Ecosystem Description

Forests dominated by red spruce and Fraser fir occur on the high mountain tops in western North Carolina, generally over 5,500 feet in elevation. The cold climate of the high elevations is equivalent in some ways to the boreal forests of Canada. However, the climate differs from the north in being less continuously cold and in being much wetter, with both rain and fog tending to concentrate on the mountain tops.

Spruce-fir forests are divided into two natural community types: Fraser fir forest and red spruce-Fraser fir forest, each with several variants. Both communities tend to have dense canopies under natural conditions. A variety of distinctive shrubs and herbs, many of them more common in the northern United States but some endemic to the southern Appalachians, occur beneath the canopy. Lush beds of moss and ferns cover the rocky soil and abundant fallen logs in some areas.

Fraser fir forest occurs on the highest mountain tops, where Fraser fir is the only tree species able to survive the cold, wind, ice, and storms in large numbers. All Fraser fir forests now exist as patches of dense young trees, resulting from balsam wooly adelgid infestations, an introduced insect pest that kills adult Fraser firs.

Red spruce-Fraser fir forests occur in slightly less hostile environments where red spruce and yellow birch can also persist in large numbers. Red spruce-Fraser fir forests have canopies of remnant spruce trees, many of which are also dying. The least affected sites are the lowest elevation examples, which have relatively little fir.

There are currently six significant areas of spruce-fir habitat in Western North Carolina, including portions of Grandfather Mountain, Roan Mountain, the Black/Craggy mountains, the Great Balsam mountains, the Plott Balsam mountains, and the Great Smoky mountains. Red spruce habitats of lesser size or with somewhat different ecological community associates occur in a few other locations, including Long Hope Valley, Beech Mountain, Unaka Mountain, and Alarka Laurel. The 2005 Wildlife Action Plan described Southern Blue Ridge Mountain Spruce-Fir Forests as a priority habitat (see Chapter 5A) (NCWRC 2005).

Table 1 at the end of this report provides of summary of expected climate change impacts to these natural communities.
**Predicted Effects to Wildlife Species**

Tables 2 through 5 at the end of this report identify the species of conservation concern and priority species that use habitats in this ecosystem.

Spruce-fir provides critical habitat for a host of plant and animal species found nowhere else in North Carolina (NCWRC 2005). Twenty species or subspecies of invertebrates are endemic to spruce-fir forests in the Southern Appalachians. Another nine are highly disjunct within this region, with their next nearest populations located in New England or Canada (some may turn out to be distinct species once genetic studies are done). Still more such species exist within other insect orders and in other invertebrate taxa such as myriapods, Tardigrades, and land snails.

For terrestrial animals, this level of endemism/disjunction is unmatched by any other habitat group in the state. This group is also among the most vulnerable to climate change. Many of these species are flightless, including salamanders and eight species of ground beetles (*Trechus* sp.). Weller’s Salamander is at the highest risk of being pushed off the top of the mountain because of climate change. As is generally true for "sky island" species, even those capable of flight (or ballooning in the possible case of *Microhexura*), probably rarely disperse out of their habitat, if at all. All of these species depend on cool, moist microclimates but the spruce-fir moss spider, ground beetles, and salamanders are particularly susceptible to desiccation and are among the species most likely to be affected by climate change of any in the state.

Spruce-fir communities provide critical breeding habitat for many landbirds of conservation concern according to Partners in Flight (brown creeper, northern saw-whet owl, black-capped chickadee) that are likely endemic to these high peaks (Pashley et al. 2000, Rich et al. 2004, Johns 2004). Local relative abundance of many birds and mammals has decreased as the availability of spruce-fir habitats has declined (e.g., red crossbill, brown creeper, pine siskin, black-capped chickadee, northern saw-whet owl, northern flying squirrel).

Many species are currently excluded from these high elevation communities because of the extreme climate, with winter cold the most likely cause. Mild winters presumably will lead to invasion by species from lower elevation. This will eventually lead to competitive exclusion of distinctive spruce-fir species from the lower parts of their elevational range (DeWan et al. 2010). The fact that these habitats are so small and isolated from each other could have a negative impact upon genetic health of individual populations, as well as demographic effects upon populations.

**Climate Change Compared to Other Threats**

Balsam woolly adelgid, climate change, and air pollution are all major threats. Much of the spruce-fir habitat throughout the southern Appalachians has been significantly altered due to a number of factors including historic logging, fire, exotic insects, historic grazing, and recreational development. Given the high number of endemics and disjuncts, it is also the one
where threats to biodiversity are the greatest. Several of the species face outright extinction and others, if lost, are unlikely to ever recover within the region.

