


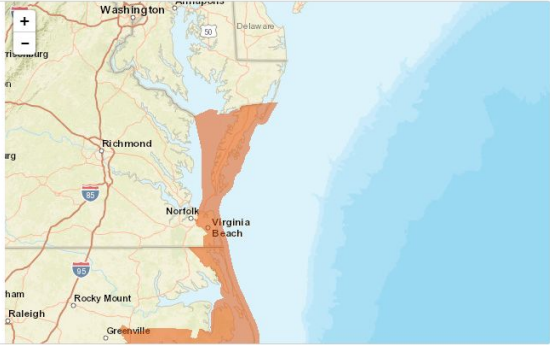

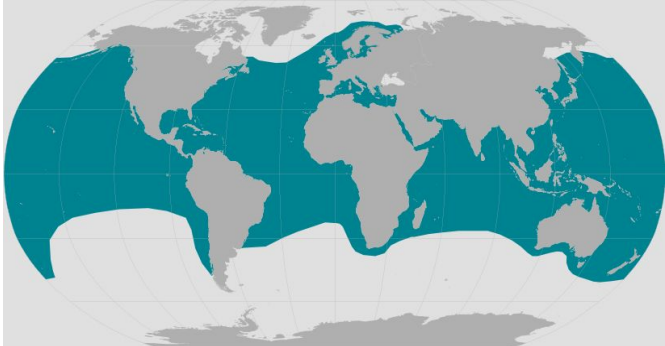




<b>Common Name</b>	Hawksbill Sea Turtle	<b>Conservation Status</b>	Endangered (1970)
<b>Scientific Name</b>	<i>Eretmochelys imbricata</i>	<b>Critical Habitat</b>	None currently designated in RRT3
 <p>Photo credit: U.S. Fish and Wildlife Service</p>		 <p>Photo credit: U.S. Fish and Wildlife Service</p>	
<p><b>Physical Description:</b>  Adults range in size from 30 to 36 inches (0.8-1.0 meters) carapace length, and weigh 100 to 200 pounds (45-90 kilograms). Its carapace (upper shell) is an attractive dark brown with faint yellow streaks and blotches and a yellow plastron (under shell). The name "hawksbill" refers to the turtle's prominent hooked beak.</p>		<p><b>Spatial Distribution:</b>  This species uses a wide range of tropical and subtropical habitats, including shallow coastal waters with rocky bottoms, coral reefs, beds of seagrass or algae, mangrove-bordered bays and estuaries, and submerged mud flats. Hatchlings and small juveniles associate with masses of floating sea plants (sargassum rafts) in the open ocean. Nesting occurs on undisturbed, deep-sand, insular or mainland beaches.</p> <p>VA, MD, DE, NJ (all coastal lying counties)</p>	
<p><b>Factors of Decline:</b>  Entanglement, marine debris, disease, chemical pollution, noise, habitat degradation and loss, harvest and destruction of nestlings</p>		<p><b>Best Management Practices:</b>  <a href="#">Hawksbill Sea Turtle Management Summary via NatureServe</a>   <a href="#">BMP's to protect sea turtles during in-situ burning operations for oil spill response</a></p>	
<p><b>References:</b>  NatureServe. 2018. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Retrieved from: <a href="http://explorer.natureserve.org">http://explorer.natureserve.org</a>   U.S. Fish &amp; Wildlife Services. (n.d.). Species profile for Hawksbill Sea Turtle (<i>Eretmochelys imbricata</i>). Environmental Conservation Online System USFWS. Retrieved from: <a href="https://ecos.fws.gov/ecp0/profile/speciesProfile?slid=3656">https://ecos.fws.gov/ecp0/profile/speciesProfile?slid=3656</a>   National Oceanic and Atmospheric Administration [NOAA] Fisheries. (n.d.). Species Directory: Hawksbill Turtle. NOAA Fisheries. Retrieved from: <a href="https://www.fisheries.noaa.gov/species/hawksbill-turtle">https://www.fisheries.noaa.gov/species/hawksbill-turtle</a></p>			

<b>Common Name</b>	Kemp's Ridley Sea Turtle	<b>Conservation Status</b>	Endangered (1970)
<b>Scientific Name</b>	<i>Lepidochelys kempii</i>	<b>Critical Habitat</b>	None currently designated in RRT3
 <p>Photo credit: National Wildlife Federation</p>		 <p>Photo credit: U.S. Fish and Wildlife Service</p>	
<p><b>Physical Description:</b> The Kemp's ridley turtle is the smallest of the sea turtles, with adults reaching about 2 feet in length and weighing up to 100 pounds. Adult turtle has an oval shell, usually olive-gray in color. Hatchlings are black on both sides. The Kemp's ridley has a triangular-shaped head with a somewhat hooked beak with large crushing surfaces. This turtle is a shallow water benthic feeder with a diet consisting primarily of crabs.</p>		<p><b>Spatial Distribution:</b> Habitat of adults primarily includes shallow coastal and estuarine waters, often over sandy or muddy bottoms where crab are numerous. Most activity is benthic. Post-hatchlings spend 1-4 years as surface pelagic drifters in weedlines of offshore currents in the Gulf of Mexico and Atlantic Ocean, then shift to benthic coastal habitats of various types</p> <p>VA (all coastal lying counties)</p>	
<p><b>Factors of Decline:</b> Entanglement, marine debris, disease, chemical pollution, noise, habitat degradation and loss</p>		<p><b>Best Management Practices:</b> <a href="#">Kemp's Ridley Sea Turtle Management Summary via NatureServe</a></p> <p><a href="#">BMP's to protect sea turtles during in-situ burning operations for oil spill response</a></p>	
<p><b>References:</b> NatureServe. 2018. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Retrieved from: <a href="http://explorer.natureserve.org">http://explorer.natureserve.org</a></p> <p>U.S. Fish &amp; Wildlife Services. (n.d.). Species profile for Kemp's Ridley Sea Turtle (<i>Lepidochelys kempii</i>). Environmental Conservation Online System USFWS. Retrieved from: <a href="https://ecos.fws.gov/ecp0/profile/speciesProfile?sld=5523#crithab">https://ecos.fws.gov/ecp0/profile/speciesProfile?sld=5523#crithab</a></p> <p>National Oceanic and Atmospheric Administration [NOAA] Fisheries. (n.d.). Species Directory: Kemp's Ridley Turtle. NOAA Fisheries. Retrieved from: <a href="https://www.fisheries.noaa.gov/species/kemps-ridley-turtle">https://www.fisheries.noaa.gov/species/kemps-ridley-turtle</a></p>			

<b>Common Name</b>	Leatherback Sea Turtle	<b>Conservation Status</b>	Endangered (1970)
<b>Scientific Name</b>	<i>Dermochelys coriacea</i>	<b>Critical Habitat</b>	None currently designated in RRT3
 <p>Photo credit: Wikipedia</p>		 <p>Photo credit: NOAA</p>	
<p><b>Physical Description:</b> Large sea turtle with a black or dark blue shell. Adults are normally 135-178 cm in length and weigh 295-544 kg. Their normal life span is at least 30 years. Nesting May - October.</p>		<p><b>Spatial Distribution:</b> Lives in the ocean, seas, gulfs, bays, and estuaries. Occasionally comes to the surface, but usually dives thousands of meters below. Nests on sandy beaches, in moist sand near the water. Migrates hundreds of kilometers for nesting.</p> <p>VA, MD, DE, NJ (all coastal lying counties)</p>	
<p><b>Factors of Decline:</b> By catch in fishing gear, harvest of eggs and killing of turtles, habitat loss, nest predation, vessel strikes, entanglement, ingestion of marine debris, changes to the natural beach/dune ecosystem</p>		<p><b>Best Management Practices:</b> <a href="#">Leatherback Sea Turtle Management Summary via NatureServe</a>  <a href="#">BMP's to protect sea turtles during in-situ burning operations for oil spill response</a></p>	
<p><b>References:</b> NatureServe. 2018. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available <a href="http://explorer.natureserve.org">http://explorer.natureserve.org</a>  National Oceanic and Atmospheric Administration [NOAA] Fisheries. (n.d.). Species Directory: Leatherback Turtle. NOAA Fisheries. Retrieved from: <a href="https://www.fisheries.noaa.gov/species/leatherback-turtle#overview">https://www.fisheries.noaa.gov/species/leatherback-turtle#overview</a></p>			



<b>Common Name</b>	Loggerhead Sea Turtle	<b>Conservation Status</b>	Endangered (1978) & Threatened (1978)
<b>Scientific Name</b>	<i>Caretta caretta</i>	<b>Critical Habitat</b>	None currently designated in RRT3
 <p data-bbox="168 804 321 825">Photo credit: Oceana</p>		 <p data-bbox="818 804 1105 825">Photo credit: U.S. Fish &amp; Wildlife Service</p>	
<p data-bbox="168 856 467 888"><b>Physical Description:</b></p> <p data-bbox="168 892 784 1283">Loggerheads were named for their relatively large heads. The top shell is slightly heart-shaped and reddish-brown in adults and sub-adults, while the bottom shell is generally a pale yellowish color. The neck and flippers are usually dull brown to reddish brown on top and medium to pale yellow on the sides and bottom. Mean straight shell length of adults in the southeastern U.S. is approximately 36 in; corresponding weight is about 250 lbs. Nesting April - early September (peak in June).</p>		<p data-bbox="818 856 1096 888"><b>Spatial Distribution:</b></p> <p data-bbox="818 892 1466 1209">Open sea to more than 500 miles from shore, mostly over continental shelf, and in bays, estuaries, lagoons, creeks, and mouths of rivers; mainly warm temperate and subtropical regions not far from shorelines. In Chesapeake Bay, occurs mainly in deeper channels, usually at river mouths or in the open bay. Nesting occurs usually on open sandy beaches above high-tide mark, seaward of well-developed dunes.</p> <p data-bbox="818 1251 1419 1318">VA (Accomack, Northampton &amp; Virginia Beach Counties )</p>	
<p data-bbox="168 1354 435 1386"><b>Factors of Decline:</b></p> <p data-bbox="168 1390 781 1493">Harvest, entanglement, marine debris, disease, chemical pollution, noise, habitat degradation and loss</p>		<p data-bbox="818 1354 1214 1386"><b>Best Management Practices:</b></p> <p data-bbox="818 1390 1474 1457"><a href="#">Loggerhead Sea Turtle Management Summary via NatureServe</a></p> <p data-bbox="818 1499 1458 1566"><a href="#">BMP's to protect sea turtles during in-situ burning operations for oil spill response</a></p>	
<p data-bbox="168 1610 337 1642"><b>References:</b></p> <p data-bbox="168 1646 1409 1703">NatureServe. 2018. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available <a href="http://explorer.natureserve.org">http://explorer.natureserve.org</a></p> <p data-bbox="168 1730 1446 1787">National Oceanic and Atmospheric Administration [NOAA] Fisheries. (n.d.). Species Directory: Loggerhead Turtle. NOAA Fisheries. Retrieved from: <a href="https://www.fisheries.noaa.gov/species/loggerhead-turtle">https://www.fisheries.noaa.gov/species/loggerhead-turtle</a></p> <p data-bbox="168 1814 1357 1871">U.S. Fish &amp; Wildlife Services. (n.d.). Species profile for Loggerhead Sea Turtle (<i>Caretta caretta</i>). Environmental Conservation Online System USFWS. Retrieved from: <a href="https://ecos.fws.gov/ecp0/profile/speciesProfile?slid=1110">https://ecos.fws.gov/ecp0/profile/speciesProfile?slid=1110</a></p>			



<b>Common Name</b>	Green Sea Turtle	<b>Conservation Status</b>	Endangered (2016) & Threatened (2016)
<b>Scientific Name</b>	<i>Chelonia mydas</i>	<b>Critical Habitat</b>	None currently designated in RRT3



Photo credit: NOAA

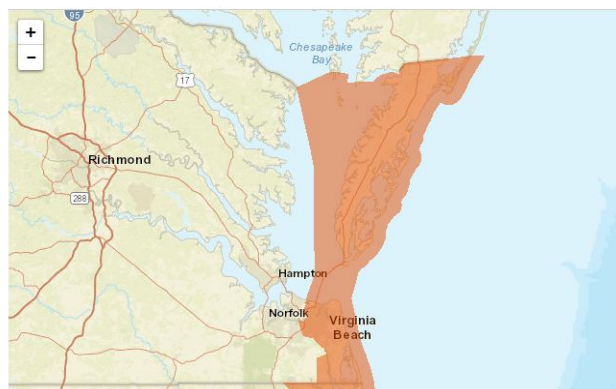


Photo credit: U.S. Fish & Wildlife Service

**Physical Description:**

A typical adult is 3 to 4 feet long and weighs 300 to 350 pounds. They have dark brown or black shells and a much lighter, yellow underside. Their shells have five scutes (bony plates) running down the middle and four scutes on each side. Another distinct characteristic of the green turtle is their two large scales located between the eyes. Nesting May - September.

**Spatial Distribution:**

Feeding occurs in shallow, low-energy waters with abundant submerged vegetation, and also in convergence zones in the open ocean. Migrations may traverse open seas. Adults are tropical in distribution, whereas juveniles range into temperate waters. Hatchlings often float in masses of marine macroalgae in convergence zones.

VA (Accomack, Northampton & Virginia Beach Counties)

**Factors of Decline:**

Bycatch in fishing gear, direct killing of turtles and harvest of eggs, degradation and loss of foraging habitat, loss and alteration of nesting habitat, entanglement, ingestion of marine debris, disease, vessel strikes

**Best Management Practices:**

[Green Sea Turtle Management Summary via NatureServe](#)



[BMP's to protect sea turtles during in-situ burning operations for oil spill response](#)

**References:**

NatureServe. 2018. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available <http://explorer.natureserve.org>

National Oceanic and Atmospheric Administration [NOAA] Fisheries. (n.d.). Species Directory: Green Turtle. NOAA Fisheries. Retrieved from: <https://www.fisheries.noaa.gov/species/green-turtle>

U.S. Fish & Wildlife Services. (n.d.). Species profile for Green Sea Turtle (*Chelonia mydas*). Environmental Conservation Online System USFWS. Retrieved from: <https://ecos.fws.gov/ecp0/profile/speciesProfile?spcode=C00S>

<b>Common Name</b>	Bog Turtle	<b>Conservation Status</b>	Threatened (1997)
<b>Scientific Name</b>	<i>Clemmys muhlenbergii</i>	<b>Critical Habitat</b>	None currently designated
 <p>Photo credit: U.S. Fish &amp; Wildlife Service</p>		 <p>Photo credit: U.S. Fish &amp; Wildlife Service</p>	
<p><b>Physical Description:</b> At only about 4 inches long, the bog turtle is one of North America's smallest turtles. This species typically shows a bright yellow, orange, or red blotch on each side of the head. The nearly parallel sides of the upper shell (carapace) give bog turtles an oblong appearance when viewed from above.</p>		<p><b>Spatial Distribution:</b> Inhabit open, unpolluted emergent and scrub/shrub wetlands. These habitats are characterized by soft muddy bottoms, interspersed wet and dry pockets, vegetation dominated by low grasses and sedges, and a low volume of standing or slow-moving water which often forms a network of shallow pools and rivulets. Bog turtles prefer areas with ample sunlight. Eggs are often laid in elevated areas. Retreat into more densely vegetated areas from mid-September through mid-April.</p> <p><b>DE</b> (New Castle County), <b>MD</b> (Baltimore, Carroll, Cecil &amp; Harford Counties), <b>NJ</b> (Burlington, Camden, Cape May, Essex, Gloucester, Hunterdon, Mercer, Middlesex, Monmouth, Morris, Ocean, Passaic, Salem, Somerset, Sussex, Union &amp; Warren Counties) &amp; <b>PA</b> (Adams, Berks, Bucks, Carbon, Chester, Cumberland, Delaware, Lancaster, Lebanon, Lehigh, Monroe, Montgomery, Northampton, Schuylkill &amp; York Counties)</p>	
<p><b>Factors of Decline:</b> The greatest threats to the bog turtle are the loss, degradation, and fragmentation of its habitat from wetland alteration, development, pollution, invasive species, and natural vegetational succession.</p>		<p><b>Best Management Practices:</b> <a href="#">Bog Turtle BMP's via U.S. Fish &amp; Wildlife Service, New Jersey Field Office</a></p>	
<p><b>References:</b> U.S. Fish &amp; Wildlife Services. (2016). New Jersey Field Office: Bog Turtle [threatened]. FWS. Retrieved from: <a href="https://www.fws.gov/northeast/njfieldoffice/endangered/bogturtle.html#distribution">https://www.fws.gov/northeast/njfieldoffice/endangered/bogturtle.html#distribution</a></p>			

<b>Common Name</b>	Eastern Massasauga (Rattlesnake)	<b>Conservation Status</b>	Threatened (2016)
<b>Scientific Name</b>	<i>Sistrurus catenatus</i>	<b>Critical Habitat</b>	None currently designated



Photo credit: U.S. Fish & Wildlife Service

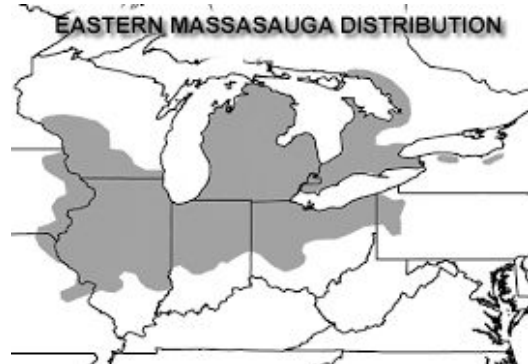


Photo credit: Purdue University

**Physical Description:**

Massasaugas are small snakes with thick bodies, heart-shaped heads and vertical pupils. The average length of an adult is about 2 feet. Adult massasaugas are gray or light brown with large, light-edged chocolate brown blotches on the back and smaller blotches on the sides. The snake's belly is marbled dark gray or black and there is a narrow, white stripe on its head. Its tail has several dark brown rings and is tipped by gray-yellow horny rattles. Young snakes have the same markings, but are more vividly colored.

**Spatial Distribution:**

Massasaugas live in wet areas including wet prairies, marshes and low areas along rivers and lakes. In many areas massasaugas also use adjacent uplands during part of the year. They often hibernate in crayfish burrows but may also be found under logs and tree roots or in small mammal burrows.

PA (Butler, Mercer & Venango Counties)

**Factors of Decline:**

Habitat loss is one of the primary factors in the decline. Draining wetlands for farms, roads, homes, and urban development has eliminated much of the massasauga habitat in many states.

**Best Management Practices:**


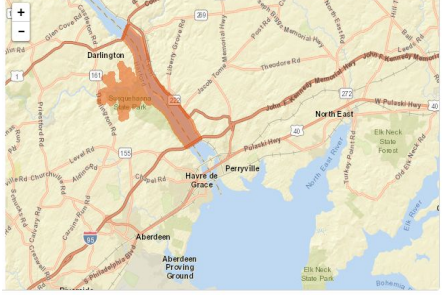
[Eastern Massasauga BMP's via Missouri Conservation Department](#)


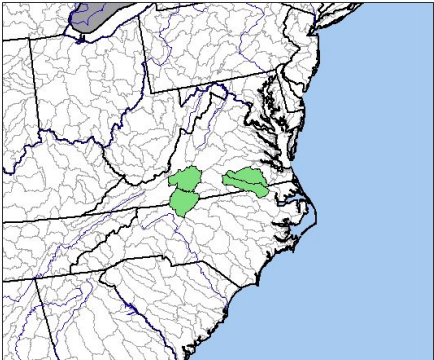
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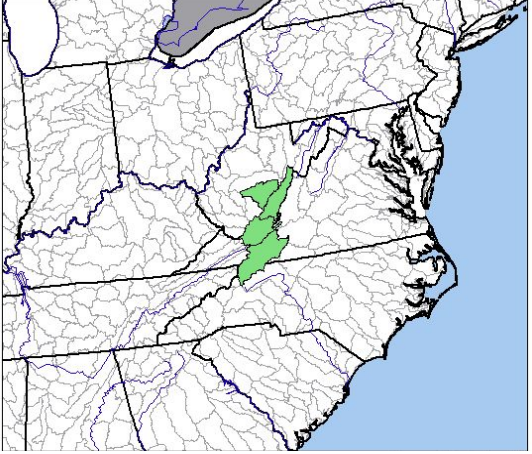
U.S. Fish & Wildlife Services. (n.d.). Species profile for Eastern Massasauga (*Sistrurus catenatus*). *Environmental Conservation Online System USFWS*. Retrieved from: <https://ecos.fws.gov/ecp0/profile/speciesProfile?slid=2202>

U.S. Fish & Wildlife Services. (2017). Pennsylvania Field Office: Eastern Massasauga Rattlesnake (*Sistrurus catenatus catenatus*). *FWS*. Retrieved from: <https://www.fws.gov/northeast/pafo/endangered/easternmassasauga.html>






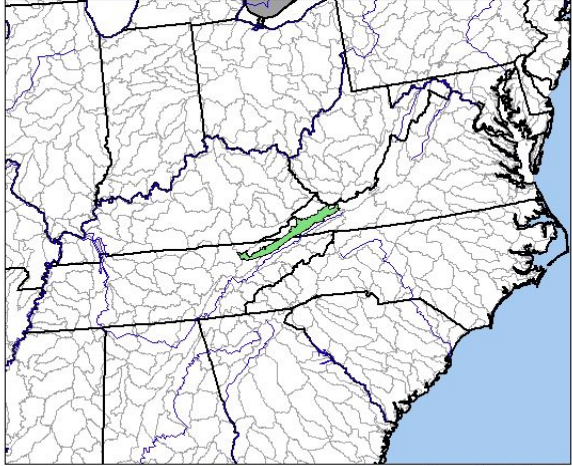
<b>Common Name</b>	Maryland Darter	<b>Conservation Status</b>	Endangered (1967)
<b>Scientific Name</b>	<i>Etheostoma sellare</i>	<b>Critical Habitat</b>	FR listing report ID 49 FR 34228 34232 (1984)
 <p>Photo credit: Maryland DNR</p>		 <p>Photo credit: U.S. Fish &amp; Wildlife Service</p>	
<p><b>Physical Description:</b> The Maryland darter is related to the yellow perch and walleye. It grows to just under three inches and has a relatively short life span averaging around three years. Reddish brown with 4 jet-black saddles extending obliquely down and forward to below the lateral line.</p>		<p><b>Spatial Distribution:</b> Habitat includes fast rocky riffles of creeks. As of the 1980s, this darter inhabited the first major riffle above tidewater in Deer Creek; it also used (particularly young and juveniles) adjacent pools. Lower Susquehanna River, Harford County, Maryland.</p> <p>MD (Cecil &amp; Harford Counties)</p>	
<p><b>Factors of Decline:</b> Habitat loss and degradation, possibly due to water quality degradation and effects of residential development in the watershed.</p>		<p><b>Best Management Practices:</b> <a href="#">Maryland Darter Management Plan via Maryland DNR</a></p>	
<p><b>References:</b> U.S. Fish &amp; Wildlife Services. (n.d.). Species profile for Maryland darter (<i>Etheostoma sellare</i>). <i>Environmental Conservation Online System USFWS</i>. Retrieved from: <a href="https://ecos.fws.gov/ecp0/profile/speciesProfile?slid=5135#crithab">https://ecos.fws.gov/ecp0/profile/speciesProfile?slid=5135#crithab</a> U.S. Fish &amp; Wildlife Services. (2011). Maryland darter (<i>Etheostoma sellare</i>). <i>FWS</i>. Retrieved from: <a href="https://www.fws.gov/northeast/pdf/MarylandDarter0511.pdf">https://www.fws.gov/northeast/pdf/MarylandDarter0511.pdf</a></p>			


