condition, 150 to 400 lb/ac/yr (Turner 1951, Hess and Alexander 1986). Aspen stands adjacent to nonforested rangeland receive much more livestock use than those more than 0.2 mile inside a closed-canopy stand, in spite of the presence of large quantities of palatable forage. Sheep, which can be herded to interior stands, can make more use of them than cattle. Most of the palatable forage in aspen stands consists of forbs or shrubs. Graminoids are typically either unpalatable or are rendered relatively unpalatable by shading. In some places, elk sedge can be an important forage species for cattle (Paulsen 1969).

Houston (1954) devised a range-condition rating based on six criteria: four groups of plant species, soil cover (vegetation plus litter), and evident indicators of erosion. Another criterion he uses, "presence of aspen reproduction," is inappropriate given what we now know about clonal aspen-reproduction processes.

Aspen sprouts are palatable to livestock, which can result in loss of some sprouts in regenerating clearcuts (Larson 1959). Damage to sprouts due to grazing is directly proportional to grazing intensity by either cattle or sheep (Sampson 1919).

Sampson (1919) suggests that on aspen clearcuts in cattle range, if the aspen sprouts have been destroyed so that a commercial stand will not be formed, then the "range has been stocked beyond its normal carrying capacity." The same concept probably applies to elk use.

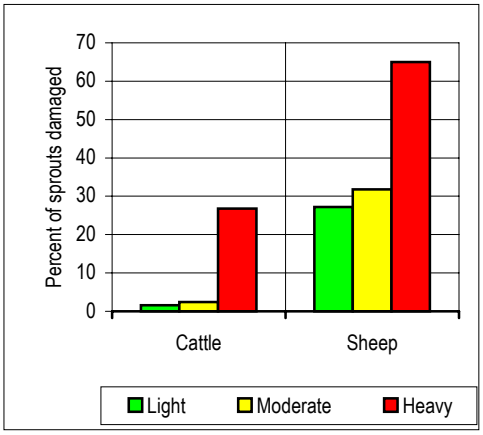

Fig. 10-6. Damage to aspen sprouts in regenerating aspen stands under three intensities of livestock grazing (Sampson 1919)

In parts of Alberta, where aspen is considered a noxious weed that invades rangeland and reduces grazing capacity, "a single late grazing [by cattle] eliminated aspen regeneration" (Fitzgerald and

Bailey 1984, also see K. Jones 1983 and Fitzgerald and others 1986). Timber and range management should be coordinated to ensure that aspen regeneration is not lost. Livestock damage is mostly (90%) due to browsing, but also occurs as a result of trampling and rubbing (Sampson 1919). Size of treatment blocks (whether clearcuts or burned patches) is critical, with the very small blocks usually not surviving because of concentration of animal use (Mueggler and Bartos 1977, Johnston 1996).

Slash management is critical in most aspen cutting areas, since slash left in the stand impedes access by livestock, which is desirable to protect aspen sprouts from browsing animals, but undesirable for livestock management (Beeson 1987). A compromise could be leaving enough slash to impede livestock (and big game) use until the aspen sprouts grow out of the animals' reach (Beeson 1987).

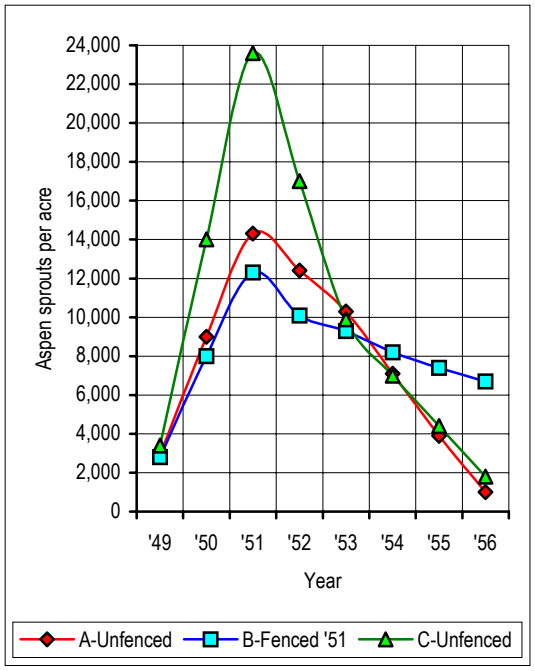

Fig. 10-7. Changes in number of aspen sprouts after fencing. In all three plots, aspen stems were killed by some means in 1949; Plot B was fenced against livestock in 1951. There was little big game use in this area (Larson 1959).

Following clearcutting in small 3-acre clearcuts, total numbers of birds did not significantly change, but there was a small decline in the "foliage nesting" and "picker and gleaner" bird guilds (including mountain chickadee, olive-sided flycatcher, golden-crowned kinglet, ruby-crowned kinglet, red-breasted nuthatch, hermit thrush, American robin, and yellow-rumped warbler). There was no change in mammal populations (Scott and others 1982).

Aspen stands provide habitat for many birds and small mammals (Gullion 1985; Figs. 10-8, 10-9). When 25% of an aspen forest is clearcut in 3-20 acre patches, bird population density does not change, but species diversity increases. The total number of birds is not different among the different sizes of clearcuts; totals were lower on clearcuts but not different from controls or leave strips (Scott and Crouch 1987-1988).

These stands are commonly used by elk and deer as summer range, providing forage, browse, and cover (Hess and Alexander 1986). All aspen stands in winter range in the UGB are seral to Douglas-fir; see the Douglas-Fir Series (No. 4). Big game, especially elk, often browse aspen sprouts, which can be a major problem after clearcutting. The severity of browsing effects depends on how many animals use the area and for how long (Johnston 1996). Elk can eliminate a sprout crop completely, reduce the survival of sprouts to the depth of snow accumulation, or damage all sprouts so that all trees in a clone will be of poor form a long time (Krebill 1972, Williams and Moir 1985, Komárková and others 1988, Romme and others 1995, Johnston 1996). Sampson (1919) suggested that when aspen sprouts in clearcuts are destroyed by cattle so that a commercial stand cannot form, such destruction is an indicator of overstocking of livestock. The same may also be true of elk.

Mule deer also browse aspen sprouts, but the effects are not as severe, because deer do not concentrate in such large numbers, and apparently, do not prefer aspen sprouts the way elk do. However, deer can have significant effects in small areas (Smith and others 1972). Sprout crops disappear quickly if more than one species is browsing, such as cattle and deer together (Smith and others 1972), if soils are light-colored and unsuitable, or if water tables are high in addition to browsing (Johnston 1996).

Injuries to aspen sprouts can be caused by animals browsing the terminal leader, by the weight of snowpack, by trampling, by diseases, or by pocket gophers (Marston and Julander 1961, Smith and others 1972, Johnston 1996). Elk also gnaw the bark of mature aspen trees, which is sometimes unsightly, but rarely fatal (Williams and Moir 1985). Mortality or poor form in aspen caused by big-game browsing is usually a combination of browsing with other factors such as pathogenic fungi and/or injurious insects (Krebill 1972).

After a prescribed fire creates a sprout crop (Basile 1979, Canon and others 1987), elk will use those stands preferentially and heavily, which can significantly reduce the aspen-sprout crop. However, elk actually prefer serviceberry (*Amelanchier alnifolia*) over aspen (Canon and others 1987). Elk also eat blue wildrye (*Elymus glaucus*), asters, geranium, and meadow-rue (*Thalictrum fendleri*; Canon and others 1987).

Pocket gophers (*Thomomys* spp.) can slow or prevent aspen expansion into adjacent sites dominated by herbaceous plants (Cantor and Whitham 1989), and can be a significant problem in disturbed sites or microsites (Julander and others 1969). Pocket gophers become more active with increased disturbance, such as exposure of bare soil by livestock grazing (Ellison and Aldous 1952). Pocket gophers generally eat the underground parts of plants. They may forage in the understory of Thurber fescue sites which have soils similar to the aspen sites, and may occur adjacent to them (McDonough 1974). Pocket gopher activity in aspen stands favors the maintenance of aggressive perennials such as collomia (*Collomia linearis*), James starwort (*Pseudostellaria jamesiana*), black-eyed Susan (*Rudbeckia* spp.), and butterweed (*Senecio serra*) (McDonough 1974).

Recreation, Roads and Trails, Scenery

Stands have low to moderately low suitability for roads and moderate suitability for trails. Soils are susceptible to compaction from heavy equipment or vehicles (Komárková and others 1988, Shepperd 1993b). Compaction causes bulk density to increase in the upper 20 cm of the soil, which will persist up to 12 years following compaction, with consequent aspen root damage (Shepperd 1993b).

Damage to individual aspen trees (leading to death from disease) is difficult to control during or after construction (Komárková and others 1988). Steep slopes and great depth to bedrock are limiting factors in heavy equipment use. Because the high-quality surface soil is a valuable resource, it should be stockpiled before major excavation (Tiedeman 1978). The soils have low strength and thus are subject to sliding under heavy equipment; mulching is required on slopes steeper than 15%. Wet soils in spring and fall create potential problems for travel (Tiedeman 1978).

Stands are moderately suitable for dispersed recreation, but unsuitable for developed recreation or construction. Because aspen is a conspicuous component of the overstory, stands are not suitable for campgrounds. Consequent damage to the aspen trees often leads to increased disease and death. Aspen forests in this series are rated as very susceptible to trampling damage by humans (Cole 1985). However, there are many revegetation options in these stands due to high soil fertility and moisture availability (Tiedeman 1978). Plantings should be on the contour, and must be protected from herbivores by fencing or other barriers (Tiedeman 1978).

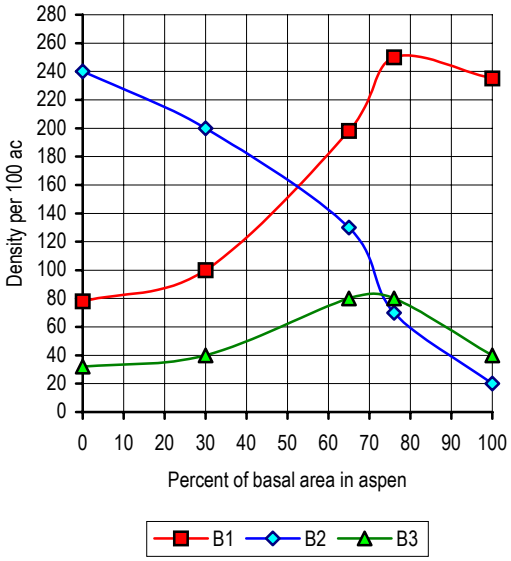

Figure 10-8. Bird groups in aspen.