Table 6 compares climate change with other existing threats.

**Table 6. Comparison Of Climate Change With Other Threats**

<table>
<thead>
<tr>
<th>Threat</th>
<th>Rank Order</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Climate Change</td>
<td>1</td>
<td>This ecosystem is among the most vulnerable to the effects of climate change of any in the state. Warmer winters will result in reduced snowfall and less snow pack, which in turn affects soil moisture gradients.</td>
</tr>
<tr>
<td>Invasive Species</td>
<td>1</td>
<td>Balsam woolly adelgid is the most severe threat to Fraser fir forests. Insect outbreaks have occurred in several areas including Roan Mountain, the Black Mountains, and the Great Balsam mountains (NCWRC 2005). Changes in seasonal temperatures may allow pest species to survive during warmer winters and thus exacerbate the threat of insect outbreaks (Logan et al. 2003).</td>
</tr>
<tr>
<td>Air Pollution</td>
<td>1</td>
<td>Air pollution (including acid rain, ozone, and lead deposition) generated in other areas is carried by prevailing winds and deposited through precipitation. Acid rain kills or stunts new growth and contributes to heavy metal toxicity in soils.</td>
</tr>
<tr>
<td>Fire</td>
<td>2</td>
<td>The natural vegetation virtually never burns under the current climate, and the biota are not adapted to fire. Spruce-fir habitats in North Carolina are now found within a narrow range of suitable conditions, isolated from each other and the rest of their range. This condition alone makes them more susceptible to perturbation and catastrophic events.</td>
</tr>
<tr>
<td>Development</td>
<td>3</td>
<td>The Parkway and its associated development (the motor road, vistas, and visitor facilities) have had a significant impact on the amount of spruce-fir habitats available (NCWRC 2005). While wind turbine farms are unlikely to be built where stands of spruce-fir forests are still present, there is some potential for them to be sited on ridge-tops where spruce-fir once occurred and could be potentially restored.</td>
</tr>
<tr>
<td>Logging/Exploitation</td>
<td>4</td>
<td>Much of the spruce was logged in the early 20th century and in some areas (notably the Great Balsams) slash fires burned not only the coarse woody debris, but also the organic soil, which has subsequently inhibited the re-development of spruce and fir forests over large areas (Schafale and Weakley 1990).</td>
</tr>
</tbody>
</table>

**Summary and Recommendations**

Most of the spruce-fir habitat in North Carolina is located on public land, or private lands with permanent conservation easements, with estimates of 90 to 95% in conservation ownership in
the southern Blue Ridge physiographic province (North Carolina, Tennessee, and Virginia) (Hunter et al. 1999, SAMAB 1996). However significant private ownership of spruce-fir habitat occurs in the Plott Balsams and Black/Craggy mountains, and to lesser extents in several other ranges (NCWRC 2005). Since virtually all examples are located on public lands and already managed to preserve their natural features, implementation of recommended interventions should be more feasible than for privately owned lands.

**Recommended Actions**

**Surveys**
- Determine the distribution, relative abundance, and status of all wildlife species associated with spruce-fir forests (NCWRC 2005).
- Focus survey priorities on species believed to be declining, at risk, or exclusively dependent on the rare spruce-fir forest communities (e.g., red crossbill, brown creeper, black-capped chickadee, rock vole, rock shrew, Carolina Northern flying squirrel, Weller’s salamander, pigmy salamanders) (NCWRC 2005).
- Secondary priority to surveys for species for which current distribution information is more available (e.g., Northern saw-whet owl), or for species associated with additional, more extensive habitats (e.g., masked shrew, smoky shrew, hairy woodpecker, Canada warbler, sharp-shinned hawk, Northern slimy salamander) (NCWRC 2005).
- Collect baseline microhabitat and microclimate characteristics in spruce-fir salamander communities

**Monitoring**
- Monitoring systems need to be expanded and/or targeted to be able to assess current population status and trend information for all wildlife species associated with spruce-fir forests (NCWRC 2005).
- Establish mechanisms for monitoring the distribution and condition of spruce-fir habitats through time (NCWRC 2005).
- Monitor phenology of priority species and spruce-fir communities in relation to climate change.
- Monitor microhabitat and microclimate characteristics in spruce-fir salamander communities in relation to climate change.