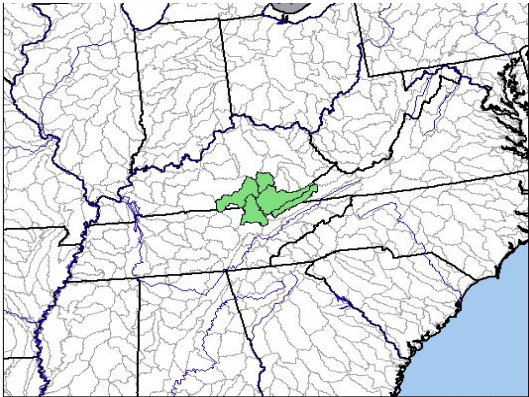
<b>Common Name</b>	Roanoke Logperch	<b>Conservation Status</b>	Endangered (1989)
<b>Scientific Name</b>	<i>Percina rex</i>	<b>Critical Habitat</b>	None currently designated
 <p>Photo credit: U.S. Fish &amp; Wildlife Service</p>		 <p>Photo credit: NatureServe</p>	
<p><b>Physical Description:</b> The Roanoke logperch is a large darter, growing to about 6 inches long. It has a bulbous snout, lateral blotches, back is scrawled, and most fins are strongly patterned. First dorsal fin has an orange band, particularly vivid in mature males. Spawns from mid April to early May.</p>		<p><b>Spatial Distribution:</b> Gravel and boulder runs of small to medium rivers. Typically this species occurs in warm, usually clear, small to medium rivers of moderate or somewhat low gradient; in riffles, runs, and pools with sandy to boulder-strewn bottoms. It inhabits streams that are mainly sandy or silty, and may occur only in gravelly or rocky areas</p> <p>VA (Bedford, Botetourt, Brunswick, Campbell, Carroll, Danville, Dinwiddie, Floyd, Franklin, Franklin, Greensville, Henry, Lunenburg, Lynchburg, Martinsville, Montgomery, Nottoway, Patrick, Pittsylvania, Prince Edward, Prince George, Roanoke, Roanoke, Salem, Southampton &amp; Sussex Counties)</p>	
<p><b>Factors of Decline:</b> Decline over the long term likely resulted from reservoir creation and widespread siltation caused by land development and agricultural activities. The upper Roanoke River population is threatened by ongoing urbanization, industrial development, water supply and flood control projects, and agricultural runoff in the upper basin.</p>		<p><b>Best Management Practices:</b> <a href="#">Roanoke Logperch Management Approach via U.S. Fish &amp; Wildlife Service, Virginia Field Office</a></p>	
<p><b>References:</b> U.S. Fish &amp; Wildlife Services. (n.d.). Species profile for Roanoke logperch (<i>Percina rex</i>). <i>Environmental Conservation Online System USFWS</i>. Retrieved from: <a href="https://ecos.fws.gov/ecp0/profile/speciesProfile?sld=1134">https://ecos.fws.gov/ecp0/profile/speciesProfile?sld=1134</a></p> <p>NatureServe. 2018. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Retrieved from: <a href="http://explorer.natureserve.org">http://explorer.natureserve.org</a></p>			

<b>Common Name</b>	Candy Darter	<b>Conservation Status</b>	Proposed Threatened
<b>Scientific Name</b>	<i>Etheostoma osburni</i>	<b>Critical Habitat</b>	None currently designated
 <p>Photo credit: U.S. Fish &amp; Wildlife Service</p>		 <p>Photo credit: NatureServe</p>	
<p><b>Physical Description:</b> The candy darter is small, measuring only 2-3 inches (55-86 millimeters) in length. Small, colorful, freshwater fish with vibrant teal, red and orange color patterns.</p>		<p><b>Spatial Distribution:</b> Habitat includes fast rubble riffles of small to medium rivers (Page and Burr 1991); swift water over stones and boulders in cool montane streams; rocky, typically clear, cold and warm, small to large creeks; adults generally occur in un-silted runs, riffles, and swift pockets of current in and around large rubble and boulders (Burkhead and Jenkins 1991); cool to warm waters of small streams to medium sized rivers in the Ridge and Valley Province of Virginia and West Virginia, and the Appalachian Plateau of West Virginia.</p> <p><b>VA</b> (Bland, Giles, Pulaski &amp; Wythe Counties) &amp; <b>WV</b> (Clay, Fayette, Greenbrier, Kanawha, McDowell, Mercer, Monroe, Nicholas, Pendleton, Pocahontas, Raleigh, Randolph, Summers, Webster &amp; Wyoming Counties)</p>	
<p><b>Factors of Decline:</b> Habitat loss, introduction of invasive species</p>		<p><b>Best Management Practices:</b> N/A</p>	
<p><b>References:</b> U.S. Fish &amp; Wildlife Services. (n.d.). Species profile for Candy darter (<i>Etheostoma osburni</i>). <i>Environmental Conservation Online System USFWS</i>. Retrieved from: <a href="https://ecos.fws.gov/ecp0/profile/speciesProfile?slid=1396">https://ecos.fws.gov/ecp0/profile/speciesProfile?slid=1396</a></p> <p>NatureServe. 2018. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Retrieved from: <a href="http://explorer.natureserve.org">http://explorer.natureserve.org</a></p>			





<b>Common Name</b>	Diamond Darter	<b>Conservation Status</b>	Endangered (2013)
<b>Scientific Name</b>	<i>Crystallaria cincotta</i>	<b>Critical Habitat</b>	FR listing report ID 78 FR 52363 52387 (2013)
 <p>Photo credit: U.S. Fish &amp; Wildlife Service</p>		 <p>Photo credit: U.S. Fish &amp; Wildlife Services</p>	
<p><b>Physical Description:</b> The diamond darter is a member of the Perch family (Percidae), a group characterized by the presence of a dorsal fin separated into two parts, one spiny and the other soft. The darters differ from other percids in being much smaller in overall size and having a more slender shape.</p>		<p><b>Spatial Distribution:</b> Habitat includes clean sand, gravel, and cobble runs of small to medium rivers. This darter has been collected from riffles and pools with &lt;1.5 meter depth, moderate flow, and sand, gravel, and cobble substrates.</p> <p>WV (Braxton, Calhoun, Clay, Kanawha, Nicholas, Pocahontas, Randolph, Roane &amp; Webster Counties)</p>	
<p><b>Factors of Decline:</b> Watershed is threatened with ongoing water quality degradation and habitat loss from activities such as coal mining, oil and gas development, siltation from these and other sources, inadequate sewage and wastewater treatment, and direct habitat loss and alterations. Invasive species have the potential to impact diamond darter habitat. The small size and restricted range of the remaining diamond darter population make it particularly susceptible to the effects of genetic inbreeding, as well as potential extirpation from spills and other catastrophic events.</p>		<p><b>Best Management Practices:</b> N/A</p>	
<p><b>References:</b> U.S. Fish &amp; Wildlife Services. (n.d.). Species profile for Diamond darter (<i>Crystallaria cincotta</i>). <i>Environmental Conservation Online System USFWS</i>. Retrieved from: <a href="https://ecos.fws.gov/ecp0/profile/speciesProfile?slid=6921">https://ecos.fws.gov/ecp0/profile/speciesProfile?slid=6921</a></p> <p>NatureServe. 2018. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Retrieved from: <a href="http://explorer.natureserve.org">http://explorer.natureserve.org</a></p>			

<b>Common Name</b>	Duskytail Darter	<b>Conservation Status</b>	Endangered (1993) & Experimental Population, Non-Essential (2007)
<b>Scientific Name</b>	<i>Etheostoma percnurum</i>	<b>Critical Habitat</b>	None currently designated
 <p>Photo credit: University of Kentucky Office for Environmental Programs Outreach Services</p>		 <p>Photo credit: NatureServe</p>	
<p><b>Physical Description:</b>  Drab, dark head; brown body; 10 -15 dark brown vertical bars on sides; white belly; as with all darters, two dorsal fins, the first with spiny rays, the second with soft rays. 2.25 - 2.5 inches long. Spawn from mid-April to mid-June.</p>		<p><b>Spatial Distribution:</b>  Large clear streams and moderate sized rivers; prefers pools one to four feet in depth located at the head of riffles with rocky and sandy river bottoms; areas with little or no siltation.</p> <p>VA (Buchanan, Dickenson, Lee, Norton, Russell, Scott, Smyth, Tazewell, Washington &amp; Wise Counties)</p>	
<p><b>Factors of Decline:</b>  Habitat loss, introduction of invasive species</p>		<p><b>Best Management Practices:</b>  <a href="#">Duskytail Darter Management Summary via NatureServe</a></p>	
<p><b>References:</b>  U.S. Fish &amp; Wildlife Services. (n.d.). Species profile for Duskytail darter (<i>Etheostoma percnurum</i>). <i>Environmental Conservation Online System USFWS</i>. Retrieved from: <a href="https://ecos.fws.gov/ecp0/profile/speciesProfile?sld=891">https://ecos.fws.gov/ecp0/profile/speciesProfile?sld=891</a></p> <p>NatureServe. 2018. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Retrieved from: <a href="http://explorer.natureserve.org">http://explorer.natureserve.org</a></p> <p>University of Kentucky. (n.d.). Duskytail Darter. <i>Office for Environmental Programs Outreach Services</i>. Retrieved from: <a href="https://oeapos.ca.uky.edu/content/duskytail-darter">https://oeapos.ca.uky.edu/content/duskytail-darter</a></p>			

<b>Common Name</b>	Blackside Dace	<b>Conservation Status</b>	Threatened (1987)
<b>Scientific Name</b>	<i>Phoxinus cumberlandensis</i>	<b>Critical Habitat</b>	None currently designated
 <p>Photo credit: NatureServe</p>		 <p>Photo credit: NatureServe</p>	
<p><b>Physical Description:</b>  Drab, dark head; brown body; 10 -15 dark brown vertical bars on sides; white belly; as with all darters, two dorsal fins, the first with spiny rays, the second with soft rays. 2.25 - 2.5 inches long. Spawn from mid-April to mid-June.</p>		<p><b>Spatial Distribution:</b>  This species inhabits small upland headwaters and creeks 2-5 meters wide where riffle and pool areas are about equal, and substrates are sand, sandstone, and shale (Burr and Warren 1986, Etnier and Starnes 1993). It occurs in pools with cover such as bedrock, rubble, undercut banks, or brush, and generally is associated with lush riparian vegetation, canopy cover greater than 70%, cool water, and unsilted conditions.</p> <p>VA (Dickenson, Lee, Norton, Russell, Scott, Washington &amp; Wise Counties)</p>	
<p><b>Factors of Decline:</b>  Threatened status is due primarily to impacts of siltation from coal mining, silviculture, agriculture, and road construction, and impacts of unregulated acid mine drainage and impoundments. Additional threats include channelization and non-point source pollution. Habitat degradation caused remaining population to be very small and isolated.</p>		<p><b>Best Management Practices:</b>  <a href="#">Blackside Dace Management Summary via NatureServe</a></p>	
<p><b>References:</b>  U.S. Fish &amp; Wildlife Services. (n.d.). Species profile for Blackside Dace (<i>Phoxinus cumberlandensis</i>). <i>Environmental Conservation Online System USFWS</i>. Retrieved from: <a href="https://ecos.fws.gov/ecp0/profile/speciesProfile?sld=4775">https://ecos.fws.gov/ecp0/profile/speciesProfile?sld=4775</a></p> <p>NatureServe. 2018. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Retrieved from: <a href="http://explorer.natureserve.org">http://explorer.natureserve.org</a></p>			



<b>Common Name</b>	Slender Chub	<b>Conservation Status</b>	Threatened (1977) & Experimental Population, Non-Essential (2007)
<b>Scientific Name</b>	<i>Erimystax cahni</i>	<b>Critical Habitat</b>	FR listing report ID 42 FR 47840 47845 (1977)
 <p data-bbox="168 821 482 840">Photo credit: U.S. Fish and Wildlife Services</p>		 <p data-bbox="824 821 1122 840">Photo credit: U.S. Fish &amp; Wildlife Services</p>	
<p data-bbox="168 873 467 905"><b>Physical Description:</b></p> <p data-bbox="168 911 797 1121">Elongate with a very long snout, barbeled mouth and dusky lateral stripe. Adults 2 - 3 ¼ inches long. Head and body are yellowish tan to brown dorsally, lateral stripe is sometimes green. Lower side and belly are silvery white; when held at some angles has violet iridescence.</p>		<p data-bbox="824 873 1105 905"><b>Spatial Distribution:</b></p> <p data-bbox="824 911 1453 1192">Habitat includes medium to fairly large, usually clear, warm rivers (30-125 m wide) of moderate gradient; this chub is mainly restricted to major bars and shoals of fine to medium gravel in moderate to swift currents (runs and riffles), occasionally in slow runs, at depths from 25 cm (rarely shallower) to at least 1 meter; usually it is found on large patches of pea grave.</p> <p data-bbox="824 1230 1435 1331">VA (Bland, Buchanan, Dickenson, Lee, Norton, Russell, Scott, Smyth, Tazewell, Washington, Wise &amp; Wythe Counties)</p>	
<p data-bbox="168 1365 435 1396"><b>Factors of Decline:</b></p> <p data-bbox="168 1402 773 1612">Habitat is threatened by siltation, dredging, pollution, water withdrawal, and impoundment. Coal silt from coal washing operations has degraded habitat in the Powell River; recovery of this species there depends on a reduction in coal silt runoff.</p>		<p data-bbox="824 1365 1224 1396"><b>Best Management Practices:</b></p> <p data-bbox="824 1402 878 1434">N/A</p>	
<p data-bbox="168 1684 337 1715"><b>References:</b></p> <p data-bbox="168 1722 1406 1778">U.S. Fish &amp; Wildlife Services. (n.d.). Species profile for Slender Chub (<i>Erimystax cahni</i>). <i>Environmental Conservation Online System USFWS</i>. Retrieved from: <a href="https://ecos.fws.gov/ecp0/profile/speciesProfile?slid=6637">https://ecos.fws.gov/ecp0/profile/speciesProfile?slid=6637</a></p> <p data-bbox="168 1803 1409 1860">NatureServe. 2018. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Retrieved from: <a href="http://explorer.natureserve.org">http://explorer.natureserve.org</a></p>			

<b>Common Name</b>	Spotfin Chub	<b>Conservation Status</b>	Threatened (1977) & Experimental Population, Non-Essential (2007)
<b>Scientific Name</b>	<i>Erimonax monachus</i>	<b>Critical Habitat</b>	FR listing report ID 42 FR 47840 47845(1977)



Photo credit: Conservation Fisheries

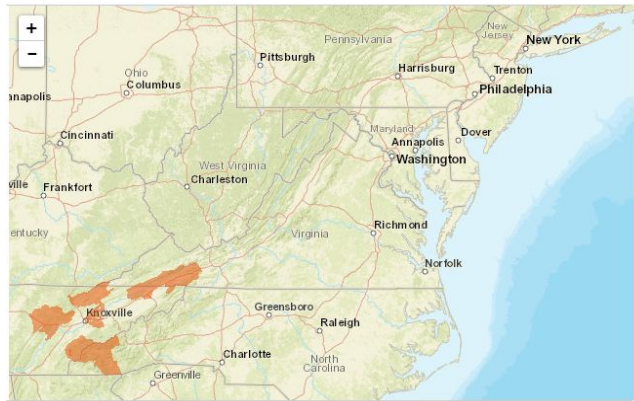


Photo credit: U.S. Fish & Wildlife Services

**Physical Description:**

The spotfin chub is a small minnow, reaching a maximum size of 5 inches in length. During the spawning season, males turn a brilliant turquoise-royal blue; while, juveniles and females remain olive along the back, silvery on the sides, and white along the belly. Scales are small and indistinct. All individuals have a distinctive black spot in the caudal region. The spot near the posterior margin of the dorsal fin is usually indistinct.

**Spatial Distribution:**

Cool and warm, typically clear, large creeks or medium-sized rivers of moderate gradient, in upland and montane areas, generally in or near moderate and swift currents over gravel to bedrock, rarely over sand or silt. Eggs are laid in stone cracks, crevices, or in the narrow interface of two touching rocks.

VA (Bland, Bristol, Grayson, Lee, Russell, Scott, Smyth, Tazewell & Washington Counties)

**Factors of Decline:**

Causes of decline include siltation, coal sedimentation, pollution, inundation by reservoir development, releases of cold water from reservoirs, stream channelization, and interspecific competition.

**Best Management Practices:**

N/A

**References:**

U.S. Fish & Wildlife Services. (n.d.). Species profile for Spotfin Chub (*Erimonax monachus*). *Environmental Conservation Online System USFWS*. Retrieved from: <https://ecos.fws.gov/ecp0/profile/speciesProfile?sld=1521>

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North Carolina Wildlife Resources Commission. (2018). Spotfin Chub. *NC Wildlife*. Retrieved from: <https://www.ncwildlife.org/Learning/Species/Fish/Spotfin-Chub#2525732-detailed-information>

<b>Common Name</b>	Yellowfin Madtom	<b>Conservation Status</b>	Threatened (1977) & Experimental Population, Non-Essential (2007)
<b>Scientific Name</b>	<i>Noturus flavipinnis</i>	<b>Critical Habitat</b>	None currently designated



Photo credit: U.S. Fish & Wildlife Services

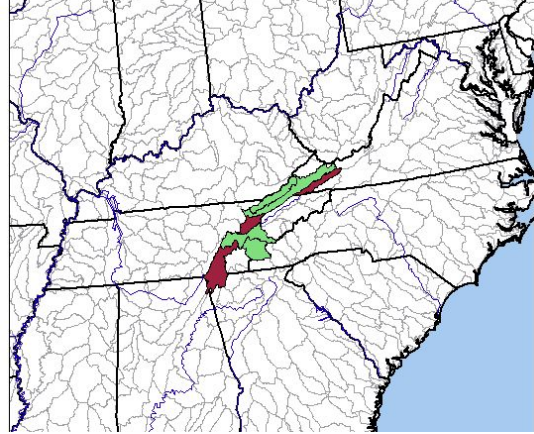


Photo credit: NatureServe

**Physical Description:**

Member of the catfish family, standard length of 115 mm. Dorsal area and fins have a yellowish tinge.

**Spatial Distribution:**

Habitat includes medium-sized and large creeks and small rivers that are unpolluted, warm or warm to cool, usually relatively unsilted (Powell River may be very silty), and of moderate to gentle gradient. This species generally occurs in slow pools and occasionally small backwaters off runs and riffles, rarely in runs. It is generally under cover (sticks, logs, leaf litter, undercut banks, tree roots, rocks, trash) during daylight hours. At night, it is often on the streambed in open clean gravel and rubble areas away from banks and riffles.

VA (Bland, Buchanan, Dickenson, Lee, Russell, Scott, Smyth, Tazewell, Washington & Wise Counties)

**Factors of Decline:**

Habitat loss via impoundments, chemical spills, mining, dredging, and pollution. Some reaches of Copper Creek, Virginia, have been impacted by heavy cutting of riparian brush and trees and by agricultural run-off.

**Best Management Practices:**


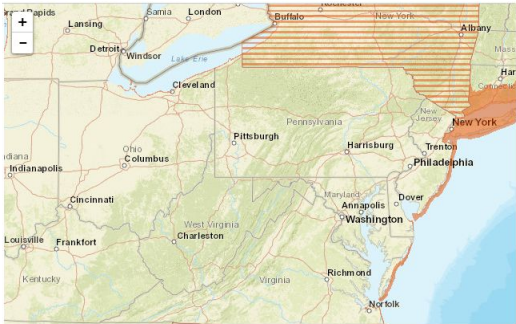
[Yellowfin Madtom Management Summary via NatureServe](#)


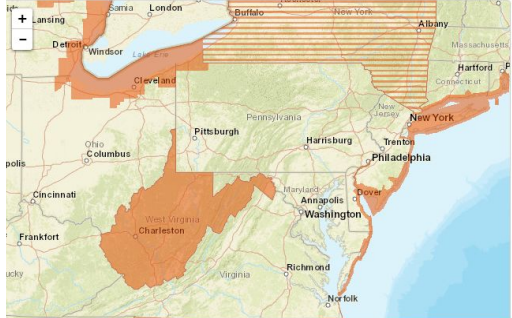
**References:**


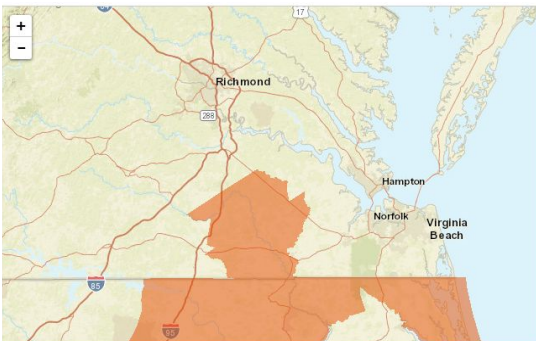
U.S. Fish & Wildlife Services. (n.d.). Species profile for Yellowfin madtom (*Noturus flavipinnis*). *Environmental Conservation Online System USFWS*. Retrieved from: <https://ecos.fws.gov/ecp0/profile/speciesProfile?slid=8565>

NatureServe. 2018. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Retrieved from: <http://explorer.natureserve.org>



<b>Common Name</b>	Piping Plover	<b>Conservation Status</b>	Endangered (1985) & Threatened (1985)
<b>Scientific Name</b>	<i>Charadrius melodus</i>	<b>Critical Habitat</b>	FR listing report ID 74 FR 23476 23600 (2009)
 <p>Photo credit: U.S. Fish &amp; Wildlife Services</p>		 <p>Photo credit: U.S. Fish &amp; Wildlife Services</p>	
<p><b>Physical Description:</b> Forehead, sides of head (including lores, underparts and collar around hindneck) plain white with a dark band across the front of the crown from eye-to-eye and black shoulder patches that often extend across the breast. Wings approximately 117 mm; tail 51 mm; weight 46-64 g (average 55 g); length averages about 17-18 cm.</p>		<p><b>Spatial Distribution:</b> Sandy upper beaches, especially where scattered grass tufts are present, and sparsely vegetated shores and islands of shallow lakes, ponds, rivers, and impoundments. Nests may also be built on sandy open flats among shells or cobble behind foredunes.</p> <p><b>DE</b> (Sussex), <b>MD</b> (Worcester), <b>NJ</b> (Atlantic, Cape May, Middlesex, Monmouth &amp; Ocean Counties), <b>VA</b> (Accomack, Hampton, Norfolk, Northampton, Poquoson, Portsmouth &amp; Virginia Beach Counties) &amp; <b>PA</b> (Erie)</p>	
<p><b>Factors of Decline:</b> Primary threats are destruction and degradation of summer and winter habitat, shoreline erosion, human disturbance of nesting and foraging birds, and predation.</p>		<p><b>Best Management Practices:</b> <a href="#">Piping Plover BMP's via U.S. Fish &amp; Wildlife Services, New Jersey Field Office</a></p>	
<p><b>References:</b> U.S. Fish &amp; Wildlife Services. (n.d.). Species profile for Piping plover (<i>Charadrius melodus</i>). <i>Environmental Conservation Online System USFWS</i>. Retrieved from: <a href="https://ecos.fws.gov/ecp0/profile/speciesProfile?slid=6039">https://ecos.fws.gov/ecp0/profile/speciesProfile?slid=6039</a></p> <p>NatureServe. 2018. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Retrieved from: <a href="http://explorer.natureserve.org">http://explorer.natureserve.org</a></p>			

