

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
<b>Amphibians</b>	Barking treefrog	<i>Hyla gratiosa</i>	II	a	Forest	Forests near or within shallow wetlands	The Virginia Fish and Wildlife Information System indicates the loss suitable wetlands constitute the greatest threats to this species. DGIF recommends working to maintain or restore forested buffers surrounding occupied wetlands. These needs are consistent with action plan priorities to conserve and restore wetland habitats and associated buffers. Recently discovered populations within its known range, may indicate this species is more abundant than previously believed. An in-depth investigation into its status may warrant delisting. This species will be prioritized as Tier 2a.
<b>Amphibians</b>	Blue Ridge dusky salamander	<i>Desmognathus orestes</i>	IV	c	Forest	High elevation seeps, streams, wet rock faces, and riparian forests	This species' distribution is very limited. Other than limiting logging activity in the occupied areas, no conservation actions have been identified. Unless other threats or actions are identified, this species will be listed as Tier 4c.
<b>Amphibians</b>	Blue Ridge two-lined salamander	<i>Eurycea wilderae</i>	III	a	Wetland	Mountain streams and adjacent riparian areas with mixed hardwood or spruce-fir forests up to 6000 feet.	The needs of this species are consistent with priorities for maintaining and enhancing riparian forests and aquatic habitats. This species will be listed as Tier 3a.
<b>Amphibians</b>	Carpenter frog	<i>Lithobates virgatipes</i>	III	a	Wetland	Freshwater wetlands with sphagnum moss	The needs of this species are consistent with action plan priorities to preserve and restore aquatic and wetland habitats and water quality. This species will be listed as Tier 3a.
<b>Amphibians</b>	Common mudpuppy	<i>Necturus maculosus maculosus</i>	III	a	Wetland	Permanent lakes, ponds, impoundments, streams, and rivers with suitable hiding cover	The needs of this species are consistent with action plan priorities to preserve and restore aquatic habitats and water quality. This species will be listed as Tier 3a.
<b>Amphibians</b>	Cow Knob salamander	<i>Plethodon punctatus</i>	I	c	Forest	Site specific - mixed hardwood forests in rocky areas in high elevations	DGIF staff have indicated this species will always face a significant threat of extinction due to its limited range. However, no conservation actions or research have been identified to help conserve this species, most of the habitat is protected via conservation agreements between the U.S. Forest Service and the U.S. Fish and Wildlife Service. As such, it is recommended that this species be prioritized as Tier 1c.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
<b>Amphibians</b>	Cumberland Plateau salamander	<i>Plethodon kentucki</i>	IV	c	Forest	Mature hardwood forests in the vicinity of rocky outcrops	This species requires large stands of mature forests. This habitat type appears to be abundant within this species' distribution. Until additional threats or actions are identified, this species will be listed as Tier 4c.
<b>Amphibians</b>	Dwarf waterdog	<i>Necturus punctatus</i>	III	a	Wetland	Sluggish streams and blackwater streams with debris	The needs of this species are consistent with action plan priorities to preserve and restore aquatic habitats and water quality. This species will be listed as Tier 3a.
<b>Amphibians</b>	Eastern hellbender	<i>Cryptobranchus alleganiensis alleganiensis</i>	I	a	Aquatic	Clean streams and rivers with rocky substrates	DGIF staff have recommended this species be listed as a Tier 1a species. The eastern hellbender has been petitioned for protection under the Federal Endangered Species Act. Virginia's populations of hellbenders have been impacted by sedimentation, chemical pollutants, and impoundments in the clear, fast flowing, well oxygenated stream and river habitats they require. Hellbenders are also occasionally caught and killed by anglers fishing for sportfish. Conservation actions identified by DGIF staff include working to maintain and improve water quality, the use of artificial nest boxes, captive propagation, public education, and conducting research to better detect and assess hellbender populations.
<b>Amphibians</b>	Eastern mud salamander	<i>Pseudotriton montanus montanus</i>	IV	a	Wetland	Freshwater wetlands with sphagnum moss	The needs of this species are consistent with action plan priorities to preserve and restore aquatic habitats, wetland habitats, and water quality. This species will be listed as Tier 4a.
<b>Amphibians</b>	Eastern spadefoot	<i>Scaphiopus holbrookii</i>	IV	c	Forest	Forest and upland habitat generalist but require fish free breeding sites and soils suitable for digging	No conservation actions or research needs have been identified for this species. This species will be listed as Tier 4c.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
<b>Amphibians</b>	Eastern tiger salamander	<i>Ambystoma tigrinum</i>	II	a	Forest	In the east, habitat needs are site specific wetlands within pine savanna. The mountain population utilizes mature forest in proximity to seasonally flooded sinkhole ponds.	This species is known from a handful of sites in the Coastal Plain and the Blue Ridge. The greatest threats include the loss of breeding ponds and the adjacent woodlands. Populations can also be lost if fish are introduced into the breeding ponds. The Virginia Fish and Wildlife Information Service indicates efforts to preserve breeding ponds and associated vegetated buffers should continue. Efforts have been established to maintain existing sites. The single greatest conservation action to protect the Coastal Plain population would be the permanent protection of the Cat Ponds. This species will be prioritized as Tier 2a.
<b>Amphibians</b>	Greater siren	<i>Siren lacertina</i>	IV	a	Wetland	Tolerates a variety of warm aquatic habitats with abundant vegetation	The needs of this species are consistent with action plan priorities to preserve and restore aquatic and wetland habitats and water quality. This species will be listed as Tier 4a.
<b>Amphibians</b>	Green salamander	<i>Aneides aeneus</i>	II	b	Forest	Damp, but not wet, crevices in shaded rock outcrops and ledges in forested areas	The most significant threat to this species involves logging areas that contain occupied rock outcrops. Conservation action includes maintaining forested buffers around occupied rock outcrops. However, recent investigations indicate this species may be more boreal than previously believed. These habitats do not appear to be limited within its distribution. Until a more thorough assessment of its status and habitat usage is completed, a Tier 2b status is warranted.
<b>Amphibians</b>	Jefferson salamander	<i>Ambystoma jeffersonianum</i>	IV	a	Forest	West of Shenandoah River - high elevation hardwood forests with suitable breeding ponds.	The needs of this species are consistent with action plan priorities to preserve and restore forested wetlands. This species will be listed as Tier 4a
<b>Amphibians</b>	Lesser siren	<i>Siren intermedia intermedia</i>	III	a	Wetland	Tolerates a variety of warm aquatic habitats with abundant vegetation	The needs of this species are consistent with action plan priorities to preserve and restore aquatic and wetland habitats and water quality. This species will be listed as Tier 3a.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
<b>Amphibians</b>	Little grass frog	<i>Pseudacris ocularis</i>	IV	a	Forest	Most abundant in wetlands within pine savanna habitats	The habitat needs of this species are consistent with action plan priorities to preserve and restore wetland habitats and vegetated buffers around wetlands. This species will be listed as Tier 4a.
<b>Amphibians</b>	Mabee's salamander	<i>Ambystoma mabeei</i>	II	a	Barren	Pine and hardwood forests with vernal ponds and other water sources suitable for breeding	DGIF indicates the most significant threat to this species involves urban development, forest loss and the draining of vernal ponds. The Virginia Fish and Wildlife Information System indicates known breeding sites and surrounding forested buffers should be conserved. As this need aligns with the priority to conserve riparian forests and large patches of forest in eastern Virginia, this species will be listed as Tier 2a.
<b>Amphibians</b>	Many-lined salamander	<i>Stereochilus marginatus</i>	IV	a	Forest	Gum and cypress swamps as well as other wooded wetlands	The needs of this species are consistent with action plan priorities to preserve and restore aquatic and wetland habitats and water quality. This species will be listed as Tier 4a.
<b>Amphibians</b>	Mole salamander	<i>Ambystoma talpoideum</i>	II	a	Forest	Hardwood and mixed forests containing fish-free breeding ponds	DGIF indicates the most significant threat to this species involves forest loss and the draining of vernal ponds. The Virginia Fish and Wildlife Information System indicates known breeding sites and surrounding forested buffers should be conserved. As this need aligns with the priority to conserve riparian forests and large patches of forest in eastern Virginia, this species will be listed as Tier 2a.
<b>Amphibians</b>	Mountain chorus frog	<i>Pseudacris brachyphona</i>	II	a	Aquatic	Forested areas up to 3500 feet that contain suitable breeding sites	DGIF indicates the most significant threat to this species involves the loss of occupied wetlands and surrounding forests. Conservation actions include maintaining and enhancing wetlands and associated forest buffers. This is consistent with the priority to conserve and restore wetlands. This species will be listed as Tier 2a.
<b>Amphibians</b>	New Jersey chorus frog	<i>Pseudacris kalmi</i>	IV	c	Forest	Various forests with suitable breeding sites	No conservation actions or research needs have been identified for this species. This species will be listed as Tier 4c.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
<b>Amphibians</b>	Northern Pygmy salamander	<i>Desmognathus organi</i>	III	c	Forest	Forested habitats in proximity to seeps and springs	This species requires large stands of mature forests and can utilize both spruce-fir, mixed, and deciduous forest types. Mature forests appear to be abundant within this species' distribution. Unless other threats or conservation actions are identified, this species will be listed as Tier 3c.
<b>Amphibians</b>	Oak toad	<i>Anaxyrus quercicus</i>	II	a	Forest	Wetlands associated with pine or hardwood savanna habitats with sandy soils.	Conservation actions for this species include working to maintain and restore wetlands and savanna habitats. These needs are consistent with priorities to conserve and restore wetlands and savanna habitats. This species will be listed as Tier 2a.
<b>Amphibians</b>	Peaks of Otter salamander	<i>Plethodon hubrichti</i>	I	c	Forest	Site specific - utilizing various forest, rhododendron thickets, and forested talus slopes with deep moist soils	DGIF staff have recommended this species be recategorized as a Tier 1c species. DGIF staff have indicated this species will always face a significant threat of extinction due to its limited range. However, no conservation actions or research have been identified to help conserve this species, most of the habitat is protected via conservation agreements between the U.S. Forest Service and the U.S. Fish and Wildlife Service. As such, it is recommended that this species be prioritized as Tier 1c. Staff from the Fish and Wildlife Service indicate that populations appear to be stable and not in immediate risk of extinction. Service staff also indicate that the 1997 Conservation agreement for this species outlines specific actions which have contributed to this species' well being.
<b>Amphibians</b>	Shenandoah Mountain salamander	<i>Plethodon virginia</i>	III	c	Forest	Site specific - deciduous hardwood forests on mountain slopes and ravines in western Rockingham County	This species requires large stands of mature forests. This habitat type appears to be abundant within this species' distribution. Until additional threats or actions are identified, this species will be listed as Tier 3c.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
<b>Amphibians</b>	Shenandoah salamander	<i>Plethodon shenandoah</i>	I	c	Forest	Handful of sites in Shenandoah National Park	Although this species has a very restricted range, its entire distribution occurs on NPS property. The only identified management action is the development of a Management Plan by the NPS. Except for climate change, NPS infrastructure development and expansion may be the only other serious threat to this species. Population appears stable and no DGIF management actions have been identified to further advance the conservation of this species. This species will be prioritized at Tier 1c.
<b>Amphibians</b>	Shovel-nosed salamander	<i>Desmognathus marmoratus</i>	III	a	Wetland	Cool highly oxygenated high elevation streams with moderate flow and graveland rock substrates	The needs of this species are consistent with action plan priorities to preserve and restore aquatic habitats and water quality. This species will be listed as Tier 3a.
<b>Amphibians</b>	Southern chorus frog	<i>Pseudacris nigrita</i>	IV	c	Forest	Grassy wet areas within or near pine forests	No conservation actions or research needs have been identified for this species. This species will be listed as Tier 4c.
<b>Amphibians</b>	Southern zigzag salamander	<i>Plethodon ventralis</i>	II	c	Forest	Hardwood forests in the vicinity of rocky outcrops	This species utilizes mature forests with access to rocky substrates, caves, and other rock features. Although the species has a very limited range in Virginia, this habitat does not appear to be limited within its distribution. Unless additional threats or conservation actions are identified, this species will be listed as Tier 2c.
<b>Amphibians</b>	Weller's salamander	<i>Plethodon welleri</i>	I	b	Forest	Either moist cove hardwoods or spruce-fir forests above 2500 feet	DGIF staff have recommended this species be elevated to a Tier 1c species for the following reasons. DGIF Staff have indicated this species will always face a significant threat of extinction due to its limited range. Staff from the USFWS indicated this species has a limited range that likely indicates remaining populations are remnants of a wider historic distribution. This restricted distribution is believed to be a natural occurrence and not the result of anthropogenic habitat destruction. Per the USFS, research is ongoing to determine how climate change may impact this species. This research may help identify additional management actions. As such, this species is being listed as Tier 1b.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
<b>Amphibians</b>	Yonahlossee salamander	<i>Plethodon yonahlossee</i>	IV	c	Forest	Mature hardwood forests with deep leaf litter layer	This species requires large stands of mature forests. This habitat type appears to be abundant within this species' distribution. Until additional threats or actions are identified, this species will be listed as Tier 4c.
<b>Aq Insects</b>	A limnephilid caddisfly	<i>Anabolia apora</i>	II	c	Aquatic	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>Aq Insects</b>	A limnephilid caddisfly	<i>Nemotaulius hostilis</i>	IV	c	Aquatic	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Aq Insects</b>	A mayfly	<i>Isonychia tusculanensis</i>	II	c	Aquatic	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>Aq Insects</b>	A mayfly	<i>Baetisca rubescens</i>	III	c	Aquatic	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.
<b>Aq Insects</b>	A mayfly	<i>Ephemerella inconstans</i>	III	c	Aquatic	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.
<b>Aq Insects</b>	A mayfly	<i>Habrophlebiodes celesteria</i>	III	c	Aquatic	Benthic	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.
<b>Aq Insects</b>	A mayfly	<i>Paraleptophlebia assimilis</i>	III	c	Aquatic	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.
<b>Aq Insects</b>	A mayfly	<i>Paraleptophlebia jeanae</i>	III	c	Aquatic	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.
<b>Aq Insects</b>	A mayfly	<i>Rhithrogena anomala</i>	III	c	Aquatic	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
Aq Insects	A mayfly	<i>Isonychia arida</i>	IV	c	Aquatic	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
Aq Insects	A mayfly	<i>Isonychia serrata</i>	IV	c	Aquatic	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
Aq Insects	A philopotamid caddisfly	<i>Wormaldia thyria</i>	III	c	Aquatic	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.
Aq Insects	A rhyacophilid caddisfly	<i>Rhyacophila tricornuta</i>	II	c	Aquatic	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
Aq Insects	A water scorpion	<i>Nepa apiculata</i>	IV	c	Aquatic	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
Aq Insects	A water strider	<i>Limnoporus dissortis</i>	IV	c	Aquatic	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
Aq Insects	Acuminate water boatman	<i>Ramphocorixa acuminata</i>	IV	c	Aquatic	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
Aq Insects	Allegheny mayfly	<i>Ameletus cryptostimulus</i>	IV	c	Aquatic	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
Aq Insects	Allegheny river cruiser	<i>Macromia alleghaniensis</i>	IV	c	Aquatic	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
Aq Insects	Allegheny snaketail	<i>Ophiogomphus allegheniensis</i>	III	c	Aquatic	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.
Aq Insects	American emerald	<i>Cordulia shurtleffi</i>	IV	c	Aquatic	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
Aq Insects	Appalachian jewelwing	<i>Calopteryx angustipennis</i>	III	c	Aquatic	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.
Aq Insects	Appalachian rhyacophilid caddisfly	<i>Rhyacophila appalachia</i>	III	c	Aquatic	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.
Aq Insects	Appalachian snaketail	<i>Ophiogomphus incurvatus alleghaniensis</i>	II	c	Aquatic	Breeds in riffle areas of spring-fed piedmont streams. They seem to prefer areas where gravel overlies soft mud in shallow water.	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
Aq Insects	Appalachian stonefly	<i>Hansonoperla appalachia</i>	II	c	Aquatic	Pristine medium-sized streams of the elevated Appalachians	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
Aq Insects	Banner clubtail	<i>Gomphus apomyius</i>	IV	c	Aquatic	Creek, medium river	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
Aq Insects	Beaverpond baskettail	<i>Epitheca canis</i>	IV	c	Aquatic	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
Aq Insects	Beaverpond clubtail	<i>Gomphus borealis</i>	IV	c	Aquatic	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
Aq Insects	Benfield's bearded small minnow mayfly	<i>Barbaetis benfieldi</i>	II	c	Aquatic	Larvae are known from a short reach of the New River. Substrate is metamorphic bedrock with overlying rubble and gravel and with dense mats of riverweed Podostemum ceratophyllum in riffle areas.	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
<b>Aq Insects</b>	Bent forestfly	<i>Ostrocerca prolongata</i>	III	c	Aquatic	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.
<b>Aq Insects</b>	Berner's Ephemerella mayfly	<i>Ephemerella berneri</i>	III	c	Aquatic	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.
<b>Aq Insects</b>	Big stripetail stonefly	<i>Isoperla major</i>	I	a	Aquatic	Unknown but stoneflies generally occur in fast flowing water with rocky substrates	This species is known only from a spring on Beartown Mountain near Burkes Garden, Virginia. One specific threat to this species is habitat destruction and degradation from livestock trampling. Management actions include: protection of the spring, either through its incorporation into the Beartown Wilderness Area of Jefferson National Forest, purchase or lease of the property by another conservation entity, or a cooperative agreement with the landowner to protect and improve the site. The recommended research need is looking for other populations. This species will be prioritized as Tier 1a.
<b>Aq Insects</b>	Black-tipped darner	<i>Aeshna tuberculifera</i>	IV	c	Aquatic	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Aq Insects</b>	Blackwater bluet	<i>Enallagma weewa</i>	IV	c	Aquatic	Inhabits slow, shady streams and rivers	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Aq Insects</b>	Blue Ridge snowfly	<i>Allocapnia stannardi</i>	III	c	Aquatic	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.
<b>Aq Insects</b>	Blue Ridge springfly	<i>Remenus kirchneri</i>	III	c	Aquatic	Small spring-fed streams and seeps of the Blue Ridge region of southwestern Virginia	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.
<b>Aq Insects</b>	Blue Ridge stonefly	<i>Perlesta frisoni</i>	III	c	Aquatic	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
Aq Insects	Brook snaketail	<i>Ophiogomphus aspersus</i>	III	c	Aquatic	lear streams where shallow current ripples over sand	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.
Aq Insects	Burgundy bluet	<i>Enallagma dubium</i>	IV	c	Aquatic	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
Aq Insects	Canada darner	<i>Aeshna canadensis</i>	IV	c	Aquatic	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
Aq Insects	Carolina salmonfly	<i>Pteronarcys scotti</i>	IV	c	Aquatic	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
Aq Insects	Carolina spreadwing	<i>Lestes vidua</i>	IV	c	Aquatic	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
Aq Insects	Chalk-fronted corporal skimmer	<i>Ladona julia</i>	IV	c	Aquatic	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
Aq Insects	Cherokee clubtail	<i>Gomphus consanguis</i>	II	c	Aquatic	Small shady spring fed streams with mud bottoms	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
Aq Insects	Cinnamon shadowdragon	<i>Neurocordulia virginensis</i>	IV	c	Aquatic	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
Aq Insects	Coppery emerald	<i>Somatochlora georgiana</i>	III	c	Aquatic	Low-gradient streams in forested to partly forested terrain	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
<b>Aq Insects</b>	Cryptic willowfly	<i>Taeniopteryx nelsoni</i>	I	b	Aquatic	Unknown but stoneflies generally occur in fast flowing water with rocky substrates	This species is only known from the streams in Mount Rogers, Virginia. The primary threats are habitat destruction from expansion of the recreational facilities at Mount Rogers National Recreation Area and cattle grazing along Lewis Fork. Management actions include avoiding further development of the watersheds within the distribution of this species. Research needs include establishing water quality and habitat monitoring to pinpoint any deterioration of habitat quality and collecting life history information. This species will be prioritized as Tier 1b. This ranking will be reconsidered when this research need is addressed.
<b>Aq Insects</b>	Delta-spotted spiketail	<i>Cordulegaster diastatops</i>	IV	c	Aquatic	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Aq Insects</b>	Dot-tailed whiteface	<i>Leucorrhinia intacta</i>	IV	c	Aquatic	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Aq Insects</b>	Drake's water scorpion	<i>Ranatra drakei</i>	IV	c	Aquatic	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Aq Insects</b>	Dusky sallfly	<i>Alloperla biserrata</i>	III	c	Aquatic	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.
<b>Aq Insects</b>	Elfin skimmer	<i>Nannothemis bella</i>	IV	c	Aquatic	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Aq Insects</b>	Elusive clubtail	<i>Stylurus notatus</i>	II	c	Aquatic	Large, clear rivers with moderate current and gravel or sandy benthos	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>Aq Insects</b>	Emerald spreadwing	<i>Lestes dryas</i>	IV	c	Aquatic	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
Aq Insects	Faded pennant	<i>Celithemis ornata</i>	IV	c	Aquatic	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
Aq Insects	Fine-lined emerald	<i>Somatochlora filosa</i>	IV	c	Aquatic	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
Aq Insects	Frosted whiteface	<i>Leucorrhinia frigida</i>	IV	c	Aquatic	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
Aq Insects	Gammon's riffle beetle	<i>Stenelmis gammoni</i>	II	c	Aquatic	No specific habitats have been identified but IUCN indicates this species requires clean clear mountain streams	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
Aq Insects	Georgia Isonychia mayfly	<i>Isonychia georgiae</i>	III	c	Aquatic	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.
Aq Insects	Gray petaltail	<i>Tachopteryx thoreyi</i>	IV	c	Forest	Seepage areas in forests	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
Aq Insects	Green-faced clubtail	<i>Gomphus viridifrons</i>	II	c	Aquatic	Large rivers with rocks and moderate current	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
Aq Insects	Green-striped darter	<i>Aeshna verticalis</i>	IV	c	Aquatic	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
Aq Insects	Hagen's bluet	<i>Enallagma hageni</i>	IV	c	Aquatic	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
Aq Insects	Harpoon clubtail	<i>Gomphus desertus</i>	IV	c	Aquatic	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
<b>Aq Insects</b>	Highlands springfly	<i>Yugus arinus</i>	III	c	Aquatic	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.
<b>Aq Insects</b>	Hoffman's Isonychia mayfly	<i>Isonychia hoffmani</i>	II	c	Aquatic	Larvae have been found in second order trout stream and a fourth order cool fast river	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>Aq Insects</b>	Holston sallfly	<i>Sweltsa holstonensis</i>	II	c	Aquatic	Freshwater	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>Aq Insects</b>	Hudsonian whiteface	<i>Leucorrhinia hudsonica</i>	IV	c	Aquatic	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Aq Insects</b>	Illinois snowfly	<i>Allocapnia illinoensis</i>	III	c	Aquatic	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.
<b>Aq Insects</b>	Jane's meadowhawk	<i>Sympetrum janeae</i>	IV	c	Aquatic	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Aq Insects</b>	Johnson's prongbill mayfly	<i>Leptophlebia johnsoni</i>	IV	c	Aquatic	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Aq Insects</b>	Kanawhole springfly	<i>Diploperla kanawholensis</i>	II	c	Aquatic	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>Aq Insects</b>	Kosztarab's common stonefly	<i>Acroneuria kosztarabi</i>	I	c	Aquatic	Unknown but stoneflies generally occur in fast flowing water with rocky substrates	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 1c.
<b>Aq Insects</b>	Lance-tipped darner	<i>Aeshna constricta</i>	IV	c	Aquatic	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
Aq Insects	Laura's clubtail	<i>Stylurus laurae</i>	IV	c	Aquatic	Streams with sand-mud bottoms	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
Aq Insects	Lilypad clubtail	<i>Arigomphus furcifer</i>	IV	c	Aquatic	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
Aq Insects	Lobed roachfly	<i>Tallaperla lobata</i>	II	c	Aquatic	Unknown but stoneflies generally occur in fast flowing water with rocky substrates	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
Aq Insects	Maine snaketail	<i>Ophiogomphus mainensis</i>	IV	c	Aquatic	Clear rivers and streams with strong current over coarse cobbles and with periodic rapids sections	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
Aq Insects	Manassas stonefly	<i>Acroneuria flinti</i>	I	c	Aquatic	Freshwater	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 1c.
Aq Insects	Mantled baskettail	<i>Epitheca semiaquea</i>	IV	c	Aquatic	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
Aq Insects	Marsh bluet	<i>Enallagma ebrium</i>	IV	c	Aquatic	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
Aq Insects	Martha's pennant	<i>Celithemis martha</i>	IV	c	Aquatic	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
Aq Insects	Maureen's shale stream beetle	<i>Hydraena maureenae</i>	II	c	Unknown	The known habitat is a shale bottom Appalachian stream. This species apparently prefers the margins of clear mountain streams, adults sometimes occur on submerged vegetation, but occur mostly among	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
						sand grains.	
<b>Aq Insects</b>	Midland clubtail	<i>Gomphus fraternus</i>	IV	c	Aquatic	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Aq Insects</b>	Mitchell needelfly	<i>Leuctra mitchellensis</i>	III	c	Aquatic	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.
<b>Aq Insects</b>	Montane needelfly	<i>Leuctra monticola</i>	II	c	Aquatic	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>Aq Insects</b>	Mountain river cruiser	<i>Macromia margarita</i>	II	c	Aquatic	Small streams to large rivers, usually rocky but with silt deposits	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>Aq Insects</b>	Moustached clubtail	<i>Gomphus adelphus</i>	IV	c	Aquatic	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Aq Insects</b>	Newfound willowfly	<i>Strophopteryx limata</i>	III	c	Aquatic	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.
<b>Aq Insects</b>	Northern bluet	<i>Enallagma cyathigerum</i> (different name in Explorer)	IV	c	Aquatic	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Aq Insects</b>	Northern common spreadwing	<i>Lestes disjunctus</i>	IV	c	Aquatic	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
<b>Aq Insects</b>	Northern pygmy clubtail	<i>Lanthus parvulus</i>	IV	c	Aquatic	Clear streams and brooks with strong current over clean gravel, cobbles or bedrock, on comparatively unproductive soils	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Aq Insects</b>	Notched forestfly	<i>Ostrocerca complexa</i>	IV	c	Aquatic	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Aq Insects</b>	Pale bluet	<i>Enallagma pallidum</i>	IV	c	Aquatic	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Aq Insects</b>	Piedmont clubtail	<i>Gomphus parvidens</i>	IV	c	Aquatic	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Aq Insects</b>	Pitcher plant midge	<i>Metriocnemus knabi</i>	IV	c	Aquatic	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Aq Insects</b>	Pygmy snaketail	<i>Ophiogomphus howei</i>	II	c	Aquatic	Large fast flowing rivers	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>Aq Insects</b>	Rapids clubtail	<i>Gomphus quadricolor</i>	III	c	Aquatic	Clear streams and brooks with strong current over clean gravel, cobbles or bedrock, on comparatively unproductive soils ("trout stream")	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.
<b>Aq Insects</b>	Red-waisted whiteface	<i>Leucorrhinia proxima</i>	IV	c	Aquatic	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Aq Insects</b>	Regal darner	<i>Coryphaeschna ingens</i>	IV	c	Aquatic	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
Aq Insects	Riffle snaketail	<i>Ophiogomphus carolus</i>	IV	c	Aquatic	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
Aq Insects	River jewelwing	<i>Calopteryx aequabilis</i>	IV	c	Aquatic	Small to medium-sized, warm rivers and streams; especially along swiftly flowing riffle segments	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
Aq Insects	Riverine clubtail	<i>Stylurus amnicola</i>	IV	c	Aquatic	Clear rivers with moderate current and gravel or sandy benthos	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
Aq Insects	Robust baskettail	<i>Epitheca spinosa</i>	IV	c	Aquatic	Swamps with some water movement	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
Aq Insects	Rock Island springfly	<i>Isogenoides varians</i>	III	c	Aquatic	Large rivers	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.
Aq Insects	Sable clubtail	<i>Gomphus rogersi</i>	IV	c	Aquatic	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
Aq Insects	Schwarz' diving beetle	<i>Laccophilus schwarzi</i>	IV	c	Aquatic	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
Aq Insects	Sedge sprite	<i>Nehalennia irene</i>	IV	c	Aquatic	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
Aq Insects	Selys' sundragon	<i>Helocordulia selysii</i>	IV	c	Aquatic	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
Aq Insects	Septima's clubtail	<i>Gomphus septima</i>	II	c	Aquatic	Small to medium rivers with a rapid current and gravel bottom	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
Aq Insects	Shenandoah needlefly	<i>Megaleuctra flinti</i>	III	c	Aquatic	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
Aq Insects	Shenandoah rhyacophilid caddisfly	<i>Rhyacophila shenandoahensis</i>	III	c	Aquatic	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.
Aq Insects	Skillet clubtail	<i>Gomphus ventricosus</i>	II	c	Aquatic	Large rivers where they burrow in the soft mud of deep pools	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
Aq Insects	Ski-tailed emerald	<i>Somatochlora elongata</i>	IV	c	Aquatic	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
Aq Insects	Smokies needelfly	<i>Megaleuctra williamsae</i>	II	c	Aquatic	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
Aq Insects	Smokies snowfly	<i>Allocapnia fumosa</i>	III	c	Aquatic	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.
Aq Insects	Smoky willowfly	<i>Bolotoperla rossi</i>	IV	c	Aquatic	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
Aq Insects	Southeastern roachfly	<i>Tallaperla cornelia</i>	IV	c	Aquatic	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
Aq Insects	Southern pitcher plant mosquito	<i>Wyeomyia haynei</i>	IV	c	Aquatic	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
Aq Insects	Southern springfly	<i>Cultus decisus isolatus</i>	III	c	Aquatic	Freshwater	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.
Aq Insects	Southern sprite	<i>Nehalennia integricollis</i>	IV	c	Aquatic	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
Aq Insects	Spatterdock darner	<i>Aeshna mutata</i>	III	c	Aquatic	Sinkhole ponds, bog ponds, small lakes, and artificial ponds; usually fishless	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
Aq Insects	Spatulate snowfly	<i>Allocapnia simmonsii</i>	II	c	Aquatic	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
Aq Insects	Sphagnum sprite	<i>Nehalennia gracilis</i>	IV	c	Aquatic	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
Aq Insects	Spieth's great speckled olive mayfly	<i>Siphloplecton costalense</i>	II	c	Aquatic	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
Aq Insects	Spine-crowned clubtail	<i>Gomphus abbreviatus</i>	III	c	Aquatic	Clear rivers and streams	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.
Aq Insects	Spiny salmonfly	<i>Pteronarcys comstocki</i>	III	c	Aquatic	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.
Aq Insects	Stripe-winged baskettail	<i>Epitheca costalis</i>	IV	c	Aquatic	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
Aq Insects	Stygian shadowdragon	<i>Neurocordulia yamaskanensis</i>	IV	c	Aquatic	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
Aq Insects	Superb jewelwing	<i>Calopteryx amata</i>	IV	c	Aquatic	Clear rivers and streams of generally greater than approximately 2 meters width with moderate to strong current over clean gravel and cobbles on comparatively productive soils	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
Aq Insects	Swamp forestfly	<i>Prostoia hallasi</i>	III	c	Aquatic	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
Aq Insects	Swannanoa sallfly	<i>Alloperla nanina</i>	IV	c	Aquatic	Freshwater	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
Aq Insects	Tarter's Ameletus mayfly	<i>Ameletus tarteri</i>	II	c	Aquatic	Benthic	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
Aq Insects	Teays stonefly	<i>Perlesta teaysia</i>	III	c	Aquatic	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.
