# DESCRIPTION OF RARE COMMUNITIES

APPENDIX C

## INTRODUCTION



Rare Communities and other special biological areas on the Jefferson National Forest were identified through a cooperative effort between the Forest and the Virginia Department of Conservation and Recreation, Division of Natural Heritage (VA-DCR-NH). VA-DCR-NH submitted two main reports summarizing areas needing special management for this Forest Plan Revision process, one in April, 1996 and another in July, 2000. In addition, several interim reports were also provided. These reports contain a listing of heritage resources found in each area, a site description, identified threats to the area, management recommendations, protection recommendations, and VA-DCR-NH's rationale for the boundary of the areas depicted on accompanying maps. All areas have a protective buffer included within the boundary, so acres shown include this buffer.

These maps were digitized by Jefferson National Forest personnel and used for allocation of Management Prescription 9F – Rare Communities, as well as Management Prescription 4D – Special Biological Areas. Special Biological Areas contain one or more rare species, but not a rare community.

Table C-1 displays the areas identified by their broad community classification. Several areas contain more than one rare community. These areas are identified by the title "Rare Community Assemblage." The acres shown are for the entire area, not individual rare communities, and as already mentioned, also include acres of protective buffer.

It is important to note that only prime examples of rare communities that support significant populations or associations of viability concern species are allocated to the Rare Community Management Prescription, 9F. For example, every rock outcrop, abandoned mine, or rich cove forest is not covered under the standards of 9F.

## GLADES, BARRENS, AND ASSOCIATED WOODLANDS

These communities are characterized by thin soils and exposed parent material that result in localized complexes of bare soils and rock, herbaceous and/or shrubby vegetation, and thin, often stunted woods. During wet periods they may include scattered shallow pools or areas of seepage. Glades, barrens, and associated woodlands differ from rock outcrop communities by exhibiting soils and vegetative cover over the majority of the site, and differ from the more widespread woodland communities in that they occur on geologic substrates which are unique for the region, including limestone, dolomite, amphibolite, greenstone, mafic rock, serpentine, sandstone, or shale. Associated communities include Calcareous Woodlands and Glades, Mafic Woodlands and Glades, Serpentine Woodlands and Glades, and Shale Barrens as defined in the Southern Appalachian Assessment (SAMAB 1996). At minimum, this rare community complex includes rare associations within the following ecological groups as defined by NatureServe (2001a):

| | |
|---|---|
| 401-17 | Appalachian Highlands Calcareous/Circumneutral Dry-Mesic Hardwood Forest |
| 440-05 | Appalachian Highlands Carbonate Glades and Barrens |
| 440-10 | Interior Highlands Carbonate Glades and Barrens |
| 440-25 | Appalachian Sandstone Glades and Barrens |
| 440-80 | Appalachian Mafic Igneous/Metamorphic Glades and Barrens |

The following descriptions of glades, barrens and associated woodlands on the Jefferson National Forest comes from Fleming and Coulling (2001) and uses their classification.

**Table C-1. Rare Communities on the Jefferson NF.**

| Glades, Barrens, and Woodlands Area Name | JNF Acres |
|---|---|
| Bald Mountain Sandstone Glades | 140 |
| Bessemer Barren | 10 |
| Broad Run Barren | 18 |
| Bryant Gap | 486 |
| County Line Barrens | 49 |
| Cove Mountain | 141 |
| Forest Road 462 Barrens | 74 |
| Furnace Mountain | 56 |
| Given Barren | 25 |
| Hanging Rock Hollow | 42 |
| Horton Barren | 57 |
| Jennings Creek Shale Barren | 43 |
| Lick Branch Barrens | 49 |
| Little Patterson Creek Barren | 42 |
| Little Stone Mountain | 1,167 |
| Maggie Shale Barren | 31 |
| Mudlick Branch Woodland | 10 |
| North Creek Woodland | 39 |
| Patterson Creek Barren | 81 |
| Patterson Mountain Barren | 33 |
| Raven Cliff | 775 |
| Roadcut Barren | 5 |
| Sarver Barrens | 154 |
| Sevenmile Mountain | 187 |
| Sinking Creek Mountain | 207 |
| Sprouts Run | 142 |
| Skegg Woodlands | 206 |
| Staunton Creek Gorge | 353 |
| Surber Barren | 31 |
| Trout Creek Shale Barren | 13 |
| Upper Skegg Spur | 25 |
| Whitetop Laurel Slopes | 63 |
| **Basic Mesic Forest Area Name** | |
| Dismal Creek | 619 |
| Little Stone Mountain | 1,167 |
| Lovelady Coves | 35 |
| Staunton Creek Gorge | 353 |
| **Beech Gap Forest Area Name** | |
| Mount Rogers | 3,936 |
| **High Elevation Balds Area Name** | |
| Whitetop Mountain | 1,090 |

| Mountain Wetlands Area Name | JNF Acres |
|---|---|
| Big Wilson Creek | 578 |
| Chimney Cliffs and Russell Fork | 368 |
| Day Creek Pond | 13 |
| Dismal Creek | 619 |
| Glady Fork Beaver Meadow | 821 |
| Hagen Hall Sinkhole Pond | 19 |
| Indian Grave Gap | 373 |
| Interior Seep | 94 |
| James Riverside Prairie | 83 |
| Kelly Knob-Big Pond | 592 |
| Little Wilson Creek Headwaters | 464 |
| N. Fork Stony Creek | 259 |
| Potts Cove | 349 |
| Potts Pond | 26 |
| Pound River | 101 |
| Salt Pond Mountain | 1,310 |
| Tazewell Beartown | 788 |
| **Rock Outcrops and Cliffs Area Name** | |
| Camp Rock | 7 |
| Chimney Cliffs and Russell Fork | 368 |
| Cliff Mountain | 2,673 |
| James River Gorge | 8,922 |
| Mount Rogers | 3,936 |
| Raven Cliff | 775 |
| **Caves and Mines Area Name** | |
| Cave Springs Cave | 166 |
| Cliff Mountain | 1,603 |
| Little Stone Mountain | 1,167 |
| Pine Mountain Tunnel | 206 |
| Shires Saltpetre Cave | 381 |
| Staunton Creek Gorge | 353 |
| Stone Mtn/Powell Mtn Cliffs | 318 |
| **Spruce-Fir Forest Area Name** | |
| Mount Rogers | 3,936 |
| Tazewell Beartown | 788 |
| Whitetop Mountain | 1,090 |
| **Carolina Hemlock Forest Area Name** | |
| Raven Cliff | 775 |
| **TOTAL Number of Areas** | **59** |
| **TOTAL JNF Acres[1]** | **28,275** |

[1] Not all of these acres are actual rare communities, they include buffer areas as well. Approximately 15,000 acres are within existing Wilderness areas.

## CENTRAL APPALACHIAN SHALE BARRENS

A variable group of sparse woodlands, shrublands, and open herbaceous rock outcrops occurring on Ridge and Valley shales and Blue Ridge metashales of the Central Appalachian Mountains. These small-patch communities range from western Virginia and eastern West Virginia to southern Pennsylvania. In Virginia, they occur at elevations from 250 to 930 m (850 to 3040 ft). Although stunted trees of several species — *e.g.*, *Quercus prinus*, *Pinus virginiana*, and *Carya glabra* — are common, shale barrens are strongly characterized by their open physiognomy and by a suite of uncommon to rare plants found almost exclusively in these habitats. Endemic or near-endemic shale barren species include *Arabis serotina*, *Clematis albicoma*, *Clematis viticaulis* (also endemic to Virginia), *Eriogonum allenii*, *Oenothera argillicola*, *Packera antennariifolia* (= *Senecio antennariifolius*) and *Trifolium virginicum*. Habitats generally occur on steep (~ 30 degree) slopes with south to west aspects. The steep, xeric slopes and friable nature of the shale create poorly vegetated hillsides of bare bedrock and loose channery visible from afar. Continual undercutting of thick but relatively weak shale strata by streams maintain shale barrens. Less common, densely graminoid-dominated variants occurring on steep spur ridge crests and mountain summits are sometimes referred to as "shale ridge balds." Shale barrens are considered globally uncommon and host many locally rare species including the butterflies Appalachian grizzled skipper (*Pyrgus wyandot*) and Olympia marble (*Euchloe olympia*) and the federally listed plant *Arabis serotina*. The primary threat to these communities is probably invasion by exotic species, but examples of these communities near roads are also threatened by quarrying.

Examples:

- Central Appalachian shale barren – Maggie shale barren, NRV
- Central Appalachian shale barren – Furnace Mt., Glenwood
- Central Appalachian shale barren – Sprouts Run, Glenwood
- Central Appalachian shale barren – North Creek woodland, Glenwood
- Central Appalachian shale barren – Hanging Rock Hollow, Glenwood
- Central Appalachian shale barren (2)– James River Gorge, Glenwood
- Central Appalachian shale barren – Little Patterson Creek shale barren, New Castle
- Central Appalachian shale barren – County Line shale barrens, New Castle
- Central Appalachian shale barren – Broad Run barren, New Castle
- Central Appalachian shale barren – Craig Creek Barren SIA, New Castle
- Central Appalachian shale barren – Sarver barrens, New Castle
- Central Appalachian shale barren – Surber barren, New Castle

## MONTANE ACIDIC WOODLANDS

Coniferous, mixed, or less commonly deciduous woodlands of xeric, edaphically stressful habitats. Communities in this group are scattered throughout the Virginia mountains and occupy somewhat heterogeneous habitats that are characterized by shallow, drought-prone, highly oligotrophic soils. These include barren, acidic shale slopes and crests in the Ridge and Valley and Northern Blue Ridge provinces; sandstone outcrops and pavements in the Ridge and Valley and Cumberland Mountains; and xeric, low-elevation terrain formed on massive alluvial fans along the western foot of the Blue Ridge. Pines, including *Pinus virginiana*, *Pinus rigida*, and *Pinus echinata* are characteristic canopy trees in several environmental / compositional variants. *Quercus prinus*, *Quercus stellata*,

GLADES, BARRENS AND ASSOCIATED WOODLANDS

*Quercus marilandica*, and *Quercus ilicifolia* are widespread oak components. In some cases, Montane Acidic Woodlands are floristically similar to Pine-Oak/Heath Woodlands but are maintained primarily by drought stresses associated with outcrop environments rather than by fire. They also tend to have a sparser representation of heath shrubs and a more diverse herb layer, with a larger component of graminoids such as little bluestem (*Schizachyrium scoparium*) or Pennsylvania sedge (*Carex pensylvanica*). At least some of the community types in this group appear to be state- or globally rare, but their relationship to vegetation on a regional scale needs further investigation.