<b>Common Name</b>	Red Knot	<b>Conservation Status</b>	Threatened (2015)
<b>Scientific Name</b>	<i>Calidris canutus rufa</i>	<b>Critical Habitat</b>	None currently designated
 <p>Photo credit: U.S. Fish &amp; Wildlife Services</p>	 <p>Photo credit: U.S. Fish &amp; Wildlife Services</p>		
<p><b>Physical Description:</b>          At 9 to 10 inches long, the red knot is a large, bulky sandpiper with a short, straight, black bill. During the breeding season, the legs are dark brown to black, and the breast and belly are a characteristic russet color that ranges from salmon-red to brick-red. Males are generally brighter shades of red, with a more distinct line through the eye. When not breeding, both sexes look alike—plain gray above and dirty white below with faint, dark streaking.</p>	<p><b>Spatial Distribution:</b>          Breeding habitats are elevated and sparsely vegetated ridges or slopes. They are often adjacent to wetlands and lake edges for feeding. Wintering and migration habitats are often muddy or sandy coastal areas, such as the mouths of bays and estuaries, and tidal flats.</p> <p><b>DE</b> (Kent, New Castle &amp; Sussex Counties), <b>MD</b> (Worcester), <b>NJ</b> (Atlantic, Burlington, Camden, Cape May, Cumberland, Gloucester, Middlesex, Monmouth, Salam &amp; Ocean Counties), <b>WV</b> (Barbour, Berkeley, Boone, Braxton, Brooke, Cabell, Calhoun, Clay, Doddridge, Fayette, Gilmer, Grant, Greenbrier, Hampshire, Hancock, Hardy, Harrison, Jackson, Jefferson, Kanawha, Lewis, Lincoln, Logan, Marion, Marshall, Mason, McDowell, Mercer, Mineral, Mingo, Monongalia, Monroe, Morgan, Nicholas, Ohio, Pendleton, Pleasants, Pocahontas, Preston, Putnam, Raleigh, Randolph, Ritchie, Roane, Summers, Taylor, Tucker, Tyler, Upshur, Wayne, Webster, Wetzel, Wirt, Wood &amp; Wyoming Counties) <b>VA</b> (Accomack, Northampton &amp; Virginia Beach Counties) &amp; <b>PA</b> (Erie)</p>		
<p><b>Factors of Decline:</b>          Reduction in food resources (horseshoe crabs)          Additional threats to flocks in winter habitat or migration stops include oil pollution, disturbance by humans, and habitat loss through reclamation for development.</p>	<p><b>Best Management Practices:</b>  <a href="#">Red Knot BMP's via U.S. Fish &amp; Wildlife Services, New Jersey Field Office</a></p>		
<p><b>References:</b>          U.S. Fish &amp; Wildlife Services. (n.d.). Species profile for Red knot (<i>Calidris canutus rufa</i>). <i>Environmental Conservation Online System USFWS</i>. Retrieved from: <a href="https://ecos.fws.gov/ecp0/profile/speciesProfile?sld=1864">https://ecos.fws.gov/ecp0/profile/speciesProfile?sld=1864</a></p> <p>NatureServe. 2018. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Retrieved from: <a href="http://explorer.natureserve.org">http://explorer.natureserve.org</a></p>			

<b>Common Name</b>	Red-Cockaded Woodpecker	<b>Conservation Status</b>	Endangered (1970)
<b>Scientific Name</b>	<i>Picoides borealis</i>	<b>Critical Habitat</b>	None currently designated
 <p>Photo credit: U.S. Fish &amp; Wildlife Services</p>	 <p>Photo credit: U.S. Fish &amp; Wildlife Services</p>		
<p><b>Physical Description:</b>  22 cm. Rather small black-and-white woodpecker with longish bill. Above black barred white. Below white with black spots on flanks. Black crown, nape and moustachial stripe border white cheeks and side of neck. Male has small red mark on the side of nape. Juvenile browner with variable extent of red on crown.</p>	<p><b>Spatial Distribution:</b>  Habitat consists of open, mature pine woodlands, rarely deciduous or mixed pine-hardwoods located near pine woodlands. Optimal habitat is characterized as a broad savanna with a scattered overstory of large pines and a dense groundcover containing a diversity of grass, forb, and shrub species.</p> <p>VA (Southampton &amp; Sussex Counties)</p>		
<p><b>Factors of Decline:</b>  Threatened by a loss of habitat (either gradually through poor management or rapidly through the outright destruction of old-growth forests), forest fragmentation, competition with other species for cavities, catastrophic events, and demographic and genetic processes affecting populations confined to isolated conservation areas.</p>	<p><b>Best Management Practices:</b>  <a href="#">Red-Cockaded Woodpecker Management Summary via NatureServe</a></p>		
<p><b>References:</b>  U.S. Fish &amp; Wildlife Services. (n.d.). Species profile for Red-cockaded woodpecker (<i>Picoides borealis</i>). <i>Environmental Conservation Online System USFWS</i>. Retrieved from: <a href="https://ecos.fws.gov/ecp0/profile/speciesProfile?sld=7614">https://ecos.fws.gov/ecp0/profile/speciesProfile?sld=7614</a></p> <p>NatureServe. 2018. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Retrieved from: <a href="http://explorer.natureserve.org">http://explorer.natureserve.org</a></p>			

<b>Common Name</b>	Roseate Tern	<b>Conservation Status</b>	Endangered (1987) & Threatened (1987)
<b>Scientific Name</b>	<i>Sterna dougallii dougallii</i>	<b>Critical Habitat</b>	None currently designated



Photo credit: U.S. Fish & Wildlife Services

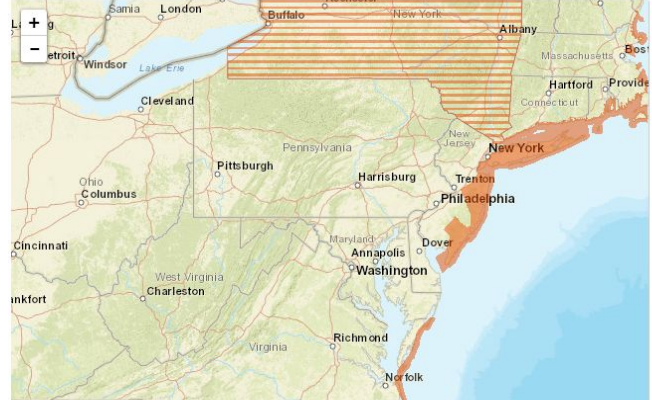


Photo credit: U.S. Fish & Wildlife Services

**Physical Description:**

The roseate tern is about 40 centimeters in length, with light-gray wings and back. Its first three or four primaries are black and so is its cap. The rest of the body is white, with a rosy tinge on the chest and belly during the breeding season. The tail is deeply forked, and the outermost streamers extend beyond the folded wings when perched. During the breeding season the basal three-fourths of the otherwise entirely black bill and legs turn orange-red.

**Spatial Distribution:**

Offshore islands free of dense woody vegetation  
 Estuarine Habitat(s): Bay/sound, Lagoon, River mouth/tidal river, Tidal flat/shore  
 Terrestrial Habitat(s): Sand/dune

**NJ** (Atlantic, Cape May, Monmouth & Ocean Counties) & **VA** (Accomack, Northampton & Virginia Beach Counties)

**Factors of Decline:**

Disturbance from humans and associated activities, predation, habitat modification, overfishing, and sea level rise.

**Best Management Practices:**

[Roseate Tern BMP's via U.S. Fish & Wildlife Services, Maine Field Office](#)



**References:**


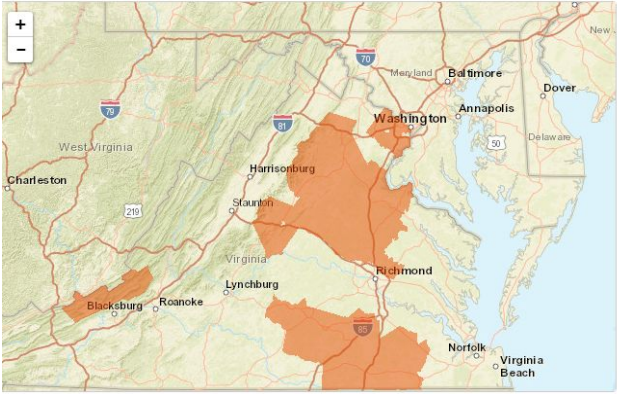
U.S. Fish & Wildlife Services. (n.d.). Species profile for Roseate tern (*Sterna dougallii dougallii*). *Environmental Conservation Online System USFWS*. Retrieved from: <https://ecos.fws.gov/ecp0/profile/speciesProfile?slid=2083>


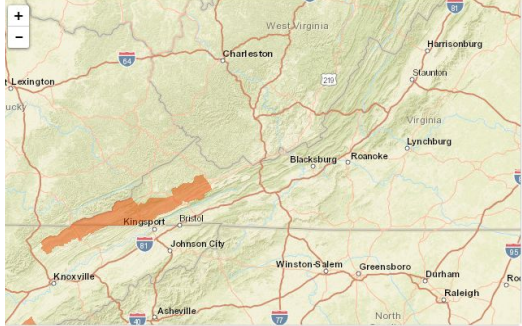
NatureServe. 2018. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Retrieved from: <http://explorer.natureserve.org>


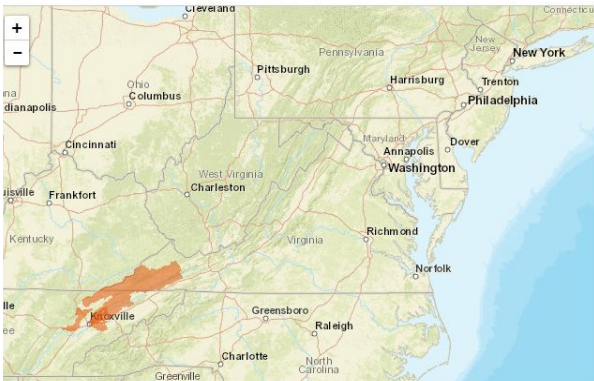
U.S. Fish & Wildlife Services. (2017). Maine Field Office: Roseate tern (*Sterna dougallii*) - Threatened. FWS. Retrieved from: [https://www.fws.gov/mainefieldoffice/Roseate\\_tern.html](https://www.fws.gov/mainefieldoffice/Roseate_tern.html)



<b>Common Name</b>	Dwarf Wedgemussel	<b>Conservation Status</b>	Endangered (1990)
<b>Scientific Name</b>	<i>Alasmidonta heterodon</i>	<b>Critical Habitat</b>	None currently designated
 <p data-bbox="168 774 464 793">Photo credit: U.S. Fish &amp; Wildlife Services</p>		 <p data-bbox="842 774 1138 793">Photo credit: U.S. Fish &amp; Wildlife Services</p>	
<p data-bbox="168 831 464 863"><b>Physical Description:</b></p> <p data-bbox="168 867 805 1041">A small (45mm length &amp; 25mm high) freshwater mussel with a trapezoidal-shaped shell. The small size, roundly pointed postero-basal margin, and reversed lateral hinge teeth readily distinguish this species.</p>		<p data-bbox="842 831 1117 863"><b>Spatial Distribution:</b></p> <p data-bbox="842 867 1471 1115">Typically, this species is found in shallow to deep quick running water on cobble, fine gravel, or on firm silt or sandy bottoms. Other habitats included are amongst submerged aquatic plants, and near stream banks underneath overhanging tree limbs. USFWS (1993) states the species commonly lives on muddy sand, sand, and gravel bottoms in creeks and rivers of various sizes. It requires areas of slow to moderate current, good water quality, and little silt deposits.</p> <p data-bbox="842 1146 1463 1503"><b>MD</b> (Caroline, Charles, Queen Anne's, St. Mary's, &amp; Talbot Counties), <b>NJ</b> (Hunterdon, Morris, Passaic, Sussex &amp; Warren Counties), <b>PA</b> (Monroe, Northampton, Pike &amp; Wayne Counties) &amp; <b>VA</b> (Albemarle, Brunswick, Caroline, Culpeper, Dinwiddie, Emporia, Essex, Fauquier, Fluvanna, Franklin, Fredericksburg, Gloucester, Goochland, Greene, Greensville, Hanover, King and Queen, King George, King William, Lancaster, Louisa, Lunenburg, Madison, Middlesex, New Kent, Northumberland, Nottoway, Orange, Page, Petersburg, Prince Edward, Prince George, Prince William, Rappahannock, Richmond, Rockingham, Southampton, Spotsylvania, Stafford, Sussex, Warren &amp; Westmoreland Counties)</p>	
<p data-bbox="168 1539 431 1570"><b>Factors of Decline:</b></p> <p data-bbox="168 1575 805 1713">Chemical and organic pollution, siltation, removal of stream bank vegetation, and impounding and regulating water flow of major rivers, as well as poor land use practices and urbanization in proximity. The largest threat is damming and channelization of rivers throughout the species' range.</p>		<p data-bbox="842 1539 1235 1570"><b>Best Management Practices:</b></p> <p data-bbox="842 1575 1357 1625"><a href="#">Dwarf Wedgemussel Management Summary via NatureServe</a></p> <p data-bbox="842 1656 1386 1707"><a href="#">Dwarf Wedgemussel BMP's via U.S. Fish &amp; Wildlife Services, New Jersey Field Office</a></p>	
<p data-bbox="168 1745 334 1776"><b>References:</b></p> <p data-bbox="168 1780 1446 1822">U.S. Fish &amp; Wildlife Services. (n.d.). Species profile for Dwarf wedgemussel (<i>Alasmidonta heterodon</i>). <i>Environmental Conservation Online System USFWS</i>. Retrieved from: <a href="https://ecos.fws.gov/ecp0/profile/speciesProfile?slid=784">https://ecos.fws.gov/ecp0/profile/speciesProfile?slid=784</a></p> <p data-bbox="168 1843 1422 1885">NatureServe. 2018. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Retrieved from: <a href="http://explorer.natureserve.org">http://explorer.natureserve.org</a></p>			

<b>Common Name</b>	Yellow Lance	<b>Conservation Status</b>	Threatened (2018)
<b>Scientific Name</b>	<i>Elliptio lanceolata</i>	<b>Critical Habitat</b>	None currently designated
 <p>Photo credit: U.S. Fish &amp; Wildlife Services</p>		 <p>Photo credit: U.S. Fish &amp; Wildlife Services</p>	
<p><b>Physical Description:</b>  The Yellow Lance is a bright yellow elongate mussel with a shell over twice as long as tall, usually not more than 86mm (3.4 inches) in length. Its periostracum usually has a waxy appearance with brownish growth rests and rarely ever has rays. The interior nacre is usually an iridescent blue color, and usually has white or salmon color on the anterior half of the shell. The posterior ridge is distinctly rounded and curves dorsally toward the posterior end. The lateral teeth are long, with two in the left valve and one in the right valve; each valve has two pseudocardinal teeth, with the posterior one on the left valve and the anterior one on the right valve being vestigial.</p>		<p><b>Spatial Distribution:</b>  The Yellow Lance is a sand-loving species often found buried deep in clean, coarse to medium sand and sometimes migrating with shifting sands, although it has also been found in gravel substrates. Yellow Lances are often found in sand at the downstream end of stable sand/gravel bars, and sometimes near the waters edge within inches of exposed substrate.</p> <p>VA (Albemarle, Arlington, Brunswick, Caroline, Craig, Culpeper, Dinwiddie, Emporia, Fairfax, Falls Church, Fauquier, Fredericksburg, Giles, Greenville, Hanover, King George, Louisa, Lunenburg, Madison, Nottoway, Orange, Prince Edward, Rappahannock, Southampton, Spotsylvania, Stafford &amp; Sussex Counties)</p>	
<p><b>Factors of Decline:</b>  Can not tolerate fine sediment and chemical pollution (habitat degradation)</p>		<p><b>Best Management Practices:</b>  <a href="#">Yellow Lance BMP's via U.S. Fish &amp; Wildlife Services Region 4</a></p>	
<p><b>References:</b>  U.S. Fish &amp; Wildlife Services. (n.d.). Species profile for Yellow lance (<i>Elliptio lanceolata</i>). <i>Environmental Conservation Online System USFWS</i>. Retrieved from: <a href="https://ecos.fws.gov/ecp0/profile/speciesProfile?slid=4511">https://ecos.fws.gov/ecp0/profile/speciesProfile?slid=4511</a></p> <p>NatureServe. 2018. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Retrieved from: <a href="http://explorer.natureserve.org">http://explorer.natureserve.org</a></p>			

<b>Common Name</b>	Appalachian Monkeyface (pearlymussel)	<b>Conservation Status</b>	Endangered (1976) & Experimental Population, Non-Essential (2007)
<b>Scientific Name</b>	<i>Quadrula sparsa</i>	<b>Critical Habitat</b>	None currently designated
 <p>Photo credit: U.S. Fish &amp; Wildlife Services</p>		 <p>Photo credit: U.S. Fish &amp; Wildlife Services</p>	
<p><b>Physical Description:</b> A medium sized (7 cm) freshwater mussel with a yellow-green or brown shell that is marked with strong concentric growth rings, tubercles, and small greenish triangles or chevrons.</p>		<p><b>Spatial Distribution:</b> This species inhabits fast-flowing, headwaters sections of rivers in shallow riffles and runs.  VA (Buchanan, Dickenson, Lee, Russell, Scott, Tazewell, Washington &amp; Wise Counties)</p>	
<p><b>Factors of Decline:</b> Threats include impoundment (for flood control, navigation, hydroelectric power, and recreation), siltation (due to strip mining, coal washing, dredging, farming, logging, and road construction), and pollution (municipal, agricultural, and industrial waste discharges, chemical spills).</p>		<p><b>Best Management Practices:</b> N/A</p>	
<p><b>References:</b> U.S. Fish &amp; Wildlife Services. (n.d.). Species profile for Appalachian monkeyface (<i>Quadrula sparsa</i>). <i>Environmental Conservation Online System USFWS</i>. Retrieved from: <a href="https://ecos.fws.gov/ecp0/profile/speciesProfile?sld=7154">https://ecos.fws.gov/ecp0/profile/speciesProfile?sld=7154</a>  NatureServe. 2018. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Retrieved from: <a href="http://explorer.natureserve.org">http://explorer.natureserve.org</a>  U.S. Fish &amp; Wildlife Services. (2011). Appalachian Monkeyface (pearlymussel) <i>Quadrula sparsa</i>. FWS. Retrieved from: <a href="https://www.fws.gov/northeast/pdf/MonkeyfaceMussel.pdf">https://www.fws.gov/northeast/pdf/MonkeyfaceMussel.pdf</a></p>			

<b>Common Name</b>	Birdwing Pearlymussel	<b>Conservation Status</b>	Endangered (1976) & Experimental Population, Non-Essential (2007)
<b>Scientific Name</b>	<i>Lemiox rimosus</i>	<b>Critical Habitat</b>	None currently designated
 <p>Photo credit: Virginia Department of Game &amp; Inland Fisheries</p>		 <p>Photo credit: U.S. Fish &amp; Wildlife Services</p>	
<p><b>Physical Description:</b> A small (to 5 cm) freshwater mussel with an olive-green shell.</p>		<p><b>Spatial Distribution:</b> This species is almost always found in riffle areas with stable, sand and gravel substrates in moderate to fast currents in small to medium sized rivers.</p> <p>VA (Buchanan, Dickenson, Lee, Norton, Russell, Scott, Tazewell, Washington &amp; Wise Counties)</p>	
<p><b>Factors of Decline:</b> Alteration and destruction of stream habitats due to impoundment, siltation from strip mining, coal washing, dredging, farming, logging and road construction. Water pollution and invasive species.</p>		<p><b>Best Management Practices:</b> N/A</p>	
<p><b>References:</b> U.S. Fish &amp; Wildlife Services. (n.d.). Species profile for Birdwing pearlymussel (<i>Lemiox rimosus</i>). <i>Environmental Conservation Online System USFWS</i>. Retrieved from: <a href="https://ecos.fws.gov/ecp0/profile/speciesProfile?sld=6636">https://ecos.fws.gov/ecp0/profile/speciesProfile?sld=6636</a></p> <p>NatureServe. 2018. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Retrieved from: <a href="http://explorer.natureserve.org">http://explorer.natureserve.org</a></p>			



<b>Common Name</b>	Clubshell	<b>Conservation Status</b>	Endangered (1993) & Experimental Population, Non-Essential (2001)
<b>Scientific Name</b>	<i>Pleurobema clava</i>	<b>Critical Habitat</b>	None currently designated



Photo credit: U.S. Fish & Wildlife Services

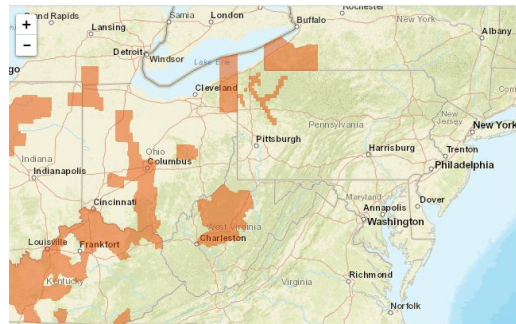


Photo credit: U.S. Fish & Wildlife Services

**Physical Description:**

The clubshell is a small to medium size (up to 3 inches long) freshwater mussel. Its shell exterior is yellow to brown with bright green blotchy rays and shell interior is typically white. The shell is wedge shaped and solid, with a pointed and fairly high umbo.

**Spatial Distribution:**

It is found mostly in sand and fine gravel, and is deeply buried. Individuals completely buried with the posterior shell margin facing up in sand/gravel substrate in riffle/run situations in less than 1.5 feet of water. This species is generally found in clean, coarse sand and gravel in runs, often just downstream of a riffle, and cannot tolerate mud or slackwater conditions.

**PA** (Armstrong, Butler, Clarion, Crawford, Erie, Forest, Mercer, Venango & Warren Counties) & **WV** (Barbour, Braxton, Calhoun, Clay, Doddridge, Gilmer, Harrison, Jackson, Kanawha, Lewis, Marion, Nicholas, Pleasants, Ritchie, Roane, Taylor, Tyler, Upshur, Webster, Wetzel, Wirt & Wood Counties)

**Factors of Decline:**

Siltation (from agriculture, construction, and forestry runoff), impoundment (including dam construction and maintenance), instream sand and gravel mining, pollutants (pesticides and fertilizers, heavy metals, ammonia from wastewater, acid-mine runoff, and invasive species (zebra mussel, quagga mussel). The species is particularly vulnerable to siltation, which clogs the substrate interstices and suffocates the animal.