Aq Insects	Tennessee sallfly	<i>Alloperla neglecta</i>	III	c	Aquatic	Freshwater	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.
Aq Insects	Treetop emerald	<i>Somatochlora provocans</i>	IV	c	Aquatic	Forest or boggy seepages	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
Aq Insects	Tufted sallfly	<i>Alloperla banksi</i>	IV	c	Aquatic	Freshwater	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
Aq Insects	Two-striped forceptail	<i>Aphylla williamsoni</i>	IV	c	Aquatic	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
Aq Insects	Variiegated meadowhawk	<i>Sympetrum corruptum</i>	IV	c	Aquatic	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
Aq Insects	Vernal sallfly	<i>Alloperla ideii</i>	III	c	Aquatic	Freshwater	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.
Aq Insects	Virginia Piedmont water boatman	<i>Sigara depressa</i>	I	c	Aquatic	Streams with clean water and healthy riparian areas site specific Per DCR, this species has only been found at one site	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 1c.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
<b>Aq Insects</b>	Virginia sallfly	<i>Sweltsa voshelli</i>	III	c	Aquatic	Freshwater	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.
<b>Aq Insects</b>	Virginia springfly	<i>Diploperla morgani</i>	III	c	Aquatic	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.
<b>Aq Insects</b>	White corporal skimmer	<i>Ladona exusta</i>	IV	c	Aquatic	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Aq Insects</b>	White sand-river mayfly	<i>Pseudiron centralis</i>	IV	c	Aquatic	Clean shifting sand in the fastest portions of the rivers and the sand must be free of silt and must not be compacted	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Aq Insects</b>	White-faced meadowhawk	<i>Sympetrum obtrusum</i>	IV	c	Aquatic	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Aq Insects</b>	Widecollar stonefly	<i>Paragnetina ichusa</i>	III	c	Aquatic	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.
<b>Aq Insects</b>	Williamson's emerald	<i>Somatochlora williamsoni</i>	IV	c	Aquatic	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Aq Insects</b>	Zebra clubtail	<i>Stylurus scudderi</i>	IV	c	Aquatic	Streams and rivers with slight to moderate current and gravel or sandy benthos	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>AQ Mollusks</b>	Alewife floater	<i>Anodonta implicata</i>	IV	a	Aquatic	Alewife obligate - coastal streams and lakes with sand or gravel substrates	Propagation and recovery of this species is currently ongoing at VFAWC. Genetics assessment needs to be conducted to determine if the Rappahannock and Pamunkey populations can be used for recovery in the James, Chickahominy and Chowan Basins. This species will be prioritized as Tier 4a.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
<b>AQ Mollusks</b>	Appalachian monkeyface	<i>Quadrula sparsa</i>	I	a	Aquatic	River headwaters with fast flow and various substrates	This species is extremely rare in Virginia and is included in the Virginia Upper Tennessee Mussel Restoration Strategy. Propagation techniques must be developed for this species and water quality and habitat improvements must be continued to be made through BMPs and land-use management. This species will be prioritized as Tier 1a.
<b>AQ Mollusks</b>	Appalachian springsnail	<i>Fontigens bottimeri</i>	II	c	Aquatic	Individual springs in Frederick county	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>AQ Mollusks</b>	Atlantic pigtoe	<i>Fusconaia masoni</i>	I	a	Aquatic	Clean swift waters with stable gravel or sand/gravel substrate	This species is currently being assessed for federal listing as part of the mega aquatics petition. In VA, we only know of 1 stable population that remains and that is in Craig Creek. When the initial tiering was done, the Nottoway River had the largest population from VA 49 and downstream through the Falls area but that population is almost extirpated as the mussel fauna throughout that area has significantly declined. This species warrants state endangered status in VA and likely will be proposed during the next reg cycle depending on what happens at the federal level. This species also has declined in NC. Propagation, augmentation, and reintroduction is a possibility with this species. Initial work has been done at White Sulphur Springs NFH and in NC. DGIF should collaborate with NCWRC to make this a reality as work could be done at VFAWC. This species will be prioritized as Tier 1a.
<b>AQ Mollusks</b>	Atlantic spike	<i>Elliptio producta</i>	IV	c	Aquatic	Areas with moderate current and sand, rocky, or mud bottom	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.
<b>AQ Mollusks</b>	Birdwing pearlymussel	<i>Lemiox rimosus</i>	I	a	Aquatic	Riffle areas with stable, sand and gravel substrates in moderate to fast currents in small to medium sized rivers	Propagation and release and habitat protection needs to be continued with this species or extirpation is likely. This species will be prioritized as Tier 1a.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
<b>AQ Mollusks</b>	Black sandshell	<i>Ligumia recta</i>	III	a	Aquatic	Medium to large rivers with strong currents and sand, gravel, and cobble substrates	The propagation of this species needs to continue. This species will be prioritized as Tier 2a.
<b>AQ Mollusks</b>	Blue Ridge springsnail	<i>Fontigens orolibas</i>	III	c	Aquatic	Springs and cave streams in the Potomac basin and along the Blue Ridge	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>AQ Mollusks</b>	Bottle hornsnail	<i>Pleurocera gradata</i>	I	c	Aquatic	Rivers	DGThis species is endemic to the Holston drainage and may be extirpated from Virginia. Threats are the same as any other aquatic species, water quality and habitat loss due to point source and non-point source impacts. This species needs a status assessment before any on-the-ground management can be initiated. This species will be prioritized as Tier 1c.
<b>AQ Mollusks</b>	Brook floater	<i>Alasmidonta varicosa</i>	I	b	Aquatic	Clear flowing water with sand or gravel substrates	This species is most likely extirpated from VA as it has not been seen live for over 15 years now and is the most rare mussel in the Atlantic Slope in VA and one of the most rare mussels in VA period. The primary locations for the species is/was the Sheanadoah River watershed and the Potomac River watershed. Broad Run in the Potomac used to harbor a population but heavy urban development has impacted this stream. The only live specimens that have been found recently include those in the mainstem Potomac River. Propagation and translocations of this species will need to occur with the cooperation of another state like WV. A regional conservation plan is in development. This species will be prioritized as Tier 1b. This status will be reconsidered when the planning need has been addressed.
<b>AQ Mollusks</b>	Brown walker	<i>Pomatiopsis cincinnatiensis</i>	III	c	Aquatic	Amphibious - vegetated banks of streams, creeks, and rivers	DGIF staff recommend this species be listed as Tier 3b. They indicate a status assessment is needed. This conservation action is more consistent with Tier 3c.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
<b>AQ Mollusks</b>	Carolina lance mussel	<i>Elliptio angustata</i>	IV	c	Aquatic	Clean flowing water with sand and gravel substrates and aquatic vegetation	A detailed genetics assessment needs conducted to determine if angustata is a valid species in VA or if this "species" is simply <i>Elliptio fisheriana</i> . Once determined, a status assessment is needed. This species will be prioritized as Tier 4c.
<b>AQ Mollusks</b>	Carolina slabshell mussel	<i>Elliptio congaraea</i>	IV	a	Aquatic	Small streams to rivers with swift flow and sandy substrates	Propagation and recovery efforts for this species are ongoing at VFAWC and this work should continue. This species will be prioritized as Tier 4a.
<b>AQ Mollusks</b>	Chesapeake ambersnail	<i>Oxyloma subeffusum</i>	III	c	Aquatic	Terrestrial	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.
<b>AQ Mollusks</b>	Coal elimia	<i>Elimia aterina</i>	II	c	Aquatic	Little is known about this species' habitat needs. It is found in flowing water in the Clinch and Powell rivers.	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>AQ Mollusks</b>	Cracking pearlymussel	<i>Hemistena lata</i>	I	b	Aquatic	Medium sized rivers with moderate current and mud, sand, and fine gravel substrates	This species is included in the Virginia Upper Tennessee Mussel Restoration Plan. Efforts to develop propagation techniques need to be continued to be developed. This species is prioritized as Tier 1b. This ranking will be reconsidered when this research need is addressed.
<b>AQ Mollusks</b>	Creeper	<i>Strophitus undulatus</i>	IV	a	Aquatic	It is usually found in streams and rivers in a range of flow conditions (rarely in high-gradient streams of mountainous regions) but can tolerate lakes and ponds, particularly in outlets.	Propagation and recovery efforts for this species are ongoing at VFAWC and this work should continue. If the South River NRDAR project comes through, this species will be a focus of recovery. This species will be prioritized as Tier 4a.
<b>AQ Mollusks</b>	Crossed dome	<i>Ventridens decussatus</i>	III	c	Aquatic	Terrestrial	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
<b>AQ Mollusks</b>	Cumberland bean	<i>Villosa trabalis</i>	I	a	Aquatic	Clear, warm streams and small rivers with moderate to swift currents and unsilted sand, gravel, and rubble substrates	This species is likely extirpated from Virginia. The USFWS five-year review document indicates Propagation/Release and habitat protection efforts needs to be continued. This species is prioritized as Tier 1a.
<b>AQ Mollusks</b>	Cumberland moccasinshell	<i>Medionidus conradicus</i>	IV	a	Aquatic	Small headwater streams with sand and gravel substrates	This species is included within the Virginia Mussel Restoration Strategy and that propagation effort should continue. Staff from the U.S. Fish and Wildlife Service indicate "this species has undergone measurable declines in certain portions of its range in Virginia. The status of the species is currently being investigated as it seems to be declining rangewide." Efforts to address water quality threats have been identified. This species will be prioritized as Tier 4a.
<b>AQ Mollusks</b>	Cumberland monkeyface	<i>Quadrula intermedia</i>	I	a	Aquatic	Small to medium sized streams with fast current and silt-free sand, gravel, and rubble substrates	This species is extremely rare in Virginia and is included in the Virginia Upper Tennessee Mussel Restoration Strategy. Propagation techniques must be developed for this species and water quality and habitat improvements must be continued to be made through BMPs and land-use management. This species will be prioritized as Tier 1a.
<b>AQ Mollusks</b>	Cumberlandian combshell	<i>Epioblasma brevidens</i>	I	a	Aquatic	Large creeks to large rivers with gravel, cobble, and boulder substrates	Propagation and release and habitat protection needs to be continued with this species or extirpation is likely. This species will be prioritized as Tier 1a.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
<b>AQ Mollusks</b>	Deertoe	<i>Truncilla truncata</i>	III	b	Aquatic	This species is a generalized in terms of substrate preference, usually occurring in fine gravel mixed with sand and mud. It is also considered a generalist in terms of the size of rivers it inhabits. It is more common in medium-sized rivers but may become numerous in large rivers, where it can live at depths of 12 to 18 feet. It will also establish viable populations in lakes lacking current	This species is listed in the Virginia Mussel Restoration Strategy. Propagation techniques need to be developed. A status assessment is also needed. This species is rarely found in VA and likely warrants state listing. This species will be prioritized as Tier 3b. This ranking will be reconsidered when the research needs have been addressed.
<b>AQ Mollusks</b>	Dromedary pearlymussel	<i>Dromus dromas</i>	I	a	Aquatic	Clean fast moving water with firm, unsilted, sand and gravel substrates	Propagation and release and habitat protection needs to be continued with this species or extirpation is likely. This species will be prioritized as Tier 1a.
<b>AQ Mollusks</b>	Dusky Fossaria	<i>Fossaria dalli</i>	IV	c	Aquatic	Freshwater	A status assessment is needed for this species. This species will be prioritized as Tier 4c.
<b>AQ Mollusks</b>	Dwarf wedgemussel	<i>Alasmidonta heterodon</i>	I	a	Aquatic	Clean warm streams and rivers with low to moderate current and unsilted substrates	Propagation and reintroduction efforts need to be initiated with this species. The only suitable broodstock site that may remain is the Po River as this species has not been found in Aquia Creek or the Nottoway River. This species will be prioritized as Tier 1a.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
<b>AQ Mollusks</b>	Eastern lampmussel	<i>Lampsilis radiata</i>	IV	a	Aquatic	Small streams, large rivers, ponds, and lakes. It is found on a wide variety of substrate types, but prefers sand or gravel	Surveys over the past decade have indicated this species is more rare than previously thought. The eastern lampmussel is extant in the Chowan, Potomac and York Basins but in neither basin is the species common. The largest populations exist in the mainstem Nottway, Meherrin and Pamunkey Rivers but the distribution is patchy and the species is not typically common when found. The species should be present in the James, Roanoke, and Chickahominy given its range in the U.S. but recent records do not exist. This species is currently being propagated with great success at VFAWC so restoration potential is high. This species will be prioritized as Tier 4a.
<b>AQ Mollusks</b>	Eastern pondmussel	<i>Ligumia nasuta</i>	IV	a	Aquatic	Areas of limited currents and significant amounts of fine organic matter - can tolerate a wide range of substrates	Propagation and recovery is currently ongoing at VFAWC and this work should continue. This species will be prioritized as Tier 4a.
<b>AQ Mollusks</b>	Elephant ear	<i>Elliptio crassidens</i>	III	a	Aquatic	Large creeks to rivers with moderate to swift currents and mud, sand, or rocky substrates	Propagation techniques need to be developed for this species. The restoration of this species in Virginia will only occur through the release of propagated mussels and the recovery of host fish species. This species is also impacted by water quality issues. Actions to address water quality concerns have been identified. This species will be prioritized as Tier 3a.
<b>AQ Mollusks</b>	Elktoe	<i>Alasmidonta marginata</i>	II	c	Aquatic	Small shallow rivers with moderately fast current and sand and gravel substrates	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>AQ Mollusks</b>	Fanshell	<i>Cyprogenia stegaria</i>	I	a	Aquatic	Warm medium to large streams with strong currents and gravel substrates	Propagation and release and habitat protection needs to be continued with this species or extirpation is likely. This species will be prioritized as Tier 1a.
<b>AQ Mollusks</b>	Fine-rayed pigtoe	<i>Fusconaia cuneolus</i>	I	a	Aquatic	Clear high gradient streams in unsilted gravel and cobble substrates	This species is very rare in Virginia and is included in the Upper Tennessee River Mussel Restoration Plan. Propagation techniques need to be continued to be developed. This species will be prioritized as Tier 1a.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
<b>AQ Mollusks</b>	Florida pondhorn	<i>Unio merus caroliniana</i>	IV	c	Aquatic	Slack water areas, generally the edges, of small creeks to medium-sized rivers. May inhabit braided channels bottomland hardwood swamps, lakes, temporary overflow pools, and probably artificial waters (e.g., canals, boat basins, impoundments)	A status assessment is needed for this species. This species will be prioritized as Tier 4c.
<b>AQ Mollusks</b>	Fluted kidneyshell	<i>Ptychobranchus subtentum</i>	II	a	Aquatic	Small to medium rivers with swift current and sand, gravel, or cobble substrates	This species is listed in the Virginia Mussel Restoration Strategy and propagation efforts should continue. Staff from the U.S. Fish and Wildlife Service indicate we should recognize this species will be listed as endangered on April 12, 2015. This species will be prioritized as Tier 2a.
<b>AQ Mollusks</b>	Fragile papershell	<i>Leptodea fragilis</i>	IV	c	Aquatic	This species is tolerant of a variety of aquatic habitats and can be found in small streams in strong current with coarse gravel and sand substrates but also rivers or river-lakes possessing slow current and a firm substrate composed of sand and mud. It can occur at depths of up to 15 or 20 feet but reaches greatest population density at normal water levels of three feet or less in areas such as shallow embayments	This species is likely extirpated from Virginia but a status assessment is needed to confirm this suspicion. Additionally, efforts are needed to address the declines of host fish; the freshwater drum (tier 3c). This species will be prioritized as Tier 4c.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
<b>AQ Mollusks</b>	Glossy covert	<i>Fumonelix christyi</i>	III	c	Aquatic	Terrestrial	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.
<b>AQ Mollusks</b>	Golden riffleshell	<i>Epioblasma florentina aureola</i>	I	a	Aquatic	No information.	Virginia's populations of golden riffleshell were previously identified as the tan riffleshell. The taxonomy has changed and the tan riffleshell has been divided into two species. Virginia's population is now classified as the Golden Riffleshell ( <i>Epioblasma florentina aureola</i> ) instead of the Tan riffleshell ( <i>E. f. walkeri</i> ). Conservation efforts are needed to address mining-related threats to water quality in Indian Creek, Tazewell County. Species is in the upper TN mussel propagation plan. This species will be prioritized as Tier 1a.
<b>AQ Mollusks</b>	Gravel elimia	<i>Elimia catenaria</i>	IV	c	Aquatic	Streams and rivers with high ground water content and good flow	A status assessment is needed for this species. This species will be prioritized as Tier 4c.
<b>AQ Mollusks</b>	Green Floater	<i>Lasmigona subviridis</i>	II	a	Aquatic	Clean, calm water in streams and rivers of various sizes with sand and gravel substrates	A draft conservation plan has been developed and propagation has been initiated with this species with some success. In 2013, over 1,100 propagated individuals were released back to the Tye River and preliminary results indicate good survival. These techniques need to be continued. A draft state conservation plan has been developed for the species, which prioritizes management actions. This species will be prioritized as Tier 2a.
<b>AQ Mollusks</b>	James spinymussel	<i>Pleurobema collina</i>	I	a	Aquatic	Clear flowing water with sand, gravel, or cobble substrates	Propagation with JSM needs to be continued. Techniques have been developed with some success at White Sulphur Springs NFH and are now being conducted at Harrison Lake NFH at VFAWC. In 2013, 532 propagated individuals were released in Mill Creek, Bath County, and data to date show high survival and expected growth. eDNA is being looked at as a possible presence/absence tool for JSM and potentially other mussel species as well. This species will be prioritized as Tier 1a.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
<b>AQ Mollusks</b>	Little-winged pearlymussel	<i>Pegias fabula</i>	I	c	Aquatic	High gradient headwater streams	This species is likely extirpated from Virginia but it is included within the Upper Tennessee Mussel Restoration Plan. Given the rarity of this species in VA, intensive surveys need to be conducted to determine its status. Propagation has not been initiated with this species and cannot until broodstock is identified. This species is difficult to find so extirpation cannot be determined at this time unless more intensive surveys are conducted. This species will be prioritized as Tier 1c.
<b>AQ Mollusks</b>	Longsolid	<i>Fusconaia subrotunda</i>	III	a	Aquatic	Medium to large rivers with strong currents and sand and gravel substrates	This species is included in the Virginia Mussel Restoration Strategy. Propagation techniques must be developed for this species and water quality and habitat improvements must be continued to be made through BMPs and land-use management. This species will be prioritized as Tier 3a.
<b>AQ Mollusks</b>	Mountain creekshell mussel	<i>Villosa vanuxemensis vanuxemensis</i>	IV	a	Aquatic	Very clean small headwaters creeks and streams with sand and gravel substrates and associated with <i>Justicia</i> beds	This species is included within the Virginia Mussel Restoration Strategy. Propagation has been initiated with this species with success and needs to be continued. This species will be prioritized as Tier 4a.
<b>AQ Mollusks</b>	Northern lance mussel	<i>Elliptio fisheriana</i>	IV	b	Aquatic	Shallow water near stable banks with intact riparian zones and soft substrates	Propagation techniques need to be developed for the species. This species will be prioritized as Tier 4b. This ranking will be reconsidered when this research need is addressed.
<b>AQ Mollusks</b>	Notched rainbow	<i>Villosa constricta</i>	III	a	Aquatic	Clean streams with stable banks and sand or gravel substrates	Propagation and recovery is currently ongoing at VFAWC and this work should continue. This species will be prioritized as Tier 3a.
<b>AQ Mollusks</b>	Oblong ancyliid	<i>Ferrissia parallelus</i>	IV	c	Aquatic	Quiet, slow-moving water, usually in ponds and lakes, where it attaches to plant surfaces at about 0.3-0.2 metres depth	A status assessment is needed for this species. This species will be prioritized as Tier 4c.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
<b>AQ Mollusks</b>	Ohio pigtoe	<i>Pleurobema cordatum</i>	III	c	Aquatic	Medium and large rivers with flow with gravel, cobble, and boulder substrates, but can also tolerate some reservoir environments	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.
<b>AQ Mollusks</b>	Oyster mussel	<i>Epioblasma capsaeformis</i>	I	a	Aquatic	Warm creeks and rivers with moderate to swift current and sand, gravel, and boulder substrates	Effort to propagation and release this species need to be continued. Habitat protection efforts should also be continued or extirpation is likely. Translocations have been started for this species in the Clinch River with positive results; gravid females have been found. This species will be prioritized as Tier 1a.
<b>AQ Mollusks</b>	Panhandle pebblesnail	<i>Somatogyrus virginicus</i>	II	c	Aquatic	Very clear flowing water with rocky substrates	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>AQ Mollusks</b>	Pearl supercoil	<i>Paravitrea calcicola</i>	IV	c	Aquatic	Terrestrial	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>AQ Mollusks</b>	Piedmont pondsnail	<i>Stagnicola neopalustris</i>	I	c	Aquatic	Freshwater	This species is known from only 1 global record in Orange County. A status assessment needs to be conducted for the species to see if it still occurs in VA or if it is extinct. This species will be prioritized as Tier 1c.
<b>AQ Mollusks</b>	Pimple back	<i>Quadrula pustulosa pustulosa</i>	IV	b	Aquatic	This species has generalized habitat preferences and can maintain abundant and viable populations in shallow to deep sections of large reservoirs as well as in small to medium-sized free-flowing rivers. It is usually found in a substrate consisting of coarse gravel, sand, and	This species is included within the Virginia Mussel Restoration Strategy. Propagation techniques need to be developed for this species. This species will be prioritized as Tier 4c.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
						silt	
<b>AQ Mollusks</b>	Pink heelsplitter	<i>Potamilus alatus</i>	III	b	Aquatic	On a variety of substrates in slow to swiftly flowing water	This species is nearing extirpation in Virginia. Propagation techniques need to be developed. This species will be prioritized as Tier 3b. This ranking will be reconsidered when research needs have been addressed.
<b>AQ Mollusks</b>	Pink mucket	<i>Lampsilis abrupta</i>	I	a	Aquatic	Either flowing or standing water with gravel, sand, silt, or mud substrates	This species is likely extirpated from Virginia but it is included within the Upper Tennessee Mussel Restoration Plan. The restoration of this species is part of DGIF mussel propagation program and reintroductions have been initiated in the Clinch River. Reintroductions need to be monitored and cooperation with Tennessee Wildlife Resources Agency needs to be continued for recovery of this species. This species will be prioritized as Tier 1a.
<b>AQ Mollusks</b>	Pistolgrip	<i>Tritogonia verrucosa</i>	III	b	Aquatic	Large rivers with gravel, sand, or mud substrates	Propagation techniques need to be developed and status assessment in New River is needed. This species is listed as threatened in VA. The species is restricted to the New River in VA has seen a significant decline downstream of Claytor Dam. Large populations exist outside of the state so recovery is more likely than with other species where broodstock options are limited. This species will be prioritized as Tier 3b. This ranking will be reconsidered when the research needs have been addressed.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
<b>AQ Mollusks</b>	Pocketbook mussel	<i>Lampsilis ovata</i>	IV	a	Aquatic	Either flowing or standing water with gravel, sand, silt, or mud substrates	This species is included within the Virginia Mussel Restoration Strategy and that propagation efforts should continue. This species will be prioritized as Tier 4a.
<b>AQ Mollusks</b>	Purple bean	<i>Villosa perpurpurea</i>	I	a	Aquatic	Headwaters, creeks, and rivers and can tolerate a variety of currents and substrates	This species is extremely rare in Virginia and is included in the Virginia Upper Tennessee Mussel Restoration Strategy. Propagation techniques have been developed for this species and need to be continued. Priority now is determining the best release sites for the species and properly identifying the species across its range since broodstock locations are limited. <i>Villosa trabilis</i> is similar to purple bean and taxonomic questions have arise regarding where each species actually exists. This species will be prioritized as Tier 1a.
<b>AQ Mollusks</b>	Purple liliput	<i>Toxolasma lividus</i>	II	c	Aquatic	Small to medium sized streams in well packed sand or gravel substrates	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>AQ Mollusks</b>	Pygmy slitmouth	<i>Stenotrema pilula</i>	III	c	Aquatic	Terrestrial	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.
<b>AQ Mollusks</b>	Pyramid pigtoe	<i>Pleurobema rubrum</i>	II	a	Aquatic	Medium and large rivers with flow and stable mud or mud/sand substrates	This species can be propagated and reintroduced into the Clinch River. A cooperative effort with the Tennessee Wildlife Resources Agency would have the greatest chance of success. This species will be prioritized as Tier 2a.
<b>AQ Mollusks</b>	Rayed bean	<i>Villosa fabalis</i>	II	a	Aquatic	Flowing water in headwater creeks with sand and gravel substrates and vegetation	Although it is likely extirpated from Virginia, this species would benefit from translocation efforts. The Tennessee Wildlife Resources Agency has a translocation program. Efforts in Virginia would benefit from a partnership with Pennsylvania.
<b>AQ Mollusks</b>	Ridged lioplax	<i>Lioplax subcarinata</i>	IV	c	Aquatic	Clean water with slow currents and sandy substrates, most often found in rivers with stable shorelines and wide riparian forests.	A status assessment is needed for this species. This species will be prioritized as Tier 4c.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
<b>AQ Mollusks</b>	Roanoke slabshell	<i>Elliptio roanokensis</i>	II	b	Aquatic	Deeper channels of relatively fast flowing rivers	Propagation and restoration protocols need to be developed for this species. A more thorough status assessment may be needed as well given the difficulty in identifying this species from other <i>Elliptio</i> . This species will be prioritized as Tier 2b. This status will be reconsidered when these research needs have been addressed.
<b>AQ Mollusks</b>	Rough pigtoe	<i>Pleurobema plenum</i>	I	a	Aquatic	Medium to large rivers with sand, gravel, and cobble substrates	This species may be extirpated from Virginia. Propagation can be accomplished with this species through coordination with the Tennessee Wildlife Resources Agency and the species may be able to be re-established in the lower Clinch River as DGIF is currently attempting with <i>Lampsilis abrupta</i> . This species will be prioritized as Tier 1a.
<b>AQ Mollusks</b>	Rough rabbitsfoot	<i>Quadrula cylindrica strigillata</i>	I	a	Aquatic	Warm medium to large rivers with swift currents and silt, sand, gravel, or cobble substrates	This species is included in the Virginia mussel restoration strategy. Propagation techniques must be developed for this species. Water quality and habitat improvements must be continued to be made through BMPs and land-use management. This species will be prioritized as Tier 1a.
<b>AQ Mollusks</b>	Round peaclam	<i>Pisidium equilaterale</i>	IV	c	Aquatic	Freshwater	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>AQ Mollusks</b>	Seep mudalia	<i>Leptoxis dilatata</i>	IV	c	Aquatic	If this species is consistent with other species in this genus, clean mid-sized rivers with fast flows and rocky substrates	A status assessment is needed for this species. This species will be prioritized as Tier 4c.
<b>AQ Mollusks</b>	Sharp sprite	<i>Promenetus exacuus</i>	IV	c	Aquatic	No specific habitats have been identified for this aquatic snail but it occurs across most of North America	A status assessment is needed for this species. This species will be prioritized as Tier 4c.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
<b>AQ Mollusks</b>	Sheepnose	<i>Plethobasus cyphus</i>	II	a	Aquatic	Warm large rivers and reservoirs with gravel and cobble substrates	This species is included in the Virginia Mussel Restoration Strategy. Propagation techniques must be developed for this species and water quality and habitat improvements must be continued to be made through BMPs and land-use management. Staff from the U.S. Fish and Wildlife Service indicate this species will be listed as endangered on April 12, 2015. This species will be prioritized as Tier 2a.
<b>AQ Mollusks</b>	Shiny pigtoe	<i>Fusconaia cor</i>	I	a	Aquatic	Moderate to swift current with stable sand, gravel, or cobble substrates	This species is very rare in Virginia and is included in the Upper Tennessee River Mussel Restoration Plan. Propagation techniques must be developed for this species. Water quality and habitat improvements must continue to be made through BMPs and land-use management. This species will be prioritized as Tier 1a.
<b>AQ Mollusks</b>	Slabside pearlymussel	<i>Lexingtonia dolabelloides</i>	II	a	Aquatic	Large creeks to moderate rivers with moderate flow and gravel and sand substrates	This species is included within the Virginia Mussel Restoration Strategy and that Propagation techniques must be developed for this species. Water quality and habitat improvements must be continued to be made through BMPs and land-use management. Staff from the U.S. Fish and Wildlife Service indicate, "This species has undergone significant rangewide decline, and in particularly drastic declines in Virginia. As a result, the species was federally listed as endangered October 28, 2013". They recommend this species be listed as a Tier 1c. Per further conversations with DGIF staff, this species will be listed as Tier 2a.
<b>AQ Mollusks</b>	Slippershell mussel	<i>Alasmidonta viridis</i>	I	b	Aquatic	Headwater creeks and small streams with constant flow and mud, sand, or gravel substrates and aquatic vegetation	This species is extremely rare across VA and is rarely found despite the numerous surveys that have been conducted throughout the Upper TN River Basin. Recent live individuals have been found in Plum Creek, Tazwell County, and Copper Creek, Scott County, but the # of individuals ranged from 1 to 5. A thorough status assessment needs to be conducted for the species and if sufficient broodstock is located, propagation should be explored. Survey effort is needed to identify new populations. Preferred headwater stream protections are needed. This species will be prioritized as Tier 1b. This status will be reconsidered as these research needs are addressed.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
<b>AQ Mollusks</b>	Snuffbox	<i>Epioblasma triquetra</i>	I	a	Aquatic	Small to medium sized creeks with swift current and sand, gravel, and cobble substrates	This species is included in the Virginia Mussel Restoration Strategy. It is a federally endangered species that has declined across its range. Propagation efforts need to continue. Staff from the U.S. Fish and Wildlife This species will be prioritized as Tier 1a.
<b>AQ Mollusks</b>	Spectaclecase	<i>Cumberlandia monodonta</i>	I	b	Aquatic	Occurs in large rivers in areas sheltered from the main current, often found in mud and rock substrates	This species is included within the Virginia Mussel Restoration strategy. Fish hosts for this species need to be identified so propaagtion can take place. This is the main priority with this species. Secondary efforts include surveying to identify new populations, as well as protecting areas of preferred habitat (bluff pools with large flat rocks). Staff from the U.S. Fish and Wildlife Service recommend this species be listed as a Tier 1 species. They indicate, "This species has undergone rangewide decline and was federally listed as endangered on March 15, 2012."This species has undergone significant rangewide decline, and declines in Virginia are particularly notable. As a result, the species was federally listed as endangered April 12, 2012. The species is nearing extirpation from Virginia." This species will be prioritized as Tier 1b. This rating will be reconsidered when the research needs related to fish hosts has been addressed.
<b>AQ Mollusks</b>	Spider Elimia	<i>Elimia arachnoidea</i>	II	c	Aquatic	Little is known about this species' habitat needs. It has only been found in small streams.	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>AQ Mollusks</b>	Spiny riversnail	<i>Io fluvialis</i>	III	a	Aquatic	Large rocks and bedrock outcrops in well-oxygenated shallow water with fast current.	This species is included in the Virginia Mussel Restoration Strategy. Propagation and release efforts need to continue and release sites monitored. This species will be prioritized as Tier 3a.
