High Elevation Rock Outcrops

Southern Blue Ridge Mountains

High elevation rock outcrops are quite limited across the North Carolina landscape, however they are quite variable in terms of both geological and ecological condition. This habitat includes many distinct natural communities defined by Schafale and Weakley (1990) including boulderfield, rocky summit, granitic dome, acidic cliff, and mafic cliff, as well as some specific habitats less well defined or occurring within the context of other forest types including rock outcrops and talus slopes. In general they are found on ridgetops, peaks, and upper slopes where soils are thin and rock dominates the surface. We have not defined a lower elevation limit for this habitat type because there is extensive overlap between the plant community, animal community, and the physical condition of this habitat and the low elevation cliff/rock outcrop habitat.

While high elevation rock outcrop habitat and low elevation cliffs/rock outcrops support many of the same animals and plants, there are species of both plants and animals that are found exclusively at high elevation rock communities (e.g. rock vole, long-tailed shrew, Allegheny woodrat, and several rare plant species), and others found only in low elevation cliffs/rock outcrop habitat (e.g. southern Appalachian woodrat, spotted skunk, crevice and Southern zigzag salamanders). The elevation limit for each of these species varies, but clearly there is a distinction between the animal assemblage at rock habitats that is dependent upon elevation.

In general high elevation rock outcrops are open canopy communities with patchy vegetation due to variability in soil depth. Lichens and mosses occur on bare rock and other vegetation may develop in deep moss mats or crevices (oatgrass species, sedges, mountain dandelion). Woody plants or trees such as mountain laurel, Catawba rhododendron, table mountain pine, red spruce, and yellow birch may occur in the deepest soil mats, rock crevices, and at the edge of these habitats. Many rare plant species are associated with high elevation rock outcrop habitats. Certain high elevation rock outcrop habitats can occur within a forested setting (e.g., boulderfields within northern hardwood forests or small rock outcrops within any forest habitat) (NCNHP 2001). Table 1 provides a list of priority species associated with high elevation rock outcrops and for which there is conservation concern.

Table 1. Priority species associated with high elevation rock outcrops.

Group	Scientific name	Common name	State status* (Federal status)
Birds	*Falco peregrinus*	Peregrine Falcon	E
Mammals	*Microtus chrotorrhinus*	Rock Vole	SC
	Neotoma magister	Allegheny Woodrat	SC
	Sorex dispar	Rock Shrew	SC
Amphibians	*Aneides aeneus*	Green Salamander	E
Reptiles	*Crotalus horridus*	Timber Rattlesnake	SC
	Eumeces anthracinus	Coal Skink	

*Abbreviations
E Endangered
SC Special Concern

Location And Condition Of Habitat

There is no current assessment available which characterizes the availability or distribution of the high elevation rock outcrop habitat. Owing to the small size, the dispersed nature, and the variability of types of this habitat, we have no means to determine the amount of it available, nor map where it occurs. However, it is certainly one of the most limited habitats in the state in terms of area, and also widely distributed throughout the mountains. High elevation rock outcrops obviously occur only in the highest mountain ranges of western North Carolina, notably in the Great Smokies, Plott Balsams, Great Balsams, Black/Craggy Mountains, Grandfather Mountain, Roan Mountain, and in the Amphibolite mountains of Ashe County. However, depending upon elevation, they can be found scattered just about anywhere that elevations allow. A map of this habitat is not provided, due to scale and sensitivity issues.

As with its distribution and abundance, we have no current means to assess the current condition of high elevation rock outcrop habitat across the region. Conditions vary, and each site can have a unique set of problems depending upon land ownership, historic uses, and a host of other potential variables that can affect the availability and use of a particular site by various animals. Many, but by no means all of the high elevation rock outcrop sites are found on conservation lands owned by the US Forest Service, National Park Service, and or The Nature Conservancy.

Problems Affecting Species And Habitats

High elevation rock outcrop habitats can be affected by numerous activities and situations, the exact nature of which remain specifically undetermined. Recreational activities such as hiking and rock climbing can have deleterious effects upon the plants and animals associated with the habitat as a result of trampling, habitat alteration, or even presence of people or human activities at or near the sites. Development (primarily housing) can and certainly has had an impact upon both the habitat as well as the species utilizing it. There has been suggestion that air pollution could be having an impact upon the high elevation rock communities of western North Carolina (TNC and SAFC 2000), however there has not been definitive evidence of air pollution impacts upon wildlife species associated with high elevation rock outcrops.