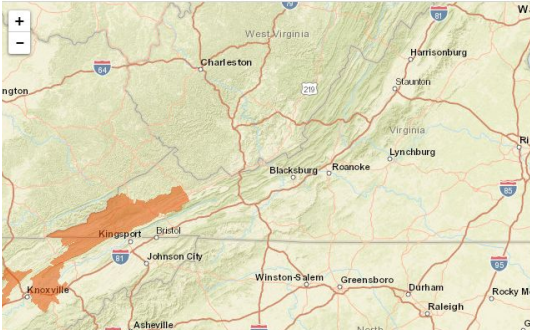
**Best Management Practices:**

[Clubshell Management Plan via Michigan State University: Michigan Natural Features Inventory](#)

**References:**

U.S. Fish & Wildlife Services. (n.d.). Species profile for Clubshell (*Pleurobema clava*). *Environmental Conservation Online System USFWS*. Retrieved from: <https://ecos.fws.gov/ecp0/profile/speciesProfile?sld=3789>

NatureServe. 2018. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Retrieved from: <http://explorer.natureserve.org>

<b>Common Name</b>	Cracking Pearlymussel	<b>Conservation Status</b>	Endangered (1989) & Experimental Population, Non-Essential (2007)
<b>Scientific Name</b>	<i>Hemistena lata</i>	<b>Critical Habitat</b>	None currently designated
 <p>Photo credit: U.S. Fish &amp; Wildlife Services</p>		 <p>Photo credit: U.S. Fish &amp; Wildlife Services</p>	
<p><b>Physical Description:</b> Freshwater mussel</p>		<p><b>Spatial Distribution:</b> This species is abundant in sand, gravel, and cobble substrates in swift currents or mud and sand in slower currents.</p> <p>VA (Buchanan, Dickenson, Lee, Norton, Russell, Scott, Tazewell, Washington &amp; Wise Counties)</p>	
<p><b>Factors of Decline:</b> Impoundments, siltation and pollution leading to water quality and habitat deterioration. Inadequate sewage treatment, coal mining, oil and gas drilling and poor land-use practices.</p>		<p><b>Best Management Practices:</b> N/A</p>	
<p><b>References:</b> U.S. Fish &amp; Wildlife Services. (n.d.). Species profile for Cracking pearlymussel (<i>Hemistena lata</i>). <i>Environmental Conservation Online System USFWS</i>. Retrieved from: <a href="https://ecos.fws.gov/ecp0/profile/speciesProfile?slid=4130">https://ecos.fws.gov/ecp0/profile/speciesProfile?slid=4130</a></p> <p>NatureServe. 2018. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Retrieved from: <a href="http://explorer.natureserve.org">http://explorer.natureserve.org</a></p>			

<b>Common Name</b>	Cumberland Bean (pearlymussel)	<b>Conservation Status</b>	Endangered (1976) & Experimental Population, Non-Essential (2007)
<b>Scientific Name</b>	<i>Villosa trabalis</i>	<b>Critical Habitat</b>	None currently designated



Photo credit: U.S. Fish & Wildlife Services: Raleigh Field Office

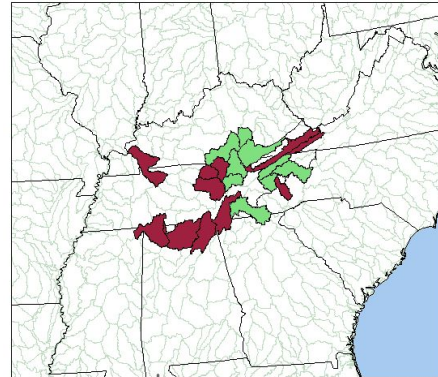


Photo credit: NatureServe

**Physical Description:**

The Cumberland bean is a small to medium sized freshwater mussel with relatively thick, elongated, oval shells. The shells of the females are somewhat more rounded and slightly larger (maximum about 55 millimeters or 2.2 inches long). The periostracum (outer shell surface) is smooth (no ridges or bumps) and somewhat shiny; it is olive green, yellowish brown, or blackish with fine wavy dark green or blackish rays. However, these rays are often difficult to see unless the shell surface is cleaned. The nacre (inside shell surface) is bluish white or white with a bluish iridescence towards posterior end of the shell.

**Spatial Distribution:**

The Cumberland bean pearlymussel inhabits small rivers and streams in fast riffles with gravel or sand and gravel substrate. Individuals have been found in riffle and run habitat areas with shallow water depths (less than one meter) and clean, stable substrate. Individuals can often be found in transitional zones between sand and gravel substrates.

VA (Bland, Buchanan, Dickenson, Lee, Norton, Russell, Scott, Smyth, Tazewell, Washington, Wythe & Wise Counties)

**Factors of Decline:**

Reasons for decline include impoundment (for flood control, navigation, hydroelectric power production, and recreation), siltation (due to strip mining, coal washing, dredging, farming, logging, and road construction), and pollution (municipal, agricultural, and industrial waste discharges; such as coal mine acids, gravel dredging, fertilizers, pesticides, industrial spills).

**Best Management Practices:**

[Cumberland Bean \(pearlymussel\) Recovery Plan via U.S. Fish & Wildlife Services](#)

**References:**

U.S. Fish & Wildlife Services. (n.d.). Species profile for Cumberland bean (*Villosa trabalis*). *Environmental Conservation Online System USFWS*. Retrieved from: <https://ecos.fws.gov/ecp0/profile/speciesProfile?sld=6061>

NatureServe. 2018. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Retrieved from: <http://explorer.natureserve.org>

U.S. Fish & Wildlife Services. (2017). Cumberland bean (*Villosa trabalis*). *Raleigh Ecological Services Field Office FWS*. Retrieved from: [https://www.fws.gov/raleigh/species/es\\_cumberland\\_bean.html](https://www.fws.gov/raleigh/species/es_cumberland_bean.html)



<b>Common Name</b>	Cumberland Monkeyface (pearly mussel)	<b>Conservation Status</b>	Endangered (1976) & Experimental Population, Non-Essential (2007)
<b>Scientific Name</b>	<i>Quadrula intermedia</i>	<b>Critical Habitat</b>	None currently designated



Photo credit: Wikipedia

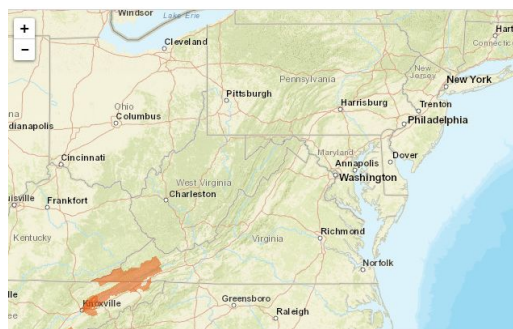


Photo credit: U.S. Fish & Wildlife Services

**Physical Description:**

A medium-size freshwater mussel or bivalve mollusk with a greenish-yellow to yellowish-green shell that darkens with age.

**Spatial Distribution:**

This species inhabits shallow riffle and shoal areas of headwater streams and bigger rivers. It prefers clean, fast-flowing water in shoal conditions, and has never been found in the ponded stretches of rivers, nor is it known from small streams. It has been found living in a sand and gravel substrate in 6 inches to 2 feet of water.

VA (Bristol, Buchanan, Dickenson, Lee, Russell, Scott, Smyth, Tazewell, Washington & Wise Counties)

**Factors of Decline:**

Threats include impoundment (for flood control, navigation, hydroelectric power production, and recreation) including Norris Dam and Columbia Dam, siltation (due to strip mining, coal washing, dredging, farming, logging, and road construction), and pollution (municipal, agricultural, and industrial) from sawdust (logging), coal mine acids, toxic wastes, gravel dredging, fertilizers, pesticides, chemical spills and discharges.


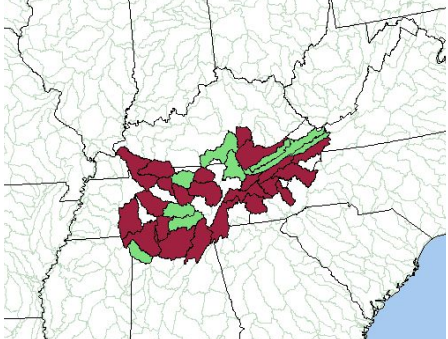
**Best Management Practices:**

[Cumberland Monkeyface Management Summary via NatureServe](#)

**References:**

U.S. Fish & Wildlife Services. (n.d.). Species profile for Cumberland monkeyface (*Quadrula intermedia*). *Environmental Conservation Online System USFWS*. Retrieved from: <https://ecos.fws.gov/ecp0/profile/speciesProfile?slid=6999>

NatureServe. 2018. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Retrieved from: <http://explorer.natureserve.org>

<b>Common Name</b>	Cumberlandian Combshell	<b>Conservation Status</b>	Endangered (1997) & Experimental Population, Non-Essential (2007)
<b>Scientific Name</b>	<i>Epioblasma brevidens</i>	<b>Critical Habitat</b>	FR listing report ID 69 FR 53136 53180 (2004)
 <p data-bbox="168 827 467 846">Photo credit: U.S. Fish &amp; Wildlife Services</p>		 <p data-bbox="857 827 1042 846">Photo credit: NatureServe</p>	
<p data-bbox="168 877 467 909"><b>Physical Description:</b></p> <p data-bbox="168 915 829 1125">A freshwater mussel that has a yellow to tawny brown shell with narrow green, broken rays. The broad, yellowish shell with broken rays and the distinctive marsupial expansion of the female distinguish this species from most other mussels in its range.</p>		<p data-bbox="857 877 1138 909"><b>Spatial Distribution:</b></p> <p data-bbox="857 915 1479 1230">The habitat ranges from large creeks to large rivers, in substrates ranging from coarse sand to mixtures of gravel, cobble, and boulder-sized particles. The mussel tends to occur at depths of less than one meter, although the relict (and presumably non-reproducing) populations now occur in considerably deeper water. Inhabits medium-sized streams to large rivers on shoals and riffles in coarse sand, gravel, cobble, and boulders and is not associated with small stream habitats.</p> <p data-bbox="857 1266 1425 1329">VA (Buchanan, Dickenson, Lee, Russell, Scott, Smyth, Tazewell, Washington &amp; Wise Counties)</p>	
<p data-bbox="168 1365 435 1396"><b>Factors of Decline:</b></p> <p data-bbox="168 1402 813 1717">Habitat alteration via impoundments, channelization, pollution, and sedimentation that have altered or eliminated those habitats that are essential to the long-term viability of many riverine mussel populations. Impoundments result in the elimination of riffle and shoal habitats, disruption of a river's ecological processes, elimination of current and the covering of rocky and sand substrates by fine sediments, and alteration of downstream water quality and riverine habitat.</p>		<p data-bbox="857 1365 1258 1396"><b>Best Management Practices:</b></p> <p data-bbox="857 1402 1386 1465"><a href="#">Cumberlandian Combshell Management Summary via NatureServe</a></p>	
<p data-bbox="168 1749 337 1780"><b>References:</b></p> <p data-bbox="168 1787 1409 1829">U.S. Fish &amp; Wildlife Services. (n.d.). Species profile for Cumberlandian combshell (<i>Epioblasma brevidens</i>). <i>Environmental Conservation Online System</i> USFWS. Retrieved from: <a href="https://ecos.fws.gov/ecp0/profile/speciesProfile?slid=3119">https://ecos.fws.gov/ecp0/profile/speciesProfile?slid=3119</a></p> <p data-bbox="168 1850 1425 1892">NatureServe. 2018. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Retrieved from: <a href="http://explorer.natureserve.org">http://explorer.natureserve.org</a></p>			

<b>Common Name</b>	Dromedary Pearlymussel	<b>Conservation Status</b>	Endangered (1976) & Experimental Population, Non-Essential (2007)
<b>Scientific Name</b>	<i>Dromus dromas</i>	<b>Critical Habitat</b>	None currently designated



Photo credit: U.S. Fish & Wildlife Services



Photo credit: U.S. Fish & Wildlife Services

**Physical Description:**

The dromedary pearlymussel is a medium-sized (reaching up to 90 mm in length) freshwater mussel with a yellowish green shell with two sets of broken green rays.

**Spatial Distribution:**

This is a riffle dwelling species occurring at shoals with sand and gravel and moderate current velocities, but also found in deeper, slower moving water in Tennessee. It is most often observed in clean, fast-flowing water in substrates that contain relatively firm rubble, gravel, and stable, clean substrates.

VA (Lee, Scott & Wise Counties)

**Factors of Decline:**

Impoundments, siltation and pollution leading to water quality and habitat deterioration inadequate sewage treatment, coal mining, oil and gas drilling and poor land-use practices.

**Best Management Practices:**

N/A


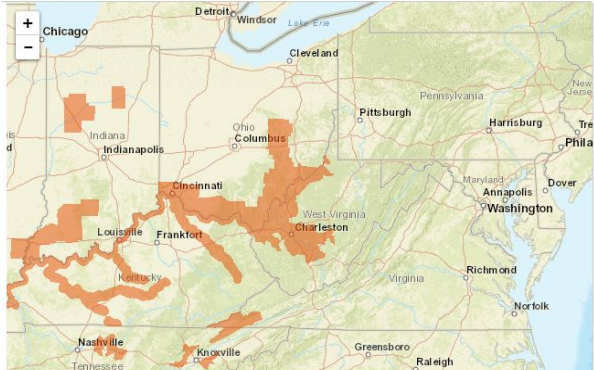
**References:**


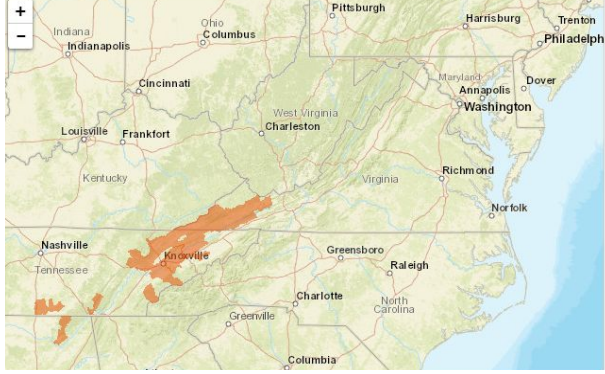
U.S. Fish & Wildlife Services. (n.d.). Species profile for Dromedary pearlymussel (*Dromus dromas*). *Environmental Conservation Online System USFWS*. Retrieved from: <https://ecos.fws.gov/ecp0/profile/speciesProfile?slid=6377>


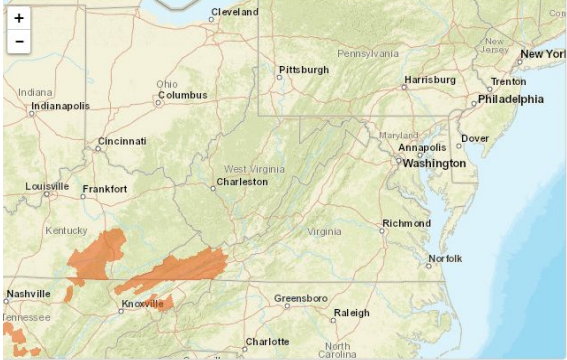
NatureServe. 2018. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Retrieved from: <http://explorer.natureserve.org>

Nuclear Regulatory Commission. (2010). Dromedary Pearlymussel. *FWS*. Retrieved from: <https://www.nrc.gov/docs/ML1219/ML12192A110.pdf>



<b>Common Name</b>	Fanshell	<b>Conservation Status</b>	Endangered (1990) & Experimental Population, Non-Essential (2007)
<b>Scientific Name</b>	<i>Cyprogenia stegaria</i>	<b>Critical Habitat</b>	None currently designated
 <p data-bbox="168 835 464 856">Photo credit: U.S. Fish &amp; Wildlife Services</p>		 <p data-bbox="857 835 1153 856">Photo credit: U.S. Fish &amp; Wildlife Services</p>	
<p data-bbox="168 884 464 919"><b>Physical Description:</b></p> <p data-bbox="168 926 824 1136">Rounded in shape with numerous pustules, elevated growth lines, and broken green rays. Length to 3 inches. Pseudocardinal teeth relatively large and serrated; two in the left valve, one in the right. Lateral teeth roughened, straight to slightly curved, heavy and very short.</p>		<p data-bbox="857 884 1136 919"><b>Spatial Distribution:</b></p> <p data-bbox="857 926 1474 1062">Characteristic habitat is medium to large streams. It has been found in river habitats with gravel substrates and a strong current, in both deep and shallow water.</p> <p data-bbox="857 1104 1474 1314"><b>VA</b> (Lee, Scott &amp; Wise Counties) &amp; <b>WV</b> (Boone, Cabell, Clay, Doddridge, Fayette, Jackson, Kanawha, Lincoln, Marshall, Mason, Nicholas, Pleasants, Putnam, Raleigh, Ritchie, Roane, Tyler, Wayne, Webster, Wetzel, Wirt &amp; Wood Counties)</p>	
<p data-bbox="168 1346 431 1381"><b>Factors of Decline:</b></p> <p data-bbox="168 1388 797 1524">Siltation, drainage of bottomland lakes, swamps, and prairie marshes, desiccation during drought, species introductions, pollution, impoundments, and increased water temperatures.</p>		<p data-bbox="857 1346 1260 1381"><b>Best Management Practices:</b></p> <p data-bbox="857 1388 1328 1451"><a href="#">Fanshell Management Summary via NatureServe</a></p>	
<p data-bbox="168 1619 334 1654"><b>References:</b></p> <p data-bbox="168 1661 1471 1713">U.S. Fish &amp; Wildlife Services. (n.d.). Species profile for Fanshell (<i>Cyprogenia stegaria</i>). <i>Environmental Conservation Online System USFWS</i>. Retrieved from: <a href="https://ecos.fws.gov/ecp0/profile/speciesProfile?sld=4822">https://ecos.fws.gov/ecp0/profile/speciesProfile?sld=4822</a></p> <p data-bbox="168 1734 1406 1787">NatureServe. 2018. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Retrieved from: <a href="http://explorer.natureserve.org">http://explorer.natureserve.org</a></p>			

<b>Common Name</b>	Finerayed Pigtoe	<b>Conservation Status</b>	Endangered (1976) & Experimental Population, Non-Essential (2007)
<b>Scientific Name</b>	<i>Fusconaia cuneolus</i>	<b>Critical Habitat</b>	None currently designated
			
<p>Photo credit: U.S. Fish &amp; Wildlife Services</p>		<p>Photo credit: U.S. Fish &amp; Wildlife Services</p>	
<p><b>Physical Description:</b> A freshwater mussel with fine green rays on a yellow to brown shell.</p>		<p><b>Spatial Distribution:</b> This species inhabits clear, high gradient streams in firm cobble and gravel substrates. Relatively silt-free substrates of sand, gravel, and cobble in good flows of smaller streams. Occurs in shallow shoals as well as deeper runs.</p> <p>VA (Bland, Buchanan, Dickenson, Lee, Norton, Russell, Scott, Smyth, Tazewell, Washington &amp; Wise Counties)</p>	
<p><b>Factors of Decline:</b> This species has declined due to impoundments, siltation, and pollution. The invasion of the Asian clam, and the possible invasion of the zebra mussel, also threaten remaining populations.</p>		<p><b>Best Management Practices:</b> N/A</p>	
<p><b>References:</b> U.S. Fish &amp; Wildlife Services. (n.d.). Species profile for Finerayed Pigtoe (<i>Fusconaia cuneolus</i>). <i>Environmental Conservation Online System USFWS</i>. Retrieved from: <a href="https://ecos.fws.gov/ecp0/profile/speciesProfile?sld=3038">https://ecos.fws.gov/ecp0/profile/speciesProfile?sld=3038</a></p> <p>NatureServe. 2018. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Retrieved from: <a href="http://explorer.natureserve.org">http://explorer.natureserve.org</a></p>			

<b>Common Name</b>	Fluted Kidneyshell	<b>Conservation Status</b>	Endangered (2013)
<b>Scientific Name</b>	<i>Ptychobranchnus subtentum</i>	<b>Critical Habitat</b>	FR listing report ID 78 FR 59555 59620 (2013)
 <p>Photo credit: U.S. Fish &amp; Wildlife Services - Kentucky Ecological Services Field Office</p>		 <p>Photo credit: U.S. Fish &amp; Wildlife Services</p>	
<p><b>Physical Description:</b> Relatively large mussel. Shape of the shell is roughly oval elongate, and solid, relatively heavy valves are moderately inflated. A series of flutings (corrugations) characterize the posterior slope. Shell texture is smooth and somewhat shiny in young specimens, becoming more dull with age. Shell color is greenish yellow, becoming brownish with age, with several broken, wide green rays. Internally, the pseudocardinal teeth are stumpy and triangular in shape. Lateral teeth are heavy. Color of the nacre is bluish white to dull white with a wash of salmon in the beak cavity.</p>		<p><b>Spatial Distribution:</b> This species inhabits small to medium rivers in areas with swift current or riffles, although a few populations were recorded from larger rivers in shoal areas. It is often found embedded in sand, gravel, and cobble substrates. It requires flowing, well-oxygenated waters.</p> <p>VA (Bland, Bristol, Buchanan, Dickenson, Grayson, Lee, Norton, Russell, Scott, Smyth, Tazewell, Washington, Wythe &amp; Wise Counties)</p>	
<p><b>Factors of Decline:</b> Habitat loss and degradation. Chief among the causes of decline are impoundments, stream channel alterations, water pollution, and sedimentation.</p>		<p><b>Best Management Practices:</b> N/A</p>	
<p><b>References:</b> U.S. Fish &amp; Wildlife Services. (n.d.). Species profile for Fluted kidneyshell (<i>Ptychobranchnus subtentum</i>). <i>Environmental Conservation Online System USFWS</i>. Retrieved from: <a href="https://ecos.fws.gov/ecp0/profile/speciesProfile?slid=1397">https://ecos.fws.gov/ecp0/profile/speciesProfile?slid=1397</a>  NatureServe. 2018. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Retrieved from: <a href="http://explorer.natureserve.org">http://explorer.natureserve.org</a></p>			

<b>Common Name</b>	Green Blossom (pearlymussel)	<b>Conservation Status</b>	Endangered (1976)
<b>Scientific Name</b>	<i>Epioblasma torulosa gubernaculum</i>	<b>Critical Habitat</b>	None currently designated