<b>AQ Mollusks</b>	Tennessee clubshell	<i>Pleurobema oviforme</i>	III	a	Aquatic	Creeks and small rivers with moderate flow and sand/gravel substrates	This species is included in the Virginia Mussel Restoration Strategy. Propagation techniques must be developed for this species and water quality and habitat improvements must be continued to be made through BMPs and land-use management. This species will be prioritized as Tier 3a.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
<b>AQ Mollusks</b>	Tennessee heelsplitter	<i>Lasmigona holstonia</i>	II	a	Aquatic	Small headwater streams with sand or mud substrates	This species is included in the Virginia mussel restoration strategy. Propagation has been initiated with this species with success. These techniques need to be developed further and release and monitoring of this species is a priority. Status assessment across the species range also is a priority. This species will be prioritized as Tier 2a.
<b>AQ Mollusks</b>	Tennessee pigtoe	<i>Fusconaia barnesiana</i>	II	a	Aquatic	Headwater streams to rivers with moderate to high flow and unsilted gravel/sand rubble, or boulder substrates	This species is included in the Virginia Mussel Restoration Strategy. Propagation techniques must be developed for this species and water quality and habitat improvements must be continued to be made through BMPs and land-use management. This species will be prioritized as Tier 2a.
<b>AQ Mollusks</b>	Threeridge	<i>Amblema plicata</i>	III	b	Aquatic	Small streams to big rivers, and from locations such as lakes, rivers, and streams with little or no current to areas of very swift current	This species has declined across its range over the past 10 - 15 years such that it is nearing extirpation in Virginia. Propagation techniques need to be developed. This species will be prioritized as Tier 3b. This ranking will be reconsidered when the research needs have been addressed.
<b>AQ Mollusks</b>	Three-ridge valvata	<i>Valvata tricarinata</i>	IV	c	Aquatic	Unknown habitat needs in Virginia but in other parts of the country this species is associated with aquatic vegetation	A status assessment is needed for this species. This species will be prioritized as Tier 4c.
<b>AQ Mollusks</b>	Tidewater mucket	<i>Leptodea ochracea</i>	IV	a	Aquatic	Ponds, canals, and slow moving sections of rivers, often connected to the ocean. Can tolerate a wide variety of substrates	Propagation and recovery is currently ongoing at VFAWC and this work should continue. This species will be prioritized as Tier 4a.
<b>AQ Mollusks</b>	Triangle floater	<i>Alasmidonta undulata</i>	IV	a	Aquatic	Clean streams with stable banks and sand or gravel substrates	Propagation and recovery is currently ongoing at VFAWC and this work should continue. If the South River NRDAR project comes through, this species will be a focus of recovery. This species will be prioritized as Tier 4a.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
<b>AQ Mollusks</b>	Unthanks Cave snail	<i>Holsingeria unthanksensis</i>	I	a	Aquatic	Karst obligate that requires clean water flowing through the system.	Protection of cave habitat is critical for conservation of this species. Efforts to conserve water quality and quantity within karst systems are consistent with other action plan priorities. This species will be prioritized as Tier 1a.
<b>AQ Mollusks</b>	Virginia pigtoe	<i>Lexingtonia subplana</i>	I	b	Aquatic	Site specific - cool clean headwater streams with sand and gravel substrates	There are taxonomic questions surrounding this species and the species is likely simply <i>Fusconaia masoni</i> . A genetics project could be conducted but sites at which subplana was identified may no longer harbor the species. This species will be listed as Tier 1b. This ranking will be reconsidered when the genetic research need has been addressed.
<b>AQ Mollusks</b>	Virginia springsnail	<i>Fontigens morrisoni</i>	I	a	Aquatic	Site specific caves and springs in Bath and Highland counties	Threats to this species results from impaired water quality and diminished water quality. This species is restricted to springs in Bath and Highland County, only 4 known sites, 2 of which have been confirmed in the past decade. Habitat protection with private landowners to protect these springs is the most critical thing that can be done but opportunities are limited. Efforts to conserve water quality and water quantity are consistent with other action plan priorities. This species will be prioritized as Tier 1a.
<b>AQ Mollusks</b>	Yellow lampmussel	<i>Lampsilis cariosa</i>	II	a	Aquatic	Large streams and rivers with low gradient and sand and gravel substrates	This species is only known from 3 river basins in VA, the Chowan, Potomac and Roanoke. The species is uncommon in the Nottoway and Meherrin Rivers in the Chowan Basin. The Dan River population was just discovered and only a few individuals were found. The Potomac Basin Population is in decline and the presence of a non-native <i>Lampsilis</i> species may be causing hybridization and loss of the species. Propagation and recovery of this species is currently underway at VFAWC and should be continued to augment existing populations and to recover the species in river basins like the James, Chickahominy and Rappahannock. This species will be prioritized as Tier 2a.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
<b>AQ Mollusks</b>	Yellow lance	<i>Elliptio lanceolata</i>	II	a	Aquatic	Requires slow currents with unsilted sandy substrates and can tolerate a various water sizes	This species has experienced significant declines across its range in VA. No stable populations are known. The species is currently under review for federal listing and likely warrants state listing. Propagation of this species is a must and coordination with North Carolina Wildlife Resources Commission is likely needed to achieve this management strategy. NCWRC has been propagating this species for a few years so it can be done. This species will be prioritized as Tier 2a.
<b>Birds</b>	American black duck	<i>Anas rubripes</i>	II	a	Wetland	Shallow margins of lakes, streams, bays mud flats, and open waters. Nests in both dry and wet woodlands. Wide variety of wetland habitats in both freshwater and marine situations, in and around marshes, swamps, ponds, lakes, bays, estuaries, and tidal flats.	The greatest management tool for black ducks and other waterfowl is developing hunting regulation to manage harvest and survival rates. Management actions for breeding black ducks include protecting and restoring nesting habitats and managing predator populations. Other management actions include reducing mute swan populations, controlling TMDLs and reducing eutrophication in the Chesapeake Bay to protect black duck food resources. There is also a critical research need for assessing and minimizing the threat of future wind farms in the Chesapeake Bay. This species will be prioritized as Tier 2a.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
<b>Birds</b>	American oystercatcher	<i>Haematopus palliatus</i>	II	a	Shoreline	Barrier beaches, salt marshes and Chesapeake Bay islands and shorelines.	VA currently supports the largest Atlantic coast breeding population and the second highest winter population in the US range. Oystercatchers are on the 2015 US shorebirds of conservation concern watch list as a species requiring immediate management action (U.S. Shorebird Conservation Plan Partnership 2015) and they ranked as a species of highest conservation concern in the New England/Mid-Atlantic Coast Bird Conservation Region (BCR30) Implementation Plan (BCR 30 Plan) winter list (ACJV 2008). Best management is already in place - the protection of the barrier islands and seaside marshes from development and most other human activities. Other on the ground management actions include continuation of predator control efforts, area closures and signage at key breeding sites on the barrier islands, Chesapeake Bay islands, and the western shore of the Chesapeake Bay, and public outreach to recreational boaters and beachgoers. Future management measures should include the identification and purchase of suitable inshore marshes and beaches to ensure that suitable breeding habitat is available as coastal fringe islands and marshes subside or become permanently inundated due to sea level rise (SLR) and climate change effects. This species will be prioritized as Tier 2a.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
<b>Birds</b>	American woodcock	<i>Scolopax minor</i>	II	a	Open Habitat	Ideal habitat consists of young forests and abandoned farmland mixed with forested land. Generally considered an edge species.	AMWO breed and winter in VA. AMWO are on the 2015 shorebirds of conservation concern watch list under the management attention category (U.S. Shorebird Conservation Plan Partnership 2015) and are considered a high priority species in the BCR 30 Plan (ACJV 2008). Although the low AI score technically disqualifies the AMWO as a SGCN, it does meet the other Tier II criteria. There is also a North America AMWO conservation plan that provides habitat protection and management guidance for states (Kelly et al. 2008). Efforts are needed to determine its breeding and wintering abundance and distribution in VA (and throughout the eastern management unit). This info is needed to guide habitat management and restoration efforts in Virginia, and to establish state harvest regulations. This species will be prioritized as Tier 2a.
<b>Birds</b>	Bachman's sparrow	<i>Peucaea aestivalis</i>	I	a	Open Woodland/ Scrub	Pine savanna/ open pine woodlands	The status of this state-threatened species in Virginia is precarious, but may be improved through re-introductions into stable habitat in mature pine savannas, such as those found on The Nature Conservancy's Piney Grove Preserve in Sussex County. This species will be prioritized as Tier 1a.
<b>Birds</b>	Bank swallow	<i>Riparia riparia</i>	III	c	Riparian/C oast	Habitat includes open and partly open situations, frequently near flowing water. Nests are in steep sand, dirt, or gravel banks, in burrows dug near the top of the bank, along the edge of inland water, or along the coast, or in gravel pits, road embankments, etc.	Recent analysis by DGIF biologists and conservation partners estimate that >5,000 breeding pairs occur in the Commonwealth. Trend data is not available from the Breeding Bird Survey(BBS) for Virginia. However, trend analysis of the Eastern Region of the BBS has shown the Bank Swallow has shown a statistically significant decline of -7.67% for the time period of 1966 – 2012. The reasons for these declines are not well understood and information on abundance and distribution are lacking. DGIF staff indicate research should focus on abundance and distributional data, nest site surveys, and trend analysis. This species will be prioritized as tier 3c.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
Birds	Barn owl	<i>Tyto alba</i>	III	a	Open Habitat	Fields of dense grass. Open and partly open country (grassland, marsh, lightly grazed pasture, hayfields) in a wide variety of situations, often around human habitation.	This species utilizes a variety of open vegetated habitats. This species' habitat needs are consistent with actions outlined within Virginia's Quail Action Plan and associated resources. This species will be prioritized as Tier 3a.
Birds	Belted Kingfisher	<i>Megaceryle lcyon</i>	III	b	Aquatic	Primarily along water, both freshwater and marine, including lakes, streams, wooded creeks and rivers, seacoasts, bays, estuaries, and mangroves. Perches in trees, on over hanging branches, posts and utility wires.	The causes of the long-term decline, both in VA and elsewhere, are unclear. Several research efforts have been implemented to attempt to answer this question. None of these efforts have provided definitive results. Research should continue so that management efforts can be identified and implemented. This species will be prioritized as Tier 3b. This ranking will be reconsidered when research needs have been addressed.
Birds	Bicknell's thrush	<i>Catharus bicknelli</i>	IV	a	Forest	Migratory with weak habitat associations in Virginia	Virginia's Eastern Shore is a critical migratory habitat for this species. The Bicknell's thrush' needs during migration, along with those of scores of other migrant birds, are being actively addressed by the Southern Tip Partnership, of which DGIF is an active member. For over two decades the group has been active in land acquisition and restoration on the southern tip of Virginia's Eastern Shore; it has protected and continues to manage over 24,000 acres for the benefit of migratory bird communities. DGIF should continue working with the partnership to enhance and expand the latter's conservation efforts and capacity. Efforts to conserve and restore these habitats should continue. This species will be prioritized as Tier 4a.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
<b>Birds</b>	Black rail	<i>Laterallus jamaicensis</i>	I	a	Wetland	High saltmarsh	Black rails were recently listed as state endangered in VA and require immediate attention to stop its extirpation from the state. The greatest threats facing black rails in VA include habitat loss to SLR and climate change effects and avian and mammalian predator pressure (Wilson et al. 2009, Wilson and Watts 2014). Local management actions should include the identification and purchase of suitable inshore high marshes to provide breeding habitat as existing habitats are inundated due to SLR. Artificial impoundments can also be created to provide suitable habitat free of nest predators. Although a broad strategy and site-specific recommendations for managing impoundments still need to be developed, basic requirements include dense grasses that offer adequate cover and very low water levels (i.e, several centimeters in depth). This would require specific flooding and draw down regimes timed specifically to produce optimal conditions for black rails. This species will be prioritized as Tier 1a.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
<b>Birds</b>	Black skimmer	<i>Rynchops niger</i>	II	a	Shoreline	Beach species that nests on bare sand	Over the last 20 years, the breeding population of black skimmers experienced significant declines (-51%) in VA (Watts and Paxton 2014). Skimmers were identified as a 2014 species of high conservation concern by the Northwestern Atlantic Marine Bird Cooperative. The greatest threats facing skimmers in VA include habitat loss to SLR and climate change effects and avian and mammalian predator pressure. Most skimmer breeding sites are under permanent protection from development. Additional management measures that should be continued include predator management on the barrier islands, area closures, signage and outreach efforts at key nesting sites, and the suite conservation actions implemented at the Hampton Roads Bridge and Tunnel (HRBT). Future management actions may include the identification and purchase of suitable inshore high marshes and sandy shorelines to ensure future availability of breeding habitat as coastal fringe sites are lost to SLR. This species will be prioritized as Tier 2a.
<b>Birds</b>	Black-and-white warbler	<i>Mniotilta varia</i>	IV	a	#N/A	#N/A	This forest-interior species is a habitat generalist with broad habitat tolerances, and enjoys a widespread distribution within Virginia. Like other area-sensitive species it is potentially subject to the negative effects of forest fragmentation. The species can benefit from conservation and management of large forest blocks. This species will be prioritized as Tier 4a.
<b>Birds</b>	Black-bellied plover (winter)	<i>Pluvialis squatarola</i>	IV	a	Shoreline	Winter resident along beaches and estuaries	Best management is already in place - the protection of the barrier islands and seaside marshes from development and most other human activities. Future management measures should include the identification and purchase of suitable inshore marshes and beaches to ensure that suitable breeding habitat is available as coastal fringe islands and marshes subside or become inundated due to SLR and climate change effects. This species will be prioritized as Tier 4a.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
Birds	Black-billed cuckoo	<i>Coccyzus erythrophthalmus</i>	II	b	Forest	Forest edge and open woodland, both deciduous and coniferous, with dense deciduous thickets.	This species is threatened by habitat fragmentation and the decline of habitat quality. Research of these issues appears to be inconclusive and these topics need to be better evaluated with managers in other states to develop habitat treatments and other management strategies. This species will be prioritized as Tier 2b. This ranking will be reconsidered when these research needs are addressed.
Birds	Black-crowned night-heron	<i>Nycticorax nycticorax</i>	III	a	Wetland	Variety of marshes, swamps, and wooded streams	The greatest threats to black-crowned night herons in VA are loss of suitable breeding habitat to SLR and climate change effects, and to a lesser extent, predator impacts. Most breeding sites are under permanent protection from development and other human activities. Additional management measures should include area closures, signage and outreach efforts at Chesapeake Bay breeding sites and the identification and purchase of suitable inshore high marshes to ensure habitat is available as coastal fringe marshes subside or become permanently inundated. This species will be prioritized as Tier 3a.
Birds	Brant	<i>Branta bernicla</i>	III	a	Wetland	Saltmarshes and estuaries.	Atlantic brant winter trends in VA have been declining for the past 10 years (VDGIF, unpubl. data). The species was identified as a 2014 species of medium conservation concern by the Northwestern Atlantic Marine Bird Cooperative and are considered a highest priority species in the BCR 30 Plan (ACJV 2008). Wintering brant in VA spend most of their time in coastal seaside marshes and lagoon system. A significant management tool for the species is the development of annual hunting regulations to manage harvest and survival rates. Other important management actions include reestablishing eelgrass beds (SAV) in the coastal lagoon system, and controlling TMDLs and reducing eutrophication in the Chesapeake Bay to protect the species' food resources. There is also a critical research need for assessing and minimizing the threat of future inshore and offshore wind farms. This species will be prioritized as Tier 3a.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
Birds	Brown thrasher	<i>Toxostoma rufum</i>	IV	a	Forest	Thickets and bushy areas in deciduous forest clearings and forest edge, shrubby areas and gardens; in migration and winter also in scrub.	This species utilizes early-successional habitats and would benefit from creation and maintenance of early-successional habitat. DGIF's efforts to create these habitats should continue. This species will be prioritized as Tier 4a.
Birds	Canada warbler	<i>Cardellina canadensis</i>	IV	b	Wetland	Breeding habitat includes moist thickets of woodland undergrowth (especially aspen-poplar), bogs, tall shrubbery along streams or near swamps, and deciduous second growth.	DGIF is looking toward the newly-formed Canada Warbler International Conservation Initiative for potential collaboration and for products that can help to guide conservation efforts for the species in Virginia. This species will be prioritized as tier 4b. This ranking will be reconsidered after potential conservation actions have been evaluated.
Birds	Cerulean warbler	<i>Setophaga cerulea</i>	II	a	Forest	A structurally mature hardwood forest in a mesic or wetter situation, with a closed canopy	This bird of mature forests thrives in areas with heterogeneity in the canopy structure. Because of this, it may respond well to disturbances that can contribute to gaps in the canopy (gypsy moth infestations, ice storms, silvicultural treatments). DGIF is actively participating in a regional collaborative effort in the Appalachians to refine existing silvicultural BMPs for the improvement of Cerulean Warbler habitat. Application of these BMPs should be achievable on a small scale. These efforts should continue. This species will be prioritized as Tier 2a.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
<b>Birds</b>	Chimney swift	<i>Chaetura pelagica</i>	IV	b	#N/A	Inhabits rural and urban environments having both an abundance of flying arthropods and suitable roosting/nesting sites.	This species is a diurnal aerial insectivore associated with a variety of habitats throughout its breeding range. It appears to be more prevalent in urban areas where there are greater concentrations of chimneys, which are used as nest sites and communal roosts (Steeves et al. 2014). As the availability of suitable nesting and roosting chimneys continues to decline, so does the swift population. Swifts will use a variety of other artificial structures, and the availability of chimneys may not be the limiting factor for all populations (Steeves et al. 2014). Aerial insectivores as a guild have declined in North America, so that swift declines may be tied to these broader declines. A better understanding of factors limiting swift populations is necessary in order to identify and enact effective conservation and management measures. This species will be prioritized as Tier 4b. This ranking will be reconsidered as these research needs are addressed.
<b>Birds</b>	Clapper rail	<i>Rallus longirostris</i>	IV	a	Wetland	Saltmarshes	This species is threatened by the loss and degradation of wetland habitats. Identification, protection and management (ex. phragmites control) of suitable marshes will be necessary to ensure continued habitat availability for these species, especially as coastal marshes subside or are threatened with sea level rise. This species will be prioritized as Tier 4a.
<b>Birds</b>	Common tern	<i>Sterna hirundo</i>	II	a	Shoreline	Nests primarily on open dynamic beaches.	Most common tern breeding sites are under permanent protection from development. Additional management measures that should be continued include predator management on the barrier islands and conservation actions at the Hampton Roads Bridge Tunnel where this species nests in high numbers. Future management may include the identification and purchase of suitable inland marshes and sandy shorelines to ensure future availability of breeding habitat as coastal fringe sites are lost to sea level rise. This species will be prioritized as Tier 2a.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
Birds	Dunlin	<i>Calidris alpina hudsonia</i>	IV	a	Shoreline	Winter resident shorelines and estuaries	Although dunlin winter trends are unknown in VA, they are on the 2015 Best management is already in place; the permanent protection of the barrier islands and seaside marshes. However, other wintering sites in the Chesapeake Bay, especially along the western shore, experience varying levels of human disturbance where additional management actions should be deployed such as dog leash laws and area closures on sand shoals and spits with heavy human disturbance. Future management actions may include the identification and purchase of suitable inshore marshes and sandy shorelines to ensure future availability of wintering habitat as coastal fringe sites are lost to SLR. Because of its widespread distribution on VA's the coastal plain, dunlin make it a good umbrella species for all wintering shorebirds that share similar wintering habitats in the Commonwealth. This species will be prioritized as Tier 4a.
Birds	Eastern kingbird	<i>Tyrannus tyrannus</i>	IV	a	Open Habitat	Forest edge, open situations with scattered trees and shrubs, cultivated lands with bushes and fencerows, and parks; in winter more closely associated with forest clearings and borders.	This species utilizes early-successional habitats and would benefit from creation and maintenance of early-successional habitat. DGIF's efforts to create these habitats should continue. This species will be prioritized as Tier 4a.
Birds	Eastern meadowlark	<i>Sturnella magna</i>	IV	a	Open habitat	Grasslands, savanna, open fields, pastures, cultivated lands, sometimes marshes.	This species is a relatively common grassland obligate species which have been undergoing steep declines. These are primarily thought to be due to habitat loss, fragmentation and degradation, though recent studies have also implicated pesticides in the decline of grassland bird populations. Both species would benefit from grassland management and farmland conservation practices, conservation of large blocks of intact grassland, as well as from altered mowing regimes that would improve productivity. This species will be prioritized as Tier 4a.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
<b>Birds</b>	Eastern towhee	<i>Pipilo erythrophthalmus</i>	IV	a	Open Habitat	Inhabits forest and swamp edges, regenerating clearcuts, open-canopied forests, particularly those with a well-developed understory, reclaimed strip mines, mid-late successional fields, riparian thickets, overgrown fencerows, shrub/small-tree thickets, and other brushy habitats.	This species utilizes early-successional habitats and would benefit from creation and maintenance of early-successional habitat. DGIF's efforts to create these habitats should continue. This species will be prioritized as Tier 4a.
<b>Birds</b>	Eastern Whip-poor-will	<i>Antrostomus vociferus</i>	III	a	Forest	Forest and open woodland, from lowland moist and deciduous forest to montane forest and pine-oak association.	This species is associated with deciduous and mixed forests with open understories (Cink 2002). A variety of additional open habitats may be used for foraging, including fallow fields, croplands, shrublands and regenerating pine stands (Wilson and Watts 2008). Spatial proximity of such habitats to open forests may be beneficial to the species (Wilson and Watts 2008); for example, interspersed harvested patches with mid-rotation patches in managed pine plantations. The species can benefit from conservation, restoration and management of forests with the appropriate degree of openness and/or juxtaposition with open habitats. This species will be prioritized as Tier 3a.
<b>Birds</b>	Eastern wood-pewee	<i>Contopus virens</i>	IV	b	Forest	Inhabits a wide variety of wooded upland and lowland habitats including deciduous, coniferous, or mixed forests.	The Pewee is a common bird with a widespread distribution in Virginia. It is a habitat generalist of forested habitats, breeding in both deciduous and coniferous forest and using both interior and edge (including suburban) habitats. High deer populations are potentially implicated in its declines through disturbance via browsing of the intermediate canopy where Pewees forage (McCarty 1996). A better understanding of factors limiting Pewee populations is necessary in order to identify and enact effective conservation and management measures. This species will be prioritized as Tier 4b. This ranking will be reconsidered as these research needs are addressed.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
Birds	Field sparrow	<i>Spizella pusilla</i>	IV	a	Open Habitat	Old fields, brushy hillsides, overgrown pastures, thorn scrub, deciduous forest edge, sparse second growth, fencerows.	This species utilizes early-successional habitats and would benefit from creation and maintenance of early-successional habitat. DGIF's efforts to create these habitats should continue. This species will be prioritized as Tier 4a.
Birds	Forster's tern	<i>Sterna forsteri</i>	III	a	Shoreline	Nests in marine and estuarine marshes.	Forster's Tern nest in low marsh habitats susceptible to sea level rise and marsh subsidence. Thus, the identification and purchase of suitable inland marshes to offset loss of existing marshes should be undertaken. Other potential management options include building nest platforms in marshes. This species will be prioritized as Tier 3a.
Birds	Glossy ibis	<i>Plegadis falcinellus</i>	I	a	Wetland	Wooded wetlands, estuarine marshes and waters and saltmarshes.	Most glossy ibis breeding sites are under permanent protection from development. Predator management on those barrier islands where this species nests should be continued. Future management may include the identification and purchase of suitable inland high marshes to ensure future availability of breeding habitat as coastal fringe sites are lost to sea level rise. This species will be prioritized as Tier 1a.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
Birds	Golden Eagle	<i>Aquila chrysaetos</i>	I	a	Open Habitat	Inhabit open and semi-open country such as prairies, sagebrush, arctic and alpine tundra, savanna or sparse woodland, and barren areas, especially in hilly or mountainous regions, in areas with sufficient mammalian prey base and near suitable nesting sites.	The Golden Eagles in the eastern United States represent a distinct and unique sub-population of only 2,000 -5,000 individuals. This is a migratory population that breeds solely in Canada and primarily winters in the Appalachian Mountains from New York to Alabama. A sizable portion (10 – 20%) of this population winters in Virginia. Known threats include incidental take by fur trappers and lead poisoning that results from birds feeding on carrion containing the fragments of lead bullets. Eagle habitat overlaps with areas designated as prime sites for wind energy development. Incidental take by trapping can be greatly diminished by changing trapping regulations and education related to use of bait and terrestrial sets used by trappers. Minimizing lead poisoning could be reduced through educating hunters of proper disposal of offal piles and use of non-lead ammunition. Wind turbine siting can be modified by utilization of risk assessment models developed by Katzner et. al. These models likely will greatly minimize strike risk but allow siting of turbines in areas of high wind production and low eagle use. This species will be prioritized as Tier 1a.
Birds	Golden-winged warbler	<i>Vermivora chrysoptera</i>	I	a	Forest	Open shrubby habitat (ex. old fields and pastures) at mid to high elevations within broader forested matrix west of the Blue Ridge Mountains.	In Virginia, this habitat specialist breeds in open, shrubby habitats within a forested context at mid- to high-elevations within the Appalachian Mountains. ‘Working Lands for Wildlife’ has been established to improve the species' status via habitat management on private lands aided by federal cost-share. DGIF leads the VA Golden-winged Warbler Partners group to assist with implementation of the program and to enable collaboration with state and regional partners on research and conservation actions. DGIF is also an active participant in the international Golden-winged Warbler Working Group, which in 2012 released a Status Review and Conservation Plan for the species. These efforts should continue. This species will be prioritized as Tier 1a.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
<b>Birds</b>	Grasshopper sparrow	<i>Ammodramus savannarum</i>	IV	a	#N/A	#N/A	This species is a relatively common grassland obligate species which have been undergoing steep declines. These are primarily thought to be due to habitat loss, fragmentation and degradation, though recent studies have also implicated pesticides in the decline of grassland bird populations. This species would benefit from grassland management and farmland conservation practices, conservation of large blocks of intact grassland, as well as from altered mowing regimes that would improve productivity. This specie will be prioritized as Tier 4a.
<b>Birds</b>	Gray catbird	<i>Dumetella carolinensis</i>	IV	a	Open Habitat	Thickets, dense brushy and shrubby areas, undergrowth of forest edge, hedgerows, and gardens, dense second growth.	This species utilizes early-successional habitats and would benefit from creation and maintenance of early-successional habitat. DGIF's efforts to create these habitats should continue. This species will be prioritized as Tier 4a.
<b>Birds</b>	Greater scaup	<i>Aythya marila</i>	IV	a	Lake/Pond	Winter resident on tidal rivers	Wintering scaup in VA spend most of their time in coastal nearshore waters, especially near and south of the mouth of the Chesapeake Bay, in the open waters of the lower and middle Chesapeake Bay, and up the major river systems within the Chesapeake Bay watershed. A significant management tool for the species is the development of annual hunting regulations to manage harvest and survival rates. Other important management actions include controlling TMDLs and reducing eutrophication in the Chesapeake Bay to protect the species' benthic food resources. There is also a critical research need for assessing and minimizing the threat of future inshore and offshore wind farms. This species will be prioritized as Tier 4a.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
<b>Birds</b>	Green heron	<i>Butorides virescens</i>	IV	b	Wetland	Swamps, mangroves, marshes, and margins of ponds, rivers, lakes, and lagoons.	Green herons nesting on the coastal plain experienced a significant 20-year decline (68%; Watts and Paxton 2014) in this part of the state. Because VA's colonial waterbird surveys are confined to the coastal plain, the statewide population is unknown. This species should remain as a SGCN until we have a better handle on statewide population and distribution and ensure some level of protection for the declining coastal population. Nearly half of the green heron coastal population occurs in urban areas; thus, the development of an urban nesting waterbird management plan will provide the necessary guidance to manage these species in urban environments. This species will be prioritized as Tier 4b. This ranking will be reconsidered as planning and research needs are addressed.
<b>Birds</b>	Gull-billed tern	<i>Gelochelidon nilotica</i>	I	a	Shoreline	Nests on open sandy beaches and marsh shell rakes.	Gull-billed terns are a state threatened species. Over the last 20 years, gull-billed terns experienced significant declines (-51.5%) in VA (Watts and Paxton 2014). Moreover, gull-billed terns are considered a species of high conservation concern by the Northwestern Atlantic Marine Bird Cooperative. The greatest threats facing the terns in VA include habitat loss to SLR and climate change effects and avian and mammalian predator pressure. Most gull-billed tern breeding sites are under permanent protection from development. Additional management measures that should be continued include predator management on the barrier islands, area closures, signage and outreach efforts at key nesting sites, and conservation actions implemented at the HRBT. Future management actions may include the identification and purchase of suitable inshore marshes and sandy shorelines to ensure future availability of breeding habitat as coastal fringe sites are lost to SLR. This species will be prioritized as Tier 1a.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
<b>Birds</b>	Henslow's sparrow	<i>Ammodramus henslowii</i>	I	a	Open vegetated	Open fields and meadows with grass interspersed with weeds or shrubby vegetation, especially in damp or low-lying areas, adjacent to salt marsh in some areas	Efforts to manage habitat at the Radford Arsenal should continue. Monitoring this population should be more consistent. Given its longevity and relative stability, the population at the Radford Arsenal may play an important role in the recovery of the species in Virginia. The addition of a monitoring component would be important in gauging whether current management efforts are benefiting the breeding population. Lastly, DGIF should work with land managers at the Radford Arsenal to adopt relevant conservation actions outlined in the national Conservation Plan as a first step in adapting the Plan to VA. This species will be prioritized as Tier 1a.
<b>Birds</b>	Kentucky warbler	<i>Geothlypis formosa</i>	III	a	Forest/wetland	Humid deciduous forest, dense second growth, swamps.	This species is associated with bottomland hardwoods and woods near streams with dense understory, often at low elevations. Although some deleterious and some beneficial silvicultural practices have been identified (McDonald 2013), BMPs to benefit Kentucky Warbler have not been generated. The species is potentially sensitive to forest fragmentation (Dunn and Garret 1997). The species can benefit from conservation, restoration and management of large forest blocks and of vegetated riparian corridors. This species will be prioritized as Tier 3a.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
Birds	King rail	<i>Rallus elegans</i>	II	b	Wetland	Variety of fresh water and marine marshes and wetlands	This species occupies marshes of different salinity gradients, and all populations are threatened by wetland loss and degradation. Identification, protection and management (ex. phragmites control) of suitable marshes will be necessary to ensure continued habitat availability for these species, especially as coastal marshes subside or are threatened with sea level rise. A DGIF-funded study is currently underway to characterize King and Clapper Rail populations in a potentially important area of co-occurrence and to develop a methodology to distinguish between the higher-ranked King Rail and the lower-ranked Clapper Rail by ear. This will allow for identification of important King Rail sites in order to prioritize conservation efforts toward the latter in areas of potential co-occurrence. This species will be prioritized as Tier 2b. This ranking will be reconsidered when the research needs are addressed.