**Research**
- Studies on the population biology of wildlife species, but also ecological relationships between the species, their habitats, and the biological, physical, and chemical habitat components (NCWRC 2005).
- Studies to explore the degree of endemism of Southern Appalachian populations (e.g., pine siskin, red crossbill, Northern saw-whet owl, black-capped chickadee) (NCWRC 2005).
- Studies to explore the degree of genetic isolation of species restricted to high elevations (e.g., Carolina Northern flying squirrel, rock vole, rock shrew,
Weller’s salamander, Northern saw-whet owl) (NCWRC 2005).

- Research on population demographics including trends, population structure, survivorship, reproduction, and population viability for all spruce-fir associated species/groups (NCWRC 2005).
- Species phenology needs to be investigated, especially where there are endemic populations.

**Management Practices**

- Develop and/or implement techniques for managing pure spruce stands to include habitats components of the entire spruce-fir/northern hardwood community (i.e., thinning) (NCWRC 2005).
- Test silvicultural techniques to re-introduce spruce into formerly disturbed areas that have regenerated in northern hardwood or northern red oak communities (i.e., thinning and underplanting) (NCWRC 2005).
- Protect from wild fire is an important action that can be taken to save the remnants of these communities.

**Land Protection**

- Eliminate or minimize negative effects of future development of state and federal government holdings (state and federal parks, US Forest Service recreation developments) (NCWRC 2005).
- Acquire additional acreage of spruce-fir habitat through purchase, conservation easement, or other perpetual management agreements (particularly in the Plott Balsams and Black/Craggy Mountains) (NCWRC 2005).

**References**


Potter, K.M. 2006. Evolutionary History and Genetic Conservation of Fraser Fir (Abies fraseri [Pursh] Poir.). Ph.D. Diss., NCSU, Raleigh, NC


<table>
<thead>
<tr>
<th>Climate Change Factor</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mild Winters</td>
<td>Reduced snow fall and less snow pack will result in drier soil conditions. Combined with drought conditions, this will create stress on forest vegetation.</td>
</tr>
<tr>
<td>Wind Damage</td>
<td>Given the extreme weather already present in the high mountains, it is unclear if the increase in severe winds will be as great as at lower elevations. These areas experience more high wind than other areas, and it is unclear if an increase in storms will mean more wind damage than already occurs.</td>
</tr>
<tr>
<td>Temperature Increase/Hot Spells</td>
<td>Increasing temperatures may cause shifts in the timing of seasons leading to asynchrony in species interactions or trophic mismatches. (DeWan et al. 2010). May depend on the behavior of cloud cover.</td>
</tr>
<tr>
<td>Fire</td>
<td>Fire is extremely destructive to spruce-fir, but rarely occurs naturally under current conditions.</td>
</tr>
<tr>
<td>Drought</td>
<td>Potential for drought effects is uncertain, and depends on the effect of the climate on orogenic rainfall. Drought and warmer temperatures may accelerate organic matter decomposition, reducing soil organic layer and threatening moist soil and litter species. Heat or drought stress may possibly lead to mortality in some species, including canopy and other dominant plants.</td>
</tr>
<tr>
<td>Exotic Species Invasion</td>
<td>Warmer and dryer years may alter the timing of insect emergence or the time of blooming (reviewed in Parmesan 2006). An increase in insect outbreaks may make spruce-fir habitats particularly vulnerable to the effects of climate change. Coltsfoot (Tussilago farfara) may increase with canopy disruption and warming</td>
</tr>
<tr>
<td>Structural Change</td>
<td>In surviving patches, structural change may result from increased wind or drought damage.</td>
</tr>
<tr>
<td>Increased Fragmentation</td>
<td>Spruce-fir forests are naturally fragmentary, but upward migration may create additional gaps in some patches.</td>
</tr>
<tr>
<td>Compositional Change</td>
<td>Uncertain how much change will occur in the higher elevation patches that survive.</td>
</tr>
<tr>
<td>Acreage Change</td>
<td>The current area is limited and many patches have been reduced further in size. Research from Iverson and Prasad (2001) suggests that spruce-fir habitat could be easily extirpated from the eastern U.S. as temperatures increase. Effects of reduced area may be significant, reducing some species populations enough to cause demographic problems</td>
</tr>
<tr>
<td>Elevation Change</td>
<td>There is no potential for latitudinal migration of these systems. No high elevation areas exist for a considerable distance north of their current range. All patches are isolated by low elevation areas that are already unsuitable in today's climate. High elevation communities such as spruce-fir forests are projected to move northward as physiological tolerances are exceeded across its southern range, which is limited by summer heat and drought.</td>
</tr>
<tr>
<td>Species</td>
<td>Common Name</td>
</tr>
<tr>
<td>--------------------------</td>
<td>-----------------------------------------------</td>
</tr>
<tr>
<td><strong>BIRDS</strong></td>
<td></td>
</tr>
<tr>
<td><em>Accipiter striatus</em></td>
<td>Sharp-shinned Hawk</td>
</tr>
<tr>
<td><em>Aegolius acadicus pop. 1</em></td>
<td>Southern Appalachian northern saw-whet owl</td>
</tr>
<tr>
<td><em>Carduelis pinus</em></td>
<td>Pine siskin</td>
</tr>
<tr>
<td><em>Catharus guttatus</em></td>
<td>Hermit thrush</td>
</tr>
<tr>
<td><em>Certhia americana</em></td>
<td>Brown creeper</td>
</tr>
<tr>
<td><em>Loxia curvirostra pop. 1</em></td>
<td>Southern Appalachian red crossbill</td>
</tr>
<tr>
<td><em>Picoides villosus</em></td>
<td>Hairy Woodpecker</td>
</tr>
<tr>
<td><em>Poecile atricapillus practica</em></td>
<td>Southern Appalachian black-capped chickadee</td>
</tr>
<tr>
<td><em>Setophaga canadensis</em></td>
<td>Canada Warbler</td>
</tr>
<tr>
<td><em>Setophaga magnolia</em></td>
<td>Magnolia warbler</td>
</tr>
<tr>
<td><em>Setophaga pensylvanica</em></td>
<td>Chestnut-sided Warbler</td>
</tr>
<tr>
<td><em>Troglodytes troglodytes</em></td>
<td>Winter wren</td>
</tr>
</tbody>
</table>
### Table 3. Mammal Species Utilizing Spruce Fir Forests