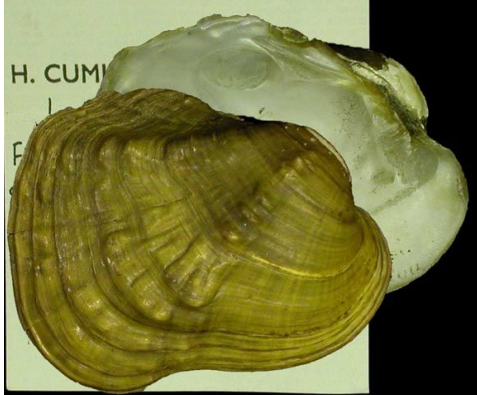


Photo credit: Earth.com

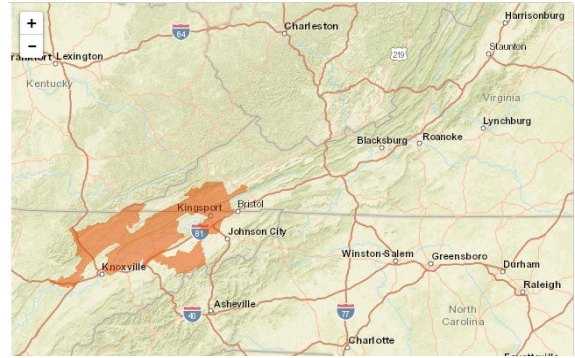



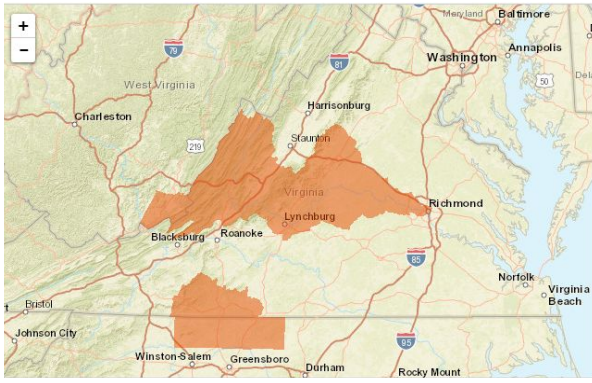
Photo credit: U.S. Fish & Wildlife Services


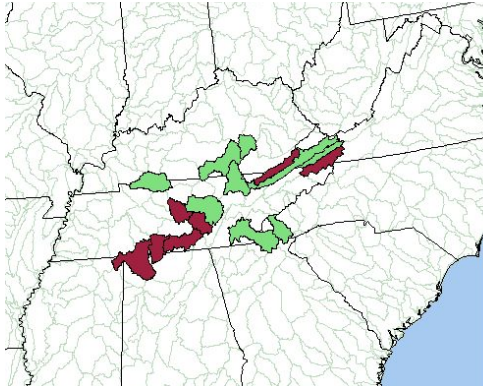
<b>Physical Description:</b> Freshwater mussel	<b>Spatial Distribution:</b> Found in riffle or shoal areas with fast flowing water that contain firm rubble, gravel, and sand substrates.  VA (Lee, Russell, Scott, Washington & Wise Counties)
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<b>Factors of Decline:</b> Impoundment (for flood control, navigation, hydroelectric power, recreation), siltation (from strip mining, coal washing, dredging, farming, logging, road construction), and pollution (municipal, agricultural, industrial).	<b>Best Management Practices:</b> N/A
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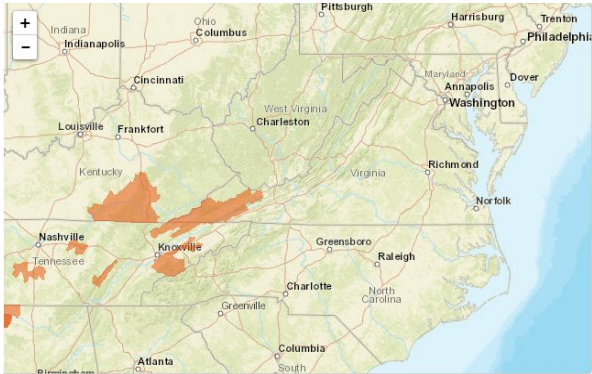
<b>References:</b> U.S. Fish & Wildlife Services. (n.d.). Species profile for Green blossom ( <i>Epioblasma torulosa gubernaculum</i> ). <i>Environmental Conservation Online System USFWS</i> . Retrieved from: <a href="https://ecos.fws.gov/ecp0/profile/speciesProfile?sld=2098">https://ecos.fws.gov/ecp0/profile/speciesProfile?sld=2098</a>  NatureServe. 2018. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Retrieved from: <a href="http://explorer.natureserve.org">http://explorer.natureserve.org</a>
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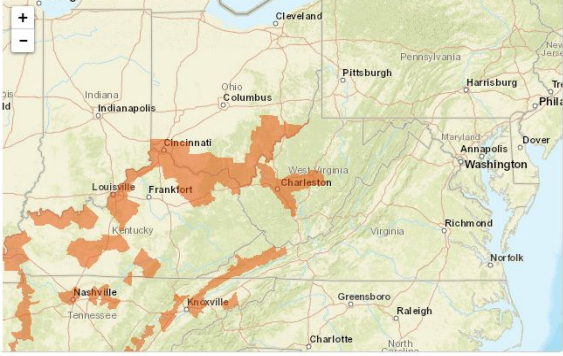
<b>Common Name</b>	James Spiny mussel	<b>Conservation Status</b>	Endangered (1988)
<b>Scientific Name</b>	<i>Pleurobema collina</i>	<b>Critical Habitat</b>	None currently designated
 <p>Photo credit: U.S. Fish &amp; Wildlife Services</p>		 <p>Photo credit: U.S. Fish &amp; Wildlife Services</p>	
<p><b>Physical Description:</b> One of three freshwater mussels where prominent spines can be found on juvenile shells. Adults have a dark brown shell and the spines are typically absent or reduced.</p>		<p><b>Spatial Distribution:</b> This species is found in waters with slow to moderate current and relatively hard water on sand and mixed sand and gravel substrates.</p> <p><b>VA</b> (Albemarle, Alleghany, Amherst, Appomattox, Augusta, Bath, Bedford, Botetourt, Buckingham, Buena Vista, Campbell, Carroll, Charlottesville, Chesterfield, Covington, Craig, Cumberland, Danville, Floyd, Fluvanna, Franklin, Giles, Goochland, Greene, Hanover, Henrico, Henry, Highland, Lexington, Louisa, Lynchburg, Martinsville, Montgomery, Nelson, Orange, Patrick, Pittsylvania, Powhatan, Richmond, Roanoke, Rockbridge &amp; Rockingham Counties) &amp; <b>WV</b> (Monroe)</p>	
<p><b>Factors of Decline:</b> Rapid decline in the past few decades is due to siltation, generated by agricultural and forestry activities such as road construction and gravel dredging; invasion of the Asiatic clam as a potential competitor; impoundments on rivers and subsequent flood control and sedimentation and change in flow regime; pollution of inland waters.</p>		<p><b>Best Management Practices:</b> <a href="#">James Spiny mussel BMP's via U.S. Fish &amp; Wildlife Services</a></p>	
<p><b>References:</b> U.S. Fish &amp; Wildlife Services. (n.d.). Species profile for James spiny mussel (<i>Pleurobema collina</i>). <i>Environmental Conservation Online System USFWS</i>. Retrieved from: <a href="https://ecos.fws.gov/ecp0/profile/speciesProfile?sld=2212">https://ecos.fws.gov/ecp0/profile/speciesProfile?sld=2212</a></p> <p>NatureServe. 2018. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Retrieved from: <a href="http://explorer.natureserve.org">http://explorer.natureserve.org</a></p>			

<b>Common Name</b>	Littlewing Pearlymussel	<b>Conservation Status</b>	Endangered (1988)
<b>Scientific Name</b>	<i>Pegias fabula</i>	<b>Critical Habitat</b>	None currently designated
 <p>Photo credit: U.S. Fish &amp; Wildlife Services</p>		 <p>Photo credit: NatureServe</p>	
<p><b>Physical Description:</b> A small freshwater mussel or bivalve mollusk which attains an average adult size of 24 mm. in length. The outer shell is usually eroded away in mature individuals. A few dark rays are apparent along the base of the shell in young individuals.</p>		<p><b>Spatial Distribution:</b> This species is most common at the head of riffles, but also found in and below riffles on sand and gravel substrates with scattered cobbles. It also inhabits sand pockets between rocks, cobbles and boulders, and underneath large rocks. It is restricted to small, cool streams. It is usually found lying on top or partially buried in sand and fine gravel between cobble in only 6 to 10 inches of water. It is usually found at the head of riffles.</p> <p>VA (Bland, Bristol, Buchanan, Dickenson, Grayson, Lee, Norton, Russell, Scott, Smyth, Tazewell, Washington, Wythe &amp; Wise Counties)</p>	
<p><b>Factors of Decline:</b> Deterioration of water quality, especially from acid mine drainage is the primary threat to the species.</p>		<p><b>Best Management Practices:</b> <a href="#">Littlewing Pearlymussel Management Summary via NatureServe</a></p>	
<p><b>References:</b> U.S. Fish &amp; Wildlife Services. (n.d.). Species profile for Littlewing pearlymussel (<i>Pegias fabula</i>). <i>Environmental Conservation Online System USFWS</i>. Retrieved from: <a href="https://ecos.fws.gov/ecp0/profile/speciesProfile?sld=2572">https://ecos.fws.gov/ecp0/profile/speciesProfile?sld=2572</a> NatureServe. 2018. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Retrieved from: <a href="http://explorer.natureserve.org">http://explorer.natureserve.org</a></p>			

<b>Common Name</b>	Northern Riffleshell	<b>Conservation Status</b>	Endangered (1993)
<b>Scientific Name</b>	<i>Epioblasma torulosa rangiana</i>	<b>Critical Habitat</b>	None currently designated
 <p>Photo credit: U.S. Fish &amp; Wildlife Services</p>		 <p>Photo credit: U.S. Fish &amp; Wildlife Services</p>	
<p><b>Physical Description:</b>  The northern riffleshell is a small to medium size (up to 3 inches long) freshwater mussel. Its shell exterior is brownish yellow to yellowish green with fine green rays. The shell interior is typically white. Males oblong with a sulcus running along the posterior ridge from the umbo to the ventral margin. Females with a large expanded posterior end. Both without knobs.</p>		<p><b>Spatial Distribution:</b>  Preferred habitat appears to require swiftly moving water. The high oxygen concentrations in swift streams may be necessary for survival. It is a species of riffle areas of smaller streams. Typically found on riffles, on a bottom of firmly packed and rather fine gravel, in swiftly flowing, shallow water or coarse gravel.</p> <p><b>PA</b> (Armstrong, Butler, Clarion, Crawford, Erie, Forest, Mercer, Venango &amp; Warren Counties) &amp; <b>WV</b> (Braxton, Clay &amp; Kanawha Counties)</p>	
<p><b>Factors of Decline:</b>  Siltation, drainage of bottomland lakes, swamps, and prairie marshes, desiccation during drought, species introductions, pollution, impoundments, and increased water temperatures.</p>		<p><b>Best Management Practices:</b>  <a href="#">Northern Riffleshell Management Summary via NatureServe</a></p>	
<p><b>References:</b>  U.S. Fish &amp; Wildlife Services. (n.d.). Species profile for Northern riffleshell (<i>Epioblasma torulosa rangiana</i>). <i>Environmental Conservation Online System USFWS</i>. Retrieved from: <a href="https://ecos.fws.gov/ecp0/profile/speciesProfile?sld=527">https://ecos.fws.gov/ecp0/profile/speciesProfile?sld=527</a></p> <p>NatureServe. 2018. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Retrieved from: <a href="http://explorer.natureserve.org">http://explorer.natureserve.org</a></p>			

<b>Common Name</b>	Oyster Mussel	<b>Conservation Status</b>	Endangered (1997) & Experimental Population, Non-Essential (2007)
<b>Scientific Name</b>	<i>Epioblasma capsaeformis</i>	<b>Critical Habitat</b>	FR listing report ID 69 FR 53136 53180 (2004)
 <p>Photo credit: U.S. Fish &amp; Wildlife Services</p>		 <p>Photo credit: U.S. Fish &amp; Wildlife Services</p>	
<p><b>Physical Description:</b> A freshwater mussel that has a yellowish to green colored shell with numerous dark rays. Recognizable by the typically dark coloration and fragility of the marsupial expansion and the lack of development of the posterior ridge.</p>		<p><b>Spatial Distribution:</b> Inhabits small to medium-sized rivers, and sometimes large rivers, in areas with coarse sand to boulder substrate (rarely in mud) and moderate to swift currents. It is sometimes associated with water-willow beds and in pockets of gravel between bedrock ledges in areas of swift current.</p> <p>VA (Dickenson, Lee, Norton, Russell, Scott, Smyth, Tazewell, Washington &amp; Wise Counties)</p>	
<p><b>Factors of Decline:</b> Habitat alteration: impoundments, channelization, pollution, and sedimentation that have altered or eliminated those habitats that are essential to the long-term viability of many riverine mussel populations.</p>		<p><b>Best Management Practices:</b> <a href="#">Oyster Mussel Management Summary via NatureServe</a>  <a href="#">Oyster BMP's via Chesapeake Bay Program</a></p>	
<p><b>References:</b> U.S. Fish &amp; Wildlife Services. (n.d.). Species profile for Oyster mussel (<i>Epioblasma capsaeformis</i>). <i>Environmental Conservation Online System USFWS</i>. Retrieved from: <a href="https://ecos.fws.gov/ecp0/profile/speciesProfile?slid=2099">https://ecos.fws.gov/ecp0/profile/speciesProfile?slid=2099</a>  NatureServe. 2018. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Retrieved from: <a href="http://explorer.natureserve.org">http://explorer.natureserve.org</a></p>			


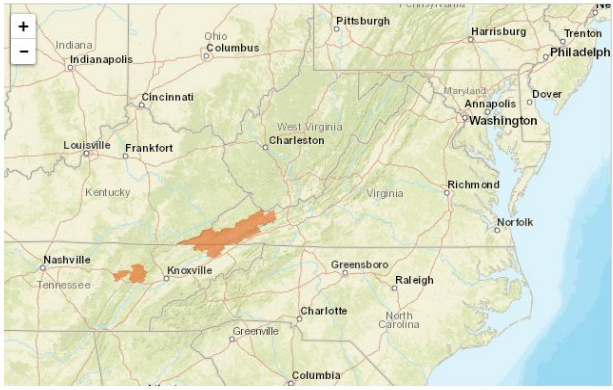


<b>Common Name</b>	Pink Mucket (pearlymussel)	<b>Conservation Status</b>	Endangered (1976)
<b>Scientific Name</b>	<i>Lampsilis abrupta</i>	<b>Critical Habitat</b>	None currently designated
 <p data-bbox="167 831 464 850">Photo credit: U.S. Fish &amp; Wildlife Services</p>		 <p data-bbox="862 831 1159 850">Photo credit: U.S. Fish &amp; Wildlife Services</p>	
<p data-bbox="167 884 464 911"><b>Physical Description:</b></p> <p data-bbox="167 919 829 1094">Shell of the male is a circle drawn out posteriorly and the female shell is truncated posteriorly almost forming a square, shell thick and stout, periostracum is yellowish brown to chestnut brown in mature specimens, rays are usually absent.</p>		<p data-bbox="862 884 1138 911"><b>Spatial Distribution:</b></p> <p data-bbox="862 919 1463 1199">Characterized as a large river species associated with fast-flowing waters, although in recent years it has been able to survive and reproduce in impoundments with river-lake conditions, but never in standing pools of water. Found in waters with strong currents, rocky or boulder substrates, with depths up to about 1 m, but is also found in deeper waters with slower currents and sand and gravel substrates.</p> <p data-bbox="862 1241 1463 1423"><b>VA</b> (Dickenson, Lee, Norton, Russell, Scott, Smyth, Tazewell, Washington &amp; Wise Counties) &amp; <b>WV</b> (Boone, Braxton, Cabell, Calhoun, Clay, Fayette, Jackson, Kanawha, Mason, Nicholas, Pleasants, Putnam, Raleigh, Roane, Tyler, Wayne, Webster, Wetzel &amp; Wood Counties)</p>	
<p data-bbox="167 1463 431 1491"><b>Factors of Decline:</b></p> <p data-bbox="167 1499 829 1778">Modification of habitat (e.g., dams and dredging), degradation of water quality, over harvest by commercial mussel industry, siltation, pollution, and channelization. Alteration or destruction of stream habitat due to impoundment for flood control, navigation, hydroelectric power, and recreation; siltation due to strip mining, coal washing, dredging, farming, logging, and road construction; and pollution from municipal, industrial, and agricultural waste discharges.</p>		<p data-bbox="862 1463 1260 1491"><b>Best Management Practices:</b></p> <p data-bbox="862 1499 1377 1562"><a href="#">Pink Mucket Management Summary via NatureServe</a></p> <p data-bbox="862 1604 1471 1667"><a href="#">Pink Mucket BMP's via Missouri Department of Conservation (Part 1)</a></p> <p data-bbox="862 1709 1471 1772"><a href="#">Pink Mucket BMP's via Missouri Department of Conservation (Part 2)</a></p>	

**References:**

U.S. Fish & Wildlife Services. (n.d.). Species profile for Pink mucket (*Lampsilis abrupta*). *Environmental Conservation Online System USFWS*. Retrieved from: <https://ecos.fws.gov/ecp0/profile/speciesProfile?slid=7829>


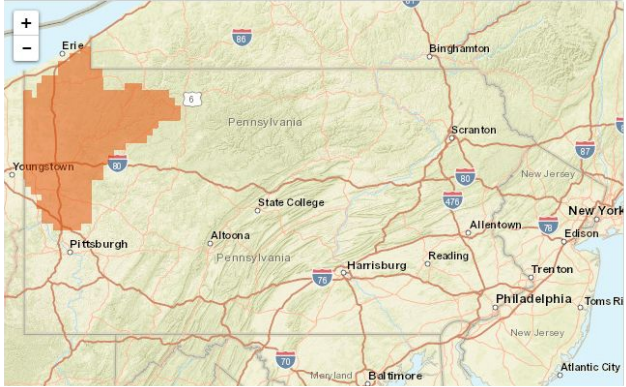
NatureServe. 2018. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Retrieved from: <http://explorer.natureserve.org>

<b>Common Name</b>	Purple Bean	<b>Conservation Status</b>	Endangered (1997)
<b>Scientific Name</b>	<i>Villosa perpurpurea</i>	<b>Critical Habitat</b>	FR listing report ID 69 FR 53136 53180 (2004)
 <p>Purple bean (<i>Villosa perpurpurea</i>)</p> <p><small>Photo by: Shane Hanlon/USFWS</small></p> <p>Photo credit: U.S. Fish &amp; Wildlife Services</p>		 <p>Photo credit: U.S. Fish &amp; Wildlife Services</p>	
<p><b>Physical Description:</b> A freshwater mussel with a dark brown to black shell with numerous closely spaced fine green rays. Purple nacre (may fade to white in dead specimens).</p>		<p><b>Spatial Distribution:</b> The habitat is creeks to medium-sized rivers and occasionally headwaters. The mussel is generally associated with riffles, but may be out of direct current, in pools, or flats in streams with season flows in riffles. It is not found in backwaters. Substrates range from silty-sand to boulder-sized rocks. Currents vary from fast to slight and water depths are typically shallow (&lt; 0.5 m).</p> <p>VA (Bland, Buchanan, Dickenson, Lee, Russell, Scott, Smyth, Tazewell, Washington &amp; Wise Counties)</p>	
<p><b>Factors of Decline:</b> Habitat alteration: impoundments, channelization, pollution, and sedimentation that have altered or eliminated those habitats that are essential to the long-term viability of many riverine mussel populations.</p>		<p><b>Best Management Practices:</b> <a href="#">Purple Bean Management Summary via NatureServe</a>  <a href="#">Purple Bean Management and Measures via Tennessee Valley Authority</a></p>	

**References:**

U.S. Fish & Wildlife Services. (n.d.). Species profile for Purple bean (*Villosa perpurpurea*). *Environmental Conservation Online System USFWS*. Retrieved from: <https://ecos.fws.gov/ecp0/profile/speciesProfile?slid=4125>

NatureServe. 2018. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Retrieved from: <http://explorer.natureserve.org>

<b>Common Name</b>	Rabbitsfoot	<b>Conservation Status</b>	Threatened (2013)
<b>Scientific Name</b>	<i>Quadrula cylindrica</i> ssp. <i>cylindrica</i>	<b>Critical Habitat</b>	FR listing report ID 80 FR 24691 24774 (2015)
 <p>Photo credit: Darby Creek Association</p>		 <p>Photo credit: U.S. Fish &amp; Wildlife Services</p>	
<p><b>Physical Description:</b> A highly distinctive mussel with an elongate shell, rectangular in shape with pustules and chevron markings reaching 6 inches in length. Internally, the color of the nacre is white and iridescent, often with a grayishgreen tinge in the umbo cavity.</p>		<p><b>Spatial Distribution:</b> Small to medium rivers with moderate to swift currents, and in smaller streams it inhabits bars or gravel and cobble close to the fast current. It has been found in depths up to 3 m. Despite their streamlined appearance, specimens are more often found fully exposed lying on their sides on top of the substrate.</p> <p>PA (Beaver, Butler, Clarion, Crawford, Elk, Erie, Forest, Lawrence, McKean, Mercer, V &amp; Warren Counties)</p>	
<p><b>Factors of Decline:</b> The chief causes of this decline are impoundments, channelization, chemical contaminants, mining, and sedimentation. Species not tolerant of poor water quality.</p>		<p><b>Best Management Practices:</b> N/A</p>	



**References:**

U.S. Fish & Wildlife Services. (n.d.). Species profile for Rabbitsfoot (*Quadrula cylindrica* ssp. *cylindrica*). *Environmental Conservation Online System USFWS*. Retrieved from: <https://ecos.fws.gov/ecp0/profile/speciesProfile?sld=5165>

NatureServe. 2018. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Retrieved from: <http://explorer.natureserve.org>



<p><b>Common Name</b></p>	<p>Rough Pigtoe</p>	<p><b>Conservation Status</b></p>	<p>Endangered (1976) &amp; Experimental Population, Non-Essential (2007)</p>
<p><b>Scientific Name</b></p>	<p><i>Pleurobema plenum</i></p>	<p><b>Critical Habitat</b></p>	<p>None currently designated</p>
<div data-bbox="251 789 748 1157" data-label="Image"> </div> <p data-bbox="168 1161 466 1182">Photo credit: U.S. Fish &amp; Wildlife Services</p>		<div data-bbox="883 789 1455 1142" data-label="Image"> </div> <p data-bbox="857 1152 1154 1173">Photo credit: U.S. Fish &amp; Wildlife Services</p>	
<p><b>Physical Description:</b> A highly variable freshwater mussel; relatively large, rounded to slightly angular, or elongate, shaped like an equilateral triangle, with a brown satin-like appearance and a moderately deep beak cavity.</p>		<p><b>Spatial Distribution:</b> This species is found in medium to large rivers (20 m wide or greater) in sand, gravel, and cobble substrates in shoals. It is occasionally found on flats and muddy sand.  VA (Buchanan, Dickenson, Lee, Norton, Russell, Scott, Smyth, Tazewell, Washington &amp; Wise Counties)</p>	
<p><b>Factors of Decline:</b> Siltation, drainage of bottomland lakes, swamps, and prairie marshes, desiccation during drought, species introductions, pollution, impoundments, and increased water temperatures.</p>		<p><b>Best Management Practices:</b> <a href="#">Rough Pigtoe Management Summary via NatureServe</a></p>	