Examples:

- Low elevation acidic outcrop barren – Bald Mt., New Castle
- Low elevation acidic outcrop barren – Cove Mt., NRV
- Low elevation acidic outcrop barren – Osborne Ridge, Clinch
- Low elevation acidic outcrop barren – Skegg woodlands, Clinch
- Low elevation acidic outcrop barren (3) – Bryant Gap, Clinch
- Oak-hickory woodland/savanna (Typic subtype)- Skegg woodlands, Clinch

### MONTANE DRY CALCAREOUS FORESTS AND WOODLANDS

Deciduous or occasionally mixed forests and woodlands of mostly subxeric, fertile habitats over carbonate formations of limestone or dolomite. Habitats are steep, usually rocky, south- to west-facing slopes at elevations from < 300 to 900 m (< 1000 to 2900 ft). Soils vary from circumneutral to moderately alkaline, and have high calcium levels. Confined in Virginia to the mountains, these communities are most frequent and extensive in the Ridge and Valley, but occur locally in both the Blue Ridge and Cumberland Mountains. Tree canopies vary from nearly closed to sparse and woodland-like. Overstory mixtures of *Quercus muehlenbergii*, *Acer saccharum*, *Acer nigrum*, *Quercus rubra*, *Quercus alba*, *Quercus shumardii*, *Fraxinus americana* are typical. These forests and woodlands share many understory and herbaceous plants with the Piedmont / Mountain Basic Woodlands group and are similarly species-rich. A few of the taxa that are confined to or most important in the limestone and dolomite communities include *Frangula caroliniana*, *Packera obovata* (= *Senecio obovatus*), *Erigeron pulchellus*, *Diarrhena americana*, *Muhlenbergia tenuiflora*, *Piptatherum racemosum (= Oryzopsis racemosa)*, *Carex purpurifera* (in extreme southwestern Virginia only), *Helianthus hirsutus*, *Helianthus microcephalus*, and *Zigadenus elegans* ssp. *glaucus*. Much compositional variation is evident in these communities across western Virginia.

Examples:

- Dry calcareous forest/woodland (Montane subtype) (2) – Stone Mt./Powell Mt. Cliffs, Clinch
- Dry calcareous forest/woodland (Montane subtype) – Cliff Mt., Clinch
- Dry calcareous forest/woodland (Montane subtype) (2) – Little Stone Mt., Clinch
- Dry calcareous forest – Staunton Creek Gorge, Clinch
- Dry calcareous forest – Little Stone Mt., Clinch
- Dry calcareous forest – Raven Cliff, NRA

### LOW ELEVATION BASIC OUTCROP BARRENS

Scrub and herbaceous vegetation of exposed, base-rich outcrops in the Piedmont and mountain regions. The majority of documented occurrences are on mafic (diabase,

amphibolite, gabbro) outcrops of the Piedmont and Southern Blue Ridge, and metabasalt (greenstone) outcrops of the northern Piedmont and Blue Ridge. A few examples on granitic rocks and calcareous sandstone have also been documented. Habitats generally have high cover of exposed bedrock, but often have more extensive organic or soil mats, and thus more vascular plant cover, than do acidic outcrops. Soils usually consist of thin veneers and vary from strongly acidic to circumneutral, with moderately high base status. Vegetation is usually a patchwork of stunted trees, shrub thickets, herbaceous mats, and lithophytic lichens. Typical woody species include *Fraxinus americana*, *Juniperus virginiana*, *Chionanthus virginicus*, *Physocarpus opulifolius*, *Rhus aromatica*, and *Ptelea trifoliata*. Typical herbs include *Allium cernuum*, *Talinum teretifolium*, *Polygonum tenue*, *Helianthus divaricatus*, *Cheilanthes lanosa*, *Woodsia ilvensis*, *Schizachyrium scoparium*, *Muhlenbergia capillaris*, *Asclepias verticillata*, *Phacelia dubia*, and *Heuchera americana*. These small-patch communities are rare in Virginia and globally. Perhaps because of their more fertile substrates, basic outcrop barrens are more prone to invasion by exotic weeds than are acidic barrens.

Examples:

- Low elevation basic outcrop barren – Millers Yard, Private land near Clinch RD.

### MONTANE BASIC WOODLANDS

Deciduous and mixed woodlands of xeric, rocky habitats over mafic substrates such as diabase, gabbro, metabasalt (greenstone), and amphibolite. A few examples of this group occur in habitats underlain by base-rich granite, calcareous shale, and calcareous sandstone. Occurrences in Virginia are widely and locally scattered throughout the Piedmont and mountains, often occurring in patch-mosaics with exposed outcrop barrens. They are most frequent (but still very local) in greenstone districts of the Northern Blue Ridge. Habitats are situated on south- to west-facing slopes with numerous outcrops and shallow, rocky soils that are dry but relatively fertile, with moderately high levels of calcium and magnesium. Although *Quercus* spp. are frequent (sometimes dominant) components, these woodlands are more often dominated by variable mixtures of *Fraxinus americana* and *Carya* spp., often with *Juniperus virginiana* or *Pinus virginiana* as a major associate. Trees are usually somewhat stunted and form an open or sparse canopy. Typical small trees and shrubs include *Cercis canadensis*, *Ostrya virginiana*, *Physocarpus opulifolius*, *Rhus aromatica*, *Celtis occidentalis*, *Celtis tenuifolia*, *Ulmus rubra*, and *Ptelea trifoliata*. These woodlands contain a surprisingly diverse array of herbaceous graminoids and forbs; a few of the more widespread, representative species are *Muhlenbergia sobolifera*, *Solidago ulmifolia*, *Elymus hystrix*, *Carex pensylvanica*, and *Pycnanthemum incanum*. There are few threats to these communities, although the shrub *Symphoricarpos orbiculatus*, introduced from farther west, is a troublesome invasive in some stands.

Examples:

- Montane basic woodland (2) – Bryant Gap, Clinch
- Montane basic woodland – Whitetop Laurel slopes, NRA

### PINE-OAK /HEATH WOODLANDS

Species-poor, fire-influenced, mixed woodlands of xeric, exposed mountain habitats. Sites are typically located on convex, south to west facets of steep spur ridges, narrow rocky crests, and cliff tops. Pine–oak/heath woodlands are widespread throughout both the Ridge and Valley and Blue Ridge provinces in western Virginia. They occur at elevations from below 300 m (1000 ft) to more than 1200 m (4000 ft) on various substrates, but most commonly on acidic, sedimentary and metasedimentary substrates, *e.g.*, sandstone,

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quartzite, and shale. A few stands occur on Piedmont monadnocks and foothills. Soils are very infertile, shallow, and droughty. Thick, poorly decomposed duff layers, along with dead wood and inflammable shrubs, contribute to a strongly fire-prone habitat (Groeschl *et al* 1992). Short-statured *Pinus pungens* and *Pinus rigida* are usually dominants forming an open canopy, often with co-dominant *Quercus prinus*. Less important tree associates include *Quercus coccinea*, *Pinus virginiana*, and *Sassafras albidum*. Except in the Piedmont stands, *Quercus ilicifolia* is characteristic (often abundant) in the shrub layer, along with various ericaceous shrubs. Colonial shrubs usually pre-empt available microhabitats for most herbaceous species, but *Pteridium aquilinum* var. *latiusculum* and the spectacular *Xerophyllum asphodeloides* are often competitive enough to achieve significant cover. Periodic fire is an important ecological process that provides opportunities for regeneration of both pines and less competitive herbaceous species, while setting back successional encroachment of potential canopy oaks (especially *Quercus prinus*). On cliffs and other very rocky sites, the vegetation is self-perpetuating due to extreme edaphic conditions. Fire reduction and the insect pest, southern pine beetle (*Dendroctonus frontalis*) are the most serious threats to communities of this group. The state-rare northern pine snake (*Pituophis melanoleucus melanoleucus*) and several rare moths, all bear oak feeders, are locally associated with these woodlands.

Examples:

- Pine-oak/heath woodland – Indian Grave Gap, Clinch
- Pine-oak/heath woodland – Lignite overlook, New Castle

These communities may be found in the Appalachian and Piedmont regions. Limestone or dolomite, and sandstone glades and barrens occur primarily in the Ridge and Valley physiographic provinces ranging from Northern Alabama to Kentucky. Good examples are few and very restricted in distribution. Serpentine glades are known primarily from the Nantahala National Forest in North Carolina. Shale and mafic woodlands are more widespread in distribution, and may be forested if fire has not played a role in their maintenance or restoration. Most occurrences for mafic associations are from the piedmont, but may occur as high as 3800 feet in elevation. Most shale woodlands are in the Carolina Slate Belt in Georgia, North Carolina, and South Carolina, but neither shale nor mafic woodlands have been well inventoried.

The SAA (1996) concluded that only 25% of the known occurrences for species associated with mafic and other calcareous habitats, occurred on National Forest lands.

Currently, inventory information for these communities is incomplete. Though underlying soils may differ from the surrounding soils in exchangeable nutrient capacity or pH, they may be overlooked in mapping efforts since they often occur as small inclusions within larger stands. To achieve desired composition and structure within these communities, many will require active restoration, such as basal area reduction, woody understory and mid-story control, or prescribed fire. Prescribed fire will often be needed to maintain these communities once restored.