<table>
<thead>
<tr>
<th>Species</th>
<th>Common Name</th>
<th>Element Rank:</th>
<th>Endemic</th>
<th>Major Disjunct</th>
<th>Extinction/Extirpation Prone</th>
<th>US/NC/WAP*</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Glaucomys sabrinus coloratus</em></td>
<td>Carolina northern flying squirrel</td>
<td>G5T1/S2</td>
<td>YES</td>
<td></td>
<td></td>
<td>E/E/P</td>
<td>Likely to face increased competition from southern flying squirrels and increased exposure to the parasite <em>Strongyloides robustus</em></td>
</tr>
<tr>
<td><em>Microtus chrotorrhinus</em></td>
<td>Rock Vole</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>/SC/P</td>
<td></td>
</tr>
<tr>
<td><em>Mustela frenata</em></td>
<td>Long-tailed Weasel</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>/ /P</td>
<td></td>
</tr>
<tr>
<td><em>Sorex cinereus</em></td>
<td>Masked Shrew</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>/ /P</td>
<td></td>
</tr>
<tr>
<td><em>Sorex dispar</em></td>
<td>Rock Shrew</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>/SC/P</td>
<td></td>
</tr>
<tr>
<td><em>Sorex fumeus</em></td>
<td>Smoky Shrew</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>/ /P</td>
<td></td>
</tr>
</tbody>
</table>