Group B1 includes birds positively correlated with aspen basal area -- northern flicker, black-capped chickadee, house wren, American robin, warbling vireo, yellow-rumped warbler, and dark-eyed junco.

Group B2 includes birds negatively correlated with aspen basal area –
hairy woodpecker, gray jay, mountain chickadee, red-breasted nuthatch, brown creeper, golden-crowned kinglet, ruby-crowned kinglet, hermit thrush, western tanager, pine grosbeak, and pine siskin.

Group B3 includes birds of other habitats loosely correlated with aspen basal area -- western wood-pewee, flycatchers, chipping sparrow, song sparrow, white-crowned sparrow, house finch, yellow-bellied sapsucker, Williamson's sapsucker, downy woodpecker, three-toed woodpecker, olive-sided flycatcher, tree swallow, violet-green swallow, Steller's jay, white-breasted nuthatch, and Cassin's finch (Scott and Crouch 1988b).

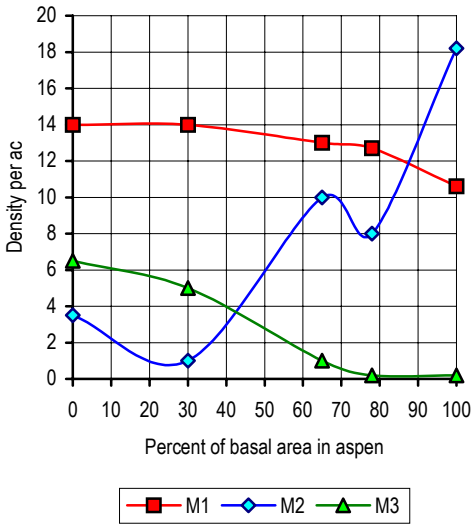

Figure 10-9. Mammal groups in aspen.

Group M1 includes mammals caught in 100 trap nights –
least chipmunk, deer mouse, southern red-backed vole, montane vole, and long-tailed vole.

M2 shows the number of new pocket gopher mounds per acre.

M3 shows the number of red squirrel caches per acre (Scott and Crouch 1988b).

Table 10-3. Plants which decrease, increase, or show little effect under livestock grazing in aspen stands (Houston 1954, Johnston & Hendzel 1985)

GF	Species	Common Name	Comments
	DECREASERS		
S	*Acer glabrum*	Rocky Mtn. maple	Palatable
F	*Aconitum columbianum*	monk's hood	Poisonous to livestock
S	*Amelanchier alnifolia*	serviceberry	Palatable
F	*Aster engelmannii*	Engelmann aster	Not very palatable
G	*Bromopsis spp.*	brome	Palatable
F	*Delphinium barbeyi*	tall larkspur	Poisonous to livestock
G	*Elymus glaucus*	blue wildrye	Not very palatable
G	*Elymus trachycaulus*	slender wheatgrass	Moderate palatability
G	*Festuca thurberi*	Thurber fescue	Palatable
F	*Frasera speciosa*	monument plant	Moderate palatability
F	*Galium septentrionale*	northern bedstraw	Somewhat palatable
F	*Heracleum sphondylium*	cow-parsnip	Palatable
F	*Lathyrus leucanthus*	aspen peavine	Moderate palatability
F	*Ligusticum porteri*	osha	Palatable
F	*Polemonium spp.*	polemonium	
S	*Ribes spp.*	currants	
F	*Senecio serra*	butterweed	
F	*Osmorhiza spp.*	sweetroot	Palatable
F	*Maianthemum stellatum*	star Solomon-plume	Not palatable
F	*Valeriana spp.*	valerian	Palatable
F	*Vicia americana*	American vetch	Palatable
	INCREASERS		
F	*Achillea lanulosa*	yarrow	Unpalatable
-	*Artemisia spp.*	sagebrush or sage	Either shrub or forb
F	*Aster spp.*	aster	
F	*Chamerion angustifolia*	fireweed	
S	*Chrysothamnus spp.*	rabbitbrush	
F	*Cirsium spp.*	thistle	
F	*Collomia linearis*	slender-leaf collomia	
F	*Descurainia spp.*	Tansy mustard	
F	*Dugaldia hoopesii*	orange sneezeweed	Poisonous to cattle
F	*Fragaria spp.*	strawberry	
F	*Gayophytum spp.*	ground smoke	
F	*Geranium spp.*	geranium	
F	*Ipomopsis aggregata*	trumpet gilia	
F	*Lactuca serriola*	false-lettuce	
F	*Lepidium spp.*	peppergrass	
F	*Madia glomerata*	tarweed	
F	*Oligosporus spp.*	wild tarragon	
F	*Orthocarpus luteus*	owl clover	
F	*Polygonum douglasii*	Douglas knotweed	
F	*Potentilla spp.*	cinquefoil	
F	*Ranunculus spp.*	buttercup	
S	*Rosa woodsii*	Woods rose	Palatable; resistant to grazing
F	*Rumex spp.*	dock	
F	*Senecio spp.*	groundsel	
G	*Stipa spp.*	needlegrass	These spp. usually not palatable (incl. *Achnatherum, Hesperostipa*)
F	*Taraxacum officinale*	dandelion	Palatable but too low to graze
F	*Urtica gracilis*	stinging nettle	Poisonous
F	*Wyethia spp.*	mule's ears	
	NEUTRAL SPECIES		
F	*Aquilegia coerelea*	Colorado columbine	
G	*Carex geyeri*	elk sedge	
F	*Castilleja spp.*	paintbrush	
F	*Erigeron spp.*	fleabane	Some species decrease, some species increase
G	*Festuca idahoensis*	Idaho fescue	Palatable; prefers open areas
F	*Gentiana spp.*	gentian	
S	*Mahonia repens*	Oregon-grape	
S	*Paxistima myrsinites*	pachistima	
T	*Populus tremuloides*	aspen (sprouts)	Palatable, especially to elk
S	*Padus virginanus*	chokecherry	Palatable; prefers open areas
F	*Pteridium aquilinum*	bracken fern	Somewhat poisonous?
S	*Sambucus spp.*	elderberry	Preferred by elk
S	*Symphoricarpos rotundifolius*	mtn. snowberry	Stimulated by fire
F	*Veratrum tenuipetalum*	false-hellebore	Heavy soil, ponded water

Key to Ecological Types in the Aspen Series

1. Douglas-fir (PSME) > 0.5% cover and reproducing ..... *See Key to Douglas-Fir Series*
1. Douglas-fir usually absent or rarely < 0.5 % ..... (2)

2. Subalpine fir (ABBI2) or Engelmann spruce > 0.5% cover and reproducing..... *See Key to Fir-Spruce Series*
2. Subalpine fir and Engelmann spruce usually absent or rarely < 0.5% cover ..... (3)

3. Pachistima (PAMY), kinnikinnick (ARUV), or buffaloberry (SHCA) > 2% cover. Mostly light-colored soils, some dark surface (Mollic) soils..... (4)
3. Pachistima, kinnikinnick, and buffaloberry usually absent or rarely < 1%. Dark surface soils.....(5)

4. Light-colored soils (Cryochrepts, Cryoboralfs, and so on). Thurber fescue absent to minor, < 3%..... ..... *See Lead 8 in Key to Fir-Spruce Series*
4. Dark-surface soils (Mollisols). Thurber fescue prominent, > 10% FM2

5. Rocky Mountain whortleberry (VAMYO) or dwarf bilberry (VACE) > 1% ..... *See Key to Fir-Spruce Series*
5. Rocky Mountain whortleberry or dwarf bilberry almost always absent, rarely < 1%..... (6)

6. Saskatoon serviceberry (AMAL2) > 3%, often > 5%. Snowberry (SYRO) usually present, often > 10% cover. Deep to very deep (avg. 80 cm) soils. Lower elevations, 8,000-9,700 ft FM1
6. Saskatoon serviceberry absent to rarely < 2%. Snowberry absent or present, but if serviceberry present then snowberry always < 5%. Moderately deep to very deep soils. Elevations up to 10,400 ft .....(7)

7. Thurber fescue always > 2%, usually > 10%. Blue wildrye (ELGL) absent or rarely < 15%. Moderately deep to deep (avg. 53 cm) soils, rarely with a clay layer (Argillic). General elevations, 8,000-10,400 ft FM2
7. Thurber fescue usually absent, rarely < 1%. Blue wildrye sometimes > 20%. Deep to very deep (average 70 cm) soils, usually with a clay layer (Argillic). Upper elevations, 9,100-10,100 ft FM3

Table 10-4. Characteristics of Ecological Types within Ecological Series 10 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 Gramin. Forbs	Total Live Cover, % No. Species TLC/NS, %
FM1 Aspen/serviceberry–Deep dark soils	16	8,956 (8,060-9,700)	5 (0.25) 19 (7-30)	36 (9-64)	83 (33-170) 47 (9-170)	3 (0-17) 3 (0-10)	66 (30-93) 68 (22-120) 78 (6-180) 49 (1-121)	262.8 (175.0-403.9) 26 (11-42) 12.0 (5.3-26.8)
FM2 Aspen/Thurber fescue–Deep dark soils	32	9,561 (8,060-10,380)	224 (0.17) 13 (1-36)	35 (4-72)	53 (33-97) 39 (18-66)	3 (0-17) 2 (0-10)	63 (6-96) 34 (0-104) 112 (44-200) 102 (20-231)	311.6 (145.8-545.0) 21 (12-38) 17.7 (5.4-32.9)
FM3 Aspen/meadow-rue-peavine–Deep dark clay soils	9	9,714 (9,140-10,080)	95 (0.65) 25 (7-50)	41 (24-46)	70 (26-92) 48 (12-88)	2 (0-17) 2 (0-10)	74 (35-91) 8 (0-31) 107 (41-178) 144 (75-280)	333.4 (185.5-491.0) 24 (13-34) 14.7 (9.5-30.7)

Aspen/serviceberry–Deep Argiborolls–
Gentle to moderate slopes and slumps, 8,000-9,700 ft

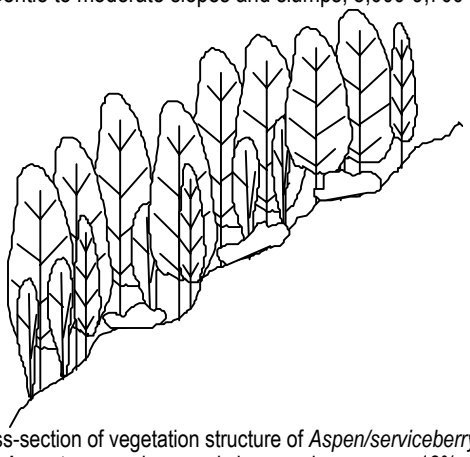

Figure 10-10. Cross-section of vegetation structure of *Aspen/serviceberry–Deep dark soils*. Aspects are various, and slope angles average 18%.