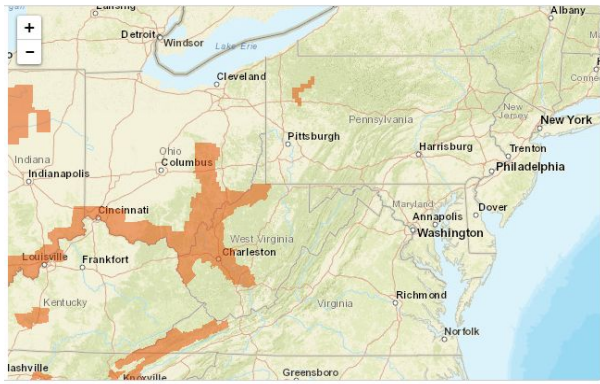
**References:**

U.S. Fish & Wildlife Services. (n.d.). Species profile for Rough pigtoe (*Pleurobema plenum*). *Environmental Conservation Online System USFWS*. Retrieved from: <https://ecos.fws.gov/ecp0/profile/speciesProfile?slid=6894>

NatureServe. 2018. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Retrieved from: <http://explorer.natureserve.org>

<p><b>Common Name</b></p>	<p>Rough Rabbitsfoot</p>	<p><b>Conservation Status</b></p>	<p>Endangered (1997)</p>
<p><b>Scientific Name</b></p>	<p><i>Quadrula cylindrica strigillata</i></p>	<p><b>Critical Habitat</b></p>	<p>FR listing report ID 73 FR 3991 3993 (2008)</p>
 <p>Photo credit: U.S. Fish &amp; Wildlife Services</p>		 <p>Photo credit: U.S. Fish &amp; Wildlife Services</p>	
<p><b>Physical Description:</b> A freshwater mussel with a yellow to greenish colored shell with green rays. Adult specimens reach lengths of up to 12 centimeters (5 inches). The tendency for the shell to be compressed, highly pustulate, and to have low or no knobs on the posterior ridge distinguishes this morph from <i>Quadrula cylindrica</i> s.s. (Rabbitsfoot)</p>		<p><b>Spatial Distribution:</b> It inhabits medium-sized to large rivers in swift currents but often exists in areas close to, but not in, the swiftest current. It is reported to live in silt, sand, gravel, or cobble in eddies at the edge of midstream currents and may be associated with macrophyte beds.</p> <p>VA (Bland, Buchanan, Dickenson, Lee, Norton, Russell, Scott, Smyth, Tazewell, Washington, Wythe &amp; Wise Counties)</p>	
<p><b>Factors of Decline:</b> Habitat alteration: impoundments, channelization, pollution, and sedimentation that have altered or eliminated those habitats that are essential to the long-term viability of many riverine mussel</p>		<p><b>Best Management Practices:</b> <a href="#">Rough Rabbitsfoot Management Summary via NatureServe</a></p>	

populations.	
<p><b>References:</b></p> <p>U.S. Fish &amp; Wildlife Services. (n.d.). Species profile for Rough rabbitsfoot (<i>Quadrula cylindrica strigillata</i>). <i>Environmental Conservation Online System USFWS</i>. Retrieved from: <a href="https://ecos.fws.gov/ecp0/profile/speciesProfile?sld=5629">https://ecos.fws.gov/ecp0/profile/speciesProfile?sld=5629</a></p> <p>NatureServe. 2018. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Retrieved from: <a href="http://explorer.natureserve.org">http://explorer.natureserve.org</a></p>	

<b>Common Name</b>	Sheepnose Mussel	<b>Conservation Status</b>	Endangered (2012)
<b>Scientific Name</b>	<i>Plethobasus cyphus</i>	<b>Critical Habitat</b>	None currently designated
 <p>Photo credit: U.S. Fish &amp; Wildlife Services</p>		 <p>Photo credit: U.S. Fish &amp; Wildlife Services</p>	
<p><b>Physical Description:</b></p> <p>A freshwater mussel with an oblong shell, surface smooth except for a single row of bumps or knobs running from the umbo to the ventral margin. Lateral teeth long, straight or slightly curved; two in the left valve, one in the right Beak cavity shallow. Nacre white, occasionally tinged with pink or salmon.</p>		<p><b>Spatial Distribution:</b></p> <p>Although it does inhabit medium-sized rivers, this mussel generally has been considered a large-river species. It may be associated with riffles and gravel/cobble substrates but usually has been reported from deep water (&gt;2 m) with slight to swift currents and mud, sand, or gravel bottoms. It also appears capable of surviving in reservoirs, such as upper Chickamauga Reservoir immediately below Watts Bar Dam. Specimens in larger rivers may occur in deep runs.</p> <p><b>PA</b> (Armstrong, Butler, Clarion, Forest &amp; Venango Counties) &amp; <b>VA</b> (Buchanan, Dickenson, Lee, Norton, Russell, Scott, Smyth, Tazewell, Washington &amp; Wise Counties) &amp; <b>WV</b> (Cabell, Fayette, Jackson, Kanawha, Mason, Pleasants, Putnam, Tyler, Wayne, Wetzel &amp; Wood Counties)</p>	

<p><b>Factors of Decline:</b> Siltation, drainage of bottomland lakes, swamps, and prairie marshes, desiccation during drought, species introductions, pollution, impoundments, and increased water temperatures.</p>	<p><b>Best Management Practices:</b> <a href="#">Sheepnose Mussel BMP's via Missouri Department of Conservation</a></p>
<p><b>References:</b> U.S. Fish &amp; Wildlife Services. (n.d.). Species profile for Sheepnose mussel (<i>Plethobasus cyphus</i>). <i>Environmental Conservation Online System USFWS</i>. Retrieved from: <a href="https://ecos.fws.gov/ecp0/profile/speciesProfile?slid=6903">https://ecos.fws.gov/ecp0/profile/speciesProfile?slid=6903</a>  NatureServe. 2018. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Retrieved from: <a href="http://explorer.natureserve.org">http://explorer.natureserve.org</a></p>	

<b>Common Name</b>	Shiny Pigtoe	<b>Conservation Status</b>	Endangered (1976) & Experimental Population, Non-Essential (2007)
<b>Scientific Name</b>	<i>Fusconaia cor</i>	<b>Critical Habitat</b>	None currently designated



Photo credit: Virginia Department of Game & Inland Fisheries

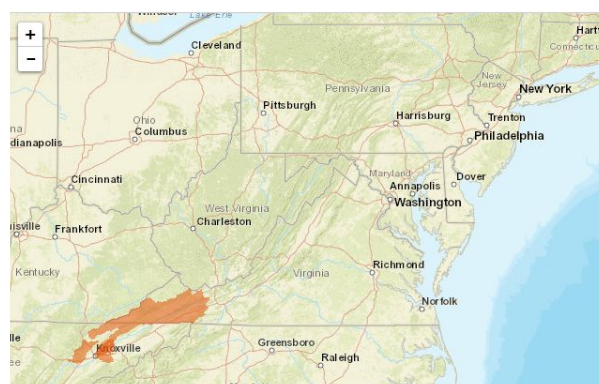


Photo credit: U.S. Fish & Wildlife Services

<p><b>Physical Description:</b> A freshwater mussel with prominent dark green to black rays on a yellow to brown shell. Spawns in late May to early June.</p>	<p><b>Spatial Distribution:</b> This species is found in shoals and riffles of small to medium sized rivers in clear streams with moderate to fast current. It is typically well burrowed in sand and cobble substrates. It does not appear tolerant of deeper water or reservoirs.  VA (Bland, Bristol, Buchanan, Dickenson, Grayson, Lee, Norton, Russell, Scott, Smyth, Tazewell, Washington, Wythe &amp; Wise Counties)</p>
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<p><b>Factors of Decline:</b> This species is threatened by habitat alteration and pollution from strip mine runoff and coal washing. Pollution is also a factor, from heavy metals,</p>	<p><b>Best Management Practices:</b> N/A</p>
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industrial effluent, chemical spills, agricultural waste, fertilizers, pesticides, and human waste. The invasion of the Asian clam, and the possible invasion of the zebra mussel, also threaten remaining populations.

**References:**

U.S. Fish & Wildlife Services. (n.d.). Species profile for Shiny pigtoe (*Fusconaia cor*). *Environmental Conservation Online System USFWS*. Retrieved from: <https://ecos.fws.gov/ecp0/profile/speciesProfile?sld=2573>

NatureServe. 2018. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Retrieved from: <http://explorer.natureserve.org>

<b>Common Name</b>	Rayed Bean	<b>Conservation Status</b>	Endangered (2012)
<b>Scientific Name</b>	<i>Villosa fabalis</i>	<b>Critical Habitat</b>	None currently designated



Photo credit: U.S. Fish & Wildlife Services

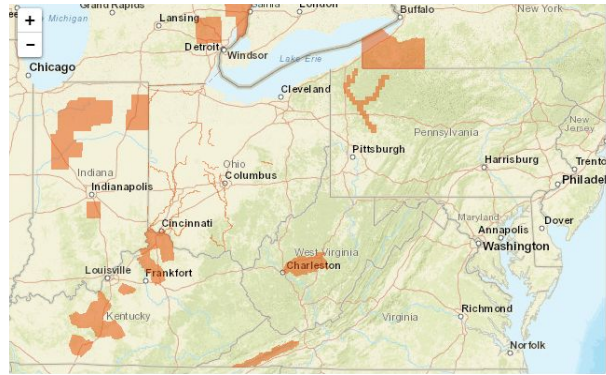


Photo credit: U.S. Fish & Wildlife Services

**Physical Description:**

A very small, solid, freshwater mussel that is dark green in color with numerous wavy lines on the shell. The rayed bean is a small mussel usually less than 4.5 cm in length. Shell outline is elongate or ovate in males and elliptical in females, and moderately inflated in both sexes, but more so in females. The valves are thick and solid. The anterior end is rounded in females and bluntly pointed in males.


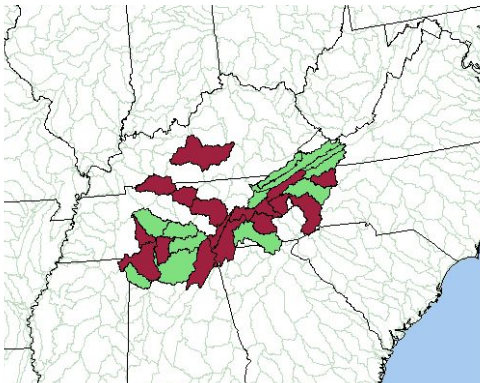
**Spatial Distribution:**

The rayed bean is generally known from smaller headwater creeks, but records exist in larger rivers. They are usually found in or near shoal or riffle areas, and in the shallow wave-washed areas of glacial lakes. Substrates typically include gravel and sand. It is oftentimes associated with vegetation in and adjacent to riffles and shoals. Specimens are typically buried among the roots of the vegetation.

**PA** (Armstrong, Butler, Carion, Crawford, Erie, Forest, Mercer, Venango & Warren Counties), **VA** (Bland, Russell, Scott, Smyth, Tazewell, Wythe & Washington Counties) & **WV** (Braxton, Calhoun, Clay, Kanawha, Nicholas, Roane & Webster Counties)



<p><b>Factors of Decline:</b> Habitat loss or degradation via siltation, drainage of bottomland lakes, swamps, and prairie marshes, desiccation during drought, species introductions, pollution, impoundments, and increased water temperatures.</p>	<p><b>Best Management Practices:</b> <a href="#">Rayed Bean BMP's via U.S. Fish &amp; Wildlife Services Regions 3, 4, 5 &amp; Canada</a></p>
<p><b>References:</b> U.S. Fish &amp; Wildlife Services. (n.d.). Species profile for Rayed bean (<i>Villosa fabalis</i>). <i>Environmental Conservation Online System USFWS</i>. Retrieved from: <a href="https://ecos.fws.gov/ecp0/profile/speciesProfile?sld=5862">https://ecos.fws.gov/ecp0/profile/speciesProfile?sld=5862</a> NatureServe. 2018. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Retrieved from: <a href="http://explorer.natureserve.org">http://explorer.natureserve.org</a></p>	

<p><b>Common Name</b></p>	<p>Slabside Pearlymussel</p>	<p><b>Conservation Status</b></p>	<p>Endangered (2013)</p>
<p><b>Scientific Name</b></p>	<p><i>Pleuronaia dolabelloides</i></p>	<p><b>Critical Habitat</b></p>	<p>FR listing report ID 78 FR 59555 59620 (2013)</p>
 <p>Photo credit: U.S. Fish &amp; Wildlife Service Kentucky Field Office</p>		 <p>Photo credit: NatureServe</p>	
<p><b>Physical Description:</b> The otherwise subtriangular shape, forwardly inclined beaks, flattened lateral surface between the two ridges, and the wavy beak sculpture distinguish this species. Periostracum yellowish to brown with variously scattered narrow to wide dark green rays, rays appear broken or as blotches.</p>		<p><b>Spatial Distribution:</b> This species occurs in moderate to high gradient riffles systems in creeks to large rivers. It is generally found at depths &lt;1 m, moderate to swift current velocities, and substrates from coarse sand to heterogenous assemblages of larger sized particles. The slabside pearlymussel is primarily a large creek to moderately-sized river species, inhabiting sand, fine gravel, and cobble substrates in relatively shallow riffles and shoals with moderate current. This species requires flowing, well-oxygenated waters to thrive.</p> <p>VA (Bland, Bristol, Buchanan, Dickenson, Grayson, Lee, Norton, Russell, Scott, Smyth, Tazewell,</p>	

	Wythe, Wise & Washington Counties)
<p><b>Factors of Decline:</b> Habitat degradation via impoundments, stream channel alterations, water pollution, and sedimentation. The species is further impacted by channel alterations, inundation by reservoirs, siltation by agriculture and clear-cutting, chemical and organic pollution, and commercial clamming.</p>	<p><b>Best Management Practices:</b> N/A</p>
<p><b>References:</b> U.S. Fish &amp; Wildlife Services. (n.d.). Species profile for Slabside pearlymussel (<i>Pleuonaia dolabelloides</i>). <i>Environmental Conservation Online System USFWS</i>. Retrieved from: <a href="https://ecos.fws.gov/ecp0/profile/speciesProfile?sld=1518">https://ecos.fws.gov/ecp0/profile/speciesProfile?sld=1518</a>  NatureServe. 2018. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Retrieved from: <a href="http://explorer.natureserve.org">http://explorer.natureserve.org</a></p>	

<b>Common Name</b>	Snuffbox Mussel	<b>Conservation Status</b>	Endangered (2012)
<b>Scientific Name</b>	<i>Epioblasma triquetra</i>	<b>Critical Habitat</b>	None currently designated



Photo credit: U.S. Fish & Wildlife Services

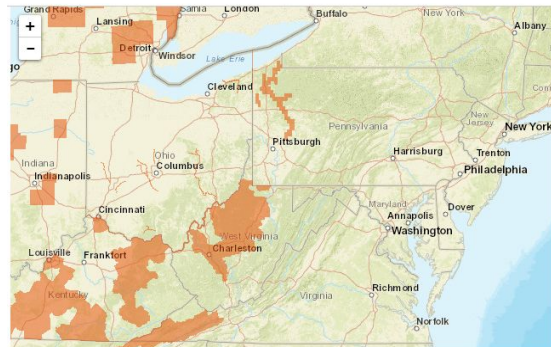


Photo credit: U.S. Fish & Wildlife Services

<p><b>Physical Description:</b> A triangular-shaped freshwater mussel; relatively thick for its size, yellow or yellowish green with green rays, blotches, or chevron markings. Internally pseudocardinal teeth elevated, roughened, relatively thin and compressed; two in the left valve, two in the right, the front one thinner and much smaller. Lateral teeth very short, slightly curved, serrated, and elevated. Beak cavity fairly deep. Nacre pearly white, iridescent posteriorly.</p>	<p><b>Spatial Distribution:</b> This species is found in riffles of small and medium creeks, in large rivers, and in shoals and wave-washed shores of lakes. Except when spawning, adults are usually burrowed deep in sand, gravel or cobble substrates.</p> <p><b>PA</b> (Armstrong, Butler, Carion, Crawford, Erie, Forest, Mercer, Venango &amp; Westmoreland Counties), <b>VA</b> (Bland, Buchanan, Dickenson, Lee, Norton, Russell, Scott, Smyth, Tazewell, Wythe, Wise &amp; Washington Counties) &amp; <b>WV</b> (Barbour, Boone, Braxton, Cabell, Calhoun, Clay, Doddridge, Fayette, Gilmer, Harrison, Jackson, Kanawha, Lewis, Marion, Marshall, Mason, Monongalia, Nicholas, Pleasants, Putnam, Raleigh, Ritchie, Roane, Taylor, Tyler, Upshur, Wayne, Webster, Wetzel, Wirt &amp; Wood</p>
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	Counties)
<p><b>Factors of Decline:</b> Siltation, drainage of bottomland lakes, swamps, and prairie marshes, desiccation during drought, species introductions, pollution, impoundments, and increased water temperatures. Pollution through point (industrial and residential discharge) and non-point (siltation, herbicide and fertilizer run-off) sources is perhaps the greatest on-going threat to this species and most freshwater mussels.</p>	<p><b>Best Management Practices:</b> <a href="#">Snuffbox Mussel BMP's via Missouri Department of Conservation (Part 1)</a>  <a href="#">Snuffbox Mussel BMP's via Missouri Department of Conservation (Part 2)</a></p>
<p><b>References:</b> U.S. Fish &amp; Wildlife Services. (n.d.). Species profile for Snuffbox mussel (<i>Epioblasma triquetra</i>). <i>Environmental Conservation Online System USFWS</i>. Retrieved from: <a href="https://ecos.fws.gov/ecp0/profile/speciesProfile?sld=4135">https://ecos.fws.gov/ecp0/profile/speciesProfile?sld=4135</a>  NatureServe. 2018. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Retrieved from: <a href="http://explorer.natureserve.org">http://explorer.natureserve.org</a></p>	

<b>Common Name</b>	Spectaclecase Mussel	<b>Conservation Status</b>	Endangered (2012)
<b>Scientific Name</b>	<i>Cumberlandia monodonta</i>	<b>Critical Habitat</b>	None currently designated



Photo credit: U.S. Fish & Wildlife Services

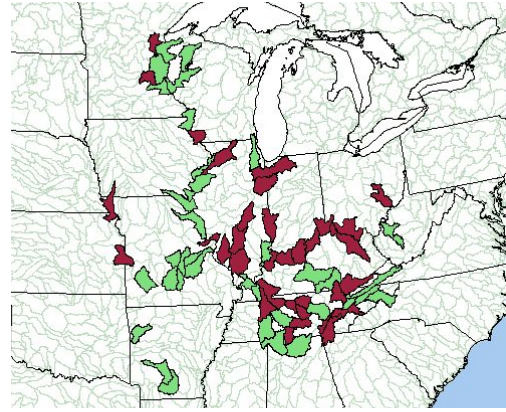




Photo credit: NatureServe

<p><b>Physical Description:</b> A freshwater mussel with an elongate, arcuate and compressed shell. Greenish or brownish in younger shells to black (picture above shows young and matured mussel). Spawns in April and May.</p>	<p><b>Spatial Distribution:</b> Most often inhabit riverine microhabitats that are sheltered from the main force of current. It occurs in substrates from mud and sand to gravel, cobble, and boulders in relatively shallow riffles and shoals with slow to swift current. Spectaclecase is usually found in firm mud between large rocks in quiet water very near the interface with swift currents. Specimens have also been reported in tree stumps, root masses, and in beds of rooted vegetation.</p>
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	<p><b>VA</b> (Buchanan, Dickenson, Lee, Norton, Russell, Scott, Smyth, Tazewell, Wise &amp; Washington Counties) &amp; <b>WV</b> (Fayette, Kanawha, Mason &amp; Putnam Counties)</p>
<p><b>Factors of Decline:</b> Habitat loss and degradation via impoundments, channelization, chemical contaminants, mining, and sedimentation.</p>	<p><b>Best Management Practices:</b> <a href="#">Recovery Outline for Spectaclecase Mussel via U.S. Fish &amp; Wildlife Services</a></p>
<p><b>References:</b> U.S. Fish &amp; Wildlife Services. (n.d.). Species profile for Spectaclecase mussel (<i>Cumberlandia monodonta</i>). <i>Environmental Conservation Online System USFWS</i>. Retrieved from: <a href="https://ecos.fws.gov/ecp0/profile/speciesProfile?sld=7867">https://ecos.fws.gov/ecp0/profile/speciesProfile?sld=7867</a>  NatureServe. 2018. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Retrieved from: <a href="http://explorer.natureserve.org">http://explorer.natureserve.org</a></p>	

<b>Common Name</b>	Tan Riffleshell	<b>Conservation Status</b>	Endangered (1977)
<b>Scientific Name</b>	<i>Epioblasma florentina walkeri</i>	<b>Critical Habitat</b>	None currently designated
 <p>Photo credit: U.S. Fish &amp; Wildlife Services</p>		 <p>Photo credit: U.S. Fish &amp; Wildlife Services</p>	
<p><b>Physical Description:</b> A medium-sized (7 cm) freshwater mussel with a brown to yellow colored shell with numerous green rays.</p>		<p><b>Spatial Distribution:</b> Found in headwaters, riffles, and shoals in sand and gravel substrates. Relatively silt-free substrates of sand, gravel, and cobble in good flows of smaller streams.</p> <p>VA (Bristol, Buchanan, Dickenson, Grayson, Russell, Scott, Smyth, Tazewell, Wise &amp; Washington Counties)</p>	



<p><b>Factors of Decline:</b> Siltation, drainage of bottomland lakes, swamps, and prairie marshes, desiccation during drought, species introductions, pollution, impoundments, and increased water temperatures.</p>	<p><b>Best Management Practices:</b> <a href="#">Tan Riffleshell BMP's via U.S. Fish &amp; Wildlife Services Asheville Ecological Services Field Office</a></p>
<p><b>References:</b> U.S. Fish &amp; Wildlife Services. (n.d.). Species profile for Tan riffleshell (<i>Epioblasma florentina walkeri</i>). <i>Environmental Conservation Online System USFWS</i>. Retrieved from: <a href="https://ecos.fws.gov/ecp0/profile/speciesProfile?sld=1247">https://ecos.fws.gov/ecp0/profile/speciesProfile?sld=1247</a>  NatureServe. 2018. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Retrieved from: <a href="http://explorer.natureserve.org">http://explorer.natureserve.org</a></p>	

<b>Common Name</b>	Tubercled Blossom (pearlymussel)	<b>Conservation Status</b>	Endangered (1976) & Experimental Population, Non-Essential (2001)
<b>Scientific Name</b>	<i>Epioblasma torulosa torulosa</i>	<b>Critical Habitat</b>	None currently designated