Birds	Laughing Gull	<i>Leucophaeus atricilla</i>	IV	a	Beach/ open water	Seacoasts, bays, estuaries, rarely on large inland bodies of water.	The LAGU breeding population in Northampton Co. has declined significantly (~80%) due to SLR and marsh subsidence. Similar declines occurred in the seaside marshes behind Cedar and Parramore islands in Accomack County. However, there are several LAGU control programs in place to benefit other nesting birds or increase human safety (i.e., Chincoteague NWR staff control LAGU numbers on Assateague Island at key piping plover breeding areas; USDA Wildlife Services shoot and harass LAGUs at commercial and military airports; and an annual LAGU egg oiling program is in place at the Hampton Roads Bridge Tunnel (HRBT) designed to reduce LAGU reproductive success and discourage them from nesting there). DGIF staff should continue to engage in discussions pertaining to controlling LAGUs for the benefit of other breeding waterbirds and human safety. This species will be prioritized as Tier 4a.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
Birds	Least bittern	<i>Ixobrychus exilis</i>	III	a	Wetland	Freshwater marshes	This species is threatened by the loss and degradation of wetland habitats. Identification, protection and management (ex. phragmites control) of suitable marshes will be necessary to ensure continued habitat availability for these species, especially as coastal marshes subside or are threatened with sea level rise. This species will be prioritized as Tier 3a.
Birds	Least tern	<i>Sterna antillarum</i>	III	a	Shoreline	Nest on open beaches	While over half of VA's LETA pop nests on the protected barrier islands, significant numbers nest at sites with a high degree of human disturbance including Craney Island Dredge material Disposal Area, Grandview Nature Preserve and at 2 mall rooftops. Management actions (e.g., signage, outreach efforts, area closures, etc.) at these sites need to continue as does predator management on the barrier islands. Future management may include the identification and purchase of suitable inshore shorelines to ensure future availability of breeding habitat as coastal fringe sites are lost to SLR. This species will be prioritized as Tier 3a.
Birds	Little blue heron	<i>Egretta caerulea</i>	II	a	Wetland	Freshwater and brackish marshes	The greatest threats to the species in VA are loss of suitable breeding habitat to SLR and climate change effects, and to a lesser extent, predator impacts. Most breeding sites are under permanent protection from development and other human activities. Predator management, area closures, signage and outreach efforts should continue on the barrier islands where this species nests. Future management measures should include area closures, signage and outreach efforts at Chesapeake Bay and western shore sites and the identification and purchase of suitable inshore high marshes to ensure habitat is available as coastal fringe marshes subside or become permanently inundated. This species will be prioritized as Tier 2a.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
Birds	Loggerhead shrike	<i>Lanius ludovicianus</i>	I	a	Open vegetated	Grasslands, orchards and open areas with scattered trees	The Loggerhead Shrike Working Group, with DGIF as a founding member, has begun addressing research needs through a regionally-coordinated project which is expected to produce a conservation plan for the species, which is state-threatened in Virginia. The project includes trapping and banding of shrikes and subsequent monitoring, with much of the work taking place on private lands. Because this entails coordination with the landowner, it also provides an opportunity for outreach and to enhance the conservation potential of the sites. These efforts should continue. This species will be prioritized as Tier 1a.
Birds	Marbled godwit	<i>Limosa fedoa</i>	IV	a	Shoreline	Seaside lagoon system throughout the winter.	Best management is already in place; the permanent protection of the barrier islands and seaside marshes. However, other wintering sites in the Chesapeake Bay, especially along the western shore, experience varying levels of human disturbance where additional management actions should be deployed such as dog leash laws and area closures on sand shoals and spits with heavy human disturbance. Future management actions may include the identification and purchase of suitable inshore marshes and sandy shorelines to ensure future availability of wintering habitat as coastal fringe sites are lost to SLR. This species will be prioritized as Tier 4a.
Birds	Marsh wren	<i>Cistothorus palustris</i>	IV	a	Wetland	Freshwater marshes with cattails and reeds	This species is threatened by the loss and degradation of wetland habitats. Identification, protection and management (ex. phragmites control) of suitable marshes will be necessary to ensure continued habitat availability for these species, especially as coastal marshes subside or are threatened with sea level rise. This species will be prioritized as Tier 4a.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
<b>Birds</b>	Nelson's sparrow (winter	<i>Ammodramus nelsoni</i>	III	a	Wetland	Wintertime resident of maritime wetlands	This species is threatened by the loss and degradation of wetland habitats. Identification, protection and management (ex. phragmites control) of suitable marshes will be necessary to ensure continued habitat availability for these species, especially as coastal marshes subside or are threatened with sea level rise. This species will be prioritized as Tier 3a.
<b>Birds</b>	Northern bobwhite	<i>Colinus virginianus</i>	III	a	Open Habitat	Early successional habitats including croplands, grasslands, pastures, grass-brush rangelands, and open forests	DGIF has an active, multi-faceted Quail Recovery Initiative, including a landowner outreach and technical support program through Private Lands Biologists, a multi-partner Virginia Quail Council and a Northern Bobwhite Quail Action Plan for Virginia, among other components. These efforts should continue. This species will be prioritized as Tier 3a.
<b>Birds</b>	Northern Flicker	<i>Colaptes auratus</i>	IV	b	Forest	Open forest, both deciduous and coniferous, open woodland, open situations with scattered trees and snags, riparian woodland, pine-oak association, parks.	Causes of this species' decline are not immediately apparent. The species is fairly plastic in its selection of habitat, utilizing woodlands, forest edges, open fields with scattered trees, as well as city parks and suburbs. Habitat does not appear to be a limiting factor. Hypotheses relating to the decline of Flicker populations include competition from European Starlings for nest cavities; declining availability of suitable nest-cavity substrate (snags, dead limbs, and live trees with heart rot via suburban expansion, dead and diseased tree removal from urban and suburban areas, and ineffective dead-limb maintenance policies on public lands); and pesticide application on golf courses, agricultural fields and suburban lawns (Wiebe and Moore 2008). While management policies relating to snag retention on public lands can be pursued at any time, properly identifying factors limiting Flicker populations is an important first step. This species will be prioritized as Tier 4b. This ranking will be reconsidered when research needs have been addressed.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
<b>Birds</b>	Northern Gannet	<i>Morus bassanus</i>	IV	a	Aquatic	Coastal waters primarily but sometimes several hundred miles out to sea.	A significant number of gannets winter in and near the mouth of the Chesapeake Bay and in nearshore ocean waters. Management actions include controlling TMDLs and reducing eutrophication in the Chesapeake Bay to protect gannets' food resources. There is also a critical research need for assessing and minimizing the threat of future wind farms in the Chesapeake Bay and in offshore waters. This species will be prioritized as Tier 4a.
<b>Birds</b>	Northern harrier	<i>Circus cyaneus</i>	III	a	Wetland and Open habitat	Marshes, meadows, grasslands, and cultivated fields.	Harriers occur in relatively low numbers as breeders in Virginia, where they may be found using both open marshes and open upland grassland habitat. Their numbers swell during the winter with the influx of migrants, and it is this winter population that should be the focus of conservation efforts. Like other grassland species, Harriers rely on relatively large tracts, such that preserving and restoring blocks of native grasslands is a high priority conservation action for this species. Wintering harriers will likewise use emergent wetlands; identification, protection and management (ex. phragmites control) of suitable marshes will be necessary to ensure continued habitat availability for this species. This species will be prioritized as Tier 3a.
<b>Birds</b>	Northern Pintail	<i>Anas acuta</i>	IV	a	Wetland/ Aquatic	Lakes, rivers, marshes and ponds in grasslands or cultivated fields.	The greatest management tool for pintails and other waterfowl is developing hunting regulations to manage harvest and survival rates. Other management actions include reducing mute swan populations, controlling TMDLs and reducing eutrophication in the Chesapeake Bay to protect pintail food resources. There is also a critical research need for assessing and minimizing the threat of future wind farms in the Chesapeake Bay. This species will be prioritized as Tier 4a.
<b>Birds</b>	Northern rough-winged swallow	<i>Stelgidopteryx serripennis</i>	IV	c	Open Habitat	Open and partly open situations, especially along watercourses with steep banks, and roadside cuts	Basic population and life history information is lacking for this species. Therefore few if any management opportunities are currently available due to this information gap. This species will be prioritized as Tier 4c.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
<b>Birds</b>	Northern saw-whet owl	<i>Aegolius acadicus</i>	I	c	Forest	Higher elevation coniferous woodlands in Blue Ridge and mountains west of Shenandoah River	Very little is known about this species in Virginia. Beyond targeted Northern Saw-whet Owl banding during migration and winter, the only survey work on the species to date in Virginia was a targeted Foray conducted by the Virginia Society of Ornithology in 2006 (Dolby and Mellinger 2006), which detected individuals along 7 of 16 routes surveyed. It is recommended that these efforts be expanded in order to gain a better baseline understanding of the status of Saw-whets in the Appalachians of Virginia, including distribution, abundance and gross habitat and landscape-level characteristics. Another significant data gap is population trend, as the species is not adequately monitored by existing programs. Such an effort would probably require at least a decade worth of monitoring prior to yielding robust trend data. If pursued, such an effort should take place at a broad scale that encompasses the entire southern Appalachian population; this could perhaps be accomplished in cooperation with an entity such as the Appalachian Mountains Joint Venture, which lists the Northern Saw-whet Owl as a Moderate Priority species. This species will be prioritized as Tier 1c. This status will be reconsidered when research needs have been addressed.
<b>Birds</b>	Peregrine falcon	<i>Falco peregrinus</i>	I	a	Mountains/ Urban	Human structures in the east and cliff sites in the west	Recovery of this state-threatened species is currently the focus of efforts by DGIF and its partners. DGIF supports monitoring and management of the coastal population, and leads efforts to survey and monitor the mountain population, which is key to the species' recovery in Virginia. Targeted hacking has proven to be successful at two sites in the mountains (Shenandoah National Park, Breaks Interstate Park) and could be expanded to additional sites; the number of occupied sites in the mountains has grown in recent years, and surveys are underway to document new breeding sites. This species will be prioritized as Tier 1a.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
<b>Birds</b>	Piping plover	<i>Charadrius melodus</i>	II	a	Shoreline	Barrier beaches and sand spits	Predator management, area closures, signage and outreach efforts should continue on the barrier islands. Deployment of nest exclosures on Assateague and Assawoman islands should continue as deemed necessary by refuge staff. Future management may include the identification and purchase of suitable inshore beaches to ensure future availability of breeding habitat as coastal fringe sites are lost to sea level rise. This species will be prioritized as Tier 2a.
<b>Birds</b>	Purple sandpiper	<i>Calidris maritima</i>	IV	c	Shoreline	Winter resident along beaches and jetties	Managers need to confirm distribution of this species and determine VA population status before on-the-ground management actions can be identified. Most occur on rock revetments and other artificial structures; thus, managers may be able to identify additional protective measures for these artificial habitats. This species will be prioritized as Tier 4c.
<b>Birds</b>	Red crossbill (Type I)	<i>Loxia curvirostra</i>	III	c	Forest	Spruce-fir or hemlock forests above 4000 feet	There are likely <500 breeding pairs of Red Crossbill in Virginia and the Virginia population does not significantly contribute to the overall population (Area Importance Score <2). However, despite the low Area Importance score this species should be kept on the WAP list as it serves as a representative of the Spruce-Fir forest communities (albeit and imperfect representative as it is nomadic). The only actions identified include developing a population assessment, trend analysis, and implementing general life history studies. This species will be prioritized as Tier 3c.
<b>Birds</b>	Red knot	<i>Calidris canutus rufus</i>	I	a	Shoreline	Migrant along barrier islands and to a lesser extent in the Chesapeake Bay.	Best management is already in place - the protection of the barrier islands and seaside marshes. There are outstanding issues such as the impacts of peregrine falcons on knots that should be researched as well as SLR impacts to habitat and prey availability. Future management actions may include the identification and purchase of suitable inshore marshes and beaches to ensure future availability of stopover habitat as coastal fringe sites are lost to SLR. This species will be prioritized as Tier 1a.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
<b>Birds</b>	Red-cockaded woodpecker	<i>Picoides borealis</i>	I	a	Forest	Pine savanna	DGIF continues its annual support of Red-cockaded Woodpecker (RCW) surveys at The Nature Conservancy's Piney Grove Preserve, where the only known Virginia population of this federally endangered species resides. The surveys are used to monitor the status of the small population and to guide management at the Preserve. Standardized management prescriptions are outlined in the Federal Recovery Plan for the species, and are well-documented and used across its range. In addition, there is a draft VA Conservation Plan for the woodpecker to help guide conservation actions. Finally, DGIF participates in an active partnership of RCW Cooperators in VA which continues to move forward with management, land acquisition and conservation planning for the species. These efforts should continue. This species will be prioritized as Tier 1a.
<b>Birds</b>	Red-throated loon	<i>Gavia stellata</i>	IV	a	Shoreline and open water	Primarily bays, seacoasts and estuaries, less frequently on lakes and rivers (nonbreeding).	A significant number of red-throated loons winter in and near the mouth of the Chesapeake Bay, in the seaside lagoon system (in some years) and in nearshore ocean waters. Management actions include controlling TMDLs and reducing eutrophication in the Chesapeake Bay to protect the loon's food resources. There is also a critical research need for assessing and minimizing the threat of future wind farms in the Chesapeake Bay and in offshore waters. This species will be prioritized as Tier 4a.
<b>Birds</b>	Royal tern	<i>Thalasseus maxima</i>	IV	a	Shoreline	Sandy beaches	Currently, nearly the entire breeding pop occurs at the Hampton Roads Bridge Tunnel where they require considerable management (i.e., avian (gull) predator control, area closures to vehicular and human traffic, barriers to keep young from entering I-64, vegetation management). Future management may include the identification and purchase of suitable inshore shorelines to ensure future availability of breeding habitat as coastal fringe sites are lost to SLR. This species will be prioritized as Tier 4a.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
<b>Birds</b>	Ruffed Grouse	<i>Bonasa umbellus</i>	III	a	Forest	Dense forest with some deciduous trees, in both wet and relatively dry situations from boreal forest (especially early seral stages dominated by aspen) and northern hardwood ecotone to eastern deciduous forest and oak-savanna woodland.	Grouse numbers have declined as open habitats have been developed or lost due to natural succession. VDGIF and partners are working collaboratively under the auspices of the national Ruffed Grouse Conservation Plan (Dessecker et al. 2006) in order to create open habitats to benefits this species and other. This species will be prioritized as Tier 3a.
<b>Birds</b>	Rusty blackbird	<i>Euphagus carolinus</i>	IV	b	Open vegetated	Wooded swamp and wooded wetland winter habitat	This boreal breeder winters in Virginia and across the southeastern United States. The International Rusty Blackbird Technical Working Group was formed in 2005 to guide collaborative research and conservation efforts for the species across both its breeding and wintering range. As an active participant in the Group, DGIF guided VA's 2009-2011 participation in Winter Blitzes for the species. Migration Blitzes, being coordinated in VA by the Virginia Society of Ornithology, are entering their 2nd year. The Blitzes have provided us with information on general distribution and flock size relative to other parts of the wintering range. Although the Blackbird is more numerous south of VA, Virginia still has a role to play in the species' recovery. Winter ecology research over the past several years has focused on populations in the more southern part of the range; such research may not be completely applicable to VA due to differences in the availability of some of the primary habitats that are used (ex. pecan orchards). Coordination with the Working Group is expected to continue as the Group moves toward drafting a Conservation Plan. This species will be prioritized as Tier4b. This ranking will be reconsidered as this planning need is addressed.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
<b>Birds</b>	Saltmarsh sparrow	<i>Ammodramus caudacutus</i>	III	a	Wetland	Maritime wetlands around estuaries and barrier islands	There are estimated <5,000 breeding pairs and populations are presumed to have experienced moderate declines over the past 50 years. This species is threatened by wetland loss and degradation. Identification, protection and management (ex. phragmites control) of suitable marshes will be necessary to ensure continued habitat availability for this species, especially as coastal marshes subside or are threatened with sea level rise. This species will be prioritized as Tier 3a.
<b>Birds</b>	Sanderling	<i>Calidris alba</i>	IV	a	Beaches and mudflats	Primarily sandy beaches, less frequently on mud flats and shores of lakes or rivers also on exposed reefs.	Best management action is already in place; the protection of the barrier islands and seaside marshes. Other wintering sites such as Grandview Nature Preserve and the eastern and western shore of the Chesapeake Bay may require additional protection to minimize human disturbance during the winter. Future management may include the identification and purchase of suitable inshore high marshes to ensure future availability of wintering habitat as coastal fringe sites are lost to SLR. This species will be prioritized as Tier 4a.
<b>Birds</b>	Seaside sparrow	<i>Ammodramus maritimus</i>	IV	a	Wetland	Grassy salt marshes	This species is threatened by the loss and degradation of wetland habitats. Identification, protection and management (ex. phragmites control) of suitable marshes will be necessary to ensure continued habitat availability for these species, especially as coastal marshes subside or are threatened with sea level rise. This species will be prioritized as Tier 4a.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
Birds	Short-billed dowitcher	<i>Limnodromus griseus</i>	IV	a	Shoreline	Migrant, migration habitat includes saltwater tidal flats, beaches, and salt marshes	Best management is already in place - the protection of the barrier islands and seaside marshes, which are key stopover sites in VA. However, other migration sites in the Chesapeake Bay, especially along the western shore, experience varying levels of human disturbance where additional management actions should be deployed such as dog leash laws and area closures on sand shoals and spits with heavy human disturbance. Future management actions may include the identification and purchase of suitable inshore marshes and sandy shorelines to ensure future availability of stopover habitat as coastal fringe sites are lost to SLR. This species will be prioritized as Tier 4a.
Birds	Snowy Egret	<i>Egretta thula</i>	II	a	Wetland	Marshes, lakes, ponds, lagoons, mangroves, and shallow coastal habitats.	Most SNEG breeding sites are under permanent protection from development. Predator management on those barrier islands where SNEGs nest should be continued. Future management may include the identification and purchase of suitable inshore high marshes to ensure future availability of breeding habitat as coastal fringe sites are lost to SLR. This species will be prioritized as Tier 2a.
Birds	Swainson's warbler	<i>Limnothlypis swainsonii</i>	II	c	Forest	Forested moist lower slopes with a rhododendron shrub layer	In Virginia the species has two disjunct populations: one occurring in the Southeast Coastal Plain in association with bottomland hardwoods and cane stands, the other one in the Appalachian Mountains in association with rhododendron thickets and cove hardwoods. Little work has been conducted on either population. Gaining a better understanding of the species' status in VA, as well as its limiting factors, is a priority that will lead to identification and enactment of management actions. This species will be prioritized as Tier 2c.
Birds	Virginia rail	<i>Rallus limicola</i>	IV	a	Wetland	Fresh and brackish marshes, may visit salt marsh in winter	This species is threatened by the loss and degradation of wetland habitats. Identification, protection and management (ex. phragmites control) of suitable marshes will be necessary to ensure continued habitat availability for these species, especially as coastal marshes subside or are threatened with sea level rise. This species will be prioritized as Tier 4a.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
Birds	Wayne's black-throated green warbler	<i>Setophaga virens waynei</i>	I	c	Forest	Cypress and white cedar swamps	The Wayne's Warbler is a subspecies of the Black-throated Green Warbler. The Black-throated Green Warbler occurs in Virginia in two distinct, reproductively isolated populations: one in the Appalachian Mountains, the other ( <i>S.v. waynei</i> ) in the Southeast Coastal Plain. The latter is a small population breeding in coastal swamps from Virginia to South Carolina. Within Virginia, it is currently documented only from the Great Dismal Swamp. Gaining a better understanding of this subspecies' status and distribution in Virginia is a priority that will enable identification and enactment of management actions. This species will be prioritized as Tier 1c.
Birds	Whimbrel	<i>Numenius phaeopus</i>	IV	a	Shoreline	Coastal migrant that typically occurs in a variety of saltmarsh habitats.	Best management is already in place; the protection of the barrier islands and seaside marshes. Other less used stopover sites may require additional protection measures such as dog leash laws and area closures on sand shoals and spits with heavy human disturbance. Future management actions may include the identification and purchase of suitable inshore marshes and sandy shorelines to ensure future availability of stopover habitat as coastal fringe sites are lost to SLR. Work is ongoing to develop morphometric and genetic techniques to identify sub-populations to better understand the extent of mixing and clarify population-level implications. This species will be prioritized as Tier 4a.
Birds	Willet	<i>Tringa semipalmata</i>	III	a	#N/A	#N/A	DGIF staff have recommended this species be added to the SGCN list as a Tier 3a species. WILLs breed on the barrier islands and in seaside, Chesapeake Bay and coastal river marshes. Identified management actions for this species includes: continued predator and human disturbance management on the barrier islands; human disturbance management on western shore recreational beaches through area closures, signage and outreach efforts; and the identification and purchase of suitable inshore marshes and sandy shorelines to ensure habitat is available in the future as coastal fringe marshes subside or become inundated. This species will be prioritized as Tier 3a.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
<b>Birds</b>	Wilson's plover	<i>Charadrius wilsonia</i>	I	a	Shoreline	Barrier beaches	Although VA is the northern extreme of the Wilson's plover nesting range, annual productivity rates suggests the species' breeding population should be increasing rather than remaining static (25-30 prs). In 2014, a working group was formed because of rangewide population concerns which will provide an opportunity to collaborate on rangewide research efforts such as banding and resighting birds to determine site fidelity, survivorship, and age at first breeding. Locally, predator management, area closures, signage and outreach efforts should continue on the barrier islands, where VA's entire breeding population occurs. Future management may include the identification and purchase of suitable inshore beaches to ensure future availability of breeding habitat as coastal fringe sites are lost to SLR. This species will be prioritized as Tier 1a.
<b>Birds</b>	Wood thrush	<i>Hylocichla mustelina</i>	IV	b	Forest	Deciduous or mixed forests with a dense tree canopy and a fairly well-developed deciduous understory, especially where moist.	While forest conservation and management on the breeding grounds are actions that have already been identified for the Wood throughsh, this is one of the first songbird species for which a full-life cycle model is being developed by the Smithsonian Migratory Bird Institute. The model will identify limiting factors in different stages of the species' life cycle, which will allow for identification and prioritization of conservation actions in the appropriate geographic regions (ex. breeding vs. wintering grounds). This species will be listed as Tier 4b, until research needs are addressed.
<b>Birds</b>	Yellow-billed cuckoo	<i>Coccyzus americanus</i>	III	a	Forest	Open woodland (especially where undergrowth is thick), parks, deciduous riparian woodland.	This species is associated with open woodland with clearings and shrubby vegetation, and is often associated with watercourses (Hughes 1999). It is thought to be sensitive to habitat fragmentation and to degradation of riparian woodlands (Hughes 1999). The species can benefit from conservation, restoration and management of large forest blocks and of vegetated riparian corridors. This species will be prioritized as Tier 3a.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
<b>Birds</b>	Yellow-breasted chat	<i>Icteria virens</i>	IV	a	Open Habitat	Second growth, shrubby old pastures, thickets, bushy areas, scrub, woodland undergrowth, and fence rows, including low wet places near streams, pond edges, or swamps; thickets with few tall trees; early successional stages of forest regeneration; commonly in sites close to human habitation	This species utilizes early-successional habitats and would benefit from creation and maintenance of early-successional habitat. DGIF's efforts to create these habitats should continue. This species will be prioritized as Tier 4a.
<b>Birds</b>	Yellow-crowned night-heron	<i>Nyctanassa violacea</i>	II	a	Wetland	Marshes, swamps, lakes, lagoons, and mangroves; chiefly coastal.	This species is threatened by the loss of suitable habitat to development, SLR, erosion and marsh subsidence. 97% of the current population breeds in urban neighborhoods and we have identified "on the ground" species management strategies that have showed some signs of success (working with communities and residents to discourage birds from nesting in areas where they are considered a nuisance. In addition, the development of an urban nesting waterbird management plan will provide the necessary guidance to manage these species in urban environments. Management and planning efforts should continue. This species will be prioritized as Tier 2a.
<b>Crustaceans</b>	Allegheny County cave amphipod	<i>Stygobromus hoffmani</i>	II	c	Cave/Karst	Caves with clean abundant water flowing through the system.	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>Crustaceans</b>	Allegheny crayfish	<i>Orconectes obscurus</i>	IV	c	Aquatic	Clean flowing streams with rocky substrates	Limited range in VA (Potomac River Basin and Cowpasture River watershed) and populations are relatively rare and populations are being impacted by the invasive virile crayfish ( <i>Orconectes virilis</i> ); <i>obscurus</i> is noticeably smaller when sympatric with <i>virilis</i> .
<b>Crustaceans</b>	An amphipod	<i>Crangonyx acicularis</i>	III	c	Aquatic	Small springs and spring-fed streams	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
<b>Crustaceans</b>	An amphipod	<i>Crangonyx montanus</i>	III	c	Aquatic	Springs, spring-fed swamps, and spring-fed ponds	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.
<b>Crustaceans</b>	Appalachian Valley cave amphipod	<i>Crangonyx antennatus</i>	III	c	Cave/Karst	Small cave streams and cave pools fed by ceiling drips and wall seepage	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.
<b>Crustaceans</b>	Bath County cave amphipod	<i>Stygobromus mundus</i>	II	c	Cave/Karst	Caves with clean abundant water flowing through the system.	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>Crustaceans</b>	Big Sandy Crayfish (aka Guyandotte River Crayfish)	<i>Cambarus veteranus</i>	I	c	Aquatic	Warm streams with fast flows and bedrock, cobble, boulder, and sand substrates	This species is being reviewed for endangered status at the federal level. Genetics studies have shown that the BSC populations in the Russell Fork watershed are distinct from the populations in the Levisa Fork watershed at the management level. Also, <i>Cambarus veteranus</i> is now known only to occur in the Guyandotte watershed in WV and BSC occurs throughout the rest of the range, restricting BSC even more. Major impacts are coal mining. Staff recommend this species be monitored, particularly in the Dismal Creek watershed at this is the only population in the Levisa Fork watershed in Virginia. This species will be prioritized as Tier 1c.
<b>Crustaceans</b>	Big Stone crayfish	<i>Cambarus spp.1</i>	I	c	Aquatic	Unknown	Only 1 population of this species is known, downstream of Cherry Reservoir near Big Stone Gap in the Powell River watershed. This species is threatened by water quality impairments resulting from logging, chlorine spills downstream of WTP and management of reservoir (e.g., burning off lower reservoir and add chemicals to remove nutrients from reservoir). This is most restricted crayfish in VA. No specific management actions are provided. This species will be prioritized as Tier 1c.
<b>Crustaceans</b>	Bland County amphipod	<i>Crangonyx fontinalis</i>	II	c	Aquatic	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
<b>Crustaceans</b>	Blue crayfish	<i>Cambarus monongalensis</i>	II	a	Aquatic	Burrowing species that utilizes wooded hillsides with springs and seeps.	This species is known from only 5 sites in VA within Highland County. It also occurs in 5 counties in WV. This species utilizes a very specific habitat type. People modifying springs are a major impact. Management actions include working with willing landowners to conserve and restore these springs thru acquisition, easement, or agreement. This species will be prioritized as Tier 2a.
<b>Crustaceans</b>	Blue Ridge spring amphipod	<i>Stygobromus spinosus</i>	III	c	Groundwater	Groundwater but found where springs emerge; individuals are in gravel substrate, leaf mats and vegetation (such as cress).	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.
<b>Crustaceans</b>	Burnsville Cove cave amphipod	<i>Stygobromus conradi</i>	II	c	Cave/Karst	Caves with clean abundant water flowing through the system.	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>Crustaceans</b>	Chowanoke crayfish	<i>Orconectes virginiensis</i>	III	a	Aquatic	Sluggish streams and swamps with abundance of dead wood on the bottom	This species is only known from the Chowan drainage. Fair number of populations in the Chowan but it is difficult to find populations with substantial numbers. The species appears to be gradient restricted and impacted by sediment. In watersheds where it is present, this species would benefit from the implementation of sediment control BMPS. This species will be prioritized as Tier 3a.
<b>Crustaceans</b>	Coalfields crayfish	<i>Cambarus theepiensis</i>	II	c	Aquatic	Unknown	This species is confined to small portion of the Big Sandy Basin. Populations are small and not widespread. Potential impacts from mineral extraction could be significant but no specific management actions have been identified. This species will be prioritized as Tier 2c.
<b>Crustaceans</b>	Craig County cave amphipod	<i>Stygobromus estesi</i>	II	c	Cave/Karst	Subterranean obligate	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>Crustaceans</b>	Cumberland cave amphipod	<i>Stygobromus cumberlandus</i>	II	c	Cave/Karst	Caves with clean abundant water flowing through the system.	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
Crustaceans	Cumberland Gap cave amphipod	<i>Baetrus angulus</i>	I	c	Cave/Karst	Caves with clean abundant water flowing through the system.	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 1c.
Crustaceans	Cumberland Gap cave isopod	<i>Caecidotea cumberlandensis</i>	II	c	Cave/Karst	Caves with clean abundant water flowing through the system.	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
Crustaceans	Dismal Swamp isopod	<i>Caecidotea attenuatus</i>	II	c	Freshwater	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
Crustaceans	Ephemeral cave amphipod	<i>Stygobromus ephemerus</i>	I	a	Cave/Karst	Subterranean obligate	This species is endemic to Giles County and occurs in two caves - one which has a gate. Human impacts from caving are a likely threat. Management actions include: protection of the caves through acquisition, easements, or cooperative agreements and groundwater protection from pollution and alteration. Life history is an important research need. Staff from DCR/Natural Heritage have also indicated land development could pose a threat to this species. This species will be prioritized as Tier 1a.
Crustaceans	Finley's cave amphipod	<i>Stygobromus finleyi</i>	II	c	Cave/Karst	Caves with clean abundant water flowing through the system.	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
Crustaceans	Henrot's Cave isopod	<i>Caecidotea henroti</i>	II	c	Cave/Karst	Subterranean obligate	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
Crustaceans	Incurved Cave isopod	<i>Caecidotea incurva</i>	II	c	Cave/Karst	Caves with clean abundant water flowing through the system.	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
Crustaceans	Lancaster County amphipod	<i>Crangonyx baculispina</i>	I	c	Aquatic	Site specific - non-karst subterranean - requires clean groundwater	Very little is known about this species. No threats have been identified. Realistic management actions could include groundwater protection and protection of specific sites where this species is confirmed in the future. Life history and distribution information are research needs. This species will be prioritized as Tier 1c.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
Crustaceans	Lee County cave amphipod	<i>Stygobromus leensis</i>	II	c	Cave/Karst	Caves with clean abundant water flowing through the system.	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
Crustaceans	Lee County cave isopod	<i>Lirceus usdagalun</i>	III	c	Cave/Karst	Caves with clean abundant water flowing through the system.	While this species is endemic to a small area, numerous effective protective measures are currently in place. It is unclear what additional measures may be necessary. This species will be prioritized as Tier 3c.
Crustaceans	Lee County terrestrial cave isopod	<i>Ligidium elrodii leensis</i>	III	c	Cave/Karst	Subterranean obligate	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.
Crustaceans	Longclaw crayfish	<i>Cambarus buntingi</i>	III	a	Aquatic	Clean creeks and streams with sand, gravel, clay, or silt substrates	This species is believed to occupy the Russell Fork watershed in the Big Sandy Basin and the Clinch River watershed of the upper TN River Basin. However, the populations within the 2 river basins may be different species. If the populations are indeed different species, the tier ranking should be II. A genetics study must be conducted to determine this info and determine proper management. This species (or two species) are impacted by degraded water quality issues resulting from mining operations and row crop agriculture in the Clinch River watershed. All populations would benefit from efforts to conserve and restore water quality. This species will be prioritized as Tier 3a.