Aspen/serviceberry–Deep dark soils is a common type on protected slopes and slumps in the lower Montane belt, in areas with deep, dark (Mollic) soils, usually outside the deep rainshadows. This type has also been described from throughout the area of potential aspen (Johnston and Hendzel 1985): southeastern Wyoming, throughout the mountains of western Colorado, and in northern New Mexico and northern Utah.

Aspen/serviceberry–Deep dark soils is characterized by aspen (POTR5) and Saskatoon serviceberry (AMAL2). Many stands have snowberry (SYRO) and elk sedge (CAGE2) in the understory. Other distinguishing features include the lack of conifers and moderately coarse Frigid soils. See Table 10-8 for common species names and codes.

Typically, *Aspen/serviceberry–Deep dark soils* occurs as moderately dense stands of short aspen on moderate to steep slopes. In good (unbrowsed) condition, these stands have a conspicuous tall shrub layer of serviceberry and a medium shrub layer of snowberry. Herbaceous understories are often dense and varied, though not as much as in the other two aspen types. Occasionally a single isolated Douglas-fir (PSME) may occur, but never as regeneration. Other conifers are absent.

The plant association *Populus tremuloides/ Amelanchier alnifolia* has been documented by Mueggler (1982) and Baker (1982). Most of the stands in the UGB are the typical phase of this plant association. *Populus tremuloides/ Amelanchier alnifolia* phase *Padus virginiana,* is described as new here, based on *Populus tremuloides/Prunus virginiana* (Youngblood 1981). *Populus tremuloides/ Amelanchier alnifolia* phase *Pteridium aquilinum* is also described as new here, based on *Populus tremuloides/Pteridium aquilinum* (Powell 1985, Bunin 1975).

Aspen/serviceberry–Deep dark soils is related to *Douglas-fir/serviceberry–Steep northerly*, which occurs at the same elevations, but on coarser, shallower, less-Mollic soils. *Aspen/serviceberry–Deep dark soils* is also related to *Aspen/Thurber fescue–Deep dark soils*, which occurs on colder, higher elevation sites, with cold (Cryic) soils, and lacks serviceberry, but has Thurber fescue. *Aspen/serviceberry–Deep dark soils* is also related to *Utah serviceberry/sedge–Dark clay soils–Leeward*, which occurs more consistently on somewhat steeper leeward (easterly) slopes with somewhat coarser soils. The two often occur on adjacent sites. *Aspen/serviceberry–Deep dark soils* is also related to *Aspen-cottonwood–Deep alluvial soils–Floodplains*, which occurs on alluvial soils in bottomlands, sometimes associated with cottonwood.

Big sagebrush communities occur adjacent to this type on gentler slopes. Douglas-fir/ serviceberry communities adjoin this type on steep, northerly slopes with shallower, coarser soils. Serviceberry shrublands border this type on concave shoulders, and tall willow riparian communities occur in adjacent bottoms. Cottonwood or blue spruce-cottonwood communities are found in bottoms at lower elevations.

Aspen regeneration is rapid in this type. Aspen quickly moves in to establish a new (relatively short) overstory. The primary disturbances are browsing on aspen sprouts, aspen bark, and serviceberry shrubs by elk, deer, and to a limited extent, cattle. In very early seral to early seral stages, these stands have no aspen overstory, but are composed of aspen sprouts. Unpalatable shrubs

such as sagebrush, rabbitbrush, and snowberry make up most of the shrub cover, but there are no tall shrubs except heavily-browsed remnants. At most serviceberry is one age class. In early midseral to midseral stages, the aspen overstory is established, with shrubs absent to sparse, and palatable graminoids sparse to absent. There is still only one age-class of serviceberry. In late midseral stages, the aspen overstory is associated with sparse, tall serviceberry, good cover of snowberry, and some palatable graminoids. This stage lacks some age-classes of serviceberry which are short enough for animals to reach. In the late seral to potential natural community, the aspen overstory coexists with a well-developed tall shrub layer of serviceberry with a good age-class distribution, a medium-shrub layer of snowberry, and conspicuous palatable graminoids.

Moderately-heavy to heavy grazing by cattle, sheep, deer, or elk tends to decrease serviceberry and graminoid cover. Some of the stands in this type in the UGB have been depleted by wildlife browsing (especially in community type C). Horizontal obstruction varies from moderate to very high, typically high to very high; see Table 10-5. Deer use these stands a great deal during all seasons because cover and browse are typically ample. These stands are critical habitat for deer, second in importance only to serviceberry shrublands. Managers should take care to maintain and increase the acreage of this type (especially community type A) in good condition to ensure the recovery of deer populations.

Elk also use these stands, especially during mild winters and on spring-fall range. Elk often eat aspen bark; in heavily used areas, they damage significant proportions of the bark on individual trees, eventually killing the stems. This has resulted in the death of whole aspen clones in a few stands in the UGB.

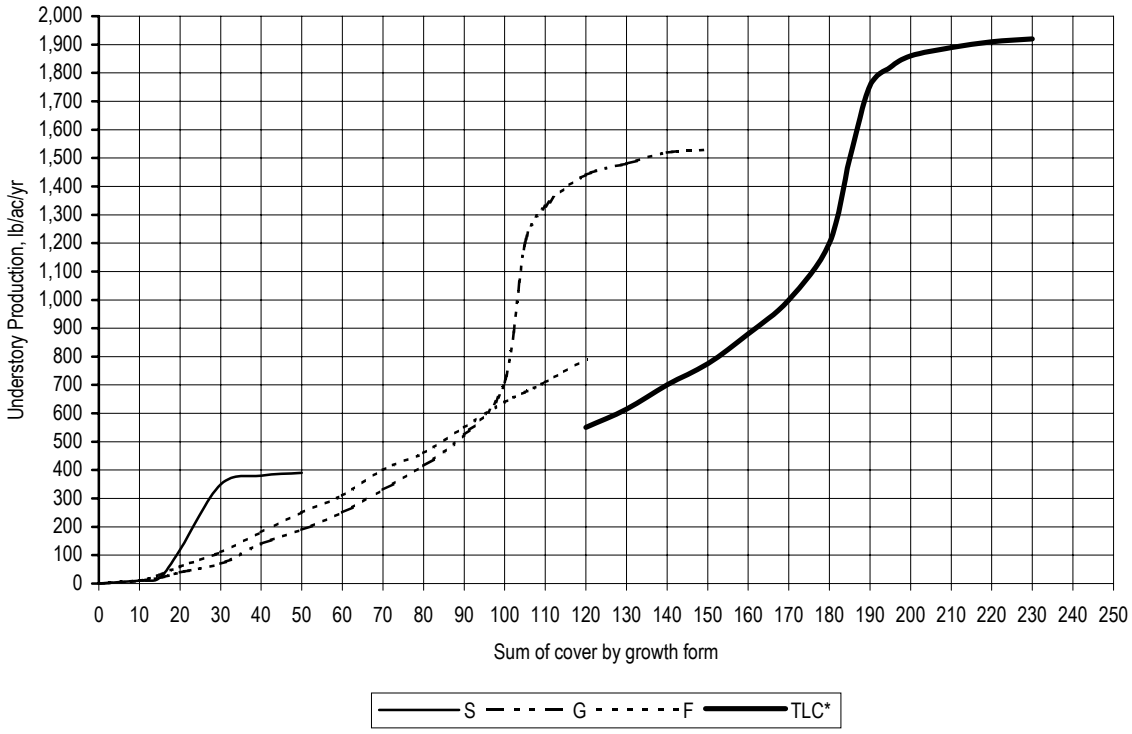

Figure 10-11. Relationship between cover and understory production. This is the POTRFETH (POTR5-FETH) model. S = Shrubs, G = Graminoids, F = Forbs, TLC* = Total Live Cover (no trees)

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	19, soil descriptions from 5 of these (total 19)
ELEVATION	8,971 ft (8,060-9,700 ft); 2,734 m (2,457-2,956 m)
AVERAGE ASPECT	13°M (r = 0.14)
LITHOLOGY	Various clay-producing lithologies, such as shale, breccia, soft granite, gneiss, tuff, or sandstone
FORMATIONS[1]	Various
LANDFORMS	Soil creep slopes [50%] or slump-earthflows [33%]
SLOPE POSITIONS	Backslopes, shoulders, or summits
SLOPE SHAPES	Mostly linear horizontally and vertically
SLOPE ANGLE	17.5% (5-30%)
SOIL PARENT MATERIAL	Colluvium [60%]
COARSE FRAGMENTS	4.2% (0-21%) cover on surface, 36.6% (9-64%) by volume in soil
SOIL DEPTH	80 cm (33-170 cm); 31.4 in (13-67 in)
MOLLIC THICKNESS	47 cm (9-170 cm); 18.5 in (4-67 in)
TEXTURE	Various surface textures (clay loam-organic-loam-silt loam); Subsurfaces various textures (clay loam-clay-sandy loam-loamy sand-sandy clay loam)
SOIL CLASSIFICATION	Argiborolls [80%]. deep to very deep
TOTAL LIVE COVER	254.9% (125.0-403.9%)
NO. SPECIES	27.7 (11-53)
TOTAL LIVE COVER/NO. SPECIES	11.7% (3.4-26.8%)
CLIMATE	Moderately cool, moist forest
WATER	There is always some water in a typical stand, in the plants and in the soil. The aspen cover, layer of litter, and soil organic matter hold much moisture and maintain it through the year.

Table 10-5. Wildlife values (relative to the whole UGB) for the principal wildlife species using *Aspen/serviceberry–Deep dark soils*.