Photo credit: U.S. Fish & Wildlife Services

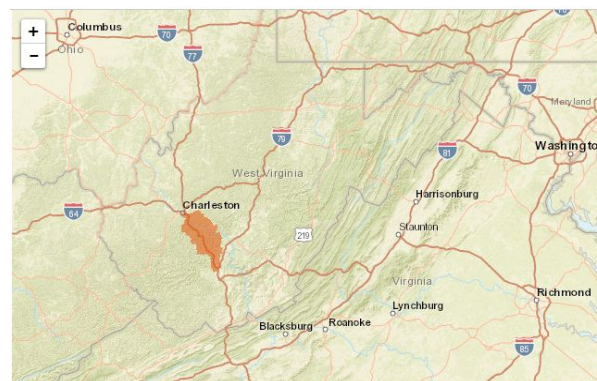

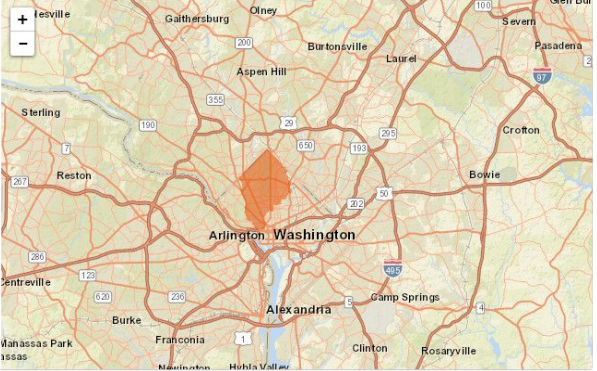

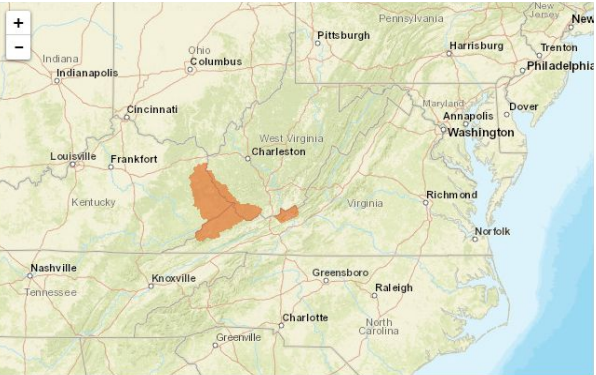


Photo credit: U.S. Fish & Wildlife Services

<p><b>Physical Description:</b> Freshwater mussel</p>	<p><b>Spatial Distribution:</b> Habitat is characterized by riffles or shoals in shallow water with sandy gravel substrate and rapid currents.</p> <p>WV (Boone, Fayette, Kanawha &amp; Raleigh Counties)</p>
<p><b>Factors of Decline:</b> Possibly the single greatest factor that contributed to its demise is the alteration and destruction of stream habitat due to impoundments for flood control, navigation, hydroelectric power production, and recreation. Siltation is another factor that has affected these mussels.</p>	<p><b>Best Management Practices:</b> N/A</p>
<p><b>References:</b> U.S. Fish &amp; Wildlife Services. (n.d.). Species profile for Tubercled Blossom (<i>Epioblasma torulosa torulosa</i>). <i>Environmental Conservation Online System USFWS</i>. Retrieved from: <a href="https://ecos.fws.gov/ecp0/profile/speciesProfile?sld=4126">https://ecos.fws.gov/ecp0/profile/speciesProfile?sld=4126</a></p> <p>NatureServe. 2018. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Retrieved from: <a href="http://explorer.natureserve.org">http://explorer.natureserve.org</a></p>	

<p><b>Common Name</b></p>	<p>Hay's Spring Amphipod</p>	<p><b>Conservation Status</b></p>	<p>Endangered (1982)</p>
<p><b>Scientific Name</b></p>	<p><i>Stygobromus hayi</i></p>	<p><b>Critical Habitat</b></p>	<p>None currently designated</p>
 <p>5 mm</p> <p>USNM 142770</p> <p>Photo credit: The Washington Post</p>		 <p>Photo credit: U.S. Fish &amp; Wildlife Services</p>	

<p><b>Physical Description:</b> A small aquatic amphipod. Albinistic; eyes lacking, body laterally compressed. Antennal flagellum 2-segmented.</p>	<p><b>Spatial Distribution:</b> Inhabits a ground water outlet that feeds into a low gradient creek. Precise data lacking due to inaccessibility of habitat. (Rock Creek Park)  DC (District of Columbia) &amp; MD (Montgomery)</p>
<p><b>Factors of Decline:</b> Possible threats include groundwater contamination or flow alteration caused by further urban development.</p>	<p><b>Best Management Practices:</b> N/A</p>
<p><b>References:</b> U.S. Fish &amp; Wildlife Services. (n.d.). Species profile for Hay's Spring amphipod (<i>Stygobromus hayi</i>). <i>Environmental Conservation Online System USFWS</i>. Retrieved from: <a href="https://ecos.fws.gov/ecp0/profile/speciesProfile?sld=8410">https://ecos.fws.gov/ecp0/profile/speciesProfile?sld=8410</a>  NatureServe. 2018. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Retrieved from: <a href="http://explorer.natureserve.org">http://explorer.natureserve.org</a></p>	

<p><b>Common Name</b></p>	<p>Big Sandy Crayfish</p>	<p><b>Conservation Status</b></p>	<p>Threatened (2016)</p>
<p><b>Scientific Name</b></p>	<p><i>Cambarus callainus</i></p>	<p><b>Critical Habitat</b></p>	<p>None currently designated</p>
 <p>Photo credit: U.S. Fish &amp; Wildlife Services</p>		 <p>Photo credit: U.S. Fish &amp; Wildlife Services</p>	

<p><b>Physical Description:</b> Like all crayfish found in North America, the adult big sandy crayfish resembles a miniature lobster, ranging from 3 to 4 inches in size. Its shell is an olive brown to light green color, with blue and red accents around its eyes and legs.</p>	<p><b>Spatial Distribution:</b> The Big Sandy Crayfish needs clean, medium-sized streams and rivers for its social reproductive, and energetic needs. They are usually found in faster moving sections of the water, in areas with large boulders and rocks, and little sedimentation or pollution.</p> <p><b>VA</b> (Buchanan, Dickenson, Giles, Norton &amp; Wise Counties) &amp; <b>WV</b> (Logan, McDowell, Mercer, Mingo, Wayne &amp; Wyoming Counties)</p>
<p><b>Factors of Decline:</b> Habitat alteration and degradation via construction, erosion and sedimentation, poor water quality and human intervention.</p>	<p><b>Best Management Practices:</b> <a href="#">Big Sandy Crayfish BMP's via U.S. Fish &amp; Wildlife Services</a></p>
<p><b>References:</b> U.S. Fish &amp; Wildlife Services. (n.d.). Species profile for Big Sandy crayfish (<i>Cambarus callainus</i>). <i>Environmental Conservation Online System USFWS</i>. Retrieved from: <a href="https://ecos.fws.gov/ecp0/profile/speciesProfile?sld=8285">https://ecos.fws.gov/ecp0/profile/speciesProfile?sld=8285</a></p> <p>U.S. Fish &amp; Wildlife Services. (2018). Big Sandy Crayfish. FWS. Retrieved from: <a href="https://www.fws.gov/southeast/wildlife/crustaceans/big-sandy-crayfish/#habitat-section">https://www.fws.gov/southeast/wildlife/crustaceans/big-sandy-crayfish/#habitat-section</a></p> <p>NatureServe. 2018. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Retrieved from: <a href="http://explorer.natureserve.org">http://explorer.natureserve.org</a></p>	


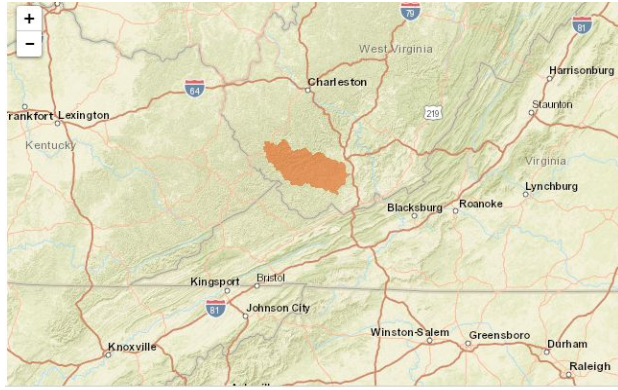
<b>Common Name</b>	Guyandotte River Crayfish	<b>Conservation Status</b>	Endangered (2016)
<b>Scientific Name</b>	<i>Cambarus veteranus</i>	<b>Critical Habitat</b>	None currently designated
			



Photo credit: Joel Sartore of National Geographic	Photo credit: U.S. Fish & Wildlife Services
<p><b>Physical Description:</b>  Adult body lengths range from 75.7 to 101.6 mm, and the cephalothorax (main body section) is streamlined and elongate, and has two well-defined cervical spines. The elongate convergent rostrum (the beak-like shell extension located between the crayfishs eyes) lacks spines or tubercles (bumps). Diagnostic characteristics that distinguish the Big Sandy crayfish from the Guyandotte River crayfish include the formers narrower, more elongate rostrum; narrower, more elongate chelea (claw); and lack of a well-pronounced lateral impression at the base of the claws immovable finger. Carapace (shell) coloration ranges from olive brown to light green, and the cervical groove is outlined in light blue, aqua, or turquoise.</p>	<p><b>Spatial Distribution:</b>  Suitable instream habitat for the Guyandotte River crayfish is similar to the Big Sandy crayfish and is generally described as clean, third order or larger, fast-flowing, permanent streams and rivers with unembedded slab boulders on a bedrock, cobble, or sand substrate.</p> <p>WV (Boone, Logan, McDowell, Mercer, Mingo, Raleigh &amp; Wyoming Counties)</p>
<p><b>Factors of Decline:</b>  Habitat alteration and degradation via construction, erosion and sedimentation, poor water quality and human intervention.</p>	<p><b>Best Management Practices:</b>  N/A</p>
<p><b>References:</b>  U.S. Fish &amp; Wildlife Services. (n.d.). Species profile for Guyandotte River crayfish (<i>Cambarus veteranus</i>). <i>Environmental Conservation Online System USFWS</i>. Retrieved from: <a href="https://ecos.fws.gov/ecp0/profile/speciesProfile?slid=10375">https://ecos.fws.gov/ecp0/profile/speciesProfile?slid=10375</a></p> <p>NatureServe. 2018. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Retrieved from: <a href="http://explorer.natureserve.org">http://explorer.natureserve.org</a></p>	

<b>Common Name</b>	Lee County Cave Isopod	<b>Conservation Status</b>	Endangered (1992)
<b>Scientific Name</b>	<i>Lirceus usdagalun</i>	<b>Critical Habitat</b>	None currently designated



Photo credit: Virginia Department of Conservation

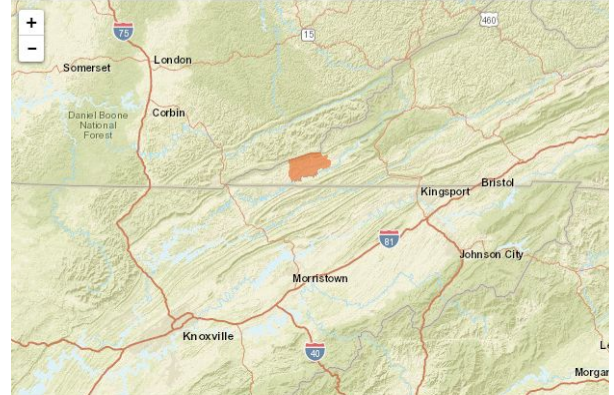


Photo credit: U.S. Fish & Wildlife Services

**Physical Description:**

The Lee County cave isopod is a small freshwater crustacean. Unlike other members of the genus *Lirceus*, it is an obligate cave dweller and lacks eyes and pigmentation. Reaching 7 mm in length, the body is more than twice as long as it is wide. The head is one-third as long as it is wide and has deep, narrow lateral incisions.

**Spatial Distribution:**

Found on submerged, small rocks in subterranean streams; sometimes among gravels.

VA (Lee)

**Factors of Decline:**

Thompson-cedar cave population destroyed; surgener/gallohan cave system threatened by development interests in Lee co. Highly susceptible to water quality changes.

**Best Management Practices:**

N/A

**References:**

U.S. Fish & Wildlife Services. (n.d.). Species profile for Lee County Cave isopod (*Lirceus usdagalun*). *Environmental Conservation Online System USFWS*. Retrieved from: <https://ecos.fws.gov/ecp0/profile/speciesProfile?sld=1550>

Virginia Department of Conservation and Recreation. (2008). Lee County Cave Isopod. VADRC. Retrieved from: <http://www.dcr.virginia.gov/natural-heritage/document/fscaveisopod.pdf>

NatureServe. 2018. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Retrieved from: <http://explorer.natureserve.org>

<b>Common Name</b>	Madison Cave Isopod	<b>Conservation Status</b>	Threatened (1982)
<b>Scientific Name</b>	<i>Antrolana lira</i>	<b>Critical Habitat</b>	None currently designated



Photo credit: U.S. Fish & Wildlife Services

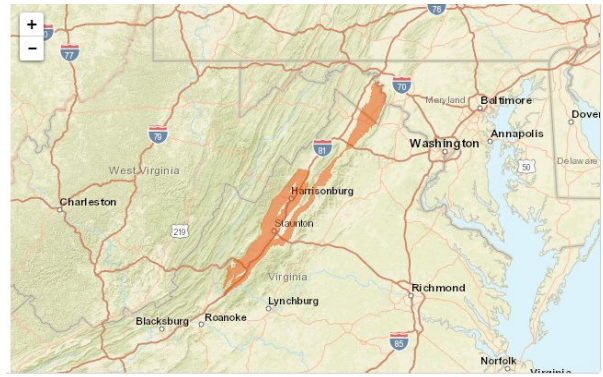


Photo credit: U.S. Fish & Wildlife Services

**Physical Description:**

The Madison Cave isopod is an eyeless, unpigmented, freshwater crustacean. Its body is flattened and bears seven pairs of long walking legs. The first pair of legs are modified as grasping structures. It has a pair of short antennae and a pair of long antennae. Males reach a length of 0.6 inches; females reach a length of 0.7 inches.

**Spatial Distribution:**

Underground lakes and deep karst aquifers, associated with the Conococheague Formation. Often found near wells, springs, sinkholes, or caves. *Antrolana lira* spends much of its time swimming freely through flooded caves formed in ancient limestone.

**VA** (Augusta, Botetourt, Buena Vista, Clarke, Frederick, Harrisonburg, Lexington, Page, Rockbridge, Rockingham, Shenandoah, Staunton, Warren & Waynesboro Counties) & **WV** (Berkley & Jefferson Counties)

**Factors of Decline:**

Habitat loss and degradation, poor water quality and human intervention.

**Best Management Practices:**

[Madison Cave Isopod BMP's via U.S. Fish & Wildlife Services \(Columbia Pipeline Group Habitat Conservation Program\)](#)

**References:**

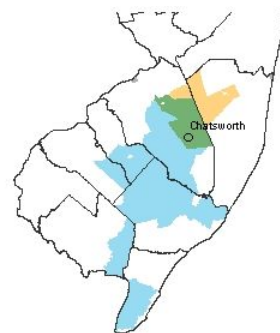
U.S. Fish & Wildlife Services. (n.d.). Species profile for Madison Cave isopod (*Antrolana lira*). *Environmental Conservation Online System USFWS*. Retrieved from: <https://ecos.fws.gov/ecp0/profile/speciesProfile?sld=4162>

NatureServe. 2018. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Retrieved from: <http://explorer.natureserve.org>

<b>Common Name</b>	American Chaffseed	<b>Conservation Status</b>	Endangered (1992)
<b>Scientific Name</b>	<i>Schwalbea americana</i>	<b>Critical Habitat</b>	None currently designated



Photo credit: U.S. Fish & Wildlife Services



**American Chaffseed (By Municipality)**  
 Current (Presently Known to Occur)  
 Historic (May Still Be Present)  
 Potential (May Be Present)  
 Extirpated (No Longer Present)

Photo credit: U.S. Fish & Wildlife Services

**Physical Description:**

A perennial herb with mostly unbranched stems, usually 3-6 dm tall. Leaves are largest at the base of the plant and gradually diminish in size towards the top of the stem. The 2-lipped flowers are yellow, suffused with purple. This species is parasitic on the roots of a wide variety of woody and herbaceous plants. It is in bloom from April through June in the South and from June to late July in the North.

**Spatial Distribution:**

Acidic, sandy or peaty soils in open pine flatwoods, pitch pine lowland forests, seepage bogs, palustrine pine savannahs, and other grass- and sedge-dominated plant communities. Frequently grows in ecotonal areas between peaty wetlands and xeric sandy soils. In these situations, individuals sometimes extend well into the drier communities, but seldom into the areas that support species characteristic of wetter soils. Surrounding plant communities are typically species-rich.

NJ (Burlington)  
 State forest land within the Pinelands National Reserve

**Factors of Decline:**

Human interference, trampling, construction and light competition.

**Best Management Practices:**

[American Chaffseed Management Summary via NatureServe](#)  
  
[American Chaffseed Recovery Plan & Conservation Measures via NC State University](#)

**References:**

U.S. Fish & Wildlife Services. (n.d.). Species profile for American Chaffseed (*Schwalbea americana*). *Environmental Conservation Online System USFWS*. Retrieved from: <https://ecos.fws.gov/ecp0/profile/speciesProfile?sid=1286>  
  
 NatureServe. 2018. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Retrieved from: <http://explorer.natureserve.org>

<b>Common Name</b>	Harperella	<b>Conservation Status</b>	Endangered (1988)
<b>Scientific Name</b>	<i>Ptilimnium nodosum</i>	<b>Critical Habitat</b>	None currently designated





Photo credit: USDA Forest Service

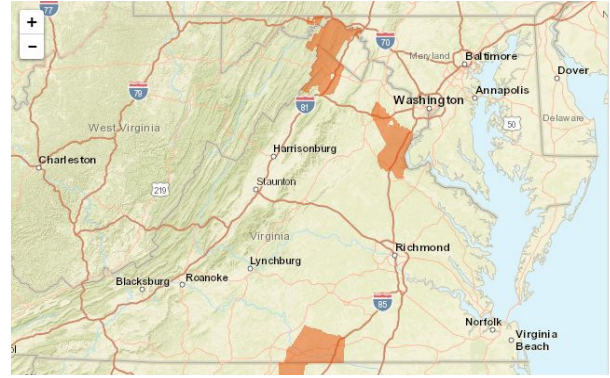


Photo credit: U.S. Fish & Wildlife Services

**Physical Description:**

An annual herb with slender, erect stems, up to 12 dm high. The roots are shallow, diffuse-fibrous, and the plants have a faint scent of dill. Unlike those of the more common members of this genus, the leaves of *P. nodosum* are reduced to hollow, quill-like structures. Broad clusters of small white flowers bloom mostly in July and August.

**Spatial Distribution:**

Occurs in three habitat types: rocky/gravelly shoals or cracks in bedrock outcrops beneath the water surface in clear, swift-flowing streams (usually in microsites that are sheltered from rapidly moving water); edges of intermittent pineland ponds or low, wet savannah meadows on the Coastal Plain; and granite outcrop seeps. In all habitat-types, the species occurs in a narrow range of water depths; it is intolerant of deep water and of conditions that are too dry. However, the plants readily tolerate periodic, moderate flooding - something to which few potential competitors are adapted.

**MD** (Allegany & Washington Counties), **VA** (Frederick, Mecklenburg, Prince William & Stafford Counties) & **WV** (Berkley, Hampshire & Morgan Counties)

**Factors of Decline:**

Habitat degradation via alterations to the natural hydrologic regime, siltation and erosion, water quality reductions, and disturbance and trampling.

**Best Management Practices:**

[Harperella Management Recommendations via Georgia Wildlife](#)

**References:**

U.S. Fish & Wildlife Services. (n.d.). Species profile for Harperella (*Ptilimnium nodosum*). *Environmental Conservation Online System USFWS*. Retrieved from: <https://ecos.fws.gov/ecp0/profile/speciesProfile?slid=1286>

NatureServe. 2018. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Retrieved from: <http://explorer.natureserve.org>

<b>Common Name</b>	Knieskern's Beaked-rush	<b>Conservation Status</b>	Threatened (1991)
<b>Scientific Name</b>	<i>Rhynchospora knieskernii</i>	<b>Critical Habitat</b>	None currently designated



Photo credit: U.S. Fish & Wildlife Services



Photo credit: U.S. Fish & Wildlife Services

**Physical Description:**

A perennial sedge (or annual under adverse growing conditions) commonly under 40 cm, but occasionally reaching 60 cm or more. Spikelets of inconspicuous flowers are produced in small clusters along the length of the stem. Achenes mature from late July until frost.

**Spatial Distribution:**

Restricted to early successional habitats in pitch pine lowland forests within pine barrens. Substrates are highly acidic, nutrient poor, fine grained mineral soils, frequently over clay deposits, but sometimes found on bog iron deposits. Sites typically have fluctuating water regimes. The species is a poor competitor and is usually found on bare or sparsely vegetated sites that are maintained open through natural disturbances such as fire or flood scouring, or through human-caused disturbances such as roadside, railroad, or powerline right-of-way maintenance, or in inactive sand or clay pits.

NJ (Atlantic, Burlington, Camden, Cape May, Cumberland, Gloucester, Monmouth & Ocean Counties)

**Factors of Decline:**

Vulnerable to roadside grading, sand & gravel operations, habitat succession, development, & recreational pressures.

**Best Management Practices:**

[Knieskern's Beaked-rush BMP's via U.S. Fish & Wildlife Services, New Jersey Field Office](#)

**References:**

U.S. Fish & Wildlife Services. (n.d.). Species profile for Knieskern's Beaked-rush (*Rhynchospora knieskernii*). *Environmental Conservation Online System USFWS*. Retrieved from: <https://ecos.fws.gov/ecp0/profile/speciesProfile?sld=3280>

NatureServe. 2018. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Retrieved from: <http://explorer.natureserve.org>

<b>Common Name</b>	Northeastern Bulrush	<b>Conservation Status</b>	Endangered (1991)
<b>Scientific Name</b>	<i>Scirpus ancistrochaetus</i>	<b>Critical Habitat</b>	None currently designated



Photo credit: U.S. Fish & Wildlife Services

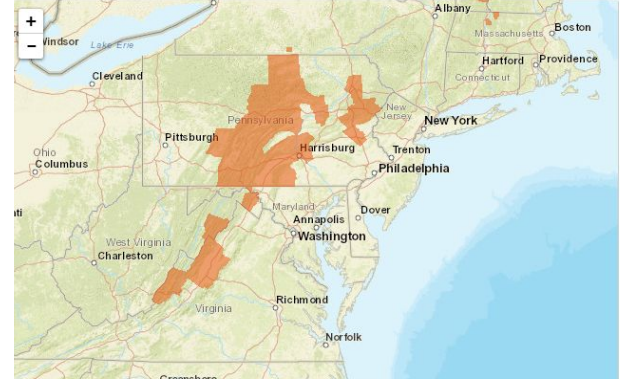


Photo credit: U.S. Fish & Wildlife Services

**Physical Description:**

A perennial sedge that typically grows to 8-12 dm in height. It is a leafy bulrush in which culm leaves are well-developed. The lowermost leaves are up to 8 millimeters (mm) wide and 40-60 times as long as wide, while the uppermost leaves are 3-5 mm wide and 30-50 times as long as wide. The umbellate inflorescence has distinctly arching rays, which bear clusters of brown spikelets (small, elongated flower clusters). Each of the minute flowers has six small (1.1-1.7 mm long), rigid perianth bristles, and each bristle is armed with thickwalled, sharply pointed barbs projecting downward.

**Spatial Distribution:**

Found in open, tall herb-dominated wetlands. Often it grows at the water's edge, or in a few centimeters of water, but it may also be in fairly deep water (0.3-0.9 m) or away from standing water.