Crustaceans	Luray Caverns amphipod	<i>Stygobromus pseudospinosus</i>	II	c	Cave/Karst	Caves with clean abundant water flowing through the system.	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
Crustaceans	Madison Cave amphipod	<i>Stygobromus stegerorum</i>	I	b	Cave/Karst	Caves with clean abundant water flowing through the system.	This species is endemic to Augusta County and is found in two cave lakes. No specific threats have been identified but disturbance to the sinkhole recharge systems and water pollution are likely threats. Realistic management actions could include: boundaries of the watersheds that feed these lakes should be determined to allow for surface protection and the second cave (Stegers Fissure) needs to be incorporated into the existing management plan. Research needs include researching life history and water quality monitoring. This species will be prioritized as Tier 1b. This ranking will be reconsidered as research needs are addressed.
Crustaceans	Madison Cave isopod	<i>Antrilana lira</i>	II	c	Cave/Karst	Caves with clean abundant water flowing through the system.	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
Crustaceans	Montgomery County cave amphipod	<i>Stygobromus fergusonii</i>	II	c	Cave/Karst	Subterranean obligate	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
Crustaceans	Morrison's cave amphipod	<i>Stygobromus morrisoni</i>	II	c	Cave/Karst	Caves with clean abundant water flowing through the system.	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
Crustaceans	Natural Bridge cave isopod	<i>Caecidotea bowmani</i>	III	c	Cave/Karst	Caves with clean abundant water flowing through the system.	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.
Crustaceans	New Castle Murder Hole amphipod	<i>Stygobromus interitus</i>	II	c	Cave/Karst	Caves with clean abundant water flowing through the system.	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
Crustaceans	Northern spring amphipod	<i>Gammarus pseudolimnaeus</i>	IV	c	#N/A	#N/A	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
Crustaceans	Northern Virginia well amphipod	<i>Stygobromus phreaticus</i>	I	c	Cave/Karst	Non-karst species - site specific restricted to seeps and aquifer on Ft. Belvoir	This species' known remaining population is located on Fort Belvoir with fair to poor condition habitat. No specific threats are known. If populations are found within the area where previously confirmed, then habitat protection should occur. If additional populations are found research should include careful monitoring and searches for additional populations. This species will be prioritized as Tier 1c.
Crustaceans	Ohio River shrimp	<i>Macrobrachium ohione</i>	IV	c	Aquatic	Low velocity water, borders of main channel	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
Crustaceans	Phreatic isopod	<i>Caecidotea phreatica</i>	I	c	Specialist	Shallow subterranean groundwater habitats	Likely threats to this species are water contamination/pollution and reduction of groundwater for human use. No management actions have been identified. Research needs include researching life history and distribution. This species will be prioritized as Tier 1c.
Crustaceans	Pittsylvania well amphipod	<i>Stygobromus obrutus</i>	II	c	Cave/Karst	Subterranean obligate	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
Crustaceans	Pizzini's amphipod	<i>Stygobromus pizzinii</i>	II	c	Cave/Karst	Non-karst groundwater habitats in Arlington and Fairfax county	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
Crustaceans	Powell Valley terrestrial isopod	<i>Amerigoniscus henroti</i>	II	c	Cave/Karst	Caves with clean abundant water flowing through the system.	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
Crustaceans	Racovitza's terrestrial cave isopod	<i>Miktoniscus racovitzai</i>	III	c	Cave/Karst	Subterranean obligate	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
<b>Crustaceans</b>	Reticulate crayfish	<i>Orconectes erichsonianus</i>	III	c	Aquatic	Streams with rocky substrates	This species has a limited range within VA and is difficult to find in the Clinch, Powell, and North Fork Holston River watersheds. It tends to be restricted to the lower portion of the watersheds. Major impacts are sedimentation and invasive species impacts from <i>Orconectes cristavarius</i> and <i>Orconectes virilis</i> in the Clinch, <i>Orconectes rusticus</i> in the NF Holston. This species would benefit from the implementation of BMPs that reduce the flow of sediments into rivers and streams. This species will be prioritized as Tier 3a.
<b>Crustaceans</b>	Rock Creek groundwater amphipod	<i>Stygobromus kenki</i>	II	c	Groundwater	Dead leaves or fine sediment submerged in the waters of their spring-seep outflows in subterranean small springs and spring like seeps; often with intermittent flow and periods of drying in late summer or early fall	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>Crustaceans</b>	Rockbridge County cave amphipod	<i>Stygobromus barodyi</i>	II	c	Cave/Karst	Caves with clean abundant water flowing through the system.	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>Crustaceans</b>	Rye Cove isopod	<i>Lirceus culveri</i>	I	a	Cave/Karst	Caves with clean abundant water flowing through the system.	This species is endemic to Scott County and is found in one cave. It is threatened by stream perturbation and groundwater pollution. Management actions acquisition or closing of McDavids Cave and groundwater protection. Research needs include: study of its life history is needed and additional surveys to determine if this species is truly endemic. This species will be prioritized as Tier 1a.
<b>Crustaceans</b>	Scott County terrestrial cave isopod	<i>Ligidium elrodii scottensis</i>	III	c	Cave/Karst	Subterranean obligate	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.
<b>Crustaceans</b>	Spiny scale crayfish	<i>Cambarus jezerinaci</i>	II	a	Aquatic	High elevation high gradient spring fed streams	In watersheds where this species occurs, this species would benefit from the implementation of sediment control BMPS. This species will be prioritized as Tier 2a.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
<b>Crustaceans</b>	Surgeon crayfish	<i>Orconectes forceps</i>	IV	c	Aquatic	Streams with rocky substrates	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Crustaceans</b>	Tidewater amphipod	<i>Stygobromus indentatus</i>	III	c	Groundwater	Shallow interstitial groundwater habitats of unconsolidated Coastal Plain sediments	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.
<b>Crustaceans</b>	Tidewater interstitial amphipod	<i>Stygobromus araeus</i>	III	c	Groundwater	Shallow interstitial groundwater habitats of unconsolidated Coastal Plain sediments	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.
<b>Crustaceans</b>	Tug Valley crayfish	<i>Cambarus hatfieldi</i>	II	c	#N/A	#N/A	This species is only found in a small region of Tazewell County and only 1 population is known in VA in the Big Sandy Basin in Dry Branch. Distribution of this species extends into the Levisa Fork in WV and the population appears stable. Given its rarity and limited distribution, this population is recommended as near threatened and vulnerable. No specific management actions are provided. This species will be prioritized as Tier 2c.
<b>Fish</b>	Alewife	<i>Alosa pseudoharengus</i>	IV	a	Aquatic	Migratory	This species would benefit from efforts to enhance aquatic connectivity. This is consistent with action plan priorities to enhance aquatic connectivity. Status and distribution surveys, population monitoring, and habitat modeling is needed to prioritize and evaluate the effectiveness of efforts to restore aquatic connectivity. This species will be prioritized as Tier 4a.
<b>Fish</b>	Allegheny pearl dace	<i>Margariscus margarita</i>	IV	b	Aquatic	Pools of small creeks and rivers with sand or gravel substrate	Research is needed to determine how climate change might impact this species. This species will be prioritized as tier 4b. This status will be reconsidered as these research needs are addressed.
<b>Fish</b>	American brook lamprey	<i>Lampetra appendix</i>	IV	c	Aquatic	Requires clear flowing water but can tolerate a range of temperatures and substrates	Baseline information is required to better understand this species' habitat requirements. This species will be prioritized as Tier 4c.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
<b>Fish</b>	American eel	<i>Anguilla rostrata</i>	III	a	Aquatic	Migratory uses variety of freshwater and marine habitats	This species has suffered population declines over much of its range due to overfishing and barriers to upstream and downstream migration in the form of dams and culverts that deny it access historical habitats. This species would benefit from efforts to restore aquatic connectivity. This action is consistent with action plan priorities to restore aquatic connectivity. Research needed to determine the need and effectiveness of these efforts include monitoring this species' status, distribution, and habitat. This species will be prioritized as Tier 3a.
<b>Fish</b>	American shad	<i>Alosa sapidissima</i>	IV	a	Aquatic	Large unfragmented migratory rivers for spawning	This species would benefit from efforts to enhance aquatic connectivity. This is consistent with action plan priorities to enhance aquatic connectivity. Status and distribution surveys, population monitoring, and habitat modeling is needed to prioritize and evaluate the effectiveness of efforts to restore aquatic connectivity. This species will be prioritized as Tier 4a.
<b>Fish</b>	Appalachia darter	<i>Percina gymnocephala</i>	IV	c	Aquatic	Clear, cool and warm streams in the New drainage with upland gradient and gravel substrates	Baseline information is required to better understand this species' habitat requirements. This species will be prioritized as Tier 4c.
<b>Fish</b>	Ashy darter	<i>Etheostoma cinereum</i>	I	b	Aquatic	Clear cool or warm streams with moderate gradient with rubble and boulder substrates	Additional surveys are required within the Powell to determine if sufficient habitat is available to justify a propagation or reintroduction effort for this species. This species will be prioritized as Tier 1b.
<b>Fish</b>	Atlantic sturgeon	<i>Acipenser oxyrinchus</i>	I	b	Aquatic	Migratory - utilize variety of aquatic and marine habitats	The following research needs should be addressed to inform a the creation of a robust recovery strategy. developing information on abundance and trends in abundance for each distinct population segment, developing information on habitat use (spawning grounds, nursery areas, foraging areas, and overwintering areas) for each distinct population segment, and developing information on the threats impacting each distinct population segment. This species will be prioritized at Tier 1b.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
Fish	Banded sunfish	<i>Enneacanthus obesus</i>	IV	c	Aquatic	Blackwater swamps, ponds, and streams with thick vegetation	Baseline information is required to better understand this species' habitat requirements. This species will be prioritized as Tier 4c.
Fish	Bigeye jumprock	<i>Moxostoma ariommum</i>	III	c	Aquatic	Moderate gradient streams with unsilted rubble, boulder, or rock outcrop substrate	Baseline information is required to better understand this species' habitat requirements. This species will be prioritized as Tier 3c.
Fish	Black sculpin	<i>Cottus baileyi</i>	IV	c	Aquatic	Cold creeks and streams with moderate to high gradient and clean gravel and boulder substrates	Baseline information is required to better understand this species' habitat requirements. This species will be prioritized as Tier 4c. r
Fish	Blackbanded sunfish	<i>Enneacanthus chaetodon</i>	I	a	Aquatic	Acidic pools, creeks, and swamps with thick vegetation	DGIF Staff indicated this species is currently restricted to 5 sites in the Blackwater and Nottoway river systems. Direct conservation actions include propagation and reintroduction. Staff also indicate additional survey efforts and habitat modeling are needed. This species will be prioritized as Tier 1a.
Fish	Blackside darter	<i>Percina maculata</i>	IV	c	Aquatic	Clean streams and rivers with moderate gradient and various substrates	Baseline information is required to better understand this species' habitat requirements. This species will be prioritized as Tier 4c.
Fish	Blotched chub	<i>Erimystax insignis</i>	IV	c	Aquatic	Clean, cool to warm, streams and rivers with moderate gradient and clean gravel and rubble substrates	Baseline information is required to better understand this species' habitat requirements. This species will be prioritized as Tier 4c.
Fish	Blotchside logperch	<i>Percina burtoni</i>	II	a	Aquatic	Clear warm moderate gradient rivers with gravel or rubble substrates	This species was identified as a candidate for reintroduction into the Powell River. This effort would benefit from additional population monitoring and habitat modeling. This species will be prioritized as Tier 1a.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
Fish	Blueback Herring	<i>Alosa aestivalis</i>	IV	a	Aquatic	Habitat includes riverine, estuarine, and Atlantic coastal waters; also in certain lakes and reservoirs in the southeastern United States.	This species would benefit from efforts to enhance aquatic connectivity. This is consistent with action plan priorities to enhance aquatic connectivity. This species is also likely to benefit from captive propagation and augmentation efforts. Status surveys, distribution surveys, population monitoring, and habitat modeling would help determine the need and effectiveness of these efforts. This species will be prioritized as Tier 4a.
Fish	Bluebreast darter	<i>Etheostoma camurum</i>	IV	c	Aquatic	Clear warm streams and rivers with moderate gradient with silt free gravel, rubble, or boulder substrates	Baseline information is required to better understand this species' habitat requirements. This species will be prioritized as Tier 4c.
Fish	Blueside darter	<i>Etheostoma jessiae</i>	IV	c	Aquatic	Clear creeks and small rivers with sand and gravel substrates with moderate to swift flow.	Baseline information is required to better understand this species' habitat requirements. This species will be prioritized as Tier 4c.
Fish	Bluestone sculpin	<i>Cottus sp. 1</i>	III	c	Aquatic	Cool or cold limestone spring runs with strong flows and gravel or rubble substrates and aquatic vegetation	Baseline information is required to better understand this species' habitat requirements. This species will be prioritized as Tier 3c.
Fish	Brassy Jumprock	<i>Moxostoma sp.</i>	IV	c	Aquatic	Silty to rocky pools and slow runs of large creeks and small to medium rivers; impoundments	Baseline information is required to better understand this species' habitat requirements. This species will be prioritized as Tier 4c.
Fish	Bridle shiner	<i>Notropis bifrenatus</i>	I	a	Aquatic	Slow clear water with aquatic vegetation	This species would benefit from augmentation and reintroduction efforts. Additional habitat modeling would be useful. This species will be prioritized as Tier 1a.
Fish	Brook silverside	<i>Labidesthes sicculus</i>	IV	c	Aquatic	Clear cool or warm lakes and large rivers and can tolerate various substrates and various amounts of aquatic	Baseline information is required to better understand this species' habitat requirements. This species will be prioritized as Tier 4c.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
						vegetation	
<b>Fish</b>	Brook Trout	<i>Salvelinus fontinalis</i>	IV	a	Aquatic	Clear, cool, well-oxygenated creeks, small to medium rivers, and lakes	Virginia's brook trout populations are threatened by a variety of factors including siltation/erosion of stream banks, increasing water temperatures caused by inadequate riparian buffers, and acid precipitation. Conservation efforts are needed to conserve and restore existing brook trout habitats. The secondary priority would involve working to restore water quality and riparian buffers in watersheds where brook trout are thought to have been extirpated. These actions are consistent with action plan priorities to conserve and restore aquatic habitats and improve water quality. This species will be prioritized as Tier 4a.
<b>Fish</b>	Bullhead minnow	<i>Pimephales vigilax</i>	IV	c	Aquatic	Pools, backwaters, and quiet runs of small to large rivers having continuous flow and low to moderate gradient, over sand, silt, or gravel	Baseline information is required to better understand this species' habitat requirements. This species will be prioritized as Tier 4c.
<b>Fish</b>	Candy darter	<i>Etheostoma osburni</i>	I	b	Aquatic	Clear creeks and streams with rocky substrates	This species is only known from four streams in the New River Drainage. Its conservation needs include investigating reintroduction into historic range, habitat modeling, and population viability analysis/genetics. This species will be prioritized as Tier 1b. This status will be reconsidered as these research needs are addressed.
<b>Fish</b>	Carolina darter	<i>Etheostoma collis</i>	II	c	Aquatic	Very slow moving water with sand or gravel substrates flowing through wooded areas or pastures	Baseline information is required to better understand this species' habitat requirements. This species will be prioritized as Tier 2c.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
Fish	Carolina fantail darter	<i>Etheostoma brevispinum</i>	IV	c	Aquatic	Rocky riffles of creeks and small to medium rivers	Baseline information is required to better understand this species' habitat requirements. This species will be prioritized as Tier 4c.
Fish	Channel darter	<i>Percina copelandi</i>	III	c	Aquatic	Warm rivers with moderate to swift flows and gravel and rubble substrate	Baseline information is required to better understand this species' habitat requirements. This species will be prioritized as Tier 3c.
Fish	Clinch dace	<i>Chrosomus sp. cf. saylori</i>	I	a	Aquatic	Small high elevation streams with gravel substrates and forested watersheds	This species occurs in nine streams in the Clinch River. Conservation needs include reducing sedimentation, reducing chemical impairments associate with mining, reducing bacterial impairments associated with livestock or insufficient sewage treatment, removing stream impediments, and implementing baitfish regulations. These needs are consistent with action plan priorities to conserve and restore aquatic habitats and improve water quality. Research needs include distribution and monitoring, population modeling, and habitat modeling. Education and outreach efforts would be beneficial. This species will be prioritized as Tier 1a.
Fish	Clinch sculpin	<i>Cottus sp. 4</i>	III	c	Aquatic	Cold clear spring runs to rivers with moderate to high gradients and unsilted gravel, rubble, and boulder substrates	Baseline information is required to better understand this species' habitat requirements. This species will be prioritized as Tier 3c.
Fish	Dusky darter	<i>Percina sciera</i>	IV	c	Aquatic	Warm streams and rivers with low gradients and unsilted gravel substrates	Baseline information is required to better understand this species' habitat requirements. This species will be prioritized as Tier 4c.
Fish	Duskytail darter	<i>Etheostoma percnurum</i>	I	a	Aquatic	Clear, warm, moderate gradient intermontane streams and rivers with clean gravel, rubble, or boulder substrates	This species would benefit from habitat restoration efforts that reduce erosion and sediment input. These needs are consistent with action plan priorities to conserve and restore aquatic habitats and improve water quality. Staff also indicate this species would benefit from additional monitoring to determine if reintroductions might be feasible. This species will be prioritized as Tier 1a.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
Fish	Emerald shiner	<i>Notropis atherinoides</i>	IV	c	Aquatic	Clear large streams and rivers with low gradient	Baseline information is required to better understand this species' habitat requirements. This species will be prioritized as Tier 4c.
Fish	Fatlips minnow	<i>Phenacobius crassilabrum</i>	II	c	Aquatic	Clear moderate to high gradient streams and rivers with clean gravel, rubble, and boulder substrates	Baseline information is required to better understand this species' habitat requirements. This species will be prioritized as Tier 2c.
Fish	Freshwater drum	<i>Aplodinotus grunniens</i>	III	c	Aquatic	Warm turbid water in lakes, reservoirs, and pools in low gradient rivers over mud substrate	DGIF staff involved with the freshwater mussel program indicate the freshwater drum is the only known fish host for the fragile papershell. Without the drum's restoration, the fragile papershell's restoration will likely be impossible. Baseline information is required to better understand this the freshwater drum's habitat requirements. This species will be prioritized as Tier 3c.
Fish	Golden Darter	<i>Etheostoma denoncourti</i>	II	b	Aquatic	Shallow gravel riffles of small to medium rivers; riffles and runs with substrates largely of pea gravel	Formerly the Tippecanoe Darter before taxonomy changed. This species is a habitat specialist that has proven to be particularly vulnerable to sedimentation. Research is needed to determine if this species could be reintroduced to the Powell River. This research would require additional status and distribution surveys, population monitoring, and habitat modeling. This species will be classified as Tier 2b. This status will be reconsidered when these research needs have been addressed.
Fish	Greenfin darter	<i>Etheostoma chlorbranchium</i>	I	b	Aquatic	Clear high gradient streams with rocky substrates	Research needs for this species include population monitoring, habitat modeling especially related to temperature changes, and determining if suitable areas exist to support a reintroduction effort. This species will be prioritized as Tier 1b. This status will be reconsidered as these research needs are addressed.
Fish	Highback chub	<i>Hybopsis hysinotus</i>	IV	c	Aquatic	Warm water (either clear or turbid) with sandy or rocky bottoms	Baseline information is required to better understand this species' habitat requirements. This species will be prioritized as Tier 4c.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
Fish	Highfin Shiner	<i>Notropis altipinnis</i>	IV	c	Aquatic	Pools, sometimes runs, of shallow, generally small streams (avg. 3-10 m wide) usually lacking vegetation, with substrate of sand and gravel (occasionally rubble); bedrock outcrops sometimes present; water varies from white to brown with moderate current	Baseline information is required to better understand this species' habitat requirements. This species will be prioritized as Tier 4c.
Fish	Holston sculpin	<i>Cottus sp. 5</i>	III	c	Aquatic	Clear streams with moderate to high gradient and clean gravel, rubble, or boulder substrates	Baseline information is required to better understand this species' habitat requirements. This species will be prioritized as Tier 3c.
Fish	Ironcolor shiner	<i>Notropis chalybaeus</i>	III	c	Aquatic	Moderately acidic creeks, streams, and swamps	Baseline information is required to better understand this species' habitat requirements. This species will be prioritized as Tier 3c.
Fish	Kanawha darter	<i>Etheostoma kanawhae</i>	III	c	Aquatic	Clear creeks and streams with rocky substrates	Baseline information is required to better understand this species' habitat requirements. This species will be prioritized as Tier 3c.
Fish	Kanawha minnow	<i>Phenacobius teretulus</i>	III	c	Aquatic	Clear moderate gradient streams with clean gravel and rubble substrates	Baseline information is required to better understand this species' habitat requirements. This species will be prioritized as Tier 3c.
Fish	Lake chubsucker	<i>Erimyzon sucetta</i>	IV	c	Aquatic	Clear to slightly stained warmwater ponds, lakes, ditches, and streams	Baseline information is required to better understand this species' habitat requirements. This species will be prioritized as Tier 4c.
Fish	Least brook lamprey	<i>Lampetra aepyptera</i>	IV	c	Aquatic	Warm small streams with slow flows and sand/silt substrates	Baseline information is required to better understand this species' habitat requirements. This species will be prioritized as Tier 4c.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
Fish	Lined topminnow	<i>Fundulus lineolatus</i>	IV	c	Aquatic	Moderately acidic margins of swamps and creeks with dense vegetation	Baseline information is required to better understand this species' habitat requirements. This species will be prioritized as Tier 4c.
Fish	Logperch	<i>Percina caprodes</i>	IV	c	Aquatic	Warm, moderate gradient, streams and rivers with gravel and rubble substrates	Baseline information is required to better understand this species' habitat requirements. This species will be prioritized as Tier 4c.
Fish	Longear Sunfish	<i>Lepomis megalotis</i>	IV	b	Aquatic	Clear, shallow, well-vegetated areas of low-gradient streams, can be found in some reservoirs	This species is considered to be rare within its native range in the upper Tennessee River and suffers from competition with other <i>Lepomis</i> species. Research is needed to determine if this species could benefit from propagation and augmentation efforts. Additional status surveys, distribution surveys, habitat modeling, and population modeling would support this research need. This species will be prioritized as Tier 4b. This status will be reconsidered as these research needs are addressed.
Fish	Mirror shiner	<i>Notropis spectrunculus</i>	III	c	Aquatic	Clear warm moderate gradient rivers with gravel or rubble substrates	Baseline information is required to better understand this species' habitat requirements. This species will be prioritized as Tier 3c.
Fish	Mountain brook lamprey	<i>Ichthyomyzon greeleyi</i>	III	c	Aquatic	Cool creeks or streams with moderate flow and clean substrates with access to pool sediments and muddy banks for ammocoetes	Baseline information is required to better understand this species' habitat requirements. This species will be prioritized as Tier 3c.
Fish	Mountain madtom	<i>Noturus eleutherus</i>	IV	c	Aquatic	Clear, warm streams and rivers with gravel and rubble substrates and vegetated riffles	Baseline information is required to better understand this species' habitat requirements. This species will be prioritized as Tier 4c.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
Fish	Mountain shiner	<i>Lythroughrus lirus</i>	IV	c	Aquatic	Typically in clear, flowing, riffle-pool type creeks and small rivers with moderate gradients and bottom materials ranging from sand- gravel to rubble-boulder	Baseline information is required to better understand this species' habitat requirements. This species will be prioritized as Tier 4c.
Fish	Mud sunfish	<i>Acantharchus pomotis</i>	IV	c	Aquatic	Swamps, ponds, and slow moving water	Baseline information is required to better understand this species' habitat requirements. This species will be prioritized as Tier 4c.
Fish	New River shiner	<i>Notropis scabriceps</i>	IV	c	Aquatic	Small to large, cool water, tributaries of the New River with high to moderate gradient and unsilted substrates	Baseline information is required to better understand this species' habitat requirements. This species will be prioritized as Tier 4c.
Fish	Northern studfish	<i>Fundulus catenatus</i>	IV	c	Aquatic	Cutoff pools, backwaters, and sluggish margins of clear, warm, moderate gradient creeks, streams and rivers with a variety of substrates	Baseline information is required to better understand this species' habitat requirements. This species will be prioritized as Tier 4c.
Fish	Notchlip redhorse	<i>Moxostoma collapsum</i>	IV	c	Aquatic	Riverine species: specific habitat details are unknown	Baseline information is required to better understand this species' habitat requirements. This species will be prioritized as Tier 4c.
Fish	Ohio lamprey	<i>Ichthyomyzon bdellium</i>	IV	c	Aquatic	Large warm rivers with clean gravel and rubble substrates and access to low gradient areas with soft substrates and detrital material for ammocoetes	This species restricted to the Tennessee drainage in Virginia. The species is naturally a low-density animal and is somewhat difficult to sample because larval stages live buried in sediment and thus are not often vulnerable to traditional sampling techniques. This species appears to be common and secure. Research is needed to determine if this species still warrants inclusion within the wildlife action plan. This species will be prioritized as Tier 4b. This status will be reconsidered as this research need is addressed.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
Fish	Orangefin madtom	<i>Noturus gilberti</i>	II	b	Aquatic	Moderate to strong flows with unsilted substrates	Research is needed to determine if this species could be reintroduced into suitable habitats. This research would require additional status and distribution surveys, population monitoring, and habitat modeling. This species will be classified as Tier 2b. This status will be reconsidered when these research needs have been addressed.
Fish	Paddlefish	<i>Polyodon spathula</i>	IV	c	Aquatic	Warm medium to large rivers with very low flows	Baseline information is required to better understand this species' habitat requirements. This effort could be enhanced using eDNA. This species will be prioritized as Tier 4c.
Fish	Piedmont darter	<i>Percina crassa</i>	IV	c	Aquatic	Cool and warm moderate gradient creeks and rivers with clean gravel and rubble substrates	Baseline information is required to better understand this species' habitat requirements. This species will be prioritized as Tier 4c.
Fish	Popeye shiner	<i>Notropis ariommus</i>	II	c	Aquatic	Clear warm moderate gradient rivers with gravel or rubble substrates	Baseline information is required to better understand this species' habitat requirements. This species will be prioritized as Tier 2c.
Fish	Redlip shiner	<i>Notropis chiliticus</i>	IV	c	Aquatic	Clear creeks and streams with moderate gradient, warm or cool water and various substrates	Baseline information is required to better understand this species' habitat requirements. This species will be prioritized as Tier 4c.
Fish	River redbhorse	<i>Moxostoma carinatum</i>	III	b	Aquatic	Clean streams and rivers with unsilted gravel, rubble, and boulder substrates	Research is needed to determine if this species could be reintroduced into the North Fork Holston River. Species distribution and status surveys would support this effort. This species will be prioritized as Tier 3b. This status will be reconsidered when these research needs have been addressed.
Fish	Roanoke bass	<i>Ambloplites cavifrons</i>	I	a	Aquatic	Warm large creeks, streams, and small rivers with low gradient and typically clear water	Many of this species' historic habitats are now occupied by rock bass. Conservation needs include propagation and reintroduction into suitable habitats that lack rock bass. Research is needed to determine the genetic viability of Roanoke bass in habitats shared with rock bass. This species will be prioritized as Tier 1a.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
Fish	Roanoke hog sucker	<i>Hypentelium roanokense</i>	IV	c	Aquatic	Moderate to high gradient streams with rock, gravel, or sand substrates	Baseline information is required to better understand this species' habitat requirements. This species will be prioritized as Tier 4c.
Fish	Roanoke logperch	<i>Percina rex</i>	II	a	Aquatic	Warm clear stream and rivers with low to moderate gradient and unsilted substrate	Reintroduction and augmentation efforts for this species should be continued. Monitoring to determine the need and effectiveness of these efforts should be expanded. This species will be prioritized as Tier 2a.
Fish	Roughhead shiner	<i>Notropis semperasper</i>	I	b	Aquatic	Clear medium sized streams with moderate current	Research needs for this species include determining the competitive interaction with congeners i.e., <i>N. telescopus</i> , conducting distribution/status surveys, population monitoring, and habitat modeling. This species will be prioritized as Tier 1b. This status will be reconsidered as these research needs are addressed.
Fish	Rustyside sucker	<i>Thoburnia hamiltoni</i>	III	c	Aquatic	Clean clear streams with moderate to high gradient and unsilted substrates	Baseline information is required to better understand this species' habitat requirements. This species will be prioritized as Tier 3c.
Fish	Sand shiner	<i>Notropis stramineus</i>	IV	c	Aquatic	Warm streams with low to moderate gradient and clean sand and gravel substrates	Baseline information is required to better understand this species' habitat requirements. This species will be prioritized as Tier 4c.
Fish	Sauger	<i>Sander canadensis</i>	III	b	Aquatic	Cool large streams, rivers, and lakes with a combination of deep swift runs and backwaters	This species is very rare in the Clinch and Powell rivers. Research is needed to species propagation and reintroduction efforts. Status surveys, distribution surveys, population monitoring, and habitat modeling would support these reintroduction efforts. This species will be prioritized as Tier 3b. This status will be reconsidered as these research needs are addressed.
Fish	Sharphead darter	<i>Etheostoma acuticeps</i>	I	c	Aquatic	Clear, cool or warm streams and rivers with moderate gradient and rubble and boulder substrates with growths of riverweed	Baseline information is required to better understand this species' status, distribution, and habitat requirements. This species will be prioritized as Tier 1c.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
Fish	Sharpnose darter	<i>Percina oxyrhynchus</i>	IV	c	Aquatic	Moderate gradient streams and rivers with unsilted gravel, rubble, and boulder substrates	Baseline information is required to better understand this species' habitat requirements. This species will be prioritized as Tier 4c.
Fish	Shortnose sturgeon	<i>Acipenser brevirostrum</i>	I	a	Aquatic	Migratory - utilize variety of aquatic and marine habitats	The status of this species could be enhanced via a cooperative propagation and reintroduction effort with the US Fish and Wildlife Service. This species will be prioritized as Tier 1a.
Fish	Sickle Darter	<i>Percina williamsi</i>	I	c	Aquatic	Flowing pools over rocky, sandy, or silty substrates in clear creeks or small rivers	This species was originally referred to as the longhead darter before the taxonomy changed. The sickle darter is a rare fish species of the Clinch and Holston drainages (Jenkins and Burkhead 2014). It is restricted to 7 isolated populations in Virginia and naturally occurs in low density and has only been documented twice since 2005. Baseline information is required to better understand this species' status, distribution, and habitat requirements. This species will be prioritized as Tier 1c.
Fish	Silver redbhorse	<i>Moxostoma anisurum</i>	III	c	Aquatic	Silty to firm-bottomed pools and runs of small to large rivers; also in natural lakes and impoundments	Baseline information is required to better understand this species' habitat requirements. This species will be prioritized as Tier 3c.
Fish	Slender chub	<i>Erimystax cahni</i>	I	c	Aquatic	Clear, open, and swift streams and rivers with unsilted gravel substrates	Baseline information is required to better understand this species' habitat requirements. This species will be prioritized as Tier 1c.
Fish	Slimy sculpin	<i>Cottus cognatus</i>	IV	c	Aquatic	Spring fed cold water streams	Baseline information is required to better understand this species' habitat requirements. This species will be prioritized as Tier 4c.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
<b>Fish</b>	Smallmouth redhorse	<i>Moxostoma breviceps</i>	IV	b	Aquatic	Large rivers with swift flows and gravel to boulder substrates.	This species is newly recognized, formerly considered to part of the shorthead redhorse population. This species is restricted to the Tennessee River drainage where it occurs in low densities and is considered to be extirpated from the North Fork Holston. Research is needed to determine if this species could be reintroduced to the North Fork Holston River. The need and effectiveness of this reintroduction effort would benefit additional status surveys, distribution surveys, habitat modeling, and population monitoring. This species will be prioritized as Tier 4b. This status will be reconsidered as these research needs are addressed.