## RARE MOUNTAIN WETLAND COMMUNITIES

RARE MOUNTAIN WETLAND COMMUNITIES

It is estimated that more than 50% of the nation's wetlands have been destroyed in the past 200 years (Ernst and Brown 1988). They are vulnerable to destruction on private land and, therefore, it is critical to maintain these communities where they occur on national forest land. Wetlands have been ditched and drained for pastures, mined for peat (Ewel 1990), and filled for shopping centers. Loss of some wetlands can also be attributed to sedimentation, pollution, and plant succession due to fire suppression (USFWS 1991). Beaver activity has historically played an important role in creating open wetland habitats that are now rare on the landscape. Beaver wetlands are beneficial for

many rare species such as monkey face orchid (Shea 1992), but may be detrimental to others such as bog turtle (Jensen, pers. comm.). Beaver impoundments also may cause unacceptable impacts to facilities and other resources.

Rare mountain wetland communities in the Southern Appalachians and Piedmont include bogs, fens, seeps, ponds, river gravel-cobble bars, and river scour areas as defined in this section.

## APPALACHIAN HIGHLANDS BOGS, FENS, SEEPS, AND PONDS

Bogs, fens, seeps, and ponds may be found in both the Appalchian and Piedmont regions, and are characterized by 1) soils that are semi-permanently to permanently saturated as a result of groundwater seepage, perched water tables, rainfall, or beaver activity, but otherwise are generally nonalluvial, and 2) presence of wetland-associated species such as sphagnum, ferns, and sedges. Dominant vegetation may be herbs, shrubs, trees, or some complex of the three. Ponds in this group include limesink, karst, and depression ponds, which may hold areas of shallow open water for signficant portions of the year. Also included are all impoundments and associated wetlands resulting from beaver activity. Artificial impoundments are not included, unless they support significant populations or associations of species at risk. The primary management need is that of protection from activities that could disrupt wetland hydrology or other community structures and functions. Some sites may require periodic vegetation management to maintain desired herbaceous and/or shrubby composition. Rare mountain wetland communities include Mafic and Calcareous Fens, Sphagnum and Shrub Bogs, Swamp Forest-Bog Complex, Mountain Ponds, Seasonally Dry Sinkhole Ponds, and Beaver Pond and Wetland Complex as defined in the Southern Appalachian Assessment (SAMAB 1996), and all Associations within the following Ecological Groups as defined by NatureServe (2001):

458-15 Appalachian Highlands Wooded Depression Ponds

458-20 Appalachian and Interior Highlands Limesink and Karst Wooded Ponds

470-10 Appalachian Highlands Forested Bogs

470-20 Appalachian Highlands Forested Acid Seeps

470-50 Appalachian Highlands Forested Fens and Calcareous Seeps

475-10 Appalachian Highlands Acid Herbaceous Seeps

475-20 Appalachian Highlands Alkaline Herbaceous Fens and Seeps

475-30 Appalachian and Interior Highlands Herbaceous Depression Ponds and Pond-shores

## APPALACHIAN HIGHLANDS RIVERINE VEGETATION

Riverine rare communities are characterized by 1) sites adjacent to or within stream channels that are exposed to periodic flooding and scour, and 2) presence of significant populations or associations of species at risk. These communities may be found in both Appalachian and Piedmont regions. Primary management needs are protection from disturbance during development of road crossings, and maintenance of desirable in-stream flows. These communities include River Gravel-Cobble Bars as defined in the Southern Appalachian Assessment (SAMAB 1996), and the rare Associations within the following Ecological Groups as defined by NatureServe (2001):

457-10 Appalachian Highlands Riverine Vegetation

457-30 Rocky Riverbeds

457-40 Appalachian Highlands Riverscour Vegetation

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The SAA Terrestrial Report summarizes the approximate number of occurrences of some of these wetland communities on National Forest lands in the Southern Appalachians (SAMAB 1996: 190). On the Jefferson National Forest there are 20 known occurrences of wetland rare communities documented in the Virginia Department of Conservation and Recreation database (Virginia Department of Conservation and Recreation 1999).

The Virginia Division of Natural Heritage has identified the following rare mountain wetland community types (using their community classifications) on the Jefferson National Forest (Fleming and Coulling 2001).

### HIGH ELEVATION SEEPAGE SWAMPS

Saturated, coniferous or mixed forests of gently sloping stream headwaters, large spring seeps, and ravine bottoms at elevations above 900 m (3000 ft). These communities are locally scattered in the higher mountains of western Virginia on various geologic substrates and soils, almost all of which are strongly to extremely acidic. Habitats feature pronounced hummock and hollow microtopography, with braided streams, muck-filled depressions, and lush bryophyte cover. *Tsuga canadensis*, *Betula alleghaniensis*, and *Acer rubrum* are the most common trees. Locally, *Picea rubens* or *Pinus strobus* may be co-dominants. Shrub layer composition and density is variable; deciduous hollies (*Ilex verticillata* and *Ilex montana*), several blueberries (particularly *Vaccinium corymbosum*, *Vaccinium simulatum*, and *Vaccinium angustifolium*), *Rhododendron maximum*, *Kalmia latifolia*, *Alnus incana* ssp. *rugosa*, and *Hamamelis virginiana* may be abundant. Characteristic herbs of these swamps include *Caltha palustris*, *Carex echinata*, *Carex leptonervia*, *Carex scabrata*, *Carex trisperma*, *Cinna latifolia*, *Doellingeria umbellata* (= *Aster umbellatus*), *Glyceria melicaria*, *Oclemena acuminata* (= *Aster acuminatus*), *Osmunda cinnamomea*, *Veratrum viride*, and *Viola macloskeyi* ssp. *pallens*. Communities in this group are naturally rare due to the scarcity of flat or gentle, wet habitats in the higher Appalachians. Beavers have partially destroyed fine examples of these swamps at several sites.

Examples:

- Southern Appalachian swamp forest-bog complex (Typic type) – Potts Mt./ Maple Flats Branch Headwaters, (Potts Cove Rare Community Assemblage) NRV
- Southern Appalachian swamp forest-bog complex (Typic type) – Salt Pond Mt., NRV
- Southern Appalachian swamp forest-bog complex (Typic type) – Lower Big Wilson Creek, NRA
- High-elevation hemlock-yellow birch seepage swamp – Camping Ridge, Glenwood
- High-elevation hemlock-yellow birch seepage swamp – Thunder Hill, Glenwood

### MOUNTAIN PONDS

Seasonally to semipermanently flooded shrub and herbaceous vegetation of basin wetlands situated on broad ridge crests, landslide benches and, more rarely, mountain-foot alluvial fans of the Ridge and Valley and Blue Ridge provinces. These very rare natural ponds range up to about 0.4 hectare (one acre) in size and are thought to have formed from the sagging or solution of underlying bedrock strata. Hydrologic regime is variable from pond to pond, and many sites exhibit pronounced seasonal water-level fluctuations. Most mountain ponds are open or partly shaded by trees rooted in drier

marginal soils. Vegetation structure varies from shrubland to herbaceous or comprises a patch-mosaic of the two; composition often exhibits distinct concentric zonation. Characteristic plants of semipermanently flooded ponds or zones include *Cephalanthus occidentalis*, *Dulichium arundinaceum*, *Sagittaria latifolia*, *Scirpus ancistrochaetus*, *Carex vesicaria*, and *Utricularia* spp. Species more typical of seasonally flooded ponds or zones include *Ilex verticillata*, *Vaccinium corymbosum*, *Smilax rotundifolia*, *Bidens discoidea*, *Carex stricta*, *Glyceria acutiflora*, *Hypericum mutilum*, and *Juncus* spp. Mountain ponds are important breeding habitats for amphibians and odonates (dragonflies and damselflies). Many of the known occurrences are protected on U.S. Forest Service land, but several privately owned ponds remain vulnerable to anthropogenic disturbances.

Examples:

- Montane herbaceous pond – (2) –Salt Pond Mountain, NRV
- Montane buttonbush pond – Big Pond, Kelly Knob, NRV
- Montane buttonbush pond – Day Creek, Glenwood
- Montane buttonbush pond – Potts Pond, New Castle

### SINKHOLE PONDS

Depressions formed by the solution of carbonate rock that may be part of a karst system. Retention of water is the result of a restricted outlet or a lining of alluvial material that retards outflow of water. Sinkholes are associated with limestone geology that is limited on the Forest. Many sinkholes on private land have been altered, filled or used as trash dumps. See Mountain pond.

Example:

- Sinkhole Pond – Hagan Hall, Clinch

### CALCAREOUS FENS AND SEEPS

Shrub and herbaceous wetlands of calcareous hillside or foot-slope spring seeps and seepage zones in small stream bottoms. These small-patch wetlands are widely scattered in carbonate rock districts of western Virginia, primarily in valleys of the Ridge and Valley province. Habitats typically have irregular or hummock-and-hollow microtopography, with areas of muck and abundant gravel or travertine marl deposits in the seepage rills. Soils, which are derived from underlying limestone or dolomite, are slightly acidic to moderately alkaline with high calcium levels. Strictly defined, fens are minerotrophic wetlands with organic soils > 40 cm deep. Because they usually have only superficial organic soil layers, most of the Virginia communities in this group are technically “seeps,” although we retain the term “fen” due to its wide application to various base-rich seepage wetlands in the southeastern United States; see Weakley and Schafale (1994) for additional discussion. The vegetation of these wetlands is often a patch-mosaic of shrubs and herbaceous openings. Common shrubs include *Salix* spp., *Alnus serrulata*, *Rosa palustris*, *Rhamnus alnifolia*, and *Photinia* (= *Aronia*) spp. Herbaceous species that are more or less diagnostic of calcareous fens or seeps include *Carex flava*, *Carex hystericina*, *Carex interior*, *Carex suberecta*, *Cypripedium reginae*, *Juncus brachycephalus*, *Liparis loeselii*, *Parnassia grandifolia*, *Pedicularis lanceolata*, and *Rhynchospora capillacea*. The ecological factors that keep fens and seeps open are not well understood, and many examples appear to be threatened by shrub and tree invasion. Ditching, grazing, and exotic weeds are additional threats to these naturally rare mountain wetlands. Calcareous fens are extremely rare on the Forest and are high priorities for conservation.