### Table 4. Amphibian Species Utilizing Spruce Fir Forests

<table>
<thead>
<tr>
<th>Species</th>
<th>Common Name</th>
<th>Element Rank:</th>
<th>Endemic</th>
<th>Major Disjunct</th>
<th>Extinction/Extirpation Prone</th>
<th>US/NC/WAP*</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Desmognathus imitator</em></td>
<td>Imitator Salamander</td>
<td>G3G4/S3</td>
<td>YES</td>
<td></td>
<td></td>
<td>/W2/</td>
<td>Waterrock Knob and Greater Smoky Mountain National Park populations.</td>
</tr>
<tr>
<td><em>Desmognathus organdi</em></td>
<td>Northern Pigmy Salamander</td>
<td>G3/SNR</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Desmognathus santeetlah</em></td>
<td>Santeetlah Dusky Salamander</td>
<td>G3G4Q/S2S3</td>
<td>YES</td>
<td></td>
<td></td>
<td>/SR/</td>
<td></td>
</tr>
<tr>
<td><em>Desmognathus wrighti</em></td>
<td>Southern Pigmy Salamander</td>
<td>G3G4/S3</td>
<td>YES</td>
<td></td>
<td></td>
<td>FSC/ SR/P</td>
<td></td>
</tr>
<tr>
<td><em>Plethodon glutinosus</em></td>
<td>Northern Slimy Salamander</td>
<td>G5/SU</td>
<td></td>
<td></td>
<td></td>
<td>/W4 /P</td>
<td></td>
</tr>
<tr>
<td><em>Plethodon welleri</em></td>
<td>Weller’s salamander</td>
<td>G3/S2</td>
<td>YES</td>
<td></td>
<td></td>
<td>/SC/P</td>
<td></td>
</tr>
<tr>
<td>Species</td>
<td>Common Name</td>
<td>Element Rank</td>
<td>Endemic</td>
<td>Major Disjunct</td>
<td>Extinction/Extirpation Prone</td>
<td>US/NC/WAP</td>
<td>Comments</td>
</tr>
<tr>
<td>------------------------</td>
<td>------------------</td>
<td>--------------</td>
<td>---------</td>
<td>----------------</td>
<td>----------------------------</td>
<td>-----------</td>
<td>--------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>Eilema bicolor</strong></td>
<td>Bicolored moth</td>
<td>G5/S1S2</td>
<td>YES</td>
<td>YES</td>
<td></td>
<td>/SR/</td>
<td>Known in the Southern Appalachians from just a couple of specimens collected in the Great Smoky Mountains.</td>
</tr>
<tr>
<td><strong>Entephria seperata</strong></td>
<td>A geometrid moth</td>
<td>GNR/SH</td>
<td>YES</td>
<td>YES</td>
<td></td>
<td>/SR/</td>
<td>Known in the Southern Appalachians from a single specimen collected on the top of Mount Mitchell.</td>
</tr>
<tr>
<td><strong>Erora laeta</strong></td>
<td>Early hairstreak</td>
<td>GU/S2S3</td>
<td></td>
<td></td>
<td></td>
<td>/SR/</td>
<td></td>
</tr>
<tr>
<td><strong>Eulithis propulsata</strong></td>
<td>A geometrid moth</td>
<td>GNR/SU</td>
<td></td>
<td></td>
<td></td>
<td>/W3/</td>
<td></td>
</tr>
<tr>
<td><strong>Gazoryctra sciophanes</strong></td>
<td>A Hepialidae moth</td>
<td>GU/S1S3</td>
<td>YES</td>
<td></td>
<td></td>
<td>/SR/</td>
<td></td>
</tr>
<tr>
<td><strong>Hydriomena exculpata</strong></td>
<td>A geometrid moth</td>
<td>GNR/SH</td>
<td>YES</td>
<td></td>
<td></td>
<td>/SR/</td>
<td>Known in the Southern Appalachians from a single specimen collected on the top of Mount Mitchell.</td>
</tr>
<tr>
<td><strong>Itame subcessaria</strong></td>
<td>Barred itame</td>
<td>G4/S1S3</td>
<td></td>
<td></td>
<td></td>
<td>/SR/</td>
<td></td>
</tr>
<tr>
<td><strong>Korscheltellus gracilis</strong></td>
<td>Conifer swift moth</td>
<td>GNR/S2S3</td>
<td>YES</td>
<td></td>
<td></td>
<td>/W5/</td>
<td></td>
</tr>
<tr>
<td><strong>Lithophane georgii</strong></td>
<td>A pinion moth</td>
<td>G5/S1?</td>
<td>YES</td>
<td></td>
<td></td>
<td>/SR/</td>
<td>Next nearest population is in the White Mountains, NH.</td>
</tr>
<tr>
<td>Species</td>
<td>Common Name</td>
<td>Element Rank:</td>
<td>Endemic</td>
<td>Major Disjunct</td>
<td>Extinction/ Extirpation Prone</td>
<td>US/ NC/ WAP*</td>
<td>Comments</td>
</tr>
<tr>
<td>--------------------</td>
<td>---------------------------</td>
<td>---------------</td>
<td>---------</td>
<td>----------------</td>
<td>-----------------------------</td>
<td>--------------</td>
<td>---------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>AMPHIBIANS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Microhexura montivaga</em></td>