<b>Fish</b>	Snail bullhead	<i>Ameiurus brunneus</i>	III	c	Aquatic	Well flowing streams and rivers with rocky substrates	Baseline information is required to better understand this species' habitat requirements. This species will be prioritized as Tier 3c.
<b>Fish</b>	Speckled darter	<i>Etheostoma stigmaeum</i>	IV	c	Aquatic	Clear sandy and rocky pools of creeks and small to medium rivers with moderate gradient and fast water, occasionally sluggish murky streams	Baseline information is required to better understand this species' habitat requirements. This species will be prioritized as Tier 4c.
<b>Fish</b>	Speckled killifish	<i>Fundulus rathbuni</i>	IV	c	Aquatic	Slow moving streams and creeks with sandy substrates	Baseline information is required to better understand this species' habitat requirements. This species will be prioritized as Tier 4c.
<b>Fish</b>	Spotfin chub	<i>Erimonax monachus</i>	I	b	Aquatic	Clean medium sized streams and rivers with clean gravel and cobble substrate	Research is needed to determine if this species would be a candidate for captive propagation and reintroduction. Additional habitat and distribution surveys are also required for the Clinch River. This species will be prioritized as Tier 1b. This status will be reconsidered when these research needs are addressed.
<b>Fish</b>	Steelcolor shiner	<i>Cyprinella whipplei</i>	III	c	Aquatic	Warm low to moderate gradient streams and rivers over a variety of substrates	Baseline information is required to better understand this species' habitat requirements. This species will be prioritized as Tier 3c.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
Fish	Stonecat	<i>Noturus flavus</i>	IV	c	Aquatic	Warm streams and rivers with moderate to low gradient with rocky substrates	Baseline information is required to better understand this species' habitat requirements. This species will be prioritized as Tier 4c.
Fish	Suckermouth minnow	<i>Phenacobius mirabilis</i>	IV	c	Aquatic	Warm, clear to turbid streams and rivers with moderate gradient with sand and gravel substrate	Baseline information is required to better understand this species' habitat requirements. This species will be prioritized as Tier 4c.
Fish	Swannanoa darter	<i>Etheostoma swannanoa</i>	IV	b	Aquatic	Cool clear streams with moderate to high gradient with clean gravel, rubble, and boulder substrates	Research is needed to determine if this species could be reintroduced into suitable habitats. Research is also needed to determine how this species might be impacted by climate change. This species will be prioritized as Tier 4b. This status will be reconsidered as these research needs are addressed.
Fish	Tadpole Madtom	<i>Noturus gyrinus</i>	IV	c	Aquatic	Quiet or slow-moving waters, especially over soft muddy bottom with extensive vegetation; lakes, reservoirs, sloughs, swamps, backwaters, lowland creeks and small to large rivers	Baseline information is required to better understand this species' habitat requirements. This species will be prioritized as Tier 4c.
Fish	Tangerine darter	<i>Percina aurantiaca</i>	IV	c	Aquatic	Clean, cool and warm streams and rivers with moderate gradient and a variety of substrates	Baseline information is required to better understand this species' habitat requirements. This species will be prioritized as Tier 4c.
Fish	Tennessee dace	<i>Chrosomus tennesseensis</i>	I	b	Aquatic	Clean creeks with rock, gravel, or silt substrates and stable banks	This species would benefit from the creation of a recovery plan. Additional information regarding its distribution and habitat needs would also be beneficial. This species will be prioritized as Tier 1b. This status will be reconsidered when the planning and research needs are addressed.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
<b>Fish</b>	Tonguetied Minnow	<i>Exoglossum laurae</i>	IV	c	Aquatic	Rocky pools and runs of cool to warm, usually clear, creeks and small to medium rivers of moderate gradient, generally with relatively unsilted bottoms of gravel, rubble, and boulder, often at deeper edges of pools near vegetation or other cover	Baseline information is required to better understand this species' habitat requirements. This species will be prioritized as Tier 4c.
<b>Fish</b>	Variagate darter	<i>Etheostoma variatum</i>	I	a	Aquatic	Warm to cool water streams with clean gravel, rubble, or boulder substrates	This species has one stable population in the Levisa Fork of the Big Sandy drainage. This species would benefit from efforts to improve water quality. This need is consistent with action plan priorities to conserve and restore aquatic habitats and improve water quality. This species would also benefit from the creation of a conservation plan. Research is also needed to determine if this species would be a candidate for reintroduction efforts in the Russel Fork. Population and habitat modeling would advance these efforts. This species will be prioritized as Tier 1a.
<b>Fish</b>	Western sand darter	<i>Ammocrypta clara</i>	IV	c	Aquatic	Warm, low and moderate gradient rivers with sand and sand-gravel substrates	Baseline information is required to better understand this species' habitat requirements. This species will be prioritized as Tier 4c.
<b>Fish</b>	Whitemouth shiner	<i>Notropis alborus</i>	II	c	Aquatic	Clear to somewhat turbid creeks, with varying substrates	Baseline information is required to better understand this species' habitat requirements. This species will be prioritized as Tier 2c.
<b>Fish</b>	Wounded darter	<i>Etheostoma vulneratum</i>	III	c	Aquatic	Warm moderate gradient streams and rivers with clean gravel and rubble substrate	Baseline information is required to better understand this species' habitat requirements. This species will be prioritized as Tier 3c.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
<b>Fish</b>	Yellowfin madtom	<i>Noturus flavipinnis</i>	I	a	Aquatic	Warm, clear streams and rivers with moderate gradient and variety of cover types	Efforts to reintroduce this species into the Northfork Holston River should continue. Efforts to monitor the success of this reintroduction and the status of existing populations and habitats should also continue. This species will be prioritized as Tier 1a.
<b>Mammals</b>	Allegheny woodrat	<i>Neotoma magister</i>	IV	a	Barren	Blue Ridge to the west - riparian areas, wooded wetlands, caves and cliffs	The two main threats to this species are parasitism and habitat destruction. Research is needed to evaluate parasite epidemiology. The USFS and others currently work to maintain occupied habitats. This species will be prioritized as Tier 4a.
<b>Mammals</b>	Appalachian cottontail	<i>Sylvilagus obscurus</i>	IV	a	Forest	High elevation forested areas west of the Shenandoah River	The primary threats to this species involve the loss of young forest habitats and competition from eastern cottontails. Efforts to create patches of young forest habitat are consistent with other action plan priorities. This species will be prioritized as Tier 4a.
<b>Mammals</b>	Atlantic bottlenose dolphin	<i>Tursiops truncatus</i>	III	b	Aquatic	Offshore form frequents pelagic waters. Coastal form usually shoreward of 20 m contour, often in lagoons, bays, river mouths; ascends river in some areas; common near passes connecting large bays with ocean	The population of this species in Virginia waters is considered to be "depleted" by NOAA under the Marine Mammal Protection Act. Currently, no management strategies have been identified for this species in Virginia waters. DGIF staff and partners expect to complete a Virginia Marine Mammal Conservation Plan either in late 2016 or early 2017. Once completed, the management category for this species will be updated. The marine mammal plan will serve as a companion document to the Action Plan and will be used to drive conservation efforts for this species. This species will be prioritized as Tier 3b. This ranking will be reconsidered when this planning need has been addressed.
<b>Mammals</b>	Carolina northern flying squirrel	<i>Glaucomys sabrinus coloratus</i>	I	c	Forest	Cool moist mature coniferous and mixed forests with abundant standing and down snags	This species' recovery plan needs to be updated to ensure that modern threats, research needs, and conservation actions are adequately understood. This species will be prioritized as Tier 4b. This status will be reconsidered when this planning need has been addressed.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
<b>Mammals</b>	Cotton mouse	<i>Peromyscus gossypinus gossypinus</i>	IV	a	Forest	Riparian forests	The main threats to this species include habitat destruction, hydrologic regime alteration, and competition. Efforts to conserve and restore aquatic and wetland habitats are consistent with other action plan priorities. This species will be prioritized as Tier 4a.
<b>Mammals</b>	Delmarva fox squirrel	<i>Sciurus niger cinereus</i>	II	c	Forest	Mature pine and hardwood forests with open understories	During September 2014, the USFWS proposed removing the Delmarva Fox Squirrel from the Federal list of endangered species. It was determined that conservation actions and habitat restoration had successfully ameliorated threats to this species' survival. This species remains rare in Virginia, but no additional conservation actions have been identified. This species will be prioritized as Tier 2c.
<b>Mammals</b>	Eastern small-footed myotis	<i>Myotis leibii</i>	I	a	Barren	Hibernation occurs in solution and fissure caves and mine tunnels (including coal, iron, copper, and talc mines). Situations near the entrance where the air is relatively cold and dry seem to be preferred, though sometimes deeper locations are used. Roost sites often are deep in crevices, or under rocks on the cave floor. Forages over ponds and streams.	This species has been significantly affected by white-nosed syndrome. No management actions have been identified to address this disease. Other threats include human disturbance of hibernacula from recreational use. Winter caving should be discouraged and high priority caves should be gated to prevent human use during vulnerable times. The USFS works to conserve known habitats. This species will be prioritized as Tier 1a.
<b>Mammals</b>	Eastern spotted skunk	<i>Spilogale putorius putorius</i>	IV	c	Barren	Blue Ridge to the west - rock piles, rock slides and cliffs surrounded by forests	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
<b>Mammals</b>	Fin whale	<i>Balaenoptera physalus</i>	IV	b	Aquatic	Pelagic	This is the most common large whale in Virginia waters and is listed as endangered under the Federal Endangered Species Act. Management strategies for this species are dated and do not include increasing pressures related to shipping and energy development. DGIF staff and partners expect to complete a Virginia Marine Mammal Conservation Plan either in late 2016 or early 2017. Once completed, the management category for this species will be updated. The marine mammal plan will serve as a companion document to the Action Plan and will be used to drive conservation efforts for this species. This species will be prioritized as Tier 4b. This ranking will be reconsidered when the planning need has been addressed.
<b>Mammals</b>	Fisher	<i>Martes pennanti pennanti</i>	IV	c	Forest	Spruce-fir forests, northern bogs and swamps, or mixed northern hardwood forests	Although populations are limited, this species appears to be more widely distributed than previously thought. Its mature forest habitats are not in limited. This species will be prioritized as Tier 4c.
<b>Mammals</b>	Gray bat	<i>Myotis grisescens</i>	II	a	Cave/Karst	Winter roosts are in deep vertical caves with domed halls. Large summer colonies utilize caves that trap warm air and provide restricted rooms or domed ceilings; maternity caves often have a stream flowing through them and are separate from the caves used in summer by males. Forage along streams flowing through forested areas.	The most significant threats to gray bats involve human disturbance in hibernacula. Other threats involve loss of riparian vegetation in foraging areas and removal of trees from areas around cave entrances. Conservation actions include gating entrances to known caves, maintaining healthy riparian forests, and retaining vegetated buffers around cave entrances. This species will be prioritized as Tier 2a

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
<b>Mammals</b>	Harbor porpoise	<i>Phocoena phocoena</i>	IV	c	Aquatic	Coastal waters and adjacent offshore shallows; also inhabits inshore areas such as bays, channels, and rivers	The population of this species in Virginia waters is considered to be "depleted" by NOAA under the Marine Mammal Protection Act. Currently, no management strategies have been identified for this species in Virginia waters however biologists are concerned populations in Virginia waters are impacted by fishing nets and other gear. DGIF staff and partners expect to complete a Virginia Marine Mammal Conservation Plan either in late 2016 or early 2017. Once completed, the management category for this species will be updated. The marine mammal plan will serve as a companion document to the Action Plan and will be used to drive conservation efforts for this species. This species will be prioritized as Tier 4b. This ranking will be reconsidered when the planning need has been addressed.
<b>Mammals</b>	Hoary Bat	<i>Lasiurus cinereus</i>	IV	a	Forest	Primarily deciduous and coniferous forests and woodlands, including areas altered by humans	Populations of this species in other parts of the country have been significantly impacted by wind energy development. Due to the economic downturn, development of wind energy facilities has been limited. However, as the economy improves, wind energy development is expected to increase. Two actions that can be taken to address this threat and three specific research questions that should be answered to enhance protection efforts. Conservation actions include: Environmental commenting related to the siting of wind energy facilities and working with wind energy companies to modify their operations during the fall migration period. Research needs include: assessing the coastal migration patterns of bats, assessing current population status and trends for tree-dwelling bats, determine why bats are attracted to wind turbines so that deterrents may be developed. This species will be prioritized as Tier 4a.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
<b>Mammals</b>	Humpback whale	<i>Megaptera novaengliane</i>	I	b	Aquatic	Open ocean and coastal waters, sometimes including inshore areas such as bays	This species is listed as endangered under the Federal Endangered Species Act and individuals of this species occur in Virginia waters seasonally. Management strategies for this species are dated and do not address increasing pressures related to shipping and energy development. DGIF staff and partners expect to complete a Virginia Marine Mammal Conservation Plan either in late 2016 or early 2017. This species will be prioritized as Tier 1b. This status will be reconsidered when this planning need has been addressed.
<b>Mammals</b>	Indiana myotis	<i>Myotis sodalis</i>	I	a	Forest	West of Shenandoah River - winter site specific caves, summer forested areas containing dead exfoliating trees.	The primary threats to this species are unintentional kills from power generation and human interactions. Additional threats include collapse of hibernacula, destruction of riparian areas, and (potentially) pesticide poisoning. Protecting hibernacula and working to conserve and restore riparian areas are consistent with action plan priorities. Management actions include: prevent disturbance to hibernacula; protect, maintain, and restore foraging and nursery areas; and carry out a public information campaign. Research needs from the recovery plan include monitoring of summer and hibernacula population trends, monitoring levels of toxins and researching their effects, and research on summer habitat requirements. This species will be prioritized as Tier 1a.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
<b>Mammals</b>	Little Brown Bat	<i>Myotis lucifugus</i>	I	a	Multiple	Wide range of habitats and often use human-made structures for resting and maternity sites; they also use caves and hollow trees	Populations of this species have been dramatically reduced by white-nose syndrome. While agencies are not currently able to address white-nose syndrome, several management actions can be taken to help preserve existing populations. Actions include: protecting hibernacula via gating, purchase, or easement; protecting fall swarm roosts and foraging areas; developing a certification for Wildlife Control Operators that exclude bats from dwellings; Environmental commenting related to the siting of wind energy facilities. Specific research needs have also been identified to address specific threats. Research needs involve determining the productivity and survivorship at maternity colonies as a means of evaluating the success of conservation actions. This species will be prioritized as Tier 1a.
<b>Mammals</b>	Long-tailed shrew	<i>Sorex dispar dispar</i>	IV	c	Forest	West of Shenandoah talus slopes, rock slides and cliffs surrounded by forests	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Mammals</b>	Marsh rabbit	<i>Sylvilagus palustris palustris</i>	IV	a	Wetland	Freshwater wetlands	The primary threats to this species are habitat destruction from and competition from eastern cottontails. Efforts to conserve freshwater wetland habitats are consistent with other Action Plan priorities. This species will be prioritized as Tier 4a.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
<b>Mammals</b>	Northern Long-Eared bat	<i>Myotis septentrionalis</i>	I	a	Forest	Hibernate in caves and mines. Mature forests for summer roosts and feeding.	Populations of this species have been dramatically reduced by white-nose syndrome. While agencies are not currently able to address white-nose syndrome, several management actions can be taken to help preserve existing populations. Actions include: protecting hibernacula via gating, purchase, or easement; protecting fall swarm roosts and foraging areas; developing a certification for Wildlife Control Operators that exclude bats from dwellings; Environmental commenting related to the siting of wind energy facilities. Specific research needs have also been identified to address specific threats. Research needs involve determining the productivity and survivorship at maternity colonies as a means of evaluating the success of conservation actions. This species will be prioritized as Tier 1a.
<b>Mammals</b>	Northern right whale	<i>Eubalaena glacialis</i>	I	b	Aquatic	Nearshore and offshore waters	This species is listed as endangered under the Federal Endangered Species Act and Virginia's coastal waters are believed to serve as an important migratory corridor. Management strategies for this species are dated and do not include increasing pressures related to shipping and energy development. DGIF staff and partners expect to complete a Virginia Marine Mammal Conservation Plan either in late 2016 or early 2017. This species will be prioritized as Tier 1b. This status will be reconsidered when this planning need is addressed.
<b>Mammals</b>	Pungo white-footed mouse	<i>Peromyscus leucopus easti</i>	III	c	Barren	Coastal marshes and dunes	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
<b>Mammals</b>	Rafinesque's eastern big-eared bat	<i>Corynorhinus rafinesquii macrotis</i>	I	a	Forest	Use hollow trees as well as various types of human structures for roosting	The main threats to this species include the loss of bottomland forest containing suitable roost trees and the decline in the number of abandoned buildings in the region. This species is very sensitive to disturbance. Additional threats include disturbance related to forestry, toxins, insecticides, and metals. Priority management actions include long-term forest management to allow forests to age, for roost trees, to occur; maintenance, preservation, and creation of abandoned buildings and alternative roost sites in likely areas; and reduction or elimination of heavy metals and pesticide contamination. Actions to restore large patches of mature forest in the eastern portions of Virginia are consistent with action plan priorities. Research needs include extensive surveys to locate maternity colonies; possible effects of wind turbines on this species; and the extent and effects of insecticide contamination and bioaccumulation in wild populations. This species will be prioritized as Tier 1a.
<b>Mammals</b>	Red Bat (proposed for inclusion)	<i>Lasiurus borealis</i>	IV	a	Forest	Wide range of forested and semi-forested areas, including developed areas with large trees (e.g., city parks) and some areas subject to intensive forest management	Populations of this species in other parts of the country have been significantly impacted by wind energy development. Due to the economic downturn, development of wind energy facilities has been limited. However, as the economy improves, wind energy development is expected to increase. This proposal identifies two actions that can be taken to address this threat, and three specific research questions that should be answered to enhance protection efforts. Conservation actions include: Environmental commenting related to the siting of wind energy facilities and working with wind energy companies to modify their operations during the fall migration period. Research needs include: assessing the coastal migration patterns of bats, assessing current population status and trends for tree-dwelling bats, determine why bats are attracted to wind turbines so that deterrents may be developed. This species will be prioritized as Tier 4a.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
<b>Mammals</b>	Silver-haired Bat (proposed for inclusion)	<i>Lasionycteris noctivagans</i>	IV	a	Forest	Forested (frequently coniferous) areas adjacent to lakes, ponds, or streams, including areas that have been altered by humans	Populations of this species in other parts of the country have been significantly impacted by wind energy development. Due to the economic downturn, development of wind energy facilities has been limited. However, as the economy improves, wind energy development is expected to increase. This proposal identifies two actions that can be taken to address this threat, and three specific research questions that should be answered to enhance protection efforts. Conservation actions include: Environmental commenting related to the siting of wind energy facilities and working with wind energy companies to modify their operations during the fall migration period. Research needs include: assessing the coastal migration patterns of bats, assessing current population status and trends for tree-dwelling bats, determine why bats are attracted to wind turbines so that deterrents may be developed. This species will be prioritized as Tier 4a.
<b>Mammals</b>	Snowshoe hare	<i>Lepus americanus virginianus</i>	I	c	Forest	Specific spruce/fir sites in Highland county that provide sufficient cover	This species is impacted by the loss of habitat from natural succession and climatic changes. The species is currently limited to areas that support red spruce, which is in significant decline in Virginia and could be extirpated by changing climatic conditions. This species may benefit from efforts to create young forest habitat, but more specific actions have not been identified. The priority management action is timber harvest, preferably heavy thinning, is desperately needed to open the overstory and promote understory growth in these areas. Research is needed to determine if this species would benefit from the creation of young forest patches. This species will be prioritized as Tier 1b. This ranking will be reconsidered when this research need has been addressed.
<b>Mammals</b>	Southeastern fox squirrel	<i>Sciurus niger niger</i>	III	a	Forest	Open mature stands of pine or pine/hardwoods	Habitat loss is the greatest threat to this species. The conservation of large stands of mature oak/pine forests are consistent with forest priorities identified within the action plan. This species will be prioritized as Tier 3a.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
<b>Mammals</b>	Southeastern myotis	<i>Myotis austroriparius</i>	IV	a	Forest	Riparian forests with suitable roost structures	The primary threats to this species appear to be the loss of roost sites and wooded wetland habitats. The conservation and restoration of wooded wetlands is consistent with other action plan priorities. This species will be prioritized as Tier 4a.
<b>Mammals</b>	Southern rock vole	<i>Microtus chrotorrhinus</i>	II	a	Forest	High elevation talus and riparian areas	This species is most threatened by the loss of forests that might allow their talus habitats to dry out. This species benefits from efforts to maintain high elevation forests in cool, moist talus areas. The USFS implements efforts to ensure that high elevation oak forests and high elevation pine forests and woodlands are maintained and managed to both preserve and connect existing habitats. This species will be prioritized as Tier 2a.
<b>Mammals</b>	Southern water shrew	<i>Sorex palustris</i>	II	a	Forest	High elevation riparian areas in Bath and Highland counties	This species is most threatened by the loss or degradation of high elevation riparian forests. The needs of this species are consistent with action plan priorities to maintain or restore riparian forests and improve water quality. This species will be prioritized as Tier 2a.
<b>Mammals</b>	Tri-colored Bat	<i>Perimyotis subflavus</i>	I	a	Forest	Forested landscapes, where they forage near trees (including forest perimeters) and along waterways	Populations of this species have been dramatically reduced by white-nose syndrome. While agencies are not currently able to address white-nose syndrome, several management actions can be taken to help preserve existing populations. Actions include: protecting hibernacula via gating, purchase, or easement; protecting fall swarm roosts and foraging areas; Environmental commenting related to the siting of wind energy facilities. Specific research needs have also been identified to address specific threats. Research needs involve determining the productivity and survivorship at maternity colonies as a means of evaluating the success of conservation actions, and collecting basic life history data for this species. This species will be prioritized as Tier 1a.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
<b>Mammals</b>	Virginia big-eared bat	<i>Corynorhinus townsendii virginianus</i>	II	a	Open vegetated	Caves typically in limestone karst regions dominated by mature hardwood forests of hickory, beech, maple, and hemlock. Prefers cool, well-ventilated caves for hibernation; roost sites are often near cave entrances or in places where there is considerable air movement.	The primary threats to this species include are human disturbance of hibernacula from recreational use of habitat and unintentional capture or killing from power generation. Winter caving should be discouraged and high priority caves should be gated to prevent human use during vulnerable times. This species will be prioritized as Tier 2a.
<b>Mammals</b>	Virginia northern flying squirrel	<i>Glaucomys sabrinus fuscus</i>	I	a	Forest	Spruce -fir and mixed conifer-northern hardwood forests	In 2008, the US Fish and Wildlife Service determined this species had responded to conservation and habitat restoration effort. The US Fish and Wildlife Service proposed removing this species from the list of endangered species. Later in 2008, the delisting decision was vacated by the court. In March 2013 USFWS moved to reinstate removal. Efforts to manage this species' habitat in Virginia are ongoing and consistent with strategies identified within the post-listing plan. Given this species limited distribution in Virginia, it will always be at a high risk of extirpation. This species will be prioritized as Tier 1a.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
<b>Mammals</b>	West Indian manatee	<i>Trichechus manatus latirostris</i>	IV	b	Aquatic	Shallow coastal waters, estuaries, bays, rivers, and lakes	This species is listed as Endangered per the Federal Endangered Species Act. Although uncommon, manatees are appearing more frequently in Virginia waters where they face a number of anthropogenic hazards. Currently, no management strategies have been identified for this species in Virginia waters. DGIF staff and partners expect to complete a Virginia Marine Mammal Conservation Plan either in late 2016 or early 2017. Once completed, the management category for this species will be updated. The marine mammal plan will serve as a companion document to the Action Plan and will be used to drive conservation efforts for this species. This species will be prioritized as Tier 4b. This ranking will be reconsidered when the planning need has been addressed.
<b>Other Aq Insects</b>	A branchiobdellid worm	<i>Ankyrodrilus legacus</i>	IV	c	Cave/Karst	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Other Aq Insects</b>	A cave lumbriculid worm	<i>Stylodrilus beattiei</i>	I	c	Cave/Karst	Caves with clean abundant water flowing through the system.	This species only occurs in Steele's Cave in Tazwell County. Potential stresses include water pollution and alteration of groundwater. No management actions have been identified. Research needs include understanding natural history and distribution. This species will be prioritized as Tier 1c.
<b>Other Aq Insects</b>	A cave lumbriculid worm	<i>Spelaedrilus multiporus</i>	II	c	Cave/Karst	Caves with clean abundant water flowing through the system.	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>Other Aq Insects</b>	A cave obligate worm	<i>Cambarincola fallax</i>	IV	c	Cave/Karst	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Other Aq Insects</b>	A cave planarian	<i>Geocentrophora cavernicola</i>	III	c	Cave/Karst	Subterranean obligate	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
<b>Other Aq Insects</b>	A groundwater planarian	<i>Procotyla typhlops</i>	I	c	Groundwater	Spring/ spring brook	This species has never been observed in the state but is anticipated to occur Virginia. Potential stresses include water pollution and alteration to groundwater. No management actions have been identified. Research needs include collecting information on life history and distribution as well as determining if it actually occurs in the state. This species will be prioritized as Tier 1c.
<b>Other Aq Insects</b>	A groundwater planarian	<i>Sphalloplana hypogea</i>	II	c	Cave/Karst	Subterranean obligate	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>Other Aq Insects</b>	Bigger's groundwater planarian	<i>Sphalloplana subtilis</i>	II	c	Cave/Karst	Subterranean obligate	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>Other Aq Insects</b>	Chandler's planarian	<i>Sphalloplana chandleri</i>	I	c	Cave/Karst	Caves with clean abundant water flowing through the system.	This species only occurs in Fallen Rock cave in Tazwell county. Potential stresses include groundwater pollution and stream alteration. No management actions have been identified. Research needs include understanding information on natural history and distribution. This species will be prioritized as Tier 1c.
<b>Other Aq Insects</b>	Holsinger's groundwater planarian	<i>Sphalloplana holsingeri</i>	II	c	Cave/Karst	Subterranean obligate	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>Other Aq Insects</b>	Powell Valley planarian	<i>Sphalloplana consimilis</i>	I	c	Cave/Karst	Caves with clean abundant water flowing through the system.	This species is endemic to a portion of Powell Valley. No specific threats have been identified however water pollution could be a threat. This species will be prioritized as Tier 1c.
<b>Other Aq Insects</b>	Rockbridge County cave planarian	<i>Sphalloplana virginiana</i>	I	c	Cave/Karst	Caves with clean abundant water flowing through the system.	This species only occurs in Showalters Cave in Rockbridge County. Potential stresses include water pollution and alteration to groundwater. No management actions have been identified. Research needs include understanding information on natural history and distribution. This species will be prioritized as Tier 1c.
<b>Other Terr Inverts</b>	A cave centipede	<i>Nampabius turbator</i>	III	c	Cave/Karst	Subterranean obligate	This species is the only cave adapted centipede in Virginia. This species will be prioritized as Tier 3c.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
<b>Other Terr Inverts</b>	A cave pseudoscorpion	<i>Kleptochthonius anophthalmus</i>	II	b	Cave/Karst	Caves with clean abundant water flowing through the system.	This species degree of endemism has been called into question. Research to determine if it is a unique species or part of a larger metapopulation would be useful. This species will be prioritized as Tier 2b. This ranking will be reconsidered when this research need has been addressed.
<b>Other Terr Inverts</b>	A cave pseudoscorpion	<i>Kleptochthonius binocularis</i>	II	b	Cave/Karst	Caves with clean abundant water flowing through the system.	This species degree of endemism has been called into question. Research to determine if it is a unique species or part of a larger metapopulation would be useful. This species will be prioritized as Tier 2b. This ranking will be reconsidered when this research need has been addressed.
<b>Other Terr Inverts</b>	A cave pseudoscorpion	<i>Kleptochthonius proximisetus</i>	II	b	Cave/Karst	Caves with clean abundant water flowing through the system.	This species degree of endemism has been called into question. Research to determine if it is a unique species or part of a larger metapopulation would be useful. This species will be prioritized as Tier 2b. This ranking will be reconsidered when this research need has been addressed.
<b>Other Terr Inverts</b>	A cave pseudoscorpion	<i>Kleptochthonius regulus</i>	II	b	Cave/Karst	Caves with clean abundant water flowing through the system.	This species degree of endemism has been called into question. Research to determine if it is a unique species or part of a larger metapopulation would be useful. This species will be prioritized as Tier 2b. This ranking will be reconsidered when this research need has been addressed.
<b>Other Terr Inverts</b>	A cave pseudoscorpion	<i>Kleptochthonius similis</i>	II	b	Cave/Karst	Caves with clean abundant water flowing through the system.	This species degree of endemism has been called into question. Research to determine if it is a unique species or part of a larger metapopulation would be useful. This species will be prioritized as Tier 2b. This ranking will be reconsidered when this research need has been addressed.
<b>Other Terr Inverts</b>	A cave pseudoscorpion	<i>Mundochthonius holsingeri</i>	II	b	Cave/Karst	Caves with clean abundant water flowing through the system.	This species degree of endemism has been called into question. Research to determine if it is a unique species or part of a larger metapopulation would be useful. This species will be prioritized as Tier 2b. This ranking will be reconsidered when this research need has been addressed.
<b>Other Terr Inverts</b>	A cave pseudoscorpion	<i>Chitrella cavicola</i>	III	b	Unknown	Unknown	This species degree of endemism has been called into question. Research to determine if it is a unique species or part of a larger metapopulation would be useful. This species will be prioritized as Tier 3b. This ranking will be reconsidered when this research need has been addressed.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
<b>Other Terr Inverts</b>	A cave spider	<i>Islandiana muma</i>	II	c	Cave/Karst	Caves with clean abundant water flowing through the system.	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>Other Terr Inverts</b>	A cave spider	<i>Anthrobia mammothia</i>	III	c	Cave/Karst	Subterranean obligate	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.
<b>Other Terr Inverts</b>	A cave spider	<i>Bathyphantes weyeri</i>	III	c	Cave/Karst	Subterranean obligate	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.