Example:

- Central Appalachian calcareous shrub fen/seep (3)– Dismal Creek, NRV

RARE MOUNTAIN WETLAND COMMUNITIES

## MONTANE BASIC SEEPAGE SWAMPS

Saturated deciduous forests of gently sloping stream headwaters, large spring seeps, and lateral areas in ravines and stream bottoms where groundwater emerges at the base of slopes. These communities are locally scattered throughout western Virginia in areas underlain by metabasalt (greenstone), base-rich granite, calcareous shale, and limestone. Habitats usually have considerable cover of bouldery, cobbly, and gravelly alluvium; braided seeps and stream channels; moss (except *Sphagnum*)-covered hummocks; and muck-filled depressions. Soils range from strongly acidic to circumneutral, with moderately high calcium and magnesium levels. Tree layers are mixed, with variable combinations of *Acer rubrum*, *Fraxinus americana*, *Fraxinus nigra*, *Liriodendron tulipifera*, and *Betula* spp. *Lindera benzoin* is usually the most abundant shrub. Herbaceous cover is usually lush, and often features patch-dominance of *Symplocarpus foetidus*, *Veratrum viride*, and/or sedges, especially *Carex bromoides* and *C. prasina*. Additional characteristic herbs include *Caltha palustris*, *Chrysosplenium americanum*, *Saxifraga pensylvanica*, *S. micranthidifolia*, *Viola cucullata*, and various ferns. Most Virginia populations of the globally rare grass *Poa paludigena*, as well as of the globally rare Blue Ridge Mountain amphipod (*Stygobromus spinosus*), are associated with these swamps. This community is rare on the Forest.

Example:

- Montane Basic Seepage Swamp – Dismal Creek, NRV

## APPALACHIAN BOGS

Saturated shrub and herbaceous vegetation of gently sloping, groundwater discharge zones along valley floors and headwaters streams in the mountain region of Virginia. Habitats supporting bogs are usually less than 0.4 hectare (one acre) in size but rarely range up to 4 hectares (10 acres) in the Southern Blue Ridge (Mount Rogers area). Fewer than twenty occurrences have been documented in the state. Soils, which vary from mineral to superficial or deep peat, are extremely acidic and support thick growths of *Sphagnum* and other mosses. The term "bog," as applied to these wetlands, is a technical misnomer, since not all of these habitats are true peatlands and none is an ombrotrophic system. This term, however, is now so widely used in the southeastern United States as a descriptor for open, acidic seepage wetlands that we have adopted it here for consistency; see Weakley and Schafale (1994) for additional discussion. The ecological dynamics of these naturally rare communities are not well understood, and many examples are currently suffering from shrub and tree invasions. Factors that may have been responsible for creating and maintaining open bogs include fire, grazing, beavers, and deep deposition of unstable soils. Bog vegetation is frequently a mosaic of shrub patches and herbaceous openings. Several compositional variants associated with geography and elevation have been documented in Virginia. Species common to most variants include *Rhododendron maximum*, *Rhododendron catawbiense*, *Salix sericea*, *Alnus serrulata*, *Osmunda cinnamomea*, *Eriophorum virginicum*, *Carex atlantica*, and *Rhynchospora capitellata*. Species more restricted to low-elevation (below 900 m [3000 ft]) bogs of the Ridge and Valley and Cumberland Mountains include *Drosera rotundifolia*, *Andropogon glomeratus*, *Calopogon tuberosus*, *Platanthera ciliaris*, and *Calamagrostis coarctata*. Species more restricted to higher-elevation (mostly above 900 m [3000 ft]) bogs of the Southern Blue Ridge, Allegheny Mountains, and/or the highest mountains of the Ridge and Valley include stunted *Picea rubens*, *Ilex collina*, *Viburnum nudum* var. *cassinioides*, *Kalmia carolina*, *Vaccinium macrocarpon*, *Solidago patula*, *Chelone cuthbertii*, *Solidago uliginosa*, *Carex echinata*, *Sparganium erectum* ssp. *stoloniferum*, *Epilobium leptophyllum*, *Juncus brevicaudatus*, *Carex trisperma*, *Carex ruthii*, and *Houstonia serpyllifolia.*

Examples:

- Appalachian bog – Interior Seep, NRV
- Appalachian bog – Salt Pond Mt., NRV
- Appalachian bog – Mt. Rogers – Whitetop Rare Community Assemblage, NRA
- Appalachian bog – Potts Cove, New Castle

### MOUNTAIN/PIEDMONT ACIDIC SEEPAGE SWAMPS

Saturated deciduous forests of gently sloping stream headwaters, large spring seeps, and ravine bottoms underlain by sandstone, quartzite, or base-poor granite. Certain basin wetlands that are saturated or seasonally saturated by perched groundwater support similar vegetation and probably belong in this group as well. These communities are locally scattered throughout the western Virginia mountains and Piedmont foothills, up to about 900 m (3000 ft) elevation. Hummock-and-hollow microtopography, braided streams, areas of coarse gravel and cobble deposition, muck-filled depressions, and abundant *Sphagnum* mats are typical habitat features. Soils are very strongly to extremely acidic, with low base status. Composition is variable over the range of this group, and several community types are probably represented. *Acer rubrum*, *Nyssa sylvatica*, *Liriodendron tulipifera*, and *Pinus rigida* are typical trees, while *Ilex verticillata*, *Rhododendron viscosum*, *Vaccinium corymbosum*, and *Vaccinium fuscatum* are abundant shrubs. *Symplocarpus foetidus* and *Veratrum viride* may be as dominant in these communities as in Montane Basic Seepage Swamps; herbs and low shrubs more abundant in or restricted to acidic swamps include *Osmunda cinnamomea*, *Rubus hispidus*, *Parnassia asarifolia*, *Platanthera ciliaris*, *Lycopodium obscurum*, *Carex debilis*, and *Carex folliculata*. Acid seeps are widely distributed across the forest. Most are very small in size and often consist of a seasonal spring that may stop flowing during the summer, but with soil moist enough to support such plant species as cinnamon fern, royal fern, rushes, sedges, and sphagnum moss. These seeps are often linear following a drainage and may be up to several meters wide and many meters long. Other seeps are larger in size and located in flatter areas and have a more constant source of water.

Example:

- Seepage marsh/wet meadow – Indian Grave Gap, Clinch

### BEAVER MEADOWS

Beaver ponds and associated wetlands are scattered across the Forest. Beavers are becoming more numerous and these types of wetlands should increase in number. Beaver created wetlands are important breeding sites for odonates as well as generally being an important wetland element in the landscape. The main limiting factor may be conflicts between beaver impoundments and human interests.

Example:

- Glady Fork beaver meadow, Clinch

### ROCKY BARS AND SHORES

Seasonally flooded to intermittently exposed shrub and herbaceous vegetation of rock outcrops and boulder or cobble bars on the shores and islands of large, high-gradient streams. Communities in this group are scattered throughout the Virginia mountains and Piedmont, primarily along major rivers and their larger tributaries. Habitats are influenced by a frequent regime of powerful flood-scouring, and soils consist of fine to coarse alluvial

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HIGH ELEVATION BALDS AND ROCKY SUMMITS

materials deposited among outcrops and boulders. Vegetation varies from densely shrubby to entirely herbaceous and sparse. Woody scrub, including battered *Platanus occidentalis*, *Betula nigra*, *Salix caroliniana*, *Salix nigra*, *Salix sericea*, *Salix eriocephala*, *Cornus amomum*, *Cornus obliqua*, *Cephalanthus occidentalis*, and *Viburnum* spp., is relatively common on stable bars and outcrops. Herbaceous composition is highly variable and includes species common to both ephemeral sand, gravel and mud bars (*e.g.*, *Justicia americana*) and more stable bedrock habitats (*e.g.*, *Andropogon gerardii*). A well-marked herbaceous variant of this group, known from bouldery banks and bars along a number of mountain streams, is dominated by *Carex torta*. Substantial data on the composition and environmental dynamics of rocky bar and shore communities in Virginia has yet to be collected. Examples of this type are very limited on the Forest because large, high gradient streams are not common.

Example:

- Rocky Bar and Shore – Chimney Cliffs Russell Fork, Clinch

### RIVERSIDE PRAIRIES

Temporarily flooded, sparse shrub and dense grassland vegetation of stabilized outcrop or boulder bars along the shores of major mountain and Piedmont rivers. Communities in this group are globally and state-rare. In Virginia, most of the few known occurrences are located in the Potomac River gorge west of Washington, D.C. and along the James River near the Blue Ridge. Habitats supporting Riverside Prairies are elevated above mean water levels and are flooded-scoured at least once annually. Because of rockiness and limited alluvial deposition, soils are relatively shallow and site moisture conditions range from mesic to somewhat xeric. The vegetation is a lush assemblage of warm-season grasses and forbs, with scattered woody scrub such as stunted *Fraxinus pennsylvanica*, *Cornus amomum, Cornus obliqua*, and *Salix* spp.. Dominant grasses are usually *Andropogon gerardii*, *Sorghastrum nutans*, and *Panicum virgatum*. Other characteristic plants include *Baptisia australis*, *Spartina pectinata*, *Orbexilum pedunculatum* var. *psoralioides*, *Physostegia virginiana*, *Lespedeza violacea*, *Silphium trifoliatum*, *Veronicastrum virginicum*, *Helianthus occidentalis*, *Vicia americana*, *Pycnanthemum tenuifolium*, *Eleocharis compressa*, *Lathyrus venosus*, and *Zizia aurea*. Riverside prairies are found along major rivers which are very limited on the Forest.

Examples:

- Riverside prairie – James Riverside Prairie, Glenwood
- Riverside prairie (4)– James River Gorge Rare Community Assemblage, Glenwood

## HIGH ELEVATION BALDS AND ROCKY SUMMITS

These communities are of two types: grassy balds and shrub (or heath) balds. Grassy balds are characterized by extensive areas dominated by herbaceous vegetation at high elevations (generally above 5,000 feet). They generally are found on ridgetops, domes, and gentle slopes. Shrub balds are typically found on steep exposed slopes and ridges at elevations ranging from 2,000 to 6,500 feet, and are characterized by dominance of ericaceous shrubs. These communities are found in the Appalachian region. Primary management needs are protection from recreational impacts and maintenance of desired vegetation using a variety of methods. This community includes Grassy Balds and Heath Balds as defined in the Southern Appalachian Assessment (SAMAB 1996: 181-182), and all Associations within the following Ecological Groups as defined by NatureServe (2001a):

436-10 Appalachian Highlands Grassy Balds

436-20 Appalachian Highlands Shrub Balds





Some environmental factors that occurred historically on heath balds include, high precipitation, extreme cold, frequent fog and wind. Conditions typically occurring on grassy balds include strong wind, high rainfall, frequent fog and extremes of temperature and moisture. Species composition varies regarding topographic features, moisture, exposure, types of disturbances and land use history. Oat grass tends to dominate the drier sites, while sedge tends to dominate the moist sites. One of the more distinctive characteristics of a grassy bald in relation to other high elevation communities is that it has extensive ranges dominated by herbaceous vegetation. (SAMAB 1996: 181-182)

The known distribution of rare grassy and heath bald communities is described in the Southern Appalachian Assessment Terrestrial Technical Report (SAMAB 1996:188-190). This report indicates that approximately two-thirds of the occurrences of grassy balds and nearly one half of the occurrences of heath balds in the southern Appalachian area are located on national forest lands.