<td>Spruce-fir moss spider</td>
<td>G1/S1</td>
<td>YES</td>
<td>YES</td>
<td>E/SR/</td>
<td></td>
<td>Dependent on cool, mesic forest floor habitats. Highly vulnerable to heat, drought, and fire. At high risk of extinction.</td>
</tr>
<tr>
<td><em>Polygonia progne</em></td>
<td>Gray comma</td>
<td>G5/S1</td>
<td>YES</td>
<td></td>
<td>/SR/</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Syngrapha alias</em></td>
<td>A looper moth</td>
<td>G5/SU</td>
<td></td>
<td></td>
<td>/W5/</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Trechus balsamensis</em></td>
<td>A ground beetle</td>
<td>GH/SU</td>
<td>YES</td>
<td>YES</td>
<td>/W3/</td>
<td></td>
<td>Dependent on cool, mesic forest floor habitats. Highly vulnerable to heat, drought, and fire. At high risk of extinction.</td>
</tr>
<tr>
<td><em>Trechus carolinae</em></td>
<td>A ground beetle</td>
<td>GH/SU</td>
<td>YES</td>
<td>YES</td>
<td>/W3/</td>
<td></td>
<td>Dependent on cool, mesic forest floor habitats. Highly vulnerable to heat, drought, and fire. At high risk of extinction.</td>
</tr>
<tr>
<td><em>Trechus mitchellensi</em></td>
<td>A ground beetle</td>
<td>GH/SU</td>
<td>YES</td>
<td>YES</td>
<td>/W3/</td>
<td></td>
<td>Dependent on cool, mesic forest floor habitats. Highly vulnerable to heat, drought, and fire. At high risk of extinction.</td>
</tr>
<tr>
<td><em>Trechus novaculosus</em></td>
<td>A ground beetle</td>
<td>GH/SU</td>
<td>YES</td>
<td>YES</td>
<td>/W3/</td>
<td></td>
<td>Dependent on cool, mesic forest floor habitats. Highly vulnerable to heat, drought, and fire. At high risk of extinction.</td>
</tr>
<tr>
<td><em>Trechus roanicus</em></td>
<td>A ground beetle</td>
<td>GH/SU</td>
<td>YES</td>
<td>YES</td>
<td>/W3/</td>
<td></td>
<td>Dependent on cool, mesic forest floor habitats. Highly vulnerable to heat, drought, and fire. At high risk of extinction.</td>
</tr>
<tr>
<td>Species</td>
<td>Common Name</td>
<td>Element Rank:</td>
<td>Endemic</td>
<td>Major Disjunct</td>
<td>Extinction/Extirpation Prone</td>
<td>US/NC/WAP*</td>
<td>Comments</td>
</tr>
<tr>
<td>---------------</td>
<td>-------------------</td>
<td>---------------</td>
<td>---------</td>
<td>----------------</td>
<td>-----------------------------</td>
<td>------------</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Trechus rosenbergi</td>
<td>A ground beetle</td>
<td>GH/SU</td>
<td>YES</td>
<td>YES</td>
<td>/W3/</td>
<td></td>
<td>Dependent on cool, mesic forest floor habitats. Highly vulnerable to heat, drought, and fire. At high risk of extinction.</td>
</tr>
<tr>
<td>Trechus uncifer</td>
<td>A ground beetle</td>
<td>GU/SU</td>
<td>YES</td>
<td>YES</td>
<td>/W2/</td>
<td></td>
<td>Dependent on cool, mesic forest floor habitats. Highly vulnerable to heat, drought, and fire. At high risk of extinction.</td>
</tr>
<tr>
<td>Trechus valentinei</td>
<td>A ground beetle</td>
<td>GU/SU</td>
<td>YES</td>
<td>YES</td>
<td>/W2/</td>
<td></td>
<td>Dependent on cool, mesic forest floor habitats. Highly vulnerable to heat, drought, and fire. At high risk of extinction.</td>
</tr>
<tr>
<td>Xestia perquiritata</td>
<td>A noctuid moth</td>
<td>G5/S1S3</td>
<td>YES</td>
<td>YES</td>
<td>/W5/</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
* US/ NC/ WAP Abbreviations (species are subject to reclassification by USFWS, NHP, or WRC).

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>E</td>
<td>Endangered</td>
</tr>
<tr>
<td>T</td>
<td>Threatened</td>
</tr>
<tr>
<td>FSC</td>
<td>Federal Species of Concern</td>
</tr>
<tr>
<td>T(S/A)</td>
<td>Threatened due to Similarity of Appearance</td>
</tr>
<tr>
<td>SC</td>
<td>Special Concern</td>
</tr>
<tr>
<td>SR</td>
<td>Significantly Rare</td>
</tr>
<tr>
<td>P</td>
<td>WAP Priority Species</td>
</tr>
<tr>
<td>W</td>
<td>Watch Category</td>
</tr>
</tbody>
</table>


[CLICK HERE TO SUBMIT COMMENTS](#)

A comment form will open in a new window