CT	Mule Deer Season–Preference	Elk Season–Preference
A	Winter, Mild– High to Very High (Cover, Browse, Forage) Winter, Severe– Moderate (Cover, Browse, Forage) Spring/Fall– High to Very High (Cover, Browse, Forage)	Winter, Mild– Mod. High (Cover, Browse, Forage) Winter, Severe– Moderate (Cover, Browse, Forage) Spring/Fall– High to Very High (Cover, Browse, Forage)
B, D	Winter, Mild– Mod. High (Cover, Browse, Forage) Winter, Severe– Moderate (Cover, Browse, Forage) Spring/Fall– High (Cover, Browse, Forage)	Winter, Mild– Mod. High (Cover, Browse, Forage) Winter, Severe– Moderate (Cover, Browse, Forage) Spring/Fall– High (Cover, Browse, Forage)
C	Winter, Mild– Mod. High (Cover, Browse, Forage) Winter, Severe– Mod, Low (Cover, Browse, Forage) Spring/Fall– Moderate (Cover, Browse, Forage)	Winter, Mild– Mod. High (Cover, Browse, Forage) Winter, Severe– Mod, Low (Cover, Browse, Forage) Spring/Fall– Moderate (Cover, Browse, Forage)

An example of aspen/serviceberry (Community Type C), but missing the tall shrubs. Notice the heavy browsing on aspen bark by elk, which is apparently the major reason for the demise of serviceberry in this stand as well. Aspen 90% cover, elk sedge 88%, Woods rose 59%, aspen peavine 30%, snowberry 14%. The medium shrub is mountain snowberry, which will nearly disappear as Douglas-fir increases in canopy dominance. Heavy elk browsing on the aspen bark. Coarse Fragments Cover = 0%, Total Live Cover = 362%, Coarse Fragments in Soil = 43. Soil sampled as a Typic Eutroboralf, Loamy-Skeletal or Clayey-Skeletal. West Elk Peak SW Quadrangle, elevation 9,380 ft, 8% 186° (S) slope. September 12, 1995.

Key to Community Types

1. Serviceberry >25% cover..... **A**
1. Serviceberry absent or <25%, often <15% ..... (2)

2. Serviceberry absent or <2% cover .....**C**
2. Serviceberry >2% cover, often >5%..... (3)

3. Rose (ROWO) prominent, >3% cover. Common juniper (JUCO6) absent or <4% cover..... **B**
3. Rose absent to <3% cover. Common juniper evident, >4% cover ..... **D**

Description of Community Types

A *Aspen-Saskatoon serviceberry* is dominated by aspen, with serviceberry cover at >25%. The conspicuous tall shrub layer includes serviceberry and sometimes chokecherry (PAVI11), at as much as 45% cover. Elk sedge is sometimes absent.

B *Aspen-rose-sparse serviceberry-elk sedge-brome* Serviceberry is present under the aspen canopy, but at <20% cover. Rose is conspicuous with 3-40% cover. Elk sedge is always present.

C *Aspen-snowberry-wheatgrass* is dominated by aspen, but serviceberry is absent or <1% cover. Snowberry cover is >10%. Rose and elk sedge may be absent or prominent.

D *Aspen-common juniper-snowberry-sparse serviceberry* Common juniper is prominent at >4% cover under the aspen canopy. Snowberry cover is 5-50%. Elk sedge cover is >20%.

Communities Not Assigned to a Community Type

- Aspen forms a sparse canopy in an open forest community. Some serviceberry and snowberry are evident, along with sun-loving species such as big sagebrush, rabbitbrush, and dryland sedges. The aspen overstory was removed in the past and is now regenerating.
- This community has a dense aspen canopy and sparse shrubs. The herbaceous layer is dominated by invaders such as Kentucky bluegrass and smooth brome. These are stands that have been browsed and grazed heavily, so as to remove the shrubs entirely.
- Browsing by elk and deer has removed the aspen (possibly permanently) and reduced this community to unpalatable shrubs such as sagebrush and shrubby cinquefoil (PEFL15).

Table 10-6. Community types within *Aspen/serviceberry–Deep dark soils*.

Community Type	No. samples	Elevation, ft Slope, %	Coarseness, % Depth, cm Mollic Depth, cm	Surface Coarse, % Bare, % Seral Stage	Layer Height, m Lr	Avg Layr Cvr %	Cover, %: Trees Shrubs Gramin. Forbs	No. Species Total Live Cover, % TLC/NS, %	Prod.[1], lb/ac/yr Shrubs Graminoids Forbs	Obstruct'n %: 1.5-2.0 m 1.0-1.5 m 0.5-1.0 m 0.0-0.5 m Total<2m
A. Aspen-Saskatoon serviceberry	6	8,393 (8,060-8,600) 22.1 (15-30)	23 (20-26) 113 (56-170) 113 (56-170)	1 (0-1) 4 (4-4) LS	T1 12 (5-16) S1 2.6 (1.5-4.0) T2 2.4 (1.0-5) S2 1.1 (0.3-2.0) T3 0.6 (0.0-1.2) GF 0.4 (0.0-0.9) S3 0.3 (0.0-0.8)	88.7 9.9 0.4 38.1 1.6 72.2 44.7	69 (30-93) 85 (54-120) 78 (6-180) 45 (20-68)	24 (11-42) 277 (175-401) 14.8 (6.4-26.8)	405-447 3-1620 77-390	75 (50-100) 73 (50-95) 88 (75-100) 98 (95-100) 83 (68-99)
B. Aspen-rose-sparse serviceberry-elk sedge-brome	5	9,404 (9,080-9,700) 20.4 (10-30)	42 (19-56) 65 (33-84) 31 (14-43)	7 (1-17) 0 (0-4) MS	T1 8 (5-12) S1 Missing T2 4 S2 0.7 (0.4-1.4) T3 1.1 (0.1-2.0) GF 0.4 (0.0-0.9) S3 0.2 (0.0-0.4)	57.2 M 13.0 9.8 7.3 92.7 26.2	63 (32-87) 54 (25-96) 85 (75-101) 47 (1-119)	32 (26-39) 250 (177-404) 8.2 (5.3-15.5)	245-439 500-883 5-767	25 (0-50) 33 (0-55) 45 (0-90) 79 (50-100) 45 (13-71)
C. Aspen-snowberry-wheatgrass	3	8,913 (8,440-9,380) 8.5 (7-11)	64 42 9	2 (1-3) 8 (5-10) EM	*		80 (65-90) 55 (22-73) 61 (29-126) 47 (33-73)	24 (20-28) 256 (190-362) 11.1 (7.6-18.1)	214-434 14-1204 145-422	40 35 55 100 57
D. Aspen-common juniper-snowberry-sparse serviceberry	2	8,530 (8,530-8,530) 30.5 (30-30)	9 150 36	* 0 EM-ES	T1 14 S1 Missing T2 5 S2 0.6 (0.3-0.9) T3 Missing GF 0.5 (0.0-1.1) S3 0.2 (0.0-0.3)	87 M T 22 M 70 35	44 (40-49) 67 (65-70) 81 (56-106) 72 (23-121)	24 (14-34) 264 (192-336) 14.8 (5.7-24.0)	426-431 242-940 90-778	20 0 20 70 28

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

Table 10-7. Resource Values for *Aspen/serviceberry–Deep dark soils*. Resource values were calculated from the numbers in Table 10-6, 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**	**D**	**Resource Value**	**A**	**B**	**C**	**D**
Potential Cattle Forage Production	4-5	4-5	3-5	4-5	Deer & Elk Forage & Browse	5-6	3-4	3	4-5
Grazing Suitability	3-4	3-4	3	3-4	Need for Watershed Protection	5	5	5	5
Potential Timber Production (POTR5)	5	4-5	5	3-4	Soil Stability	2	2	2	2
Timber Suitability	3-4	3-4	4-5	3-4	Risk of Soil Loss-Natural	4	4	4	4
Developed Recreation	1	1	1	1	Risk of Soil Loss-Management	4	4	4	4
Dispersed Recreation	2-3	2-3	2-3	2-3	Risk of Permanent Depletion-Range	4	4	4	4
Scenic	4-5	4-5	3-4	4-5	Risk of Permanent Depletion-Wildlife	4-5	4	3-4	3
Road & Trail Stability	2	2	2	2	Risk of Permanent Depletion-Timber	2	2	2	2
Construction Suitability	1	1	1	1	Resource Cost of Management	5	4	4	4
Deer & Elk Hiding Cover	5-6	3-5	5	3	Cost of Rehabilitation	2	2	2	2

A typical view in aspen/Saskatoon serviceberry (Community Type A), here mixed with chokecherry, typically on moderate to steep slopes and with short trees of poor form. Aspen 95%, valley sedge 49%, chokecherry 44%, Saskatoon serviceberry 30%, meadow-rue 14%, snowberry 9%. Coarse Fragments Cover = 1%, Total Live Cover = 267%, Coarse Fragments in Soil = 38. Soil sampled as a Cumulic Haploboroll, Fine-Loamy, Mixed. Flat Top Quadrangle, elevation 8,520 ft, 15% 074° (E) slope. June 15, 1994.