There are four balds currently recognized on the Jefferson National Forest as shown in Table C-2 below along with their approximate acreage. Each of these are recognized as grass balds primarily, although relatively small areas of heath bald and high elevation rocky summits exist at Whitetop Mountain and within the Crest Zone balds. The heath balds and high elevation rocky summits within the Crest Zone are located predominately along Wilburn Ridge. These areas are very important to a variety of rare plants and animals. The primary threat to grassy bald habitat appears to be the increasing encroachment of woody stems such as hawthorne, red spruce, and various northern hardwood species. The primary threat to high elevation rocky summits is overuse by forest visitors for rock climbing and repelling which may damage the flora and fauna of these areas.

**Table C-2. Existing bald habitats on the Jefferson National Forest and their approximate acreage**

| Bald Name | Acres | Ecological Section |
|---|---|---|
| Whitetop Bald | 155 | Blue Ridge |
| Elk Garden | 80 | Blue Ridge |
| Crest Zone | 2,200 | Blue Ridge |
| Chestnut Ridge | 85 | Ridge & Valley |

The Jefferson National Forest plan objectives outlines restoration of historic communities, and maintenance of balds using such tools as hand cutting, grazing, prescribed burning, mechanical treatments, and herbicides. The Crest Zone bald will be managed under the 4.K.3 Special Area Management Prescription and Whitetop and Elk Garden balds will be managed under the 4.K.4 Special Area Management Prescription. Chestnut Ridge will be managed under the 4.A. Appalachian Trail Management Prescription.

## CAROLINA HEMLOCK FORESTS

Carolina Hemlock Forests are dominated or co-dominated by Carolina hemlock (*Tsuga caroliniana*). These forests have a restricted range that mirrors the patchy distribution of Carolina hemlock, which is a Southern Appalachian endemic, occurring primarily in the Central and Southern Blue Ridge Province from Virginia south to northeastern Georgia and northwestern South Carolina with scattered occurrences in the western Piedmont and

CAROLINA HEMLOCK FORESTS

Ridge and Valley. In Virginia these forests occupy a few small, local, scattered sites on dry to xeric mountain slopes and rocky bluffs of the Blue Ridge and Ridge and Valley south of the James River. Sites are typically very steep and rocky, with shallow, nutrient-poor soils. Common associates are chestnut oak (*Quercus prinus)*, white oak (*Quercus alba)*, scarlet oak (*Quercus coccinea)*, pine species (*Pinus* spp), black gum (*Nyssa sylvatica)*, and various ericaceous shrubs like mountain laurel (*Kalmia latifolia*) and Catawba rhododendron (*Rhododendron catawbiense*). Stand structure (physiognomy) varies from closed-canopy to very open, approaching a woodland structure. These communities often occur in patch-mosaics with fire-influenced oak/heath and pine-oak/heath vegetation. Fire may be an important factor that has limited Carolina hemlock, evidently a fire-intolerant species, to rocky areas and bluffs that are somewhat protected from burning. Currently, the exotic insect pest, hemlock woolly adelgid (*Adelges tsugae*) poses a major threat to the viability and continued existence of Carolina hemlock (as well as Eastern hemlock (*Tsuga canadensis*)). Community types in this group are generally considered globally rare (Fleming and Coulling, 2001).

Over the full geographic range of this forest community, stands typically occur on narrow ridges and upper, north-facing rocky slopes. Four documented Virginia stands occurred at elevations from 591 m (1940 ft) to 1075 m (3525 ft). Sites include a narrow spur ridge crest, one upper slope, and two middle slopes, with south, southwest, and north aspects. Slopes are strongly convex. Two sites have substantial surface cover of rocks (70% and 31%), while the other two sites have negligible rock cover. Soils are extremely acidic (mean pH = 3.8), with very low calcium and magnesium levels and high iron and aluminum levels (Fleming and Coulling, 2001).

These rare forests are separated into three distinct subtypes that are included in one ecological group (401-20) as defined by NatureServe 2001:

- Carolina Hemlock / Mountain Laurel – Catawba Rhododendron Forest (typic type)
- Carolina Hemlock – (Pitch Pine, Table Mountain Pine, Virginia Pine) Forest (pine type)
- Carolina Hemlock – (Eastern Hemlock) / Great Rhododendron Forest (mesic type)

The typical expression of the type has a canopy dominated by *Tsuga caroliniana*, with minor associates of *Quercus prinus*, *Pinus virginiana*, *Pinus pungens*, *Pinus rigida*, *Nyssa sylvatica*, and *Quercus coccinea*. The shrub layer tends to be dense and dominated by ericaceous species, particularly *Kalmia latifolia*, *Rhododendron catawbiense*, *Rhododendron minus*, and *Leucothoe recurva*. Herbs are sparse but can include species such as *Xerophyllum asphodeloides* and *Polypodium appalachianum*.

Occurrences in Virginia are strongly dominated by *Tsuga caroliniana*, with *Quercus prinus* the most important canopy associate. *Quercus rubra*, *Quercus alba*, several *Pinus* spp., *Nyssa sylvatica*, and *Acer rubrum* are minor canopy associates. *Acer rubrum*, *Amelanchier arborea*, and *Sassafras albidum* are common understory trees, while *Rhododendron catawbiense*, *Kalmia latifolia*, and *Hamamelis virginiana* are dominant shrubs. Additional shrubs include *Pieris floribunda*, *Vaccinium pallidum*, *Rhododendron periclymenoides*, and *Gaylussacia baccata*. The herb layer is generally sparse with scattered individuals or patches of *Aralia nudicaulis*, *Carex pensylvanica*, *Chimaphila maculata*, *Cunila origanoides*, and *Hexastylis virginica*. Species richness ranges from 12 to 19 taxa per 400 $m^2$ (mean = 16).

Although no doubt a rare, small-patch community type in Virginia, additional examples are likely on the Forest and should be sought. The long-term impact of hemlock woolly adelgid on Carolina hemlock needs systematic study. The role of fires in the ecology of Carolina

Hemlock Forests is also unclear, since evidence of stand expansion following both following fires and periods of fire exclusion have been noted (Schafale and Weakley 1990). Rentch *et al.* (2000) found that Carolina hemlock dominating a site in Bottom Creek Gorge (Montgomery County, Virginia) was long-lived, very tolerant of drought stresses, and had reproduced episodically over the past 200 years. No evidence of fire is mentioned in this paper. Further description of the life history of Carolina hemlock can be found in Humphry (1989).

There are two rare plant species of concern that are associated with Carolina hemlock forests on the Jefferson National Forests – piratebush (*Buckleya distichophylla*) and of course Carolina hemlock. (Appendix F)

The known distribution of Carolina hemlock forests across the southern Appalachians includes five occurrences on National Forests, one occurrence in National Parks, and six occurrences under private ownership (SAMAB 1996). The fact that these communities are often small in size and that half of the known occurrences are on private lands leaves this community type vulnerable throughout it's range.

Representative sites in the Jefferson National Forest include:

- Glenwood Ranger District – James River Face Wilderness, near Marble Spring
- Mount Rogers NRA – Raven Cliff Recreation Area, SW slope of Gleaves Knob

## BEECH GAP FORESTS

Beech Gap Forests are characterized by an overstory canopy dominated with American beech (*Fagus grandifolia*) on slopes and near mountain gaps above 4,000 feet. Virginia examples of the type occur at elevations from 3600 to 5200 ft. Mean elevation of 28 plot-sampled Virginia stands is 4400 ft. Habitats include a wide range of slope positions and aspects. Surface cover of bedrock and boulders is typically less than 25%, but occasionally higher. Soil samples collected from plot-sampling sites are consistently extremely acidic (mean pH = 3.8) with low base status. Beech gap forests are considered a distinctive subtype of the northern hardwood forest (Schafale and Weakley 1990). These forests have a very restricted range and typically occur as small acreages. As a result of exposure to severe climatic conditions (wind, snow, ice) the canopy trees typically have a distinctive stunted and gnarled appearance. Shrub layers are typically sparse, and herbaceous growth dense. This community is found in the Southern Appalachians and is endemic to the higher elevations of the Southern Blue Ridge in eastern Tennessee, western North Carolina, and southwestern Virginia. In the Virginia Blue Ridge, it is prevalent in the Mount Rogers – Whitetop Mountain area and at high elevations of the Iron Mountains (Fleming and Coulling, 2001). This community corresponds to Beech Gap Forest as defined in the Southern Appalachian Assessment (SAMAB 1996:179), and the following Associations defined by NatureServe (2001a, 2001b):

CEGL006246 Southern Appalachian Beech Gap (North Slope Tall Herb Type)

CEGL006130 Southern Appalachian Beech Gap (South Slope Sedge Type)

Beech Gap Forests are localized and found only on the Blue Ridge. These forests are typically found on convex, often south-facing slopes and ridge spurs with very infertile soils. *Fagus grandifolia* is the clear (sometimes overwhelming) canopy dominant, although yellow birch (*Betula alleghaniensis)* and sugar maple (*Acer saccharum)* are constant, less abundant canopy associates. Yellow buckeye (*Aesculus flava)* is essentially absent from this unit, while Fraser magnolia (*Magnolia fraseri)*, Eastern hemlock (*Tsuga canadensis)*, and red spruce (*Picea rubens)* are locally important canopy associates. Understory and

BEECH GAP FORESTS

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shrub layers are dominated by young *Fagus* and *Acer saccharum*, in addition to striped maple (*Acer pensylvanicum)* and red maple (*Acer rubrum)*. This subtype often has a well-developed shrub layer with hobblebush (*Viburnum lantanoides)* dominant. Herb layers are moderately sparse to moderately dense and graminoid-rich; large patches of Northern woodland sedge (*Carex lucorum* var. *austrolucorum)* are particularly characteristic. Other frequent or abundant herbs are round-leaf violet (*Viola rotundifolia)*, fancy fern (*Dryopteris intermedia)*, Blue Ridge white heart-leaf aster (*Eurybia chlorolepis (= Aster chlorolepis))*, whorled aster (*Oclemena acuminata* (= *Aster acuminatus*)), shining clubmoss (*Huperzia lucidula)*, white wood-sorrel (*Oxalis montana)*, New York fern (*Thelypteris noveboracensis)*, hayscented fern (*Dennstaedtia punctilobula)*, sedge (*Carex aestivalis)*, sedge (*Carex debilis* var. *rudgei)*, and Northern shorthusk (*Brachyelytrum septentrionale)*. Mean species richness of plot-sampled stands is 37 taxa per ~0.1 acre (400 $m^{2)}$.