Each site can have a somewhat unique set of problems particular to it, ranging from almost no impact to a high degree of impact. Common threats across the range of high elevation rock outcrops include:

- Recreational activities (climbing and trampling) can have significant impacts upon both the physical characteristics of the site, as well as disrupting behavior patterns of particular wildlife species.

- Development (both recreational development and housing development in particular locations have, and continue to cause direct habitat loss and indirect impacts upon wildlife species dependent upon them).
- Intrusion by alder, rhododendron and other woody plants causing rock outcrops to become overgrown.

Individual wildlife and plant species can be affected by the problems mentioned above, however they may also face additional threats specific to either their particular location or the species itself. For example, timber rattlesnakes face threats in addition to habitat loss including being subject to collection, disturbance of hibernacula/gestation sites, and persecution. There has been considerable effort undertaken in the northeastern United States to determine the impact upon Allegheny woodrat populations from a roundworm parasite that may have impacted populations in that region (McGowan 1993, Stone et al. 1993), though no studies have been conducted within North Carolina to assess the level of threat posed to North Carolina woodrat populations. The decline of peregrine falcons during the last half of the 20th century has been widely attributed to the use of DDT and its concomitant effect on bird reproduction. The use of DDT was banned and peregrine restoration efforts occurred in the late 1980's and 1990's, however peregrine falcons still face threats due to habitat loss to development and recreation impacts at individual cliff sites. Furthermore, the North Carolina population remains at fairly low density, thereby increasing the threat of stochastic events having significant population impacts.

For many plant and animal species associated with high elevation rock outcrops we may not currently know the entire spectrum of threats that are affecting populations due to inadequate levels of study or knowledge. For example, green salamander populations in North Carolina may have experienced dramatic declines during the late 1970's and early 1980's (Wilson 2001). Various theories were promulgated to explain the apparent decline including impacts of air pollution, deforestation, development, disease, and over-collection (see Wilson 2001 for discussion), however there is no definitive cause for the apparent decline, and in fact, we do not really know if an overall population decline occurred or whether isolated impacts upon particular sites caused local declines. There remain many unknown problems which can and will impact high elevation rock outcrop communities and their fauna.

Species And Habitat Conservation Actions and Priorities For Implementation

High elevation rock outcrops are extremely rare, have a very restricted range, and are subject to extreme environmental conditions. All existing habitats of this type should be high priorities for conservation action including:

- Habitat protection site management - closure of sensitive areas at certain times or permanently to stop direct (trampling, loss of habitat to recreation developments (trails, vistas, etc.) and indirect human impacts (disturbance).

- Maintenance of biologically significant areas, including peregrine falcon nesting areas, reptile den sites and significant salamander occurrences.
- Easements and land acquisition (potential for partnerships with NC Natural Heritage Program, The Nature Conservancy, and the NC Plant Conservation Program) to protect from long term impacts such as housing development.
- Management of outcrops to reduce intrusion by alder, rhododendron, and other species, which contributes to the disappearance of some vertebrates.

Priority Research, Survey, And Monitoring

- **Surveys**
  - Prioritize surveys for rock shrew, rock vole, coal skink, and timber rattlesnake.
- **Monitoring**
  - Continue monitoring for green salamander, Allegheny woodrat, and peregrine falcon populations.
  - Initiate long-term monitoring (when baseline surveys permit) for the species mentioned above (rock shrew, rock vole, coal skink, timber rattlesnake).
- **Research**
  - Examine peregrine falcon productivity, contaminant effects (per US Fish and Wildlife Service monitoring plan, 2003), and juvenile dispersal (using satellite telemetry).
  - Examine green salamander habitat use/movements and genetic relationships within/between populations.
  - Examine parasite (*Baylisascaris*) prevalence in Allegheny woodrats.
  - Explore better ways to identify the distribution and characteristics of this habitat across the landscape.

Supporting References

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