Table 10-8. Common Species in *Aspen/serviceberry–Deep dark 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	D	
		Ccv (Con)	Ccv (Con)	Ccv (Con)	Ccv (Con)	
Code	Species	N = 6	5	3	2	Common Name
	TREES					
POTR5	Populus tremuloides	69 (100)	63 (100)	80 (100)	44 (100)	quaking aspen
	SHRUBS					
AMAL2	Amelanchier alnifolia	37 (100)	7 (100)	T (33)	7 (100)	Saskatoon serviceberry
CHVI8	Chrysothamnus viscidiflorus	– –	1 (60)	– –	T (50)	Douglas rabbitbrush
JUCO6	Juniperus communis	4 (33)	1 (60)	– –	32 (100)	common juniper
MARE11	Mahonia repens	13 (50)	6 (60)	– –	– –	Oregon-grape
PAVI11	Padus virginiana	15 (83)	T (20)	6 (33)	1 (50)	common chokecherry
PAMY	Paxistima myrsinites	2 (17)	21 (20)	– –	– –	mountain-lover
ROWO	Rosa woodsii	22 (67)	25 (100)	31 (67)	1 (50)	Woods rose
SYRO	Symphoricarpos rotundifolius	14 (83)	16 (80)	30 (100)	25 (100)	mountain snowberry
	GRAMINOIDS					
ACLE9	Achnatherum lettermanii	– –	2 (20)	18 (33)	– –	Letterman needlegrass
ACNE9	Achnatherum nelsonii	5 (33)	13 (20)	– –	1 (50)	Nelson's needlegrass
BRCA10	Bromopsis canadensis	T (17)	14 (100)	4 (67)	T (50)	fringed brome
CAGE2	Carex geyeri	57 (67)	42 (100)	54 (67)	31 (100)	elk sedge
ELEL5	Elymus elymoides	15 (33)	8 (40)	– –	– –	bottlebrush squirreltail
ELTR7	Elymus trachycaulus	– –	T (40)	12 (100)	– –	slender wheatgrass
FETH	Festuca thurberi	8 (33)	23 (40)	– –	5 (50)	Thurber fescue
KOMA	Koeleria macrantha	10 (17)	8 (40)	– –	T (50)	prairie junegrass
POFE	Poa fendleriana	30 (17)	22 (40)	8 (33)	7 (50)	muttongrass
PONE2	Poa nervosa	15 (17)	– –	– –	– –	Wheeler bluegrass
POPR	Poa pratensis	39 (50)	T (20)	– –	80 (50)	Kentucky bluegrass
	FORBS					
ACLA5	Achillea lanulosa	2 (67)	3 (100)	8 (100)	16 (100)	western yarrow
ARCO9	Arnica cordifolia	– –	38 (20)	– –	– –	heartleaf arnica
ASTRA	Astragalus	10 (17)	T (20)	– –	30 (50)	milkvetch
CALI4	Castilleja linariifolia	6 (33)	T (40)	– –	5 (50)	Wyoming paintbrush
ERSP4	Erigeron speciosus	10 (17)	14 (20)	1 (67)	– –	Oregon fleabane
ERSU2	Erigeron subtrinervis	– –	9 (60)	– –	T (50)	threenerve fleabane
GASE6	Galium septentrionale	7 (33)	1 (60)	3 (67)	4 (50)	northern bedstraw
GERI	Geranium richardsonii	16 (33)	1 (60)	2 (100)	5 (50)	Richardson geranium
LALE2	Lathyrus leucanthus	9 (33)	13 (60)	29 (33)	– –	aspen peavine
LUAR3	Lupinus argenteus	6 (67)	9 (40)	2 (33)	1 (50)	silvery lupine
MAST4	Maianthemum stellatum	3 (33)	2 (40)	2 (33)	– –	star Solomon-plume
OSDE	Osmorhiza depauperata	4 (33)	– –	2 (67)	– –	sweet cicely
PSMO	Pseudocymopterus montanus	T (17)	1 (60)	– –	– –	mountain parsely
TAOF	Taraxacum officinale	1 (33)	3 (60)	– –	50 (50)	common dandelion
THFE	Thalictrum fendleri	13 (50)	5 (60)	4 (67)	3 (50)	Fendler meadow-rue
VIAM	Vicia americana	7 (50)	11 (60)	9 (67)	– –	American vetch
	FERNS & FERN-ALLIES					
PTAQ	Pteridium aquilinum	– –	– –	40 (33)	– –	bracken
	GROUND COVER					
.BARESO	bare soil	4 (17)	T (40)	8 (67)	T (50)	
.LITTER	litter and duff	98 (50)	93 (100)	94 (100)	99 (50)	
GRAVEL	gravel 0.2-10 cm	T	T	–	–	
.COBBLE	cobble 10-25 cm	1 (17)	1 (20)	– –	– –	
.STONES	stone > 25 cm	– –	9 (40)	– –	– –	
.MOSSON	moss on soil	– –	– –	– –	– –	
LICHENS	lichens on soil	4	–	2	–	

Aspen/Thurber fescue–Deep Cryoborolls–
Gentle to moderate slopes and slumps, 8,100-10,400 ft

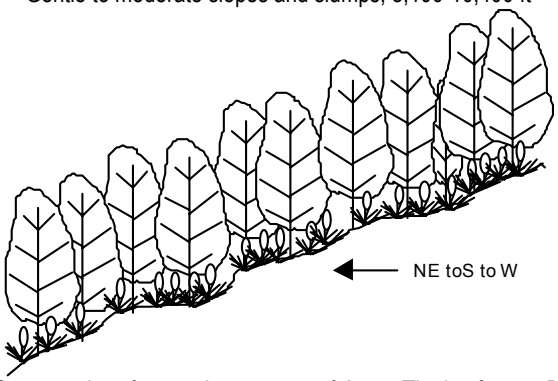

Figure 10-12. Cross-section of vegetation structure of *Aspen/Thurber fescue–Deep dark soils*. Aspects are non-northerly, and slope angles average 12%.

Aspen/Thurber fescue–Deep dark soils is a moderately common type on gentle to moderate protected Subalpine slopes and benches, in areas with deep, dark (Mollic) soils outside the deep rainshadows. This type has also been described from the area of potential aspen (Johnston and Hendzel 1985) on the western slope of Colorado, and in northern Utah.

Aspen/Thurber fescue–Deep dark soils is characterized by aspen (POTR5), Thurber fescue (FETH), elk sedge (CAGE2), and yarrow (ACLA5). The lack of conifers and cold (Cryic), dark (Mollic) soils are also distinguishing features. See Table 10-12 for common species names and codes. *Aspen/Thurber fescue–Deep dark soils* occurs as a dense to moderately dense canopy of aspen, with the tall bunchgrass Thurber fescue conspicuous underneath.

Aspen/Thurber fescue–Deep dark soils is related to *Douglas-fir/Thurber fescue–Cold dark soils–Gentle*, which occurs on somewhat steeper slopes at higher elevations, on coarser soils, and supports Douglas-fir regeneration. *Aspen/Thurber fescue–Deep dark soils* is also related to *Aspen/serviceberry-snowberry–Deep dark soils*, which occurs at lower elevations, on somewhat steeper slopes with warmer (Frigid) soils, and features conspicuous serviceberry but lacks fescue. *Aspen/Thurber fescue–Deep dark soils* is also related to *Aspen/meadow-rue-peavine–Deep dark clay soils*, which occurs at higher elevations on soils with a clay (Argillic) layer, and features dense cover by forbs. *Aspen/Thurber fescue–Deep dark soils* is also related to *Thurber-Arizona fescues–Deep cold dark soils* and *Thurber-Idaho fescues–Deep cold dark soils*, which occurs at higher elevations on deeper, more clay (Argillic) soils, and which lacks trees. *Aspen/Thurber fescue–Deep dark soils* is further related to *Mountain sagebrush/ Thurber-Arizona fescues–Deep cold clay soils* and *Mountain sagebrush/Thurber-Idaho fescues–Deep loamy clay soils*, both of which lack trees and support sagebrush on more open sites. The plant association *Populus tremuloides/Festuca thurberi* was recognized by Hess (1981-1982) and Mueggler (1986). *Populus tremuloides/Festuca thurberi* phase *Symphoricarpos rotundifolius* is described as new here.

Thurber fescue is an obligate outcrosser; which means that plants must be close enough together for pollen to move from one plant to another in order to set seed. In addition, Thurber fescue seeds have naturally low viability. When Thurber fescue plants are on average 3-4 m (10-13 ft) or more apart, pollen apparently cannot transfer between plants, and the stand becomes non-reproductive. When the remaining Thurber fescue plants age and die, the species is lost from the site, increasing erosion potential and creating a permanent disclimax. Older Thurber fescue plants are not particularly palatable, unlike the other fescues in our region; however, young Thurber fescue plants are much more palatable than older plants.

As a consequence, populations where the individual Thurber fescue plants are 4 m (13 ft) or more apart are at high risk of loss of reproductive capability, which is exacerbated by the increased palatability of young plants. If the site is grazed, the few young plants produced may not survive. One of the best indicators of range health in older Thurber fescue stands is the relative abundance of young Thurber fescue plants.

One hypothesis is that these stands may be the result of an aspen clone invading a Thurber fescue grassland or a mountain big sagebrush/Thurber fescue shrubland, followed by development of equilibrium between the microclimate and vegetation. Sometimes another stand type occurs as an intermediate between this aspen type and Thurber fescue grasslands, but more often these stands occur without intermediates.

Another hypothesis is that some of these stands arose when a fir, Douglas-fir, or spruce stand with a

Thurber fescue understory lost its conifers due to fire or disease. In one of these stands, the aspen canopy was very healthy, with about 80% cover, and Thurber fescue was also healthy at 70-80% cover. A soil pit demonstrated about 60 cm (24 in) of dark, Mollic, highly organic soil, below which was a burned spruce log. Under the log was a light-colored, clay-rich horizon which looked like the typical Alfisol found under spruce-fir stands. The condition of the log indicated that it had burned about 200-250 yr before. If that date is accurate, aspen stands of this type can build a Mollic epipedon at the rate of about a foot per century. It is possible that many aspen soils have arisen within historical times.

In very early seral to early seral stages, no aspen overstory exists, but aspen is present as sprouts. Unpalatable, sun-loving shrubs such as sagebrush, rabbitbrush, and snowberry make up most of shrub cover. Palatable bunchgrasses are sparse.

In early midseral to midseral stages, a sparse aspen overstory develops, usually with sparse shrubs which are beginning to be shaded out. Thurber fescue is conspicuous, but shares dominance with a wide variety of forbs, some of which are sun-loving. By late midseral to potential natural community stages, a dense to patchy aspen overstory has developed, with a dense, well-developed understory of Thurber fescue. Some forbs are present, all of which are shade-tolerant.

Spruce-fir forests, some of which are dominated by aspen, adjoin this type on better-drained, shallower soils and steeper slopes. Serviceberry shrublands border this type on snow-deposition sites and steeper slopes. Mountain big sagebrush/Thurber fescue or Thurber fescue grasslands occur on adjacent better-drained, less-protected slopes and benches. Blue spruce or Engelmann spruce riparian areas occur in bottoms below.

Moderately-heavy to heavy grazing by cattle, sheep, deer, or elk decreases Thurber fescue, elk sedge, and bluegrass in stands. Horizontal obstruction varies from low to high, averaging moderate to moderately high. Deer and elk use these stands, though not as much as the two other aspen types. In most stands, there is good forage, though not much cover. Elk often eat aspen bark in these stands. In heavily used areas, they can damage significant proportions of the bark on individual stems, eventually killing them. In a few stands in the UGB, this has resulted in the death of the whole aspen clone. Deer and elk use of Community Types A and E is moderately low in mild winters for cover and forage, but very low in severe winters. Both species use these communities moderately during the spring through fall for cover, forage and overnight. Deer and elk make moderately low use of communities B, C, and D for forage during mild winters, though their use is very low in severe winters. Both species make moderately low use of these communities during spring through fall for forage and overnight stays.

Summary of Ecological Characteristics

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

NUMBER OF SAMPLES	32, soil descriptions from 5 of these (total 32)
ELEVATION	9,561 ft (8,060-10,380 ft); 2,914 m (2,457-3,164 m)
AVERAGE ASPECT	224°M (r = 0.17)
LITHOLOGY	Mostly sedimentaries: sandstone-shale-siltstone [70%], some of the finer-textured igneous: basalt-granite-gneiss [30%]
FORMATIONS[1]	Various
LANDFORMS	Soil creep slopes [67%] or slump-earthflows
SLOPE POSITIONS	Upper backslopes or backslopes
SLOPE SHAPES	Concave [50%] to linear horizontally, Linear vertically
SLOPE ANGLE	12.8% (1-36%)
SOIL PARENT MATERIAL	Colluvium
COARSE FRAGMENTS	2.0% (0-21%) cover on surface, 35.4% (4-72%) by volume in soil
SOIL DEPTH	53 cm (33-97 cm); 20.8 in (13-38 in)
MOLLIC THICKNESS	39 cm (18-66 cm); 15.4 in (7-26 in)
TEXTURE	Clay loam-loam [67%], organic, or clay surface; Clay loam-clay-sandy clay [86%] or silty clay loam subsurface
SOIL CLASSIFICATION	Cryoborolls, some Argic, some Pachic, deep to very deep
TOTAL LIVE COVER	311.6% (145.8-545.0%)
NUMBER OF SPECIES	21.2 (12-38)
TOTAL LIVE COVER/NO. SPECIES	17.7% (5.4-32.9%)
CLIMATE	Moderately cool to moderately cold, moist forest
WATER	There is some water always in a typical stand, in the plants and in the soil. The typically dense aspen cover, thick layers of litter, and high soil organic matter hold moisture and maintain it through the year.