Most of the range of this forest is on public lands administered by the U.S. Forest Service (Pisgah, Nantahala, Cherokee, and Jefferson national forests) and National Park Service (Great Smoky Mountains National Park and Blue Ridge Parkway) (SAMAB 1996: 190),. There are less than ten occurrences of Beech Gap Forests in Virginia. Most are on the Jefferson National Forest in the Mt. Rogers area.

Examples of these occurrances are:

- Mount Rogers National Recreation Area – Whitetop Mountain (prevalent)
- Mount Rogers National Recreation Area – Beech Mountain (prevalent)
- Mount Rogers National Recreation Area – Mount Rogers & Elk Ridge (prevalent)
- Mount Rogers National Recreation Area – Pine Mountain (prevalent)
- Mount Rogers National Recreation Area – Iron Mountains / Roundtop (local, north slopes at high elevations)

## BASIC MESIC FORESTS

These communities are typically characterized by complex multi-storied canopies, deciduous overstories and rich and diverse understories of calciphilic herbs, underlain by high-base geologic substrates with moist soil conditions. On moderate to high elevation sites, these communities are typically found in protected coves, and can be distinguished from more acidic mesic cove forests by the abundance of species such as white basswood (*Tilia americana*), yellow buckeye (*Aesculus flava*), black walnut (*Juglans nigra*), faded trillium (*Trillium discolor*), sweet white trillium (*Trillium simile*), black cohosh (*Cimicifuga racemosa*), blue cohosh (*Caulophyllum thalictroides*), whorled horsebalm (*Collinsonia verticillata*), mock orange (*Philadelphus inodorus*), sweet shrub (*Calycanthus floridus*), sweet cicely (*Ozmorhiza* spp.), doll's eyes (*Actaea racemosa*), maidenhair fern (*Adiantum pedatum*), and plantain-leaved sedge (*Carex plantaginea*). Good examples of moderate and high elevation basic mesic forests have a low incidence of white pine (*Pinus strobus*), eastern hemlock (*Tsuga canadensis*), rhododendron (*Rhododendron* spp.), and Christmas fern (*Polystichum acrostichoides*) since these species are found in more acidic soil conditions.

On lower elevation sites, these communities are more typically found on north slopes, where dominant and characteristic overstory species are American beech (*Fagus grandifolia*) and northern red oak (*Quercus rubra*), with tulip poplar (*Liriodendron tulipifera*), white oak (*Quercus alba*), shagbark hickory (*Carya ovata*), or white ash (Fraxinus *americana*), with southern sugar maple, chalk maple, painted buckeye (*Aesculus sylvatica*), and pawpaw (*Asimina triloba*) in the midstory and shrub layers, and understories that include faded trillium, nodding trillium (*Trillium rugelii*), black cohosh, doll's eyes, foam flower (*Tiarella cordifolia var. collina*), bloodroot (*Sanguinaria*

*canadensis*), bellworts (*Uvularia sp.*) and trout lilies (*Erythronium spp.)*. Good examples of low elevation basic mesic forests have a low incidence of sweetgum (*Liquidambar styraciflua*), loblolly pine (*Pinus taeda*), and exotics such as Japanese honeysuckle (*Lonicera japonica*) or Chinese privet (*Lingustrum vulgare*).

Basic mesic forest communities are found in both the Appalachian and Piedmont regions. This community includes the following Associations defined by NatureServe (2001a, 2001b):

| | |
|---|---|
| CEGL007711 | Southern Appalachian Cove Forest (Rich Foothills Type) |
| CEGL007695 | Southern Appalachian Cove Forest (Rich Montane Type) |
| CEGL008488 | Southern Ridge and Valley Basic Mesic Hardwood Forest |

For the Jefferson National Forest the basic mesic rare community type is composed of two ecological communities as defined by the Virginia Division of Natural Heritage (Fleming and Coulling 2001): 1) Rich Coves and Slope Forests, including the Central Appalachian Rich Cove Forest (sugar maple-basswood type) and Southern Appalachian Rich Cove Forest (typic type), but not the Central Appalachian Rich Cove Forest (tuliptree-northern red oak-cucumbertree type); and 2) Basic Mesic Forests. These ecological communities are described as follows:

**Rich cove and slope forests:** Mixed hardwood forests of fertile, mesic, mountain-slope habitats at elevations ranging from about 300 m (1000 ft) to about 1100 m (3600 ft). Distributed locally throughout western Virginia, these forests are strongly associated with moist, sheltered, landforms (*i.e*., coves, ravines, and concave lower slopes). Soils may be weathered from various substrates and generally range from strongly acidic to moderately alkaline, with high base saturation. In these habitats, soil fertility appears to be strongly correlated with high base cation levels (particularly calcium, magnesium, and manganese) rather than with high pH, and higher-elevation sites often have soils with surprisingly low pH. Characteristic trees include *Acer saccharum*, *Tilia americana* var. *americana* and var. *heterophylla*, *Fraxinus americana*, *Liriodendron tulipifera*, and *Aesculus flava*. Herbaceous growth is lush with spring ephemerals and leafy, shade-tolerant forbs such as *Caulophyllum thalictroides*, *Impatiens pallida*, *Trillium grandiflorum*, *Laportea canadensis*, and many others. Compositional variation related to substrate and elevation is complex and will require intensive future study. The principal threats to rich cove forests are logging and invasion by *Alliaria petiolata* and other shade-tolerant, exotic weeds.

Examples:

- Central Appalachian rich cove forest (sugar maple-basswood type) -Rich cove/mesic slope forest – Lovelady Coves, Clinch
- Central Appalachian rich cove forest (sugar maple-basswood type) - Rich cove/mesic slope forest (4) – Cliff Mt., Clinch
- Central Appalachian rich cove forest (sugar maple-basswood type) - Rich cove/mesic slope forest – Lower Little Stony Creek, Clinch
- Central Appalachian rich cove forest (sugar maple-basswood type) - Rich cove/mesic slope forest (2) – Staunton Creek Gorge, Clinch
- Central Appalachian rich cove forest (sugar maple-basswood type) - Rich cove/mesic slope forest – Whitetop Mt., NRA
- Central Appalachian rich cove forest (sugar maple-basswood type) – Apple Orchard Falls, Apple Orchard Mt., Glenwood

BASIC MESIC FORESTS

- Southern Appalachian rich cove forest (typic type) – Raven Cliff Horse Camp, NRA

ROCK OUTCROPS AND CLIFFS

**Basic Mesic Forests:** Mixed hardwood forests of fertile, mesic, low-elevation habitats in the Coastal Plain, Piedmont and lower slopes and valleys of the mountain region. Typical sites are deep ravines, sheltered north- or east-facing slopes subtending large streams and rivers, and occasionally well-drained floodplain terraces. Soils are usually weathered from carbonate or mafic bedrock, or from calcareous, shell-rich deposits in the Coastal Plain. Dominant trees include the species of Rich Cove and Slope Forests, as well as *Quercus muehlenbergii*, *Acer nigrum*, *Acer barbatum* (Coastal Plain and Piedmont only), *Fagus grandifolia*, *Carya cordiformis*, and *Juglans nigra*. Shrub and herb layers contain a number of species that are atypical of mountain slopes, such as *Asimina triloba*, *Jeffersonia diphylla*, *Erigenia bulbosa*, and *Trillium sessile*. The extent and viability of basic mesic forests has been reduced by repeated logging and invasive exotic weeds.

Example:

- Central Appalachian/piedmont rich slope forest (twinleaf-canada waterleaf type) – Smith Tract (lower slope along James River), Glenwood

The Southern Appalachian Assessment (SAMAB 1996:49) combined mesic and xeric mafic communities, and concluded that only 25% of the known occurrences for species associated with mafic and other calcareous habitats, occurred on National Forest land.

## ROCK OUTCROPS AND CLIFFS

Rock outcrops and cliffs are defined here as rare communities and include the following types of communities as defined in the Southern Appalachian Assessment (SAMAB 1996:179-186), and by NatureServe (2001). Regional descriptions are given followed by the relevant ecological communities for the Jefferson National Forest from Fleming and Coulling (2001), and Fleming, et al. (2001).