<b>Other Terr Inverts</b>	A centipede	<i>Escaryus ethopus</i>	IV	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Other Terr Inverts</b>	A funnel-web spider	<i>Barronopsis jeffersi</i>	II	c	Unknown	No habitats have been identified for this species	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>Other Terr Inverts</b>	A gnaphosid spider	<i>Gnaphosa fontinalis</i>	IV	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Other Terr Inverts</b>	A gnaphosid spider	<i>Drassyllus louisianus</i>	IV	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Other Terr Inverts</b>	A millipede	<i>Aniulus orientalis</i>	II	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>Other Terr Inverts</b>	A millipede	<i>Auturus erythropygos</i>	II	c	Unknown	No habitats have been identified for this species	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>Other Terr Inverts</b>	A millipede	<i>Brachoria dentata</i>	II	c	Unknown	No habitats have been identified for this species	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>Other Terr Inverts</b>	A millipede	<i>Brachoria insolita</i>	II	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
<b>Other Terr Inverts</b>	A millipede	<i>Buotus carolinus</i>	II	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>Other Terr Inverts</b>	A millipede	<i>Cleidogona lachesis</i>	II	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>Other Terr Inverts</b>	A millipede	<i>Dixioria fowleri</i>	II	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>Other Terr Inverts</b>	A millipede	<i>Nannaria simplex</i>	II	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>Other Terr Inverts</b>	A millipede	<i>Pseudotremia alecto</i>	II	c	Unknown	No habitats have been identified for this species	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>Other Terr Inverts</b>	A millipede	<i>Pseudotremia armesi</i>	II	c	Cave/Karst	Caves with clean abundant water flowing through the system.	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>Other Terr Inverts</b>	A millipede	<i>Pseudotremia momus</i>	II	c	Cave/Karst	Caves with clean abundant water flowing through the system.	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>Other Terr Inverts</b>	A millipede	<i>Pseudotremia sublevis</i>	II	c	Cave/Karst	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>Other Terr Inverts</b>	A millipede	<i>Pseudotremia tuberculata</i>	II	c	Unknown	No habitats have been identified for this species	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>Other Terr Inverts</b>	A millipede	<i>Striaria causeyae</i>	II	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>Other Terr Inverts</b>	A millipede	<i>Striaria columbiana</i>	II	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
<b>Other Terr Inverts</b>	A millipede	<i>Striaria granulosa</i>	II	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>Other Terr Inverts</b>	A millipede	<i>Trichopetalum dux</i>	II	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>Other Terr Inverts</b>	A millipede	<i>Brachoria separanda calcaria</i>	III	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.
<b>Other Terr Inverts</b>	A millipede	<i>Brachoria separanda hamata</i>	III	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.
<b>Other Terr Inverts</b>	A millipede	<i>Brachoria separanda versicolor</i>	III	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.
<b>Other Terr Inverts</b>	A millipede	<i>Dixioria coronata</i>	III	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.
<b>Other Terr Inverts</b>	A millipede	<i>Pseudopolydesmus paludicolous</i>	III	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.
<b>Other Terr Inverts</b>	A millipede	<i>Semionellus placidus</i>	III	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.
<b>Other Terr Inverts</b>	A millipede	<i>Uroblaniulus jerseyi</i>	III	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.
<b>Other Terr Inverts</b>	A millipede	<i>Abacion tessalatum</i>	IV	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Other Terr Inverts</b>	A millipede	<i>Apheloria virginiensis</i>	IV	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
<b>Other Terr Inverts</b>	A millipede	<i>Boraria infesta</i>	IV	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Other Terr Inverts</b>	A millipede	<i>Brachoria separanda</i>	IV	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Other Terr Inverts</b>	A millipede	<i>Chaetaspis albus</i>	IV	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Other Terr Inverts</b>	A millipede	<i>Cherokia georgiana latassa</i>	IV	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Other Terr Inverts</b>	A millipede	<i>Desmonus earlei</i>	IV	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Other Terr Inverts</b>	A millipede	<i>Euryurus leachi fraternus</i>	IV	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Other Terr Inverts</b>	A millipede	<i>Gyalostethus monticolens</i>	IV	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Other Terr Inverts</b>	A millipede	<i>Nannaria wilsoni</i>	IV	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Other Terr Inverts</b>	A millipede	<i>Okeanobates americanus</i>	IV	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Other Terr Inverts</b>	A millipede	<i>Onomeris underwoodi</i>	IV	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Other Terr Inverts</b>	A millipede	<i>Orinisobates nigrior</i>	IV	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
<b>Other Terr Inverts</b>	A millipede	<i>Petaserpes rosalbus</i>	IV	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Other Terr Inverts</b>	A millipede	<i>Petaserpes strictus</i>	IV	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Other Terr Inverts</b>	A millipede	<i>Pseudotremia valga</i>	IV	c	Cave/Karst	Subterranean obligate	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Other Terr Inverts</b>	A millipede	<i>Rudiloria kleinpeteri</i>	IV	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Other Terr Inverts</b>	A millipede	<i>Scytonotus virginicus</i>	IV	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Other Terr Inverts</b>	A millipede	<i>Thalassisobates littoralis</i>	IV	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Other Terr Inverts</b>	A millipede	<i>Trichomeris sinuata</i>	IV	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Other Terr Inverts</b>	A millipede	<i>Trichopetalum lunatum</i>	IV	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Other Terr Inverts</b>	A millipede	<i>Uroblaniulus canadensis</i>	IV	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Other Terr Inverts</b>	A millipede	<i>Virgoiulus minutus</i>	IV	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Other Terr Inverts</b>	A millipede	<i>Rudiloria trimaculata tortua</i>	IV	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
<b>Other Terr Inverts</b>	A nursery-web spider	<i>Pisaurina dubia</i>	IV	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Other Terr Inverts</b>	A two-clawed hunting spider	<i>Castianeira trilineata</i>	IV	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Other Terr Inverts</b>	A two-clawed hunting spider	<i>Clubiona spiralis</i>	IV	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Other Terr Inverts</b>	A wolf spider	<i>Lycosa lenta</i>	IV	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Other Terr Inverts</b>	Aeto millipede	<i>Conotyla aeto</i>	II	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>Other Terr Inverts</b>	An amaurobiid spider	<i>Amaurobius borealis</i>	IV	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Other Terr Inverts</b>	Appalachia bellytooth	<i>Gastrodonta fonticula</i>	III	c	Unknown	Forest/Woodland, Savanna, Shrubland, Suburban/orchard, Urban/edificarian, Conifer, Hardwood, Mixed	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.
<b>Other Terr Inverts</b>	Atlantic purse-web spider	<i>Sphodros atlanticus</i>	IV	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Other Terr Inverts</b>	Baffled three-tooth	<i>Triodopsis fradulenta</i>	IV	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Other Terr Inverts</b>	Balsam globe	<i>Mesodon andrewsae</i>	II	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
<b>Other Terr Inverts</b>	Barred supercoil	<i>Paravitrea seradens</i>	II	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>Other Terr Inverts</b>	Bidentate dome	<i>Ventridens coelaxis</i>	III	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.
<b>Other Terr Inverts</b>	Big Cedar Creek millipede	<i>Brachoria falcifera</i>	II	c	Rock ledges	No habitats have been identified for this species	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>Other Terr Inverts</b>	Black mantleslug	<i>Pallifera hemphilli</i>	II	c	Forest	Spruce-fir forests above 5000 feet and most frequently found during wet weather	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>Other Terr Inverts</b>	Black Mountain disc	<i>Discus nigrimontanus</i>	IV	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Other Terr Inverts</b>	Black purse-web spider	<i>Sphodros niger</i>	IV	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Other Terr Inverts</b>	Blotchy mantleslug	<i>Megapallifera wetherbyi</i>	II	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>Other Terr Inverts</b>	Blowing Rock millipede	<i>Cleidogona medialis</i>	II	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>Other Terr Inverts</b>	Bluegrass snaggletooth	<i>Gastrocopta clappi</i>	III	c	Unknown	Under rocks, around the base of grass tufts, and under sparse vegetation on xeric glades and grasslands	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.
<b>Other Terr Inverts</b>	Brilliant glyph	<i>Glyphyalinia praecox</i>	IV	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
<b>Other Terr Inverts</b>	Brooks millipede	<i>Dixioria brooksi</i>	II	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>Other Terr Inverts</b>	Brown globelet	<i>Inflectarius kalmianus</i>	II	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>Other Terr Inverts</b>	Brown supercoil	<i>Paravitrea septadens</i>	I	c	Forest	Deep moist leaf litter on wooded hillsides at the base of hills and ravines	This species is endemic to Dickenson and Buchanan counties. The only known threats include the reduction of leaf litter. No management actions have been identified. The only research need included is to survey for additional populations. This species will be prioritized sa Tier 1c.
<b>Other Terr Inverts</b>	Budded three-tooth	<i>Triodopsis tennesseensis</i>	IV	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Other Terr Inverts</b>	Buttressed threetooth	<i>Triodopsis rugosa</i>	IV	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Other Terr Inverts</b>	Carinate slitmouth	<i>Stenotrema spinosum</i>	III	c	Unknown	Rotting logs in woods	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.
<b>Other Terr Inverts</b>	Carolina scorpion	<i>Vaejovis carolinianus</i>	IV	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Other Terr Inverts</b>	Carter threetooth	<i>Triodopsis anteridon</i>	III	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.
<b>Other Terr Inverts</b>	Cave pseudoscorpion	<i>Apochthonius coecus</i>	II	b	Cave/Karst	Caves with clean abundant water flowing through the system.	This species degree of endemism has been called into question. Research to determine if it is a unique species or part of a larger metapopulation would be useful. This species will be prioritized as Tier 2b. This ranking will be reconsidered when this research need has been addressed.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
<b>Other Terr Inverts</b>	Cave pseudoscorpion	<i>Apochthonius holsingeri</i>	II	b	Cave/Karst	Caves with clean abundant water flowing through the system.	This species degree of endemism has been called into question. Research to determine if it is a unique species or part of a larger metapopulation would be useful. This species will be prioritized as Tier 2b. This ranking will be reconsidered when this research need has been addressed.
<b>Other Terr Inverts</b>	Cave pseudoscorpion	<i>Chitrella superba</i>	II	b	Cave/Karst	Caves with clean abundant water flowing through the system.	This species degree of endemism has been called into question. Research to determine if it is a unique species or part of a larger metapopulation would be useful. This species will be prioritized as Tier 2b. This ranking will be reconsidered when this research need has been addressed.
<b>Other Terr Inverts</b>	Cedar millipede	<i>Brachoria cedra</i>	II	c	Unknown	No habitats have been identified for this species	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>Other Terr Inverts</b>	Celero millipede	<i>Conotyla celero</i>	II	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>Other Terr Inverts</b>	Cherrystone drop	<i>Hendersonia occulta</i>	IV	c	Unknown	Algific talus slopes; cool, shaded talus	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Other Terr Inverts</b>	Clingman covert	<i>Fumonelix wheatleyi</i>	III	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.
<b>Other Terr Inverts</b>	Collinwood millipede	<i>Brachoria mendota</i>	II	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>Other Terr Inverts</b>	Comb supercoil	<i>Paravitrea dentilla</i>	II	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>Other Terr Inverts</b>	Coyle's purse-web spider	<i>Sphodros coylei</i>	IV	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
<b>Other Terr Inverts</b>	Crablike spiny orb weaver	<i>Gasteracantha cancriformis</i>	IV	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Other Terr Inverts</b>	Cumberland liptooth	<i>Millerelix plicata</i>	III	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.
<b>Other Terr Inverts</b>	Cupped vertigo	<i>Vertigo clappi</i>	III	c	Unknown	Well-decomposed leaf litter and fine soil on shaded boulders, talus, ledges and bases of forested bedrock outcrops	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.
<b>Other Terr Inverts</b>	Delicate vertigo	<i>Vertigo bollesiana</i>	II	c	Unknown	Leaf litter on wooded hill sides and marshes	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>Other Terr Inverts</b>	Depressed glyph	<i>Glyphyalinia virginica</i>	III	c	Aquatic	No habitats have been identified for this terrestrial snail	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.
<b>Other Terr Inverts</b>	Duke Forest xystodesmid millipede	<i>Nannaria conservata</i>	II	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>Other Terr Inverts</b>	Ellett Valley Pseudotremia millipede	<i>Pseudotremia cavernarum</i>	I	c	Cave/Karst	Subterranean obligate	This species has a very limited range and this habitat is threatened by suburban development. Efforts can be made to work with willing landowners to conserve this habitat via acquisition, easement, or agreement. This species will be prioritized as Tier 1a.
<b>Other Terr Inverts</b>	Emerton's crab spider	<i>Xysticus emertoni</i>	IV	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Other Terr Inverts</b>	Faithful millipede	<i>Cleidogona fidelitor</i>	II	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
<b>Other Terr Inverts</b>	Fine-ribbed striate	<i>Striatura milium</i>	IV	c	Forest	No habitats have been identified for this species	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Other Terr Inverts</b>	Five-tooth vertigo	<i>Vertigo ventricosa</i>	III	c	Unknown	Humid, well-decomposed graminoid and broadleaf plant litter in moderately to highly acidic wooded and open wetlands	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Other Terr Inverts</b>	Flat button	<i>Mesomphix subplanus</i>	III	c	Forest	Forested areas above 2000 feet with downed logs and moist leaf litter	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.
<b>Other Terr Inverts</b>	Funnel supercoil	<i>Paravitrea mira</i>	II	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>Other Terr Inverts</b>	Gertsch's lampshade-web spider	<i>Hypocheilus gertschi</i>	III	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.
<b>Other Terr Inverts</b>	Gertsch's cave pseudoscorpion	<i>Kleptochthonius gertschi</i>	II	b	Cave/Karst	Caves with clean abundant water flowing through the system.	This species degree of endemism has been called into question. Research to determine if it is a unique species or part of a larger metapopulation would be useful. This species will be prioritized as Tier 2b. This ranking will be reconsidered when this research need has been addressed.
<b>Other Terr Inverts</b>	Glassy grapeskin	<i>Vitrinizonites latissimus</i>	IV	c	Unknown	Leaf litter or crawling on the ground in wet weather usually above 2000 feet in the mountains, but may occur below 1000 feet in the outlying hills	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Other Terr Inverts</b>	Glossy supercoil	<i>Paravitrea placentula</i>	II	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
<b>Other Terr Inverts</b>	Golden dome	<i>Ventridens arcellus</i>	IV	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Other Terr Inverts</b>	Hanging Rock threetooth	<i>Triodopsis pendula</i>	II	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>Other Terr Inverts</b>	Highland slitmouth	<i>Stenotrema altispira</i>	II	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>Other Terr Inverts</b>	Hoffman's cleidogonid millipede	<i>Cleidogona hoffmani</i>	II	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>Other Terr Inverts</b>	Hoffman's xystodesmid millipede	<i>Brachoria hoffmani</i>	II	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>Other Terr Inverts</b>	Hollow dome	<i>Ventridens lasmodon</i>	IV	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Other Terr Inverts</b>	Hungry mother millipede	<i>Brachoria ethotela</i>	IV	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Other Terr Inverts</b>	Keeton's millipede	<i>Brachoria laminata</i>	II	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>Other Terr Inverts</b>	Laurel Creek xystodesmid millipede	<i>Sigmoria whiteheadi</i>	I	c	Aquatic	Known from one location where it occurs under leaf litter of rhododendrons and hardwoods within 5 meters of stream.	This species has only been observed at one location, near the headwaters of Laurel Creek in Floyd County. No threats are included for this species. As it occurs in land owned by NPS, the only management action is to continue to protect this land. Research needs include surveys and surveys for likely habitat. This species will be prioritized as Tier 1c.
<b>Other Terr Inverts</b>	Lowland pillsnail	<i>Euchemotrema leai</i>	IV	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
<b>Other Terr Inverts</b>	Lutz's cave pseudoscorpion	<i>Kleptochthonius lutzi</i>	II	b	Cave/Karst	Caves with clean abundant water flowing through the system.	This species degree of endemism has been called into question. Research to determine if it is a unique species or part of a larger metapopulation would be useful. This species will be prioritized as Tier 2b. This ranking will be reconsidered when this research need has been addressed.
<b>Other Terr Inverts</b>	Maryland glyph	<i>Glyphyalinia raderi</i>	II	c	Forest	Calciphile and a burrower that lives in forest leaf litter	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>Other Terr Inverts</b>	McGraw Gap xystodesmid millipede	<i>Nannaria ericaea</i>	III	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.
<b>Other Terr Inverts</b>	Melinda millipede	<i>Conotyla melinda</i>	II	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>Other Terr Inverts</b>	Montane centipede	<i>Escaryus cryptorobius</i>	II	c	Unknown	No habitats have been identified for this species	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>Other Terr Inverts</b>	Mountain disc	<i>Anguispira jessica</i>	III	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.
<b>Other Terr Inverts</b>	Natural Bridge supercoil	<i>Paravitrea pontis</i>	III	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.
<b>Other Terr Inverts</b>	Ovate vertigo snail	<i>Vertigo ovata</i>	IV	c	Unknown	Raminoid litter and on cattail leaves in swamps, sedge meadows, wet and mesic prairie, low calcareous meadows, river banks, lakeshores, roadside ditches, and wooded wetlands	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
<b>Other Terr Inverts</b>	Palmetto vertigo	<i>Vertigo oralis</i>	IV	c	Unknown	Broadleaf and graminoid leaf litter accumulations, and under logs, in wet woodlands including pool margins in oak-sweetgum forest, red maple swamp, cypress swamp, and riparian and pocosin scrub	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Other Terr Inverts</b>	Pinhole threetooth	<i>Triodopsis messana</i>	IV	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Other Terr Inverts</b>	Pittsylvania three-tooth	<i>Triodopsis burchi</i>	IV	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Other Terr Inverts</b>	Pocock's lampshade-web spider	<i>Hypochilus pococki</i>	IV	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Other Terr Inverts</b>	Proud globe snail	<i>Mesodon elevatus</i>	IV	c	Forest	Calcareous river bluffs and ravines with oak, maple, hickory, or sycamore	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Other Terr Inverts</b>	Red-legged purse-web spider	<i>Sphodros rufipes</i>	IV	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Other Terr Inverts</b>	Ribbed striate	<i>Striatura exigua</i>	IV	c	Forest	No habitats have been identified for this terrestrial snail	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Other Terr Inverts</b>	Robust trapdoor spider	<i>Antrodiaetus robustus</i>	III	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.
<b>Other Terr Inverts</b>	Round supercoil	<i>Paravitrea reesei</i>	II	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
<b>Other Terr Inverts</b>	Rounded dome	<i>Ventridens lawae</i>	III	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.
<b>Other Terr Inverts</b>	Rubble coil	<i>Helicodiscus lirellus</i>	I	a	Barren	Known from two rubble piles at the bases of two hills in Rockbridge county.	This species is endemic to a small portion of the Ridge and Valley ecoregion. The only known threat involves the disturbance of slopes where the species is found. The primary management action is to protect the hills where found. The only research need included is to conduct more surveys near the location of current populations. This species will be prioritized as Tier 1a..
<b>Other Terr Inverts</b>	Rust glyph	<i>Glyphyalinia picea</i>	II	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>Other Terr Inverts</b>	Shaggy coil	<i>Helicodiscus diadema</i>	I	c	Open vegetated	Known from four locations and occupies leaf litter at the base of limestone/shale outcroppings.	This species is endemic to the Ridge and Valley. Threats listed include: disturbance to the rock, trees around leaf litter, or the leaf litter itself. No management actions are included. The only research need included is to survey near the known populations to try to identify additional populations. This species will be prioritized as Tier 1c.
<b>Other Terr Inverts</b>	Shenandoah Mountain xystodesmid millipede	<i>Nannaria shenandoah</i>	II	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>Other Terr Inverts</b>	Shenandoah pseudoscorpion	<i>Kleptochthonius polychaetus</i>	III	b	Unknown	Unknown	This species degree of endemism has been called into question. Research to determine if it is a unique species or part of a larger metapopulation would be useful. This species will be prioritized as Tier 3b. This ranking will be reconsidered when this research need has been addressed.
<b>Other Terr Inverts</b>	Shrew supercoil	<i>Paravitrea blarina</i>	II	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
<b>Other Terr Inverts</b>	Slender supercoil	<i>Paravitrea subtilis</i>	II	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>Other Terr Inverts</b>	Slim snaggletooth	<i>Gastrocopta pellucida</i>	IV	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Other Terr Inverts</b>	Smallmouth vertigo	<i>Vertigo parvula</i>	III	c	Unknown	Limestone substrata, low elevation, steep slopes, neutral soils and leaf litter microhabitat	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Other Terr Inverts</b>	Smith Creek xystodesmid millipede	<i>Nannaria laminata</i>	II	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>Other Terr Inverts</b>	Smooth bladetooth	<i>Patera laevior</i>	IV	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Other Terr Inverts</b>	Snowhill ambersnail	<i>Catinella hubrichti</i>	II	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>Other Terr Inverts</b>	South Branch Valley cave millipede	<i>Pseudotremia princeps</i>	II	c	Cave/Karst	Caves with clean abundant water flowing through the system.	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>Other Terr Inverts</b>	Southeastern wandering spider	<i>Anahita punctulata</i>	IV	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Other Terr Inverts</b>	Spirit supercoil	<i>Paravitrea hera</i>	I	a	Forest	Site specific - inhabits leaf litter on specific river bluffs in Pittsylvania county	This species only occurs in Pittsylvania County. Logging in the wooded bluffs where this species occurs is the only known threat. The primary management action is to work with willing landowners to protect these wooded bluffs from logging and disturbance. Research needs include surveys as this species is only known from its shells. This species will be prioritized as Tier1a.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
<b>Other Terr Inverts</b>	Spruce Knob threetooth	<i>Triodopsis picea</i>	II	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>Other Terr Inverts</b>	Suborb glyph	<i>Glyphyalinia sculptilis</i>	IV	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Other Terr Inverts</b>	Swamp vertigo	<i>Vertigo teskeyae</i>	IV	c	Unknown	Open mud and water-saturated logs in floodplain forests and along river, pond, and lake shores following water level drawdown in mid to late summer	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Other Terr Inverts</b>	Talus coil	<i>Helicodiscus triodus</i>	II	c	Barren	No habitats have been identified for this species	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>Other Terr Inverts</b>	Temperate coil	<i>Helicodiscus shimeki</i>	IV	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Other Terr Inverts</b>	Thorell's lampshade-web spider	<i>Hypochilus thorelli</i>	IV	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Other Terr Inverts</b>	Tiny liptooth	<i>Lobosculum pustuloides</i>	III	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.
<b>Other Terr Inverts</b>	Trumpet vallonias	<i>Vallonia parvula</i>	IV	c	Unknown	Calcareous cliff, alvar, grassland and upland forest	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Other Terr Inverts</b>	Turner's millipede	<i>Brachoria turneri</i>	II	c	Unknown	No habitats have been identified for this species	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
<b>Other Terr Inverts</b>	Twilight coil	<i>Helicodiscus multidentis</i>	IV	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Other Terr Inverts</b>	Valentine's cave pseudoscorpion	<i>Microcreagris valentinei</i>	II	b	Cave/Karst	Caves with clean abundant water flowing through the system.	This species degree of endemism has been called into question. Research to determine if it is a unique species or part of a larger metapopulation would be useful. This species will be prioritized as Tier 2b. This ranking will be reconsidered when this research need has been addressed.
<b>Other Terr Inverts</b>	Variable mantleslug	<i>Pallifera varia</i>	III	c	Forest	Moist forest habitats	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.
<b>Other Terr Inverts</b>	Venetia millipede	<i>Conotyla venetia</i>	II	c	Unknown	No habitats have been identified for this species	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>Other Terr Inverts</b>	Virginia bladetooth	<i>Patera panselenus</i>	III	c	Terrestrial	Exposed rock outcrops and talus within mature forest, usually on steep (15-30 degree) slopes at elevations from 340-490 m; usually on nearly vertical rock surfaces or the underside of rock (mostly sandstone but also shale and limestone) overhangs	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.
<b>Other Terr Inverts</b>	Virginia fringed mountain snail	<i>Polygyriscus virginianus</i>	I	a	Forest	Leaf litter but burrows in loose, damp, dolomitic limestone talus mixed with rootlets and clay	Recent surveys conducted by the US Fish and Wildlife Service indicate this species has a larger distribution than previously thought. The two most significant threats to this species are disturbance/destruction of the narrow habitat area and climate change. Efforts should be made to work with willing landowners to conserve the occupied habitat via acquisition, easement, or agreement. This species will

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
							be prioritized as Tier 1a.
<b>Other Terr Inverts</b>	Virginia mantleslug	<i>Philomycus virginicus</i>	III	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.
<b>Other Terr Inverts</b>	Whitetop Mountain centipede	<i>Escaryus orestes</i>	II	c	Unknown	No habitats have been identified for this species	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>Other Terr Inverts</b>	Widespread column	<i>Pupilla muscorum</i>	IV	c	Unknown	Disturbed anthropogenic habitats such as road verges, vacant lots, abandoned quarries, old fields, and concrete culverts, occasionally inhabit less disturbed carbonate cliff, glade, and grassland sites	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Other Terr Inverts</b>	Wrinkled button	<i>Mesomphix rugeli</i>	IV	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Other Terr Inverts</b>	Yellow dome	<i>Ventridens pilsbryi</i>	IV	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Other Terr Inverts</b>	Yellow globelet snail	<i>Mesodon clausus</i>	IV	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
Reptiles	Bog turtle	<i>Clemmys muhlenbergii</i>	I	a	Wetland	Emergent wetlands with dense vegetation	The original wildlife action plan indicated this species would benefit from more rigorous enforcement of collection laws and efforts to conserve/restore wetland habitats used by this species. This species will be prioritized as Tier 1a.
Reptiles	Canebrake rattlesnake	<i>Crotalus horridus (canebrake)</i>	II	a	Barren	#N/A	Virginia's Canebrake Rattlesnake recovery plan was completed in 2011. This document identifies 7 management actions and research needs for this species. These include conserving and restoring occupied habitats, enforcing laws to preclude take, monitoring known populations and looking for new populations, researching the species' life history, working to conserve or restore large forest patches in occupied areas, developing outreach materials, and researching translocation and artificial hibernation as a potential recovery tool.
Reptiles	Common ribbonsnake	<i>Thamnophis sauritus sauritus</i>	IV	a	Wetland	Permanent ponds, marshes, streams, and rivers, east of the Shenandoah river, with vegetated shorelines and amphibian and small fish populations	The needs of this species are consistent with priorities to conserve and restore wetland habitats. This species will be prioritized as Tier 4a.
Reptiles	Common snapping Turtle	<i>Chelydra serpentina</i>	IV	b	Aquatic	Ponds, lakes, streams, rivers, swamps, freshwater marshes, and brackish marshes.	Virginia's snapping turtle populations have become the target of commercial harvesters. Harvested animals are either processed for human consumption or shipped to Asia for propagation purposes. It is unclear if this level of harvest is sustainable. DGIF has initiated research to determine if populations are being impacted by these commercial activities and what management or regulatory changes should be made to conserve this species. This species will be prioritized as Tier 4b. This ranking will be reconsidered when research needs have been addressed.
Reptiles	Cumberland slider	<i>Trachemys scripta troostii</i>	III	c	Aquatic	A variety of freshwater habitats including rivers, ponds, lakes, and roadside ditches	Additional information regarding this species' distribution and life history are required before other research or conservation needs can be identified. This species will be prioritized as Tier 3c.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
Reptiles	Eastern black kingsnake	<i>Lampropeltis nigra</i>	III	c	Barren	This species is known to utilize various habitats including dry rocky hills, open woods, dry prairies, stream valleys, and many other habitats	Despite its limited distribution in Virginia, no threats, research, or conservation actions have been identified for this species. This species will be prioritized as Tier 3c.
Reptiles	Eastern box turtle	<i>Terrapene carolina carolina</i>	III	a	Forest	This species is known to use a variety of areas including forests, wetlands, and interdunal areas.	This species benefits from the maintenance of open canopied woodlands and meadows with areas of dense ground cover. These habitat needs are consistent with priorities to conserve forest and open habitats in eastern and western Virginia. This species will be prioritized as Tier 3a.
Reptiles	Eastern chicken turtle	<i>Deirochelys reticularia reticularia</i>	I	a	Forest	Extreme habitat specialist - only two sites known.	The chicken turtle is only known to occur at First Landing (formerly Seashore) State Park in the City of Virginia Beach and at the Cat Ponds in Isle of Wight County. After several years of survey efforts, only one older female was found at FLSP. This population should be considered biologically extinct. Survey efforts at the Cat Ponds have resulted in what appears to be a small (<30 adults), but stable and reproducing population. The primary focus of conservation for this species should be the permanent protection of the Cat Ponds. This species will be prioritized as Tier 1a
Reptiles	Eastern glass lizard	<i>Ophisaurus ventralis</i>	II	a	Forest	Pine savanna and grassy areas near marshes	The needs of this species are consistent with priorities to conserve and restore wetland habitats; including the establishment of vegetative buffers. This species will be prioritized as Tier 2a.
Reptiles	Eastern hog-nosed snake	<i>Heterodon platirhinos</i>	IV	c	#N/A	This species inhabits areas with sandy soils. They have been found in fields, open grassy areas adjacent to woodlands, and various forest types.	No threats, research, or conservation actions have been identified for this species. This species will be prioritized as Tier 4c.
Reptiles	Eastern slender glass lizard	<i>Ophisaurus attenuatus longicaudus</i>	IV	a	Open vegetated	Savanna and other open habitats	This species' needs are consistent with priorities to conserve and restore open habitats in eastern portions of Virginia. This species will be prioritized as Tier 4a.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
Reptiles	Glossy crayfish snake	<i>Regina rigida rigida</i>	III	c	Wetland	Freshwater wetland generalist	Additional information regarding this species' distribution and life history are required before other research or conservation needs can be identified. This species will be prioritized as Tier 3c.
Reptiles	Green Sea Turtle	<i>Chelonia mydas</i>	I	b	#N/A	#N/A	Very little is known about which habitats this species utilizes in Virginia or how those habitats could be managed to better benefit this species. Research needs are identified with the Virginia and Maryland Sea Turtle Conservation Plan. This species will be prioritized as Tier 1b. This status will be reconsidered as these research needs are addressed.
Reptiles	Kemp's ridley sea turtle	<i>Lepidochelys kempii</i>	I	a	#N/A	#N/A	DGIF staff recommend this species be added to the Action Plan and listed as Tier 1a. On the ground species and habitat management strategies have been articulated within the Virginia and Maryland Sea Turtle Conservation Plan.
Reptiles	Leatherback Sea Turtle	<i>Dermochelys coriacea</i>	I	c	#N/A	#N/A	DGIF staff have recommended this species be added to the Action Plan and be included as Tier 1c. Very little is known about this species in Virginia waters. It would be beneficial to better determine status. Implementing the Virginia and Maryland Sea Turtle Conservation Plan would likely benefit this species.
Reptiles	Loggerhead sea turtle	<i>Caretta caretta</i>	I	a	Shoreline	Nests on ocean-facing beaches and occurs in the lower Chesapeake Bay and inshore, nearshore and offshore coastal waters.	DGIF staff recommend this species be added to the Action Plan and listed as Tier 1a. On the ground species and habitat management strategies have been articulated within the Virginia and Maryland Sea Turtle Conservation Plan.
Reptiles	Mountain earthsnake	<i>Virginia valeriae pulchra</i>	II	c	Forest	Forested portions of NW Highland County	DGIF has indicated a need to document this species' distribution, ecological requirements, and life history. This species will be prioritized as tier 2c.
Reptiles	Mudsnake	<i>Farancia abacura abacura</i>	IV	a	Wetland	Wetland generalist as long as aquatic salamanders are present	The needs of this species are consistent with priorities to conserve and restore wetlands. This species will be prioritized as Tier 4a.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
Reptiles	Northern diamondback terrapin	<i>Malaclemys terrapin terrapin</i>	II	a	Shoreline	Barrier beaches, estuarine marshes and waters.	The 2005 Action Plan identifies no research or management opportunities specific to this species. Since 2005, this species has become an increasing source of concern. Populations appear to be impacted by loss of submerged aquatic vegetation and foraging habitat, loss of nesting habitat, and mortalities related to crab pots. Regulations have been put in place to prevent the collection of this species. This species will be prioritized as Tier 2a.
Reptiles	Northern map turtle	<i>Graptemys geographica</i>	IV	a	Wetland	Clear flowing water with gravel substrates	The needs of this species and its primary prey (freshwater mollusks) are consistent with priorities to conserve and restore aquatic and riparian habitats and maintain good water quality. This species will be prioritized as Tier 4a.