Table 10-9. Wildlife values (relative to the whole UGB) for the principal wildlife species using *Aspen/Thurber fescue–Deep dark soils*.

CT	Mule Deer Season–Preference	Elk Season–Preference
A, E	Winter, Mild– Mod. Low (Cover, Forage) Winter, Severe– Very Low Spring/Fall– Moderate (Cover, Forage, Overnight)	Winter, Mild– Mod. Low (Cover, Forage) Winter, Severe– Very Low Spring/Fall– Moderate (Cover, Forage, Overnight)
B, C, D	Winter, Mild– Mod. Low (Forage) Winter, Severe– Very Low Spring/Fall– Mod. Low (Forage, Overnight)	Winter, Mild– Mod. Low (Forage) Winter, Severe– Very Low Spring/Fall– Mod. Low (Forage, Overnight)

Key to Community Types

1. Total graminoid cover >150% ..... (2)
1. Total graminoid cover <150% ..... (3)

2. Elk sedge always present, >20% cover ..... **A**
2. Elk sedge usually absent, sometimes <5% ..... **C**

3. Elk sedge usually absent, sometimes <5% ..... **C**
3. Elk sedge always present, 5-80% ..... (4)

4. Elk sedge >40%. Total graminoid cover >90% ..... (5)
4. Elk sedge <40%. Total graminoid cover 20-210% (6)

5. Thurber fescue >40% cover ..... **B**
5. Thurber fescue <40% cover ..... **D**

6. Thurber fescue >40% cover ..... (7)
6. Thurber fescue <40% cover ..... (9)

7. Elk sedge >30% cover ..... (8)
7. Elk sedge absent to <10% cover ..... (9)

8. Kentucky bluegrass (POPR) absent or <5% cover **E**
8. Kentucky bluegrass prominent, >15% cover ..... **B**

9. Total graminoid cover >90% ..... **D**
9. Total graminoid cover <90% ..... **E**

Description of Community Types

A *Aspen-Thurber fescue-elk sedge-dandelion* has Thurber fescue >10% and elk sedge >30%. Kentucky bluegrass is often >30% cover. Total graminoid cover is >150%.

B *Aspen-snowberry-Thurber fescue-elk sedge-Kentucky bluegrass-forbs* has Thurber fescue 40-50%, snowberry usually >10%, and elk sedge >30%. Kentucky bluegrass is >10% cover. Total graminoid cover is >150%.

C *Aspen-Thurber fescue-yarrow-dandelion* has Thurber fescue variable, 3-90% cover. Elk sedge is absent. Kentucky bluegrass is sometimes >40% cover. Total graminoid cover is 80-170%.

D *Aspen-elk sedge-Thurber fescue-yarrow* has Thurber fescue variable, 3-40% cover. Elk sedge is prominent, >40% cover. Kentucky bluegrass is usually absent, but rarely prominent. Total graminoid cover is 90-150%.

E *Aspen-Thurber fescue-elk sedge-yarrow* has Thurber fescue variable, 2-90% cover. Elk sedge is variable, 6-65% cover. Kentucky bluegrass is usually absent, but rarely <5%. Total graminoid cover is usually <90%, rarely <110%.

Table 10-10. Community types within *Aspen/Thurber fescue–Deep dark soils*.

Community Type	No. samples	Elevation, ft Slope, %	Coarseness, % Depth, cm Mollic Depth, cm	Surface Coarse, % Bare, % Seral Stage	Layer Height, m	Avg Layr Cvr %	Cover, %: Trees Shrubs Gramin. Forbs	No. Species Total Live Cover, % TLC/NS, %	Prod.[1], lb/ac/yr Shrubs Graminoids Forbs	Obstruct'n %: 1.5-2.0 m 1.0-1.5 m 0.5-1.0 m 0.0-0.5 m Total<2m
A. Aspen-Thurber fescue-elk sedge-dandelion	6	* *	* * *	* * LS-LM	*		61 (50-70) 37 (0-95) 171 (150-200) 169 (106-231)	15 (13-17) 437 (356-545) 29.4 (24.4-32.9)	0-439 1443-1668 674-1236	*
B. Aspen-snowberry-Thurber fescue-elk sedge-Kentucky bluegrass-forbs	2	9,700 4	* * *	* 0 LM	*		64 (58-70) 32 (5-60) 136 (127-145) 88 (75-102)	21 (16-26) 321 (292-350) 16.5 (11.2-21.9)	49-419 1220-1401 439-643	0 0 35 90 31
C. Aspen-Thurber fescue-yarrow-dandelion	7	9,353 (9,180-9,500) 13.0 (10-15)	30 89 43	3 * LM-MS	T1 12 T2 6 T3 0.8 S1 0.5 (0.3-0.7) GF 0.4 (0.0-0.8) S2 0.2 (0.0-0.3)	91 36 T 3 92 6	65 (35-96) 54 (8-95) 115 (80-170) 136 (61-205)	16 (12-26) 370 (253-480) 24.8 (9.7-32.9)	77-439 571-1576 336-1186	10 0 10 45 16
D. Aspen-elk sedge-Thurber fescue-yarrow	8	9,460 (9,070-9,680) 13.6 (1-36)	42 (22-72) 46 (38-56) 38 (27-46)	0 (0-3) * MS	T1 14 (7-21) T2 6 (2.0-8) T3 0.8 (0.3-0.9) S1 0.5 (0.1-1.2) GF 0.3 (0.0-1.3) S2 0.1 (0.0-0.3)	65.7 25.5 6.6 20.2 88.7 T	65 (6-90) 25 (6-39) 105 (85-141) 76 (20-141)	22 (13-29) 270 (178-346) 14.5 (6.5-26.2)	54-347 644-1359 79-911	17 (0-35) 4 (0-10) 10 (0-35) 67 (48-90) 24 (14-43)
E. Aspen-Thurber fescue-elk sedge-yarrow	9	9,694 (9,035-10,380) 13.3 (5-31)	31 (4-71) 53 (33-97) 39 (18-66)	4 (1-10) 2 (0-5) EM	T1 10 (3.5-15) T2 Missing T3 0.9 (0.2-2.5) S1 0.4 (0.1-0.5) GF 0.4 (0.0-1.2) S2 0.2 (0.0-0.3)	72 M 1 7 96 1	61 (23-95) 24 (1-104) 72 (44-109) 58 (25-98)	29 (20-38) 217 (146-300) 7.6 (5.4-11.1)	10-440 109-992 100-611	9 (0-25) 18 (5-25) 38 (0-90) 71 (40-100) 34 (21-54)

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

Table 10-11. Resource Values for *Aspen/Thurber fescue–Deep dark soils*. Resource values were calculated from the numbers in Table 10-10, 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				
Resource Value	**A**	**B**	**C**	**D**	**E**
Potential Cattle Forage Production	4	4	3-4	3-4	1-3
Grazing Suitability	3-4	3-4	3	3	2
Potential Timber Production (POTR5)	3-4	3-4	3-4	3-4	3-4
Timber Suitability	3-4	3-4	3-4	3-4	3-4
Developed Recreation	0-1	1	1	1	1
Dispersed Recreation	1-2	2	2	2	2
Scenic	4-5	4-5	4-5	4-5	4-5
Road & Trail Stability	1	1	1	1	1
Construction Suitability	0-1	0-1	0-1	0-1	0-1
Deer & Elk Hiding Cover	3-4	2	1	1-3	3-5
Deer & Elk Forage & Browse	4-5	4-5	4-5	3-4	4-5
Need for Watershed Protection	4	4	4	4	4-5
Soil Stability	1	1	1	1	1
Risk of Soil Loss-Natural	5	5	5	5	5
Risk of Soil Loss-Management	3-4	3-4	3-4	3-4	3-4
Risk of Permanent Depletion-Range	3	3	3	3	3
Risk of Permanent Depletion-Wildlife	2	2	2	2	2
Risk of Permanent Depletion-Timber	2	2	2	2	2
Resource Cost of Management	5	5	5	5	5
Cost of Rehabilitation	2	2	2	2	2

A typical view in aspen/Thurber fescue (Community Type E). Aspen 72% cover, Thurber fescue 59%, aspen peavine 22%, nodding brome 14%, slender wheatgrass 12%, meadow-rue 13%. Soil sampled as a Pachic Cryoboroll, Loamy-Skeletal, Mixed; the A3 horizon (22–35 cm deep) had much charcoal in it, and a burnt Engelmann spruce log was found at 56 cm. Below 56 cm, the soil looked a lot like the Cryoboralf under a typical fir-spruce stand. Judging by the apparent age of the spruce log, this 56 cm (22 in) of soil has been built in about 200–250 years, or about 1 cm of soil depth every 4 years. The litterfall from aspen and herbaceous plants is a major contributor to rapid soil development here. Rudolph Hill Quadrangle, elevation 10,160 ft, 31% 261° (WSW) slope. August 9, 1994.