### TALUS SLOPES

**Regional Description.** This community is characterized by nonvegetated or sparsely vegetated accumulations of rock at 2,500 to 4,600 feet elevation. It is found in the Appalachian region and is distinguished from Forested Boulderfields by the lack of trees, and from rocky summits by its occurrence on side slopes as opposed to ridges and peaks. This community includes Talus Slopes as defined in the Southern Appalachian Assessment (SAMAB 1996:186), and all Associations within the following Ecological Group as defined by NatureServe (2001):

430-10 Eastern Acid Talus

**Jefferson National Forest Ecological Communities**

**Moss / lichen boulderfields:** Non-vascular vegetation occupying exposed, minimally weathered boulderfields on mountain ridges of western Virginia. Boulderfield habitats have resulted from periglacial phenomena and the collapse of resistant strata from weathering and erosion of weaker underlying rocks. The most numerous and extensive exposed boulderfields are composed of sandstone or quartzite, with a few occurrences on metabasalt at higher elevations of the Northern Blue Ridge. These habitats, where few vascular plants survive, are often densely populated by overlooked or cryptic species of lichens and moss. Dominant on boulders are umbilicate "rock tripe" lichens, including *Umbilicaria mamulata, U. muehlenbergii,* and *Lasallia papulosa*. Also common are small, round, tightly attached patches of the bright yellow-green lichen *Dimelaena oreina*. Sheltered surfaces where detritus collects are often colonized by mosses. The most

common of these are *Dicranum* spp., but *Hedwigia ciliata* and other species are also present. The fern *Polypodium appalachianum* occurs frequently on weathered edges. Progressive, long-term weathering of exposed boulderfields results in slow invasion by trees such as *Betula alleghaniensis* and *Sorbus americana* at higher elevations, and *Betula lenta* at lower elevations. Open boulderfields are favored by timber rattlesnakes (*Crotalus horridus horridus*), which often locate their hibernacula in the rocky substrates. These small-patch community types are uncommon and are primarily threatened by air pollution and acid rain.

Example:

- Devils Marbleyard – James River Face Wilderness, Glenwood

## CLIFFS AND BLUFFS

**Regional description.** These communities are characterized by steep, rocky, sparsely-vegetated slopes, usually above streams or rivers. Cliff communities may be dry or wet, and include communities associated with waterfalls, such as spray cliffs and rock houses. These communities are found in the Appalachian region. This community includes Calcareous Cliffs, Mafic Cliffs, Sandstone Cliffs, and Spray Cliffs as defined in the Southern Appalachian Assessment (SAMAB 1996:179,182,183,185), and all Associations within the following Ecological Groups as defined by NatureServe (2001a):

| | |
|---|---|
| 430-40 | Eastern Dry Acid Cliffs |
| 430-45 | Eastern Moist Acid Cliffs |
| 430-50 | Eastern Dry Alkaline Cliffs |
| 430-55 | Eastern Moist Alkaline Cliffs |
| 430-60 | Appalachian Highlands Northern White Cedar Bluffs |
| 430-65 | Appalachian Highlands Rock Houses |

**Jefferson National Forest Ecological Communities**

**Mountain Acidic Cliffs:** Sparse woodland, shrub, and herbaceous vegetation of very steep to precipitous sandstone, acidic shale, and quartzite outcrops, cliffs, and rocky escarpments. These communities are scattered throughout the mountain and western Piedmont foothill regions of Virginia, but are poorly inventoried and documented at present. Acidic cliffs occur under several geomorphic conditions, especially on slopes undercut by large streams or rivers and on resistant caprock exposed by differential weathering of weaker underlying strata. Habitats vary with aspect and other environmental conditions. Local zones of ephemeral seepage may be present. The vegetation is generally dominated by lichens, with umbilicate "rock tripe" species such as *Umbilicaria* spp. and *Lasalia papulosa* especially prominent. Vascular plants are confined to crevices and humus-covered shelves. On drier, south- to west-facing cliffs, vascular species may be very sparse and consist of stunted pines *(Pinus virginian*a, *P. pungen*s), ericaceous shrubs, and occasional erbaceous lithophytes such as mountain spleenwort *(Asplenium montanu*m), silverling *(Paronychia argyrocom*a), and wild bleeding heart *(Dicentra eximi*a). Sheltered, north- to east-facing cliffs often support more diverse shrub and herbaceous flora. Characteristic species include stunted eastern hemlock *(Tsuga canadensi*s), evergreen rhododendrons *(Rhododendron maximum* and *R. catawbiens*e), rock polypodies *(Polypodium appalachianum* and *P. virginianu*m), Michaux's saxifrage *(Saxifraga michauxi*i), rock alumroot *(Heuchera villosa* var. *villos*a), and wavy hairgrass *(Deschampsia flexuosa* var. *flexuos*a). Shaded grottoes and "rock houses" on cliffs of the Cumberland Mountains in southwestern Virginia support colonies of little-leaved alumroot *(Heuchera parviflora* var. *parviflor*a) and round-leaved catchfly *(Silene rotundifoli*a). There are few threats to acidic cliffs, except for local damage by rock climbers.

ROCK OUTCROPS AND CLIFFS

Example:

- Montane acidic cliff – Raven Cliff, NRA

**Xeric calcareous cliffs:** Sparse shrub and herbaceous vegetation of very steep to precipitous, south- to west-facing limestone and dolomitic outcrops, cliffs, and rocky escarpments. In Virginia, communities of this group are confined to carbonate rock districts of the Ridge and Valley province and Cumberland Mountains. Habitats are usually undercut by large streams or rivers and are situated on upper slopes or crests with predominantly convex slope shapes. Microtopography is rugged and complex, with very high cover of exposed bedrock. The surficial rock and associated edaphic stresses limit overall vegetation cover, woody growth, and species richness. Scattered scrub growth of *Juniperus virginiana*, *Quercus muehlenbergii*, *Philadelphus hirsutus*, *Toxicodendron radicans*, and other shrubs is typical. Prevalent among herbaceous species are lithophytes such as *Asplenium resiliens*, *Asplenium ruta-muraria*, *Carex eburnea*, *Draba ramosissima*, *Melica nitens*, *Minuartia michauxii*, *Muhlenbergia cuspidata*, *Pellaea atropurpurea*, *Pellaea glabella*, *Phlox subulata*, and *Symphyotrichum oblongifolium* (= *Aster oblongifolius*). These small-patch communities are generally considered state-rare, but their conservation status needs further investigation. Because of inaccessible locations, stands seem immune from many types of anthropogenic disturbance. Scattered individuals of exotic weeds sometimes find footholds but are largely excluded from cliffs by the hot, xeric, rocky substrates. Reference: Fleming (1999).

Example:

- Central Appalachian limestone/dolomite woodland – Cliff Mt., Clinch

**Northern white-cedar slope forests:** Mixed, largely coniferous forests in which *Thuja occidentalis* is a dominant or co-dominant tree. This is a rare natural community occurring in small, isolated patches from the Ridge and Valley province of western Virginia south to the Eastern Highland Rim, Ridge and Valley, and low Blue Ridge regions of Tennessee. Habitats are on steep, rocky, mesic to submesic slopes that are undercut by streams and have west to north aspects. Underlying bedrock is usually limestone or dolomite, but one Virginia site is underlain by calcareous Silurian sandstone. *Pinus strobus* and/or eastern hemlock *Tsuga canadensis* are the most frequent (often co-dominant) tree associates, with scattered hardwoods also present. Understory and herbaceous layers are variable but generally contain a number of typical calciphiles such as *Berberis canadensis*, *Dirca palustris*, *Galium boreale*, and *Hepatica nobilis* var*. acuta*.

Example:

- Southern Appalachian northern white-cedar slope forest – Dismal Creek, NRV

**Spray Cliffs:** Constantly wet rock faces within the spray or splash zone of waterfalls, or sheltered cliffs saturated with permanent seepage. Communities in this group have been well documented in North Carolina, but have not been studied in Virginia. A few examples, scattered over the entire mountain region of the state, are known from qualitative reports. At this time, very little can be said about the ecological dynamics or floristic composition of these occurrences. Based on casual observations, mosses and liverworts are usually the dominant plants, with vascular species more sparsely rooted in crevices and on moss- or humus-covered shelves. Among the more characteristic or abundant vascular plants are brook saxifrage *(Boykinia aconitifoli*a), small enchanter's nightshade *(Circaea alpina* ssp. *alpin*a), little-leaved alumroot *(Heuchera parviflora* var. *parviflor*a), rock clubmoss *(Huperzia porophil*a), saxifrages *(Saxifraga caroliniana* and *S. micranthidifoli*a), mountain meadowrue *(Thalictrum clavatu*m), and various lithophytic ferns. Very few waterfalls in Virginia are large and constant enough to provide requisite conditions for spray cliff communities. Good examples, therefore, should be high priorities for protection. A full

understanding of Virginia's spray cliff vegetation and its relationship to similar vegetation further south in the Appalachians will require comprehensive bryophyte inventories.



Example:

- Sandstone seepage cliff - Raven Cliff, NRA

## ROCK OUTCROPS

**Regional description.** These communities are characterized by significant areas of exposed, usually smooth, exfoliating granite or related rocks, with scattered vegetation mats and abundant lichens. These communities are found in both the Appalachian and Piedmont regions. This community includes Granitic Dome and Granitic Flatrock as defined in the Southern Appalachian Assessment (SAMAB 1996:180-181), and all Associations within the following Ecological Groups as defined by NatureServe (2001a):

435-10 Appalachian Highlands Granitic Domes

435-20 Appalachian Highlands Grantic Flatrock

These communities are not known to occur outside the Piedmont in Virginia.