Reptiles	Northern pinesnake	<i>Pituophis melanoleucus melanoleucus</i>	I	a	Open vegetated	Dry open slopes with cover and soils suitable for burrowing	The historic range of the pinesnake in Virginia includes at least 5 vouchered and 11 unvouchered records from 11 counties in the Blue Ridge and western Ridge and Valley regions of Virginia. A century ago, pinesnakes were considered common in several parts of Virginia. Prevalence persisted through the mid-1940s up to the mid-1970s. Fire suppression, habitat loss and fragmentation, and human persecution are most likely the primary causes of this species disappearance in Virginia. Because there have been no sightings in the past 25 years, this species is presumed extirpated from Virginia. A recent investigation demonstrated habitat is available and that a reintroduction is feasible. This species is listed as Tier 1a
Reptiles	Queen snake	<i>Regina septemvittata</i>	IV	a	Open vegetated	Crayfish obligate clear streams with rock or sandy bottoms and vegetated shorelines	The needs of this species and its primary prey (crayfish) are consistent with priorities to conserve and restore aquatic and riparian habitats and maintain good water quality. This species will be prioritized as Tier 4a.
Reptiles	Rainbow snake	<i>Farancia erythrogramma erythrogramma</i>	IV	a	Forest	Riparian forest - eel obligate	The needs of this species and its primary prey (eels) is consistent with priorities to conserve and restore aquatic and riparian habitats and maintain good water quality. This species will be prioritized as Tier 4a.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
Reptiles	Scarlet kingsnake	<i>Lampropeltis elapsoides</i>	III	c	Forest	Forests, meadows and agricultural areas.	For a long time the status of the scarlet kingsnake ( <i>Lampropeltis elapsoides</i> ) in Virginia has been debated and was based on the highly variable phenotypic patterns of the <i>Lampropeltis triangulum</i> complex. For many years, it was concluded that populations of <i>L. triangulum</i> were intergrades between <i>L.t. triangulum</i> and <i>L.t. elapsoides</i> . In 2007, however, it was concluded that scarlet kingsnakes were a distinct species in Virginia. Genetic samples were limited to southern Bedford County, but specimens from Albemarle, Appomattox and Mecklenburg counties are also considered valid. Unconfirmed photos from Nelson County need to be substantiated. Until the status and distribution can be better defined, this species should be listed as a Tier 3c.
Reptiles	Scarletsnake	<i>Cemophora coccinea copei</i>	IV	a	Forest	Forest generalist but require soils suitable for digging	The needs of this species are consistent with action plan priorities to conserve and restore patches of mature forests in the eastern portions of Virginia. This species will be prioritized as Tier 4a.
Reptiles	Smooth greensnake	<i>Opheodrys vernalis</i>	III	a	Barren	Moist meadows or grassy areas at the edges of bogs or small streams	This species benefits from the maintenance of balds and other open habitats. This need is consistent with priorities to maintain and create open habitats, including balds, in western portions of Virginia. This species will be prioritized as Tier 3a.
Reptiles	Southeastern crowned snake	<i>Tantilla coronata</i>	IV	c	Forest	Forest generalist but require soils suitable for digging	Basic life history and distribution research are needed for this species. This species will be classified as Tier 4c.
Reptiles	Spiny softshell	<i>Apalone spinifera spinifera</i>	IV	a	Aquatic	Clean clear rivers with flowing water and sand substrates	The needs of this species are consistent with action plan priorities to conserve and restore aquatic and riparian habitats and maintain good water quality. This species will be prioritized as Tier 4a.
Reptiles	Spotted turtle	<i>Clemmys guttata</i>	III	a	Wetland	Freshwater swamps and marshes	The needs of this species are consistent with priorities to conserve and restore wetland habitats. This species will be prioritized as Tier 3a.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
Reptiles	Stripe-necked musk turtle	<i>Sternotherus minor peltifer</i>	IV	a	Aquatic	Warm streams with fast flows and rock and cobble substrates	The needs of this species are consistent with action plan priorities to conserve and restore aquatic and riparian habitats and maintain good water quality. This species will be prioritized as Tier 4a.
Reptiles	Timber rattlesnake	<i>Crotalus horridus (timber)</i>	IV	a	Barren	Hibernates in fissures in rock ledges or talus slopes. When active, utilizes a diversity of forest and open habitats.	This species can best be protected by protecting hibernacula via regulation, acquisition, or other management opportunity. This species would also benefit from action plan priorities to conserve and restore various forest and open habitats. This species will be prioritized as Tier 4a.
Reptiles	Wood turtle	<i>Glyptemys insculpta</i>	I	a	Forest	Clear streams with adjacent riparian forests and fields	Virginia's original wildlife action plan indicated this species would benefit from more rigorous enforcement of collection laws and efforts to conserve/restore riparian and upland habitats used by this species. A variety of research topics are also identified. The habitat conservation efforts are consistent with the new action plan's conservation priorities. This species will be prioritized as Tier 1a.
Reptiles	Yellow-bellied slider	<i>Trachemys scripta scripta</i>	IV	b	Aquatic	A variety of freshwater habitats including rivers, ponds, lakes, and roadside ditches	This species is most threatened by the red-eared slider which was introduced to Virginia via the pet trade. These two sub-species can breed which diminishes the genetic integrity of the native yellow-eared slider. Before conservation actions can be defined, additional research is required to more fully describe the extent to which the yellow-bellied slider has interbred with, the red-eared slider, determine if the removal of red-eared sliders could be achieved, and determine how to prevent the future introduction of red-eared sliders into additional watersheds. This species will be prioritized as Tier 4b.
Terr Insects	A cane moth	<i>Argillophora furcilla</i>	IV	c	Unknown	Variety of habitats as long as there is substantial cane	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
Terr Insects	A cane moth	<i>Francllemontia interrogans</i>	IV	c	Unknown	Not well known	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
<b>Terr Insects</b>	A cave beetle	<i>Pseudanophthalmus gracilis</i>	II	c	Cave/Karst	Caves with clean abundant water flowing through the system.	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>Terr Insects</b>	A cave beetle	<i>Pseudanophthalmus seclusus</i>	II	c	Cave/Karst	Caves with clean abundant water flowing through the system.	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>Terr Insects</b>	A cave beetle	<i>Pseudanophthalmus pusio</i>	III	c	Cave/Karst	Subterranean obligate	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.
<b>Terr Insects</b>	A geometrid moth	<i>Lophosis laberculata</i>	IV	c	#N/A	#N/A	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Terr Insects</b>	A geometrid moth	<i>Lytrosis permagnaria</i>	IV	c	Unknown	Not well known	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Terr Insects</b>	A ground beetle	<i>Cyclotrachelus incisus</i>	III	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.
<b>Terr Insects</b>	A ground beetle	<i>Phloeoxena signata</i>	IV	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Terr Insects</b>	A ground beetle	<i>Rhadine caudata</i>	IV	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Terr Insects</b>	A leaf beetle	<i>Calligrapha pnirsa</i>	IV	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Terr Insects</b>	A mirid bug	<i>Bothynotus johnstoni</i>	IV	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Terr Insects</b>	A noctuid moth	<i>Hadena ectypa</i>	IV	c	Forest	Wooded areas or openings in them	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
<b>Terr Insects</b>	A noctuid moth	<i>Meropleon titan</i>	IV	c	Unknown	No habitat requirement	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Terr Insects</b>	A noctuid moth	<i>Oxycilla mitographa</i>	IV	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Terr Insects</b>	A noctuid moth	<i>Zale curema</i>	IV	c	Forest	Mountain species associated with pitch pine	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Terr Insects</b>	A shield bug	<i>Galgupha denudata</i>	IV	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Terr Insects</b>	A spur-throat grasshopper	<i>Melanoplus pachycercus</i>	IV	c	Forest	Woodland/ hardwood	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Terr Insects</b>	A tiger beetle	<i>Cicindela formosa generosa</i>	IV	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Terr Insects</b>	A tiger beetle	<i>Cicindela gratiosa</i>	IV	c	Dune	Sandy soils with some clay content in sparsely vegetated patches	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Terr Insects</b>	A tiger beetle	<i>Cicindela limbalis</i>	IV	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Terr Insects</b>	A turtle bug	<i>Oncozygia clavicornis</i>	IV	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
<b>Terr Insects</b>	American Bumble Bee	<i>Bombus pensylvanicus</i>	IV	a	Unknown	Variety of open and grassland habitats	This species is impacted by habitat loss, insecticide use, climate change, pathogens from captive bees, exotic and invasive species, and intentional and accidental deaths. Actions to conserve bumble bees include managing pesticide free grassland and young forest habitats with suitable forage plants and nest sites. Habitat guidelines from the Wildlife Management Institute's Young Forest Project and the DGIF's Quail Action Plan should be suitable to enhance bumble bee conservation. This species will be prioritized as Tier 4a.
<b>Terr Insects</b>	American burying beetle	<i>Nicrophorus americanus</i>	I	c	Open habitat	Grassland, old field shrubland, and hardwood forests	There are no known populations of this species in Virginia but it has a high likelihood of occurring in Virginia. Threat to it elsewhere include: habitat fragmentation and the related loss of edge habitat. No management actions are listed in the Action Plan. The research need listed is to conduct surveys to determine if any populations can be found. This species will be prioritized as Tier 1c.
<b>Terr Insects</b>	An assassin bug	<i>Ploiaria hirticornis</i>	IV	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Terr Insects</b>	Appalachian grasshopper	<i>Appalachia hebaridi</i>	III	c	Unknown	Acidic mountain heathlands	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.
<b>Terr Insects</b>	Appalachian grizzled skipper	<i>Pyrgus wyandot</i>	I	a	Open habitat	Dry open areas with shale soils, clear cuts, utility rights of way, and other areas with dwarf cinquefoil	The primary threats to this species include habitat succession and gypsy moth control measures. The following management action is included: all shale barren and powerline right of ways in the Ridge and Valley should be exempted from gypsy moth spraying. The following research needs are includes: surveys to identify additional populations, understanding the relationship between distribution and density to disturbance regimes. This species will be prioritized as Tier 1a.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
<b>Terr Insects</b>	Arogos skipper	<i>Atrytone arogos arogos</i>	I	c	Open habitat	No details for Virginia	This species is likely extirpated from Virginia. Historic threats included habitat degradation and poor management. If the species is found in Virginia, a likely management action would be to restore large tracts of native grasses, that support many small, frequent burns. This species will be prioritized as Tier 1c.
<b>Terr Insects</b>	Ashton Cuckoo Bumble Bee	<i>Bombus bohemicus</i>	I	a	Open habitat	Various open and grassland habitats.	Bumble bees are impacted by habitat loss, insecticide use, climate change, pathogens from captive bees, exotic and invasive species, and intentional and accidental deaths. Actions to conserve bumble bees include managing pesticide free grassland and young forest habitats with suitable forage plants and nest sites. Habitat guidelines from the Wildlife Management Institute's Young Forest Project and the DGIF's Quail Action Plan should be suitable to enhance bumble bee conservation. This species will be prioritized as Tier 1a.
<b>Terr Insects</b>	Avernus cave beetle	<i>Pseudanophthalmus avernus</i>	II	c	Cave/Karst	Caves with clean abundant water flowing through the system.	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>Terr Insects</b>	Barrens dagger moth	<i>Acrionicta albarufa</i>	IV	c	Forest	Dry oak dominated habitats, including black oak or bur oak savanna and overgrown former savanna and pitch pine/scrub oak barrens, and especially ozark oak and oak-hickory woods	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Terr Insects</b>	Barrens tiger beetle	<i>Cicindela patruela</i>	III	c	Unknown	Sandy/coarse gravel or eroding sandstone throughout the species' range	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.
<b>Terr Insects</b>	Black dash	<i>Euphyes conspicua</i>	IV	c	Forest	Shrubby or partially wooded (red maple) wetland or part thereof at least co-dominated by <i>Carex stricta</i>	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
<b>Terr Insects</b>	Black lordithon rove beetle	<i>Lordithon niger</i>	III	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.
<b>Terr Insects</b>	Brimley's assassin bug	<i>Pnirontis brimleyi</i>	III	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.
<b>Terr Insects</b>	Bronze copper	<i>Lycaena hyllus</i>	IV	c	Wetland	Marshes, sedge meadows, moist to wet grassy meadows, ditches, fens, streamside or pondshore wetlands, or roads and right of ways through marshlands	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Terr Insects</b>	Buchholz's gray moth	<i>Hypomecis buchholzaria</i>	IV	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Terr Insects</b>	Buffalo Mountain mealybug	<i>Puto kosztarabi</i>	I	c	Open habitat	South slope of Buffalo Mountain in Floyd county on poverty oatgrass in open glades	This species is endemic to Buffalo Mountain in Floyd County, Virginia and the site where it is found is already under state ownership. No threats or management actions are included in the Action Plan. The primary research need includes researching life history and conducting surveys. This species will be prioritized as Tier 1c.
<b>Terr Insects</b>	Burkes Garden cave beetle	<i>Pseudanophthalmus hortulanus</i>	II	c	Cave/Karst	Caves with clean abundant water flowing through the system.	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>Terr Insects</b>	Chestnut clearwing moth	<i>Synanthedon castaneae</i>	IV	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Terr Insects</b>	Chestnut leaf-mining moth	<i>Tischeria perplexa</i>	III	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.
<b>Terr Insects</b>	Combneck assassin bug	<i>Ctenotrachelus shermani</i>	IV	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
<b>Terr Insects</b>	Consort underwing	<i>Catocala consors sorsconi</i>	IV	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Terr Insects</b>	Crossroads Cave beetle	<i>Pseudanophthalmus intersectus</i>	II	c	Cave/Karst	Caves with clean abundant water flowing through the system.	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>Terr Insects</b>	Cumberland Gap cave beetle	<i>Pseudanophthalmus hirsutus</i>	II	c	Cave/Karst	Caves with clean abundant water flowing through the system.	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>Terr Insects</b>	Dark stoneroot borer moth	<i>Papaipema duplicata</i>	IV	c	Forest	Foodplant <i>Collinsonia</i> is common in rich hardwood forest	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Terr Insects</b>	Deceptive cave beetle	<i>Pseudanophthalmus deceptivus</i>	II	c	Cave/Karst	Caves with clean abundant water flowing through the system.	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>Terr Insects</b>	Delicate cave beetle	<i>Pseudanophthalmus delicatus</i>	III	c	Cave/Karst	Subterranean obligate	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.
<b>Terr Insects</b>	Diana fritillary	<i>Speyeria diana</i>	IV	c	Forest	Deciduous or mixed forest with a lot of violets in the understory in most of the range	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Terr Insects</b>	Dismal Swamp green stink bug	<i>Chlorochroa dismalia</i>	III	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.
<b>Terr Insects</b>	Doll's Merolonch moth	<i>Merolonche dolli</i>	III	c	Forest	Acid oak-heath forest	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.
<b>Terr Insects</b>	Dotted skipper	<i>Hesperia attalus slossonae</i>	II	c	Open habitat	Short grass prairies, pine barrens, and woodland meadows	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>Terr Insects</b>	Dukes' skipper	<i>Euphyes dukesi</i>	III	c	Wetland	Adjacent open wetlands for nectar, but the primary habitat is sedge	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
						patches in forested swamps	
<b>Terr Insects</b>	Dusky roadside-skipper	<i>Amblyscirtes alternata</i>	III	c	Open habitat	Open grassy pine woods but may range from moist to dry, includes moist flatwoods, savannas, and sandhill ridges	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.
<b>Terr Insects</b>	Early hairstreak	<i>Erora laeta</i>	IV	c	Forest	Hardwood forests or hardwood-northern conifer mixed forests	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Terr Insects</b>	Frosted elfin	<i>Callophrys irus</i>	IV	c	Open habitat	Natural settings, such as grassy openings or burn scars in barrens and savannas	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Terr Insects</b>	Georgia satyr	<i>Neonympha areolata</i>	IV	c	Wetland	Wet to boggy meadows, savannas, and wet pinelands	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Terr Insects</b>	Hebard's noctuid moth	<i>Erythroecia hebardi</i>	III	c	Forest	Forests with many foodplants	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.
<b>Terr Insects</b>	Hercules club stink bug	<i>Elasmotethus atricornis</i>	IV	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Terr Insects</b>	Hessel's hairstreak	<i>Callophrys hesseli</i>	III	c	Wetland/forest	Bog/ fen, riparian	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.
<b>Terr Insects</b>	Hoary elfin	<i>Callophrys polios</i>	IV	c	Open habitat	Rocky or sandy barrens, bogs, outcrops etc. with abundant bearberry. Also in dry rocky forest with <i>Epigea repens</i>	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
<b>Terr Insects</b>	Holsinger's cave beetle	<i>Pseudanophthalmus holsingeri</i>	I	c	Cave/Karst	Caves with clean abundant water flowing through the system.	This species is endemic to Young-Fugate Cave in Lee County, Virginia and that the species is stable. The majority of known habitat occurs either beneath or immediately adjacent to US58 in Lee County. Threats to this species include the following: alteration of surface features that would affect the water table such as removal of forest cover, road construction, and water pollution in various forms. Management actions include limiting gypsy moth spraying near caves where this species is found. Research needs include life history studies and regular surveys to determine current status of the species. This species will be prioritized as Tier 1c.
<b>Terr Insects</b>	Hubbard's cave beetle	<i>Pseudanophthalmus hubbardi</i>	II	c	Cave/Karst	Caves with clean abundant water flowing through the system.	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>Terr Insects</b>	Hubricht's cave beetle	<i>Pseudanophthalmus hubrichti</i>	II	c	Cave/Karst	Caves with clean abundant water flowing through the system.	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>Terr Insects</b>	Jefferson's short-nosed scorpionfly	<i>Brachyanorpa jeffersoni</i>	III	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.
<b>Terr Insects</b>	King's hairstreak	<i>Satyrium kingi</i>	IV	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Terr Insects</b>	Lemmer's pinion moth	<i>Lithophane lemmeri</i>	IV	c	Wetland	Swamps with Atlantic white cedar ( <i>Chamaecyparis thyoides</i> ) dominant or at least common	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Terr Insects</b>	Little Kennedy Cave beetle	<i>Pseudanophthalmus cordicollis</i>	II	c	Cave/Karst	Caves with clean abundant water flowing through the system.	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
<b>Terr Insects</b>	Little metalmark	<i>Calephelis virginiensis</i>	III	c	Open habitat	Open grassy fields, pine savanna, salt marsh meadows, and wood margins	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.
<b>Terr Insects</b>	Long dash	<i>Polites mystic</i>	IV	c	Open habitat	Lush, moist flowery meadows whether natural or artificial, including old fields, pastures, hayfields	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Terr Insects</b>	Long-headed cave beetle	<i>Pseudanophthalmus longiceps</i>	II	c	Cave/Karst	Caves with clean abundant water flowing through the system.	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>Terr Insects</b>	Maiden Spring cave beetle	<i>Pseudanophthalmus virginicus</i>	II	c	Cave/Karst	Caves with clean abundant water flowing through the system.	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>Terr Insects</b>	Marbled underwing	<i>Catocala marmorata</i>	IV	c	Forest	Riparian and forest	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Terr Insects</b>	Milne's Euchlaena moth	<i>Euchlaena milnei</i>	IV	c	Forest	Unknown, but appears to be in hardwood forests	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Terr Insects</b>	Mississippi turtle bug	<i>Allopodops mississippiensis</i>	IV	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Terr Insects</b>	Mitchell's satyr	<i>Neonympha mitchellii</i>	I	a	Wetland	Calcareous fen complexes, sedge meadows	The primary threats facing this species include: loss of wetland habitat (sedge fens or meadows) and historic over collection. This species would likely benefit from the conservation and restoration of wetland habitats. This species will be prioritized as Tier 1a.
<b>Terr Insects</b>	Mixed dart moth	<i>Euxoa immixta</i>	IV	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
<b>Terr Insects</b>	Monarch Butterfly	<i>Danaus plexippus plexippus</i>	III	a	Open habitat	Breeding areas are virtually all patches of milkweed in North America and some other regions	Threats to this species includes the loss of milkweed and nectar sources in agricultural lands and the loss of forests in the US, Canada, and Mexico. Actions to conserve monarchs include the conservation and restoration of existing grasslands with milkweed and other nectar producing plants, and working to conserve known migratory roost sites. Habitat guidelines from DGIF's Quail Action Plan should be consistent with habitats needed by monarchs. This species will be prioritized as Tier 3a.
<b>Terr Insects</b>	Mottled duskywing	<i>Erynnis martialis</i>	III	c	Forest	Strongly associated with various sorts of oak (black, post, etc.) or pine (jack, pitch, longleaf) savannas or open woodlands, non-coastal pine barrens, or grassy openings within these communities, also probably embankments along rivers	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.
<b>Terr Insects</b>	Mud-dwelling cave beetle	<i>Pseudanophthalmus limicola</i>	II	c	Cave/Karst	Caves with clean abundant water flowing through the system.	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>Terr Insects</b>	Natural Bridge cave beetle	<i>Pseudanophthalmus pontis</i>	II	c	Cave/Karst	Caves with clean abundant water flowing through the system.	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>Terr Insects</b>	Nelson's cave beetle	<i>Pseudanophthalmus nelsoni</i>	II	c	Cave/Karst	Caves with clean abundant water flowing through the system.	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>Terr Insects</b>	New River Valley cave beetle	<i>Pseudanophthalmus egberti</i>	II	c	Cave/Karst	Twilight zone or deeper in or on moist soil, often near streams or drip areas	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
<b>Terr Insects</b>	Northeastern beach tiger beetle	<i>Cicindela dorsalis dorsalis</i>	II	a	Beach	Beach obligate - does not tolerate heavy foot or vehicle traffic	Management largely focused on conserving beach habitats and excluding human use from occupied areas. This species will be prioritized as Tier 2a.
<b>Terr Insects</b>	Northern bush katydid	<i>Scudderia septentrionalis</i>	IV	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Terr Insects</b>	Northern metalmark	<i>Calephelis borealis</i>	IV	c	Forest	Openings within forested or wooded areas	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Terr Insects</b>	Orange-bellied tiger beetle	<i>Cicindela abdominalis</i>	IV	c	Dune/open habitat	Dry, sandy, coastal plain pine barrens, sand hills, and other pine or mixed pine-oak woodland or scrub	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Terr Insects</b>	Overlooked cave beetle	<i>Pseudanophthalmus praetermissus</i>	II	c	Cave/Karst	Caves with clean abundant water flowing through the system.	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>Terr Insects</b>	Palatka skipper	<i>Euphyes pilatka</i>	III	c	Wetland	Brackish and freshwater sawgrass marshes and mangroves	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.
<b>Terr Insects</b>	Persius duskywing	<i>Erynnis persius persius</i>	II	c	Open habitat	Pine barrens/ oak savanna and other open sunny habitats	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>Terr Insects</b>	Petrunkevitch's cave beetle	<i>Pseudanophthalmus petrunkevitchi</i>	II	c	Cave/Karst	Caves with clean abundant water flowing through the system.	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>Terr Insects</b>	Pine barrens underwing	<i>Catocala herodias</i>	III	c	Open habitat	Scrubby oaks, pine barrens, and some oak savanna	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.
<b>Terr Insects</b>	Pink-edged sulphur	<i>Colias interior</i>	IV	c	Open habitat	Bogs, any kind of low heathland, pine barrens, burn scars, logged areas, right of ways, other openings in forests	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
<b>Terr Insects</b>	Pink-streak moth	<i>Faronta rubripennis</i>	IV	c	Open habitat	Natural sandy grassy situations such as prairies and dunes	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Terr Insects</b>	Precious underwing	<i>Catocala pretiosa pretiosa</i>	II	c	Forest	Pinelands swamp forest	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>Terr Insects</b>	Rare skipper	<i>Problema bulenta</i>	II	c	Wetland	Freshwater and brackish marsh	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>Terr Insects</b>	Rare spring moth	<i>Heliomata infulata</i>	IV	c	Forest	Forest or woodland specie	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Terr Insects</b>	Regal fritillary	<i>Speyeria idalia idalia</i>	I	a	Open habitat	Glades and prairie remnants	The likely threats to this species include spraying for gypsy moth and increasing distance between suitable habitats. Management actions include the following: protection of remaining grasslands within its range, cessation of collection, and suspension of spraying for gypsy moth where it likely occurs. This species will be prioritized as Tier 1a.
<b>Terr Insects</b>	Riverbank tiger beetle	<i>Cicindela ancocisconensis</i>	III	c	Riparian	Open sand or a matrix of sand and cobble along permanent streams or medium-sized rivers	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.
<b>Terr Insects</b>	Rotund cave beetle	<i>Pseudanophthalmus rotundatus</i>	II	c	Cave/Karst	Caves with clean abundant water flowing through the system.	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>Terr Insects</b>	Rusty-patched bumble bee	<i>Bombus affinis</i>	I	a	Open habitat	Various open and grassland habitats.	Bumble bees are impacted by habitat loss, insecticide use, climate change, pathogens from captive bees, exotic and invasive species, and intentional and accidental deaths. Actions to conserve bumble bees include managing pesticide free grassland and young forest habitats with suitable forage plants and nest sites. Habitat guidelines from the Wildlife Management Institute's Young Forest Project and the DGIF's Quail Action Plan should be suitable to enhance bumble bee conservation. This species will be prioritized as Tier 1a.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
<b>Terr Insects</b>	Saint Paul cave beetle	<i>Pseudanophthalmus sanctipauli</i>	II	c	Cave/Karst	Caves with clean abundant water flowing through the system.	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>Terr Insects</b>	Sandpit alydid bug	<i>Stachyocnemus apicalis</i>	III	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.
<b>Terr Insects</b>	Schaum's ground beetle	<i>Sphaeroderus schaumi</i>	IV	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Terr Insects</b>	Silken cave beetle	<i>Pseudanophthalmus sericus</i>	II	c	Cave/Karst	Caves with clean abundant water flowing through the system.	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>Terr Insects</b>	Six-banded longhorn beetle	<i>Dryobius sexnotatus</i>	IV	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Terr Insects</b>	Smyth's Apamea moth	<i>Apamea smythi</i>	II	c	Forest	Forested areas	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>Terr Insects</b>	South Branch Valley cave beetle	<i>Pseudanophthalmus potomaca potomaca</i>	II	c	Cave/Karst	Caves with clean abundant water flowing through the system.	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>Terr Insects</b>	Southeastern myotis bat fly	<i>Basilisa boardmani</i>	III	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.
<b>Terr Insects</b>	Southern Plains Bumble Bee	<i>Bombus fraternus</i>	II	a	Open habitat	Various open and grassland habitats.	Bumble bees are impacted by habitat loss, insecticide use, climate change, pathogens from captive bees, exotic and invasive species, and intentional and accidental deaths. Actions to conserve bumble bees include managing pesticide free grassland and young forest habitats with suitable forage plants and nest sites. Habitat guidelines from the Wildlife Management Institute's Young Forest Project and the DGIF's Quail Action Plan should be suitable to enhance bumble bee conservation. This species will be prioritized as Tier 2a.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
<b>Terr Insects</b>	Southern Ptichodis moth	<i>Ptichodis bistrigata</i>	IV	c	Forest	Probably xeric, maybe also mesic, pine/oak scrub, savanna and prairie	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Terr Insects</b>	Spectral tiger beetle	<i>Cicindela lepida</i>	IV	c	Dune	Open, deep, dry, sparsely vegetated sands, as well as dunes, openings in various woodlands, old sand pits, sandy washes in some areas	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Terr Insects</b>	Spotted cave beetle	<i>Pseudanophthalmus punctatus</i>	II	c	Cave/Karst	#N/A	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>Terr Insects</b>	Straley's Cave beetle	<i>Pseudanophthalmus quadratus</i>	II	c	Cave/Karst	Twilight zone or deeper in or on moist soil, often near streams or drip areas	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>Terr Insects</b>	Sweet underwing	<i>Catocala dulciola</i>	III	c	Forest	Forest species	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 3c.
<b>Terr Insects</b>	Tawny crescent	<i>Phyciodes batesii batesii</i>	II	c	Open habitat	Dry habitats, including clearings, open woods and roadsides containing wavy-leaved asters	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>Terr Insects</b>	Thin-neck cave beetle	<i>Pseudanophthalmus parvicollis</i>	II	c	Cave/Karst	Caves with clean abundant water flowing through the system.	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>Terr Insects</b>	Thomas' cave beetle	<i>Pseudanophthalmus thomasi</i>	II	c	Cave/Karst	Caves with clean abundant water flowing through the system.	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>Terr Insects</b>	Tuscarora emerald	<i>Nemoria tuscarora</i>	IV	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
<b>Terr Insects</b>	Two-spotted skipper	<i>Euphyes bimacula</i>	IV	c	Wetland	Bogs, sedge meadows, sedge marshes along streams and sometimes openings in swamps	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Terr Insects</b>	Variable Cuckoo Bumble Bee	<i>Bombus variabilis</i>	I	a	Open habitat	Various open and grassland habitats.	Bumble bees are impacted by habitat loss, insecticide use, climate change, pathogens from captive bees, exotic and invasive species, and intentional and accidental deaths. Actions to conserve bumble bees include managing pesticide free grassland and young forest habitats with suitable forage plants and nest sites. Habitat guidelines from the Wildlife Management Institute's Young Forest Project and the DGIF's Quail Action Plan should be suitable to enhance bumble bee conservation. This species will be prioritized as Tier 1a.
<b>Terr Insects</b>	Vicariant cave beetle	<i>Pseudanophthalmus vicarius</i>	II	c	Cave/Karst	Caves with clean abundant water flowing through the system.	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 2c.
<b>Terr Insects</b>	Yellow Bumble Bee	<i>Bombus fervidus</i>	IV	a	Unknown	Variety of open and grassland habitats	This species is impacted by habitat loss, insecticide use, climate change, pathogens from captive bees, exotic and invasive species, and intentional and accidental deaths. Actions to conserve bumble bees include managing pesticide free grassland and young forest habitats with suitable forage plants and nest sites. Habitat guidelines from the Wildlife Management Institute's Young Forest Project and the DGIF's Quail Action Plan should be suitable to enhance bumble bee conservation. This species will be prioritized as Tier 4a.
<b>Terr Insects</b>	Yellow stoneroot borer moth	<i>Papaipema astuta</i>	IV	c	Forest	Wooded environment with <i>Collinsonia</i>	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.

## APPENDIX A. VIRGINIA SPECIES OF GREATEST CONSERVATION NEED

Taxa	Common Name	Scientific Name	Tier	Cons. Opp. Ranking	Habitat	Descriptive Habitat	Notes
<b>Terr Insects</b>	Yellow-banded Bumble Bee	<i>Bombus terricola</i>	III	a	Unknown	Various open and grassland habitats.	Bumble bees are impacted by habitat loss, insecticide use, climate change, pathogens from captive bees, exotic and invasive species, and intentional and accidental deaths. Actions to conserve bumble bees include managing pesticide free grassland and young forest habitats with suitable forage plants and nest sites. Habitat guidelines from the Wildlife Management Institute's Young Forest Project and the DGIF's Quail Action Plan should be suitable to enhance bumble bee conservation. This species will be prioritized as Tier 3a.
<b>Terr Insects</b>	Yellow-edged Pygarctia moth	<i>Pygarctia abdominalis</i>	IV	c	Unknown	Unknown	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.
<b>Terr Insects</b>	Yucca giant-skipper	<i>Megathymus yuccae</i>	IV	c	Dune	Coastal dunes, dry pine woods, sandy fields	No specific research needs or management actions have been identified for this species. This species will be prioritized as Tier 4c.