Table 10-12. Common Species in *Aspen/Thurber fescue–Deep dark 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	D	E	
		Ccv(Con)	Ccv(Con)	Ccv(Con)	Ccv(Con)	Ccv(Con)	
Code	Species	N = 6	2	7	8	9	Common Name
	TREES						
POTR5	Populus tremuloides	61(100)	64(100)	65(100)	65(100)	61(100)	quaking aspen
	SHRUBS						
ARUV	Arctostaphylos uva-ursi	– –	– –	– –	T (13)	18 (22)	kinnikinnick
ARTRV	Artemisia tridentata ssp. vaseyana	15 (33)	30 (50)	25 (14)	5 (13)	– –	mountain big sagebrush
JUCO6	Juniperus communis	13 (83)	5 (50)	17 (86)	8 (38)	1 (22)	common juniper
MARE11	Mahonia repens	– –	– –	1 (14)	8 (50)	2 (44)	Oregon-grape
ROWO	Rosa woodsii	35 (33)	T (50)	19 (86)	13 (75)	12 (89)	Woods rose
SAMI15	Sambucus microbotrys	– –	– –	– –	– –	15 (11)	mountain red elderberry
SYRO	Symphoricarpos rotundifolius	13 (50)	14(100)	22 (71)	9 (63)	14 (44)	mountain snowberry
	GRAMINOIDS						
ACNE9	Achnatherum nelsonii	– –	9 (50)	5 (14)	4 (50)	3 (33)	Nelson's needlegrass
BRCA10	Bromopsis canadensis	18 (67)	3 (50)	20 (57)	5 (88)	3 (56)	fringed brome
CAFO3	Carex foenea	– –	– –	– –	20 (13)	8 (11)	silvertop sedge
CAGE2	Carex geyeri	50(100)	36(100)	– –	63(100)	25(100)	elk sedge
ELEL5	Elymus elymoides	18 (50)	10 (50)	20 (29)	– –	1 (22)	bottlebrush squirreltail
ELGL	Elymus glaucus	– –	– –	– –	14 (13)	– –	blue wildrye
ELTR7	Elymus trachycaulus	10 (17)	– –	T (14)	12 (25)	6 (56)	slender wheatgrass
FEID	Festuca idahoensis	20 (17)	– –	40 (14)	– –	28 (11)	Idaho fescue
FETH	Festuca thurberi	37(100)	46(100)	32(100)	18(100)	31(100)	Thurber fescue
HECO26	Hesperostipa comata	20 (17)	– –	– –	T (13)	– –	needle-and-thread
POA	Poa	– –	– –	60 (14)	T (13)	2 (22)	bluegrass
POPR	Poa pratensis	83 (67)	39(100)	71 (71)	80 (13)	3 (22)	Kentucky bluegrass
	FORBS						
ACLA5	Achillea lanulosa	34 (83)	25(100)	29(100)	12(100)	4(100)	western yarrow
ANPA4	Antennaria parvifolia	13 (33)	– –	– –	– –	– –	smallleaf pussytoes
ASAL7	Astragalus alpinus	27 (33)	– –	– –	20 (13)	– –	alpine milkvetch
ERCO24	Eremogone congesta	15 (33)	– –	25 (14)	– –	1 (22)	desert sandwort
ERIGE2	Erigeron	– –	– –	– –	– –	11 (33)	fleabane
ERSP4	Erigeron speciosus	13 (33)	16(100)	13 (29)	– –	1 (22)	Oregon fleabane
ERSU2	Erigeron subtrinervis	20 (17)	– –	– –	15 (13)	5 (22)	threenerve fleabane
FRVI	Fragaria virginiana	– –	– –	40 (14)	16 (50)	1 (11)	Virginia strawberry
GASE6	Galium septentrionale	27 (33)	– –	T (14)	1 (63)	2 (78)	northern bedstraw
GERI	Geranium richardsonii	10 (17)	10 (50)	12 (43)	13 (63)	3 (11)	Richardson geranium
HEQU2	Helianthella quinquenervis	1 (17)	– –	– –	1 (13)	5 (56)	nodding helianthella
HESP6	Heracleum sphondylium	– –	– –	– –	– –	14 (11)	cow-parsnip
HEVI4	Heterotheca villosa	– –	– –	– –	10 (13)	– –	hairy golden aster
LALE2	Lathyrus leucanthus	43 (50)	23 (50)	30 (29)	18 (88)	16 (89)	aspen peavine
LUAR3	Lupinus argenteus	33 (50)	– –	10 (29)	11 (63)	3 (56)	silvery lupine
PHMU3	Phlox multiflora	20 (17)	– –	– –	– –	– –	flowery phlox
POPU9	Potentilla pulcherrima	– –	– –	– –	T (38)	3 (44)	beauty cinquefoil
PSMO	Pseudocymopterus montanus	– –	2 (50)	– –	1 (38)	1 (78)	mountain parsely
TAOF	Taraxacum officinale	32(100)	12(100)	37(100)	15 (63)	3 (67)	common dandelion
THFE	Thalictrum fendleri	60 (17)	14 (50)	60 (14)	4 (50)	11 (78)	Fendler meadow-rue
THMO6	Thermopsis montana	– –	– –	– –	17 (13)	– –	golden banner
TRRE3	Trifolium repens	60 (17)	– –	60 (29)	– –	– –	white Dutch clover
VIAM	Vicia americana	40 (17)	2 (50)	24 (43)	5 (38)	6 (78)	American vetch
	GROUND COVER						
.BARESO	bare soil	– –	T (50)	– –	– –	2 (33)	
.LITTER	litter and duff	– –	100 (50)	96 (14)	98 (63)	94(100)	
GRAVEL	gravel 0.2-10 cm	–	–	–	–	T	
.COBBLE	cobble 10-25 cm	– –	– –	– –	– –	5 (33)	
.STONES	stone > 25 cm	– –	– –	3 (14)	T (25)	1 (33)	
.MOSSON	moss on soil	– –	– –	– –	– –	3 (22)	
LICHENS	lichens on soil	–	–	–	–	4	

Aspen/meadow-rue-peavine–Argic Pachic Cryoborolls–
Gentle to steep slopes, benches, and slumps, 9,100-10,100 ft

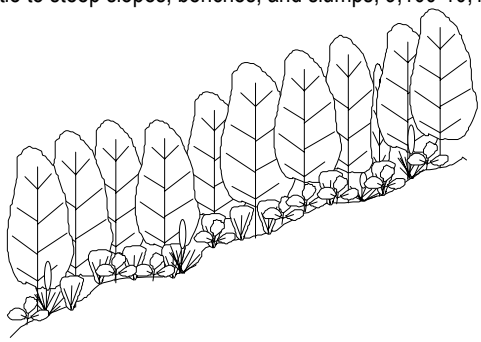

Figure 10-13. Cross-section of vegetation structure of *Aspen/meadow-rue-peavine–Deep dark clay soils*. Aspects are non-northerly, and slope angles average 12%.

Aspen/meadow-rue-peavine–Deep dark clay soils is a common type on protected Subalpine benches, slumps, and slopes with cold (Cryic) soils, outside the deep rainshadows. This type has also been described from other areas within the area of potential aspen (Johnston and Hendzel 1985) on the western slope of Colorado and in northern Utah.

Aspen/meadow-rue-peavine–Deep dark clay soils is characterized by aspen (POTR5) and elk sedge (CAGE2). Various forbs are dense in the understory, including osha (LIPO), aspen peavine (LALE2), vetch (VIAM), meadow-rue (THFE), and Richardson geranium (GERI). See Table 10-16 for common species names and codes. Other distinguishing features include a lack of conifers and Cryoboroll soils. *Aspen/meadow-rue-peavine–Deep dark clay soils* is typically a dense stand of tall, fast-growing aspen, under which there are many dense layers of graminoids and forbs. Total live cover averages 330%, and can be as much as 500%.

Aspen/meadow-rue-peavine–Deep dark clay soils is related to *Aspen/Thurber fescue–Deep dark soils*, which occurs on non-clay (non-Argillic) soils and has prominent Thurber fescue (FETH). *Aspen/meadow-rue-peavine–Deep dark clay soils* is also related to *Osha–Very deep heavy-clay soils*, which occurs on deeper, less-coarse soils. The plant association *Populus tremuloides/Thalictrum fendleri* has been documented by Boyce (1977), Hoffman (1980), Hess (1981-1982), and Youngblood (1981). *Populus tremuloides/Thalictrum fendleri* phase *Ligusticum porteri,* described as new here, is based on *Populus tremuloides/Ligusticum porteri* (Johnston 1985).

Moderately-heavy to heavy grazing by cattle, sheep, deer, or elk decreases palatable forbs such as osha, meadow-rue, and vetch. Grasses such as blue wildrye decrease more slowly under grazing pressure because they are less palatable than the forbs. Palatable bunchgrasses are sparse throughout succession. In very early seral to early seral stages, aspen is represented by young sprouts. Unpalatable, sun-loving shrubs such as sagebrush, rabbitbrush, and snowberry make up most of the shrub cover. Weedy, dry-site, sun-loving forbs and grasses such as Kentucky bluegrass are dominant.

In early midseral to midseral stages, the aspen overstory is sparse above usually sparse shrubs, which are beginning to be shaded out. The understory is a mixture of sun-loving and shade-tolerant forbs, while sun-loving graminoids (such as Kentucky bluegrass) are being replaced by more shade-tolerant species such as blue wildrye and brome. In late midseral to potential natural community stages, the aspen overstory is dense to patchy over a well-developed, multi-layered understory of moist-site, shade-tolerant forbs, grasses, and sedges.

Spruce-fir forests, some dominated by aspen, adjoin this type on better-drained, shallower soils and steeper slopes. Serviceberry shrublands occur on adjacent snow-deposition sites and steeper slopes. Mountain big sagebrush/Thurber fescue or Thurber fescue grasslands border this type on better-drained, less-protected slopes and benches. Blue spruce or Engelmann spruce riparian communities occur in bottoms below.

There is little horizontal obstruction, so hiding cover potential for deer and elk is poor. Deer and elk use of both communities is low in mild winters and very low in severe winters. Deer and elk make moderate use of community type A in spring through fall for cover, forage, and overnight stays; both species make moderately high use of community type B in spring through fall. Elk often eat aspen bark in these stands; in heavily used areas, they can damage significant quantities of aspen bark, leading eventually to the death of individual stems. There are a few stands in the UGB where this has resulted in the death of the whole aspen clone.

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	9, soil descriptions from 4 of these (total 9)
ELEVATION	9,714 ft (9,140-10,080 ft); 2,961 m (2,786-3,072 m)
AVERAGE ASPECT	95°M (r = 0.65)
LITHOLOGY	Fine-textured granite, shale
FORMATIONS[1]	Tmi, Km
LANDFORMS	Soil creep slopes, benches, slump-earthflows, and moraines
SLOPE POSITIONS	Lower backslopes, backslopes, upper backslopes, and summits
SLOPE SHAPES	Concave [50%] to other horizontally, Linear [75%] to undulating vertically
SLOPE ANGLE	24.5% (7-50%)
SOIL PARENT MATERIAL	Colluvium [75%] or glacial
COARSE FRAGMENTS	0.5% (0-2%) cover on surface, 41.1% (24-46%) by volume in soil
SOIL DEPTH	70 cm (26-92 cm); 27.4 in (10-36 in)
MOLLIC THICKNESS	48 cm (12-88 cm); 18.8 in (5-35 in)
TEXTURE	Clay loam or loam surface; clay loam, clay, sandy loam, or sandy clay loam subsurface
SOIL CLASSIFICATION	Cryoborolls, mostly Argic [75%], mostly Pachic [75%], deep
TOTAL LIVE COVER	333.4% (185.5-491.0%)
NUMBER OF SPECIES	24.0 (13-34)
TOTAL LIVE COVER/NO. SPECIES	14.7% (9.5-30.7%)
CLIMATE	Cool to cold, moist to very moist forest.
WATER	There is much water in a typical stand, in the plants and in the soil. The typically dense aspen cover, thick layers of litter, and high soil organic matter hold much moisture and maintain it through the year.