## ROCKY SUMMITS

**Regional description.** This community is characterized by sparsely vegetated outcrops of fractured, irregular rock found above 4,000 feet elevation on peaks, ridges, and upper slopes. It is distiguished from rock outcrop communities by its fractured, irregular rock surface, and from talus slopes and cliff communities by its topographic position on or near summits. It differs from forested boulderfields in its general lack of forest cover. This community is found in the Appalachian region. This community includes High Elevation Rocky Summits as defined in the Southern Appalachian Assessment (SAMAB 1996:182), and all Associations within the following Ecological Group as defined by NatureServe (2001a):

436-30 Appalachian Highlands Rocky Summits

**Jefferson National Forest Ecological Communities**

High-elevation outcrop barrens: Scrub and herbaceous vegetation of exposed, metamorphic, igneous, and sedimentary outcrops in the Blue Ridge and Ridge and Valley provinces. The lower-elevation limit of these barrens is about 900 m (3000 ft) in northern Virginia, increasing to about 1200 m (4000 ft) in the Southern Blue Ridge. The full range of environmental and compositional variation in this group, especially in the Southern Blue Ridge occurrences, has not been documented. In the Northern Blue Ridge, high-elevation outcrop barrens occupy granitic and metabasaltic outcrops of mostly west- to north-facing upper slopes and summits. Known examples in the Southern Blue Ridge occur on amphibolite (Buffalo Mountain, Floyd Co.) and rhyolite (Mount Rogers area). A few local examples of high-elevation quartzite barrens occur in the northern Ridge and Valley. While bedrock chemistry no doubt exerts some influence on floristics, geologically heterogeneous habitats share similar microclimatic and edaphic stresses. The habitats are wind-blasted and subject to severe winter temperatures and ice, while oligotrophic soils consist of very thin, local veneers of organic matter, gravel, or silt. Vegetation is usually a patchwork of shrub thickets, herbaceous mats, and lithophytic lichens. Characteristic shrubs are *Sorbus americana*, *Photinia melanocarpa* (= *Aronia melanocarpa*), *Prunus pensylvanica*, *Diervilla lonicera*, *Physocarpus opulifolius* (on mafic outcrops), *Kalmia latifolia*, and severely stunted *Betula alleghaniensis*. Typical herbs are *Saxifraga michauxii*, *Solidago simplex* var. *randii*, *Minuartia groenlandica*, *Hylotelephium telephioides* (=*Sedum telephioides*), *Sibbaldiopsis tridentata*, *Deschampsia flexuosa*, and

ROCK OUTCROPS AND CLIFFS

*Polypodium appalachianum*. A number of remarkable, long-range boreal disjuncts, *e.g.*, *Juncus trifidus*, *Huperzia appalachiana*, and *Trisetum spicatum*, are associated with these outcrops. Community types in this group are considered very rare in Virginia and globally. Threats include trampling and destruction of fragile vegetation mats and invasive exotic weeds such as *Poa compressa* and *Rumex acetosella*.

Example:

- High-elevation outcrop barren (black chokeberry igneous/metamorphic type) – Mt. Rogers, NRA

## FORESTED BOULDERFIELDS

**Regional description.** This community is characterized by rock fields, found at 3,500 to 5,300 feet elevation, that support a variable density of trees, typically dominated by yellow birch. It is distinguished from talus slopes by the presence of trees. It is found in the Appalachian region. This community includes Boulderfields as defined in the Southern Appalachian Assessment (SAMAB 1996:179), and the following Associations as defined by NatureServe (2001a, 2001b):

| | |
|---|---|
| CEGL004982 | Southern Appalachian Hardwood Boulderfield Forest (Typic Type) |
| CEGL006124 | Southern Applachian Boulderfield Forest (Currant and Rockcap Type) |

**Jefferson National Forest Ecological Communities**

High-elevation boulderfield forests and woodlands: Open forests and woodlands occupying relatively unweathered boulderfields at elevations above 900 m (3000 ft) in both the Blue Ridge and Ridge and Valley provinces. *Betula alleghaniensis*, *Sorbus americana*, and *Acer spicatum* are the typical dominants of boulderfields weathered from granite, metabasalt, quartzite, and sandstone at the highest elevations. These habitats are usually best developed on north-facing slopes. Trees here are typically gnarled and widely spaced because of difficult establishment and repeated damage from wind and ice. Typical shrubs include *Ribes* spp. and *Sambucus racemosa* (= *Sambucus pubens*). The high cover of exposed rock in these habitats tends to limit overall species richness and herbaceous density. Cool microclimates favor the occurrence of many northern and high mountain species. The globally rare and federally listed Shenandoah salamander (*Plethodon shenandoah*) is endemic to three thinly wooded, high-elevation boulderfields on the Northern Blue Ridge.

Examples:

- Southern Appalachian high-elevation boulderfield forest – North slope Pine Mt., NRA
- Southern Appalachian high-elevation boulderfield forest – North slope Mt. Rogers, NRA
- Southern Appalachian high-elevation boulderfield forest – North slope Whitetop Mt., NRA

Low-elevation boulderfield forests and woodlands: Open forests and woodlands occupying partially weathered boulderfields at elevations below 975 m (3200 ft). These habitats are widely scattered throughout the mountains on steep sideslopes of ridges, often in zones below large outcrops. Stand composition varies greatly with substrate, aspect, and slope position. *Betula lenta* is often the sole invader of large-block sandstone and quartzite boulderfields, forming pure stands of gnarled, spreading trees. Here, *Parthenocissus*

*quinquefolia* is sometimes the only low-growing plant able to become established in the deep interstices between boulders. On somewhat more weathered or less blocky boulderfields, *Quercus prinus* or mixtures of *Quercus prinus*, *Quercus rubra*, *Nyssa sylvatica*, and *Betula lenta*, along with a greater diversity of shrubs and herbs, may prevail. Cool, north-facing, sandstone/quartzite boulderfields frequently support *Tsuga canadensis* and, locally, disjunct populations of *Betula papyrifera* var. *cordifolia*. On base-rich metabasalt and granitic boulderfields of the Northern Blue Ridge, *Tilia americana*, *Fraxinus americana*, and *Quercus rubra* are characteristic trees. Dolomitic or limestone boulderfields support open stands of *Tilia americana* and *Aesculus flava*, with a variety of mosses, *Cystopteris bulbifera*, and other calciphilic herbs forming dense mats on rock surfaces. Communities in this group are uncommon in Virginia; their classification and distributional status need further assessment.

Example:

- Appalachian calacareous boulderfield forest – North slope Staunton Creek Gorge, Clinch

The known regional distribution of rare rock outcrop and cliff communities is described in the Southern Appalachian Assessment Terrestrial Technical Report (SAMAB 1996:188-190). According to this source, approximately one third of all occurrences of these communities in the southern Appalachian area are located on national forest lands.

## TABLE MOUNTAIN PINE WOODLANDS

This community is characterized by a dominant or significant component of Table Mountain pine (*Pinus pungens*) in the overstory, often in combination with pitch pine (*Pinus rigida*). This forested community is a species-poor, fire-influenced, mixed woodland of xeric, exposed mountain habitats. Sites are typically located on convex, south to west slopes of steep spur ridges, narrow rocky crests, and cliff tops. Pine–oak/heath woodlands (of which Table Mountain Pine Woodlands are part of) are widespread throughout the Central and Southern Appalachian region. In Virginia, the type ranges through the Blue Ridge and Ridge and Valley provinces with a few outliers in the Piedmont. The Table-Mountain Subtype occurs throughout this range, while the Pitch Pine Subtype is more confined to the northern two-thirds of the state's mountain region. They occur at elevations from below 300 m (1000 ft) to more than 1200 m (4000 ft) on various substrates, but most commonly on acidic, sedimentary and metasedimentary substrates, *e.g.*, sandstone, quartzite, and shale, but the type is most frequent and extensive on sandstone and quartzite. Soils are very infertile, shallow, and droughty. Thick, poorly decomposed duff layers consisting primarily of pine needles, along with dead wood and flammable shrubs, contribute to a strongly fire-prone habitat (Groeschl *et al* 1992). The influences of past fires are seen in the even-aged character of overstory trees to numerous pieces of charred wood debris and charcoal in duff layers (Fleming and Coulling, 2001).

Short-statured *Pinus pungens* and *Pinus rigida* are usually dominants forming an open canopy, often with co-dominant *Quercus prinus*. Less important tree associates include *Quercus coccinea*, *Pinus virginiana*, and *Sassafras albidum*. Except in the Piedmont stands, *Quercus ilicifolia* is characteristic (often abundant) in the shrub layer, along with various ericaceous shrubs. Colonial shrubs usually pre-empt available microhabitats for most herbaceous species, but *Pteridium aquilinum* var. *latiusculum* and the spectacular *Xerophyllum asphodeloides* are often competitive enough to achieve significant cover. Periodic fire is an important ecological process that provides opportunities for regeneration of both pines and less competitive herbaceous species, while setting back successional encroachment of potential canopy oaks (especially *Quercus prinus*). On cliffs and other very rocky sites, the vegetation is self-perpetuating due to extreme edaphic

TABLE MOUNTAIN PINE WOODLANDS

conditions. Fire reduction and the insect pest, southern pine beetle (*Dendroctonus frontalis*) are the most serious threats to communities of this group. The state-rare northern pine snake (*Pituophis melanoleucus melanoleucus*) and several rare moths, all bear oak (*Quercus ilicifolia*) feeders, are locally associated with these woodlands (Fleming and Coulling, 2001).

This community corresponds to Table Mountain pine/Pitch Pine Woodlands as defined in the Southern Appalachian Assessment (SAMAB 1996:185-186), and all Associations within the following Ecological Group as defined by NatureServe (2001a):

401-80 Appalachian Highlands Pitch and Table Mountain pine Woodlands.

This community type is closely related to other associations classified in the *Pinus pungens* - (*Pinus rigida*) Woodland Alliance. It is thought to differ in the shrub layer dominance of *Quercus ilicifolia*, a northern species which is absent in similar communities south of Virginia, the presence of several other northern species, and the absence of a number of characteristic Southern Appalachian species such as *Gaylussacia ursina*, *Rhododendron carolinianum*, *Rhododendron minus*, *Leiophyllum buxifolium*, and *Fothergilla major*.

There are significant differences in site conditions associated with the two subtypes of this community. The Table-Mountain Pine Subtype occurs at low to middle elevations (mean of plot-sampled stands = 647 m or 2147 ft) and tends to occupy steep (mean slope = 23º) sideslopes with significant rock cover (mean = 14%). The Pitch Pine Subtype occurs at middle to high elevations (mean of plot-sampled stands = 983 m or 3225 ft) and tends to occupy moderately steep to sub-level (mean slope = 7º) upper slopes and crests with little rock cover (mean = 1%) and very dense duff. Although strongly fire-prone habitats influence vegetation structure and composition of both subtypes, the Table-Mountain Pine Subtype tends to be more influenced by edaphic stresses because of its frequent association with cliffs and outcrop areas.

Examples of Table Mountain Pine Woodlands are numerous and widespread on the Jefferson National Forest, although most occurrences consist of small acreages on slopes with a southerly aspect surrounded by oak dominated forests. Such areas include James River Face Wilderness, Broad Mountain, Bald Mountain, Peters Mountain, Potts Mountain, Brush Mountain, Walker Mountain, Brushy Mountain, and Pine Mountain.