Table 10-13. Wildlife values (relative to the whole UGB) for the principal wildlife species using *Aspen/meadow-rue-peavine–Deep dark clay soils*.

CT	Mule Deer Season–Preference	Elk Season–Preference
A	Winter, Mild– Low Winter, Severe– Very Low Spring/Fall– Moderate (Cover, Forage, Overnight)	Winter, Mild– Low Winter, Severe– Very Low Spring/Fall– Moderate (Cover, Forage, Overnight)
B	Winter, Mild– Low Winter, Severe– Very Low Spring/Fall– Mod. High (Cover, Forage, Overnight)	Winter, Mild– Low Winter, Severe– Very Low Spring/Fall– Mod. High (Cover, Forage, Overnight)

Key to Community Types

1. Blue wildrye (ELGL) prominent, >20% cover. Osha present, often >10% cover. Vetch sometimes absent. ....**A**
1. Blue wildrye absent to <10% cover. Osha absent to <5% cover. Vetch always present, 1-20% cover .....**B**

Descriptions of Community types

A *Aspen-osha-blue wildrye-elk sedge-geranium-brome-dense* has prominent blue wildrye at >20% cover. Elk sedge is always present at >50% cover. Osha is always present at 1-70% cover. Aspen peavine cover is 0-20% or sometimes absent.

B *Aspen-peavine-yarrow-dense grasses and forbs* lacks blue wildrye. Elk sedge cover is 0-60%, though it may be absent. Osha is absent. Aspen peavine is always present at 10-50% cover.

Table 10-14. Community types within *Aspen/meadow-rue-peavine–Deep dark clay soils*.

Community Type	No. samples	Elevation, ft Slope, %	Coarseness, % Depth, cm Mollic Depth, cm	Surface Coarse, % Bare, % Seral Stage	Lr	Layer Height, m	Avg Layr Cvr %	Cover, %: Trees Shrubs Graminoids Forbs	No. Species Total Live Cover, % TLC/NS, %	Prod.[1], lb/ac/yr Shrubs Gramin. Forbs	Obstruct'n %: 1.5-2.0 m 1.0-1.5 m 0.5-1.0 m 0.0-0.5 m Total<2m
A. Aspen-osha-blue wildrye-elk sedge-geranium-brome-dense	4	9,580 (9,140-9,960) 26.7 (8-48)	39 (24-46) 89 (85-92) 59 (12-88)	* 0 (0-5) PN	T1 T2 T3 S1 GF S2	23 (18-28) 4 (3-20) 1.8 (0.0-4) 0.9 (0.5-1.3) 0.5 (0.0-2.2) Missing	80.3 6.8 T T 98.5 M	82 (77-86) 0 (0-0) 140 (119-178) 152 (77-186)	27 (22-34) 374 (288-446) 14.0 (12.0-17.1)	0-4 1122-1611 458-1130	38 (25-50) 45 (25-75) 85 (65-100) 99 (95-100) 67 (57-81)
B. Aspen-peavine-yarrow-dense grasses and forbs	5	9,893 (9,600-10,080) 21.6 (7-50)	45 (45-46) 44 (26-63) 32 (20-43)	2 (2-2) 4 (4-4) LM	T1 T2 T3 S1 GF S2	15 (10-17) 3 (1.8-11) 0.6 (0.1-1.8) 0.6 (0.3-0.9) 0.5 (0.0-0.9) 0.2 (0.0-0.3)	80 4 T T 99 7	68 (35-91) 14 (2-31) 81 (41-146) 138 (75-280)	22 (13-29) 301 (186-491) 15.3 (9.5-30.7)	19-296 84-1405 439-1279	38 (25-50) 43 (25-60) 38 (25-50) 60 (35-85) 44 (28-61)

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

Table 10-15. Resource Values for *Aspen/meadow-rue-peavine–Deep dark clay soils*. Resource values were calculated from the numbers in Table 10-14, 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	
Resource Value	**A**	**B**
Potential Cattle Forage Production	5	4-5
Grazing Suitability	3-4	3-4
Potential Timber Production (POTR5)	4-5	4-5
Timber Suitability	2-3	3
Developed Recreation	0-1	0-1
Dispersed Recreation	1-2	1-2
Scenic	4	5
Road & Trail Stability	1	1
Construction Suitability	0-1	0-1
Deer & Elk Hiding Cover	4-6	3-5
Deer & Elk Forage & Browse	4-5	3-4
Need for Watershed Protection	5	5
Soil Stability	0-1	0-1
Risk of Soil Loss-Natural	5-6	5-6
Risk of Soil Loss-Management	4	4
Risk of Permanent Depletion-Range	3-4	3-4
Risk of Permanent Depletion-Wildlife	2	2
Risk of Permanent Depletion-Timber	4	4-5
Resource Cost of Management	5-6	5-6
Cost of Rehabilitation	2	2

A typical view in a climax aspen stand of the aspen/meadow-rue type (Community Type A). Most of the understory vegetation is composed of forbs, and the undergrowth production can be very high. Aspen 86% cover, elk sedge 75%, blue wildrye 69%, cow-parsnip 37%. Coarse Fragments Cover = 0%, Total Live Cover = 446%, Coarse Fragments in Soil = 31. Soil sampled as a Pachic Cryoboroll, Fine-Loamy, Mixed. Mount Axtell Quadrangle, elevation 9,140 ft, 8% 092° (E) slope. September 15, 1995.

View in an aspen/bracken fern stand outside the Upper Gunnison Basin. This stand is near Beaver Creek Ski Area in the Eagle Valley in north-central Colorado. September 28, 1982.

Table 10-16. Common Species in *Aspen/meadow-rue-peavine–Deep dark clay 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	
		Ccv (Con)	Ccv (Con)	
Code	Species	N = 4	5	Common Name
	TREES			
ABBI2	Abies bifolia	T (25)	T (20)	subalpine fir
POTR5	Populus tremuloides	82 (100)	68 (100)	quaking aspen
	SHRUBS			
JUCO6	Juniperus communis	– –	20 (20)	common juniper
MARE11	Mahonia repens	T (25)	3 (40)	Oregon-grape
ROWO	Rosa woodsii	T (25)	7 (60)	Woods rose
SAMI15	Sambucus microbotrys	T (75)	– –	mountain red elderberry
SYRO	Symphoricarpos rotundifolius	– –	7 (60)	mountain snowberry
	GRAMINOIDS			
ACLE9	Achnatherum lettermanii	– –	3 (40)	Letterman needlegrass
ACNE9	Achnatherum nelsonii	– –	25 (20)	Nelson's needlegrass
BRCA10	Bromopsis canadensis	16 (100)	9 (20)	fringed brome
BRPO5	Bromopsis porteri	– –	12 (20)	nodding brome
CACA4	Calamagrostis canadensis	2 (75)	7 (20)	bluejoint reedgrass
CAFO3	Carex foenea	– –	78 (20)	silvertop sedge
CAGE2	Carex geyeri	73 (100)	31 (80)	elk sedge
ELGL	Elymus glaucus	48 (100)	– –	blue wildrye
ELTR7	Elymus trachycaulus	– –	1 (40)	slender wheatgrass
FEID	Festuca idahoensis	– –	7 (40)	Idaho fescue
PASM	Pascopyrum smithii	– –	10 (20)	western wheatgrass
POFE	Poa fendleriana	– –	10 (20)	muttongrass
POPR	Poa pratensis	– –	50 (40)	Kentucky bluegrass
	FORBS			
ACLA5	Achillea lanulosa	3 (25)	15 (100)	western yarrow
ACCO4	Aconitum columbianum	20 (25)	– –	Columbian monkshood
AQEL	Aquilegia elegantula	13 (25)	– –	western red columbine
ASFO	Aster foliaceus	24 (25)	– –	leafybract aster
CEFO2	Cerastium fontanum	– –	10 (20)	mouse-ear
CHDA2	Chamerion danielsii	1 (50)	24 (40)	fireweed
CIRSI	Cirsium	1 (50)	– –	thistle
COLI2	Collomia linearis	– –	30 (20)	slender-leaf collomia
DEBA2	Delphinium barbeyi	1 (25)	3 (20)	Barbey larkspur
ERCO6	Erigeron coulteri	17 (25)	– –	Coulter fleabane
FRVI	Fragaria virginiana	8 (75)	12 (60)	Virginia strawberry
GASE6	Galium septentrionale	6 (75)	16 (20)	northern bedstraw
GERI	Geranium richardsonii	11 (100)	17 (60)	Richardson geranium
HEQU2	Helianthella quinquenervis	3 (25)	4 (20)	nodding helianthella
HESP6	Heracleum sphondylium	20 (50)	– –	cow-parsnip
LALE2	Lathyrus leucanthus	10 (75)	30 (100)	aspen peavine
LIPO	Ligusticum porteri	34 (100)	– –	osha
LUAR3	Lupinus argenteus	T (50)	10 (40)	silvery lupine
MAST4	Maianthemum stellatum	1 (25)	7 (20)	star Solomon-plume
PEPR7	Pedicularis procera	1 (50)	T (20)	Gray's lousewort
POPU9	Potentilla pulcherrima	1 (25)	T (20)	beauty cinquefoil
SESE2	Senecio serra	5 (75)	5 (20)	butterweed groundsel
TAOF	Taraxacum officinale	– –	41 (40)	common dandelion
THFE	Thalictrum fendleri	46 (75)	18 (60)	Fendler meadow-rue
TRRE3	Trifolium repens	– –	40 (20)	white Dutch clover
VIAM	Vicia americana	11 (50)	7 (80)	American vetch
FORB	forb unknown	14 (25)	8 (20)	unknown forb
	GROUND COVER			
.BARESO	bare soil	T (25)	4 (20)	
.LITTER	litter and duff	100 (100)	97 (60)	
GRAVEL	gravel 0.2-10 cm	–	–	
.COBBLE	cobble 10-25 cm	– –	2 (20)	
.STONES	stone > 25 cm	– –	– –	
.MOSSON	moss on soil	– –	– –	
LICHENS	lichens on soil	–	–	