**MD** (Washington), **PA** (Adams, Bedford, Blair, Cambria, Carbon, Centre, Clinton, Columbia, Cumberland, Dauphin, Franklin, Fulton, Huntingdon, Lackawanna, Lehigh, Lycoming, Mifflin, Monroe, Perry, Snyder Tioga & Union Counties), **VA** (Alleghany, Augusta, Bath, Covington, Harrisonburg, Rockingham, Staunton & Waynesboro Counties) & **WV** (Berkeley & Hardy Counties)

**Factors of Decline:**

Agricultural runoff, logging roads, fire roads (one site in Pennsylvania burns frequently; fire protection may damage sites here), development, all-terrain vehicle, collection, and dredging. Oil and gas development, road construction, and powerline maintenance are also threats.

**Best Management Practices:**

[Northeastern Bulrush Management Summary via NatureServe](#)

**References:**

U.S. Fish & Wildlife Services. (n.d.). Species profile for Northeastern bulrush (*Scirpus ancistrochaetus*). *Environmental Conservation Online System USFWS*. Retrieved from: <https://ecos.fws.gov/ecp0/profile/speciesProfile?sld=6715>

NatureServe. 2018. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Retrieved from: <http://explorer.natureserve.org>

<b>Common Name</b>	Sandplain Gerardia	<b>Conservation Status</b>	Endangered (1988)
<b>Scientific Name</b>	<i>Agalinis acuta</i>	<b>Critical Habitat</b>	None currently designated

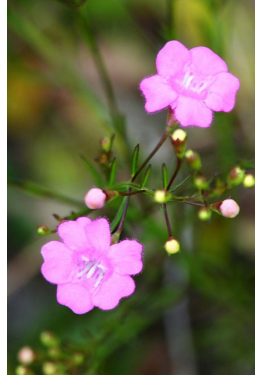


Photo credit: U.S. Fish & Wildlife Services

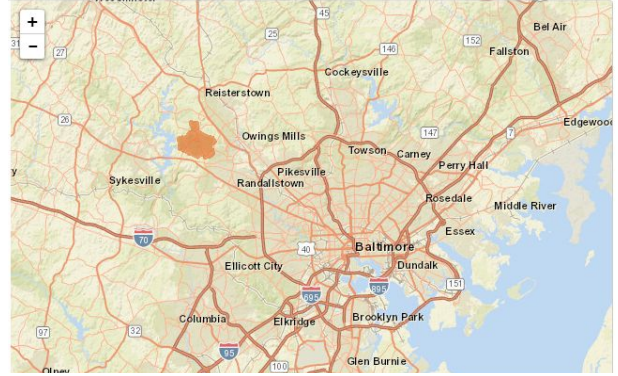


Photo credit: U.S. Fish & Wildlife Services

**Physical Description:**

A small, inconspicuous plant that grows from 1-4 dm tall, simple or sparsely branched. Branching is ascending, giving the plant a more erect rather than bushy appearance. It has a deep pink flower with darker spots toward a cream-colored center. The five petals are squared off and slightly indented at the ends. The diagnostic characters of *Agalinis acuta* are long pedicels, shallowly notched petals, scalloped calyx border, and short calyx teeth fringed with hairs.

**Spatial Distribution:**

Dry, sandy, short grass plains, roadsides, and openings in oak scrub. Dependent on periodic disturbance that maintains an open habitat. In an open area with a lack of competition.

MD (Baltimore)  
Soldiers Delight Natural Environment Area

**Factors of Decline:**

Outright habitat destruction by human activities and habitat loss due to succession appear to be the most serious threats to most *Agalinis acuta* populations. Loss of grazing animals and the control of natural fires has caused the encroachment by pitch pine and scrub oak.

**Best Management Practices:**

[Sandplain Gerardia Management Summary via NatureServe](#)

**References:**

U.S. Fish & Wildlife Services. (n.d.). Species profile for Sandplain gerardia (*Agalinis acuta*). *Environmental Conservation Online System USFWS*. Retrieved from: <https://ecos.fws.gov/ecp0/profile/speciesProfile?sid=8128>

NatureServe. 2018. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Retrieved from: <http://explorer.natureserve.org>

<b>Common Name</b>	Seabeach Amaranth	<b>Conservation Status</b>	Threatened (1993)
<b>Scientific Name</b>	<i>Amaranthus pumilus</i>	<b>Critical Habitat</b>	None currently designated





Photo credit: U.S. Fish & Wildlife Services

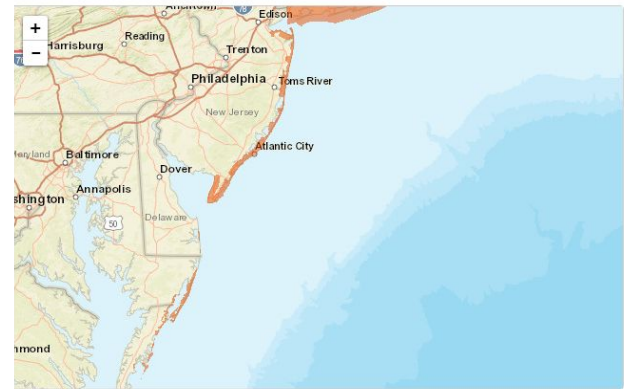


Photo credit: U.S. Fish & Wildlife Services

**Physical Description:**

An annual herb with reddish-colored, prostrate, highly branched stems that form clumps, often reaching 3 dm in diameter. Leaves are spinach-green, clustered towards the tips of the stems. Flowers and fruits are inconspicuous.

**Spatial Distribution:**

Barrier islands, mainly on coastal overwash flats at the accreting ends of the islands and lower foredunes and on ocean beaches above mean high tide (occasionally on sound-side beaches). Intolerant of competition; does not occur on well-vegetated sites.

**DE** (Sussex), **MD** (Worcester), **NJ** (Atlantic, Cape May, Middlesex, Monmouth & Ocean Counties) & **VA** (Accomack & Northampton Counties)

**Factors of Decline:**

Primarily threatened by beach-hardening (sea walls, riprap, etc.), soft stabilization (dune fencing), development, heavy recreational use, and off-road traffic.

**Best Management Practices:**


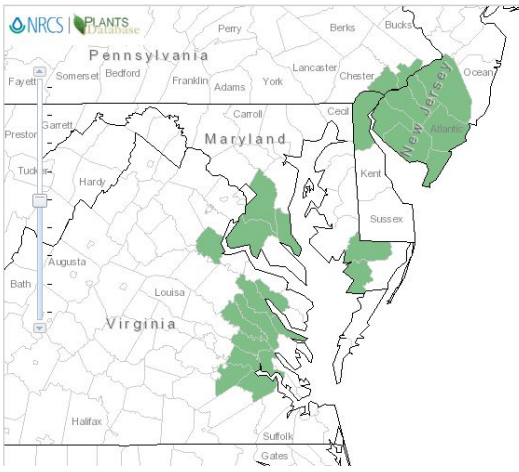
[Seabeach Amaranth BMP's via U.S. Fish & Wildlife Services, New Jersey Field Office](#)

**References:**


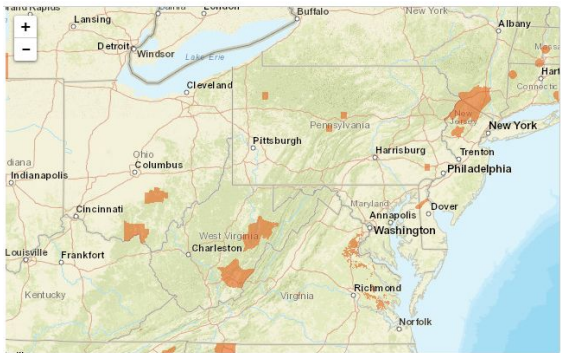
U.S. Fish & Wildlife Services. (n.d.). Species profile for Seabeach amaranth (*Amaranthus pumilus*). *Environmental Conservation Online System USFWS*. Retrieved from: <https://ecos.fws.gov/ecp0/profile/speciesProfile?sld=8549>


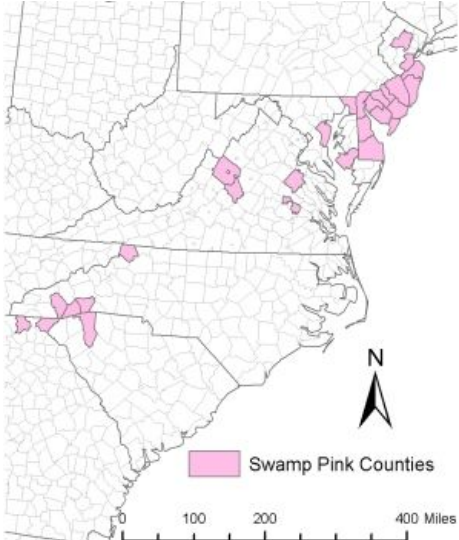
NatureServe. 2018. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Retrieved from: <http://explorer.natureserve.org>

<b>Common Name</b>	Sensitive Joint-Vetch	<b>Conservation Status</b>	Threatened (1992)
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<b>Scientific Name</b>	<i>Aeschynomene virginica</i>	<b>Critical Habitat</b>	None currently designated
 <p>Photo credit: U.S. Fish &amp; Wildlife Services</p>		 <p>Photo credit: U.S. Department of Agriculture</p>	
<p><b>Physical Description:</b> A tall single-stemmed annual, up to 2.4 m in height, with leaves that will fold slightly if touched. Flowers (late July-October) are about 1 cm long; yellow with streaks of orange-red.</p>		<p><b>Spatial Distribution:</b> Fresh to slightly brackish tidal river shores and estuarine-river marsh borders. Usually grows within 2m of low water mark on raised banks. Peaty, sandy or gravelly substrates.</p> <p><b>MD</b> (Calvert, Charles, Dorchester, Prince George, Somerset &amp; Wicomico Counties), <b>NJ</b> (Burlington, Camden, Cumberland, Cape May, Salem &amp; Atlantic Counties), <b>PA</b> (Delaware &amp; Philadelphia Counties) &amp; <b>VA</b> ( Charles City, Chesterfield, Essex, Henrico, James City, King William, King and Queen, New Kent, Richmond, Stafford &amp; Westmoreland Counties)</p>	
<p><b>Factors of Decline:</b> Habitat alteration is the primary threat to the species' continued existence. Many sites where it occurred historically have been dredged, filled or bulkheaded. If water levels, tidal flow or salinity levels change, the species would be threatened at its existing sites.</p>		<p><b>Best Management Practices:</b> <a href="#">Sensitive Joint-Vetch BMP's via Virginia Department of Conservation and Recreation</a></p>	
<p><b>References:</b> U.S. Fish &amp; Wildlife Services. (n.d.). Species profile for Sensitive joint-vetch (<i>Aeschynomene virginica</i>). <i>Environmental Conservation Online System USFWS</i>. Retrieved from: <a href="https://ecos.fws.gov/ecp0/profile/speciesProfile?slid=855">https://ecos.fws.gov/ecp0/profile/speciesProfile?slid=855</a> NatureServe. 2018. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Retrieved from: <a href="http://explorer.natureserve.org">http://explorer.natureserve.org</a></p>			

<b>Common Name</b>	Small Whorled Pogonia	<b>Conservation</b>	Threatened (1982)
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		<b>Status</b>	
<b>Scientific Name</b>	<i>Isotria medeoloides</i>	<b>Critical Habitat</b>	None currently designated
 <p>Photo credit: U.S. Fish &amp; Wildlife Services</p>	 <p>Photo credit: U.S. Fish &amp; Wildlife Services</p>		
<p><b>Physical Description:</b>  A perennial herb that grows up to 3 dm in height. A whorl of 5 or 6 leaves near the top of the stem and beneath the flower(s) gives the plant its common name. The leaves are grayish-green and are usually 4-8 cm long. Solitary (or occasionally paired) greenish-yellow flowers arise from the center of the leaf whorl. Blooms in May in the south, and as late as mid-June in the northern part of its range. Capsules mature in the fall.</p>	<p><b>Spatial Distribution:</b>  Acidic soils of dry to mesic second-growth, deciduous or deciduous-coniferous forests with an open herb layer, although occasionally dense ferns, moderate to light shrub layer, and a relatively open canopy. Soils typically covered with light to moderate leaf litter. Frequently occurs on flats or slope bases near canopy breaks.</p> <p><b>DE</b> (Keny &amp; New Castle Counties), <b>MD</b> (Kent), <b>NJ</b> (Hunterdon, Morris, Passaic, Somerset, Sussex &amp; Warren Counties), <b>PA</b> (Centre, Chester, Clinton, Monroe, Pike &amp; Venango Counties), <b>VA</b> (Albemarle, Alexandria, Amherst, Appomattox, Arlington, Bedford, Buckingham, Campbell, Caroline, Craig, Culpeper, Essex, Fairfax, Fauquier, Floyd, Fredericksburg, Gloucester, Hanover, James City, King and Queen, King George, King William, Lancaster, Lee, Madison, Middlesex, Nelson, New Kent, Orange, Pittsylvania, Prince William, Richmond, Spotsylvania, Stafford, Surry, Westmoreland, Williamsburg, Wise &amp; York Counties) &amp; <b>WV</b> (Greenbrier &amp; Randolph Counties)</p>		
<p><b>Factors of Decline:</b>  Primary threat is habitat destruction for residential or commercial development or forestry. Aside from habitat conversion, the absence of low intensity disturbance allowing for forest succession including subsequent canopy closure and in the absence of low intensity disturbance.</p>	<p><b>Best Management Practices:</b>  <a href="#">Small Whorled Pogonia Management Summary via NatureServe</a></p>		
<p><b>References:</b>  U.S. Fish &amp; Wildlife Services. (n.d.). Species profile for Small whorled pogonia (<i>Isotria medeoloides</i>). <i>Environmental Conservation Online System USFWS</i>. Retrieved from: <a href="https://ecos.fws.gov/ecp0/profile/speciesProfile?sld=1890#status">https://ecos.fws.gov/ecp0/profile/speciesProfile?sld=1890#status</a></p> <p>NatureServe. 2018. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Retrieved from: <a href="http://explorer.natureserve.org">http://explorer.natureserve.org</a></p>			

<b>Common Name</b>	Swamp Pink	<b>Conservation Status</b>	Threatened (1988)
<b>Scientific Name</b>	<i>Helonias bullata</i>	<b>Critical Habitat</b>	None currently designated
 <p data-bbox="168 892 474 911">Photo credit: U.S. Fish and Wildlife Service</p>		 <p data-bbox="813 898 1118 917">Photo credit: U.S. Fish and Wildlife Service</p>	
<p data-bbox="168 949 467 982"><b>Physical Description:</b></p> <p data-bbox="168 989 781 1339">A perennial member of the lily family, swamp pink has smooth, oblong, dark green leaves that form an evergreen rosette. In spring, some rosettes produce a flowering stalk that can grow over 3 feet tall. The stalk is topped by a 1 to 3-inch-long cluster of 30 to 50 small, fragrant, pink flowers dotted with pale blue anthers. The evergreen leaves of swamp pink can be seen year round, and flowering occurs between March and May.</p>		<p data-bbox="813 949 1092 982"><b>Spatial Distribution:</b></p> <p data-bbox="813 989 1463 1087">Grows in forested wetlands which have consistent levels of water and little flooding, such as at the source of streams. Can grow with some shade.</p> <p data-bbox="813 1129 1455 1228">DE, MD, VA, NJ (Morris, Middlesex, Monmouth, Ocean, Burlington, Camden, Gloucester, Atlantic, Salem, Cumberland, and Cape May Counties)</p>	
<p data-bbox="168 1373 435 1407"><b>Factors of Decline:</b></p> <p data-bbox="168 1413 769 1654">Habitat degradation is the primary rangewide threat. Clearing, draining, and filling forested wetlands can quickly destroy swamp pink and its habitat, changes in water quality and water supply to wetlands, collecting and trampling of swamp pink populations and competition from non-native plants</p>		<p data-bbox="813 1373 1211 1407"><b>Best Management Practices:</b></p> <p data-bbox="813 1413 1450 1476"><a href="https://www.fws.gov/northeast/njfieldoffice/conservation/swamppink/bestmanagementpractices/">Swamp Pink BMP's via U.S. Fish &amp; Wildlife, New Jersey Field Office</a></p>	
<p data-bbox="168 1688 337 1722"><b>References:</b></p> <p data-bbox="168 1728 1479 1780">U.S. Fish &amp; Wildlife Services. (2016). New Jersey Field Office: Swamp Pink (<i>Helonias bullata</i>) [threatened]. FWS. Retrieved from: <a href="https://www.fws.gov/northeast/njfieldoffice/endangered/swamppink.html">https://www.fws.gov/northeast/njfieldoffice/endangered/swamppink.html</a></p>			



<b>Common Name</b>	Eastern Prairie Fringed Orchid	<b>Conservation Status</b>	Threatened (1989)
<b>Scientific Name</b>	<i>Platanthera leucophaea</i>	<b>Critical Habitat</b>	None currently designated



Photo credit: U.S. Fish & Wildlife Services

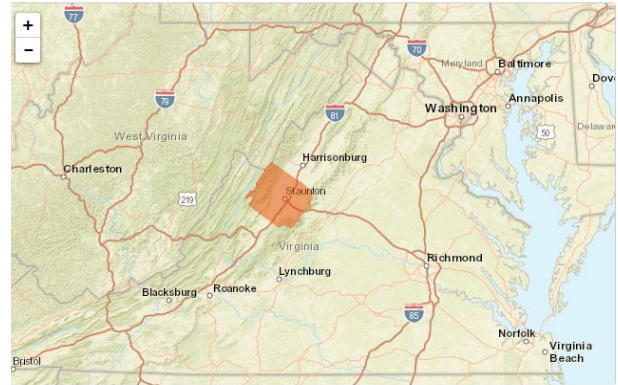


Photo credit: U.S. Fish & Wildlife Services

**Physical Description:**

A stout orchid (2-12 dm tall) that bears a long narrow cluster of up to 40 large white flowers, the petals coarsely fringed. The plants emerge from a winter-dormant, underground tuber in May and flowering usually begins by early July. The flowers become noticeably fragrant after sunset, an adaptation to attract their pollinators, the night-flying hawkmoths.

**Spatial Distribution:**

Mesic to wet prairies and wet sedge meadows. Peripheral habitat includes sedge-sphagnum bog mats around neutral pH kettle lakes, and fallow agricultural fields. Wet ditches and railroad rights-of-way also serve as refugia. This species' winter-dormant tubers are adapted to dormant-season prairie fires; such fires and high precipitation levels appear to promote flowering.

VA (Augusta, Staunton & Waynesboro Counties)

**Factors of Decline:**

Threats include drainage and ditching for crop production, commercial and residential development, grazing by cattle and deer, drought, and encroachment of woody vegetation in prairies due to fire suppression.



**Best Management Practices:**

[Eastern Prairie Fringed Orchid BMP's via Missouri Department of Conservation](#)

**References:**

U.S. Fish & Wildlife Services. (n.d.). Species profile for Eastern prairie fringed orchid (*Platanthera leucophaea*). *Environmental Conservation Online System USFWS*. Retrieved from: <https://ecos.fws.gov/ecp0/profile/speciesProfile?sld=601>

NatureServe. 2018. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Retrieved from: <http://explorer.natureserve.org>

<b>Common Name</b>	Michaux's Sumac	<b>Conservation Status</b>	Endangered (1989)
<b>Scientific Name</b>	<i>Rhus michauxii</i>	<b>Critical Habitat</b>	None currently designated
 <p data-bbox="168 804 464 825">Photo credit: U.S. Fish &amp; Wildlife Services</p>		 <p data-bbox="867 804 1162 825">Photo credit: U.S. Fish &amp; Wildlife Services</p>	
<p data-bbox="168 867 464 898"><b>Physical Description:</b></p> <p data-bbox="168 905 797 1119">A low-growing, densely hairy, dioecious shrub, mostly 0.3 to 0.6 m tall. Leaves are pinnately compound with 7-13 leaflets that are coarsely toothed. Female plants produce erect clusters of greenish-yellow to white 4-5 parted flowers and conspicuous red drupes. Flowers from April to June. Fruits persist from August through September or October.</p>		<p data-bbox="867 867 1146 898"><b>Spatial Distribution:</b></p> <p data-bbox="867 905 1433 993">Michaux's sumac occurs in sandy or rocky open woods, sometimes in association with circumneutral soils.</p> <p data-bbox="867 1031 1438 1062">VA (Brunswick, Dinwiddie &amp; Nottoway Counties)</p>	
<p data-bbox="168 1339 431 1371"><b>Factors of Decline:</b></p> <p data-bbox="168 1377 837 1560">Degradation of habitat due to lack of disturbance, and low reproductive capacity resulting from the geographic isolation of small single-sex populations. Shade-intolerant species which declines when its habitat becomes fire suppressed and a dense overstory develops.</p>		<p data-bbox="867 1339 1268 1371"><b>Best Management Practices:</b></p> <p data-bbox="867 1377 919 1409">N/A</p>	
<p data-bbox="168 1633 334 1665"><b>References:</b></p> <p data-bbox="168 1671 1433 1724">U.S. Fish &amp; Wildlife Services. (n.d.). Species profile for Michaux's sumac (<i>Rhus michauxii</i>). <i>Environmental Conservation Online System USFWS</i>. Retrieved from: <a href="https://ecos.fws.gov/ecp0/profile/speciesProfile?slid=5217">https://ecos.fws.gov/ecp0/profile/speciesProfile?slid=5217</a></p> <p data-bbox="168 1755 1406 1808">NatureServe. 2018. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Retrieved from: <a href="http://explorer.natureserve.org">http://explorer.natureserve.org</a></p>			

<b>Common Name</b>	Peter's Mountain Mallow	<b>Conservation Status</b>	Endangered (1986)
<b>Scientific Name</b>	<i>Iliamna corei</i>	<b>Critical Habitat</b>	None currently designated



Photo credit: Virginia Department of Conservation and Recreation

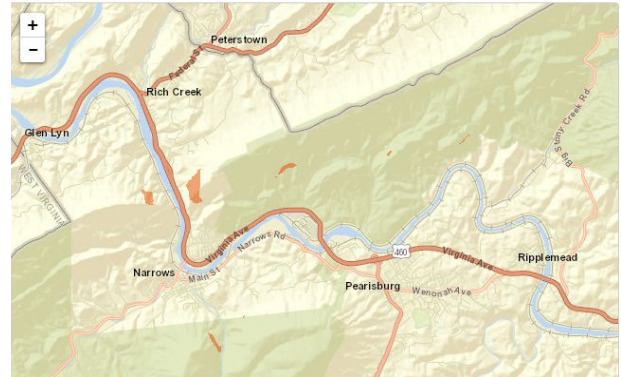


Photo credit: U.S. Fish & Wildlife Services

**Physical Description:**

It is a perennial herb that grows up to 3.5 feet tall and has large, pink, odorless flowers two inches in diameter.

**Spatial Distribution:**

Shallow soils on rocky ridge crest underlain by calcareous sandstone. Peters Mountain mallow is known only from a single population on Peters Mountain in Giles County, Virginia above the New River at The Narrows.

VA (Giles)

**Factors of Decline:**

Extremely limited distribution, small size, proximity of Appalachian Trail, and competition with other coarse perennials.

**Best Management Practices:**



N/A

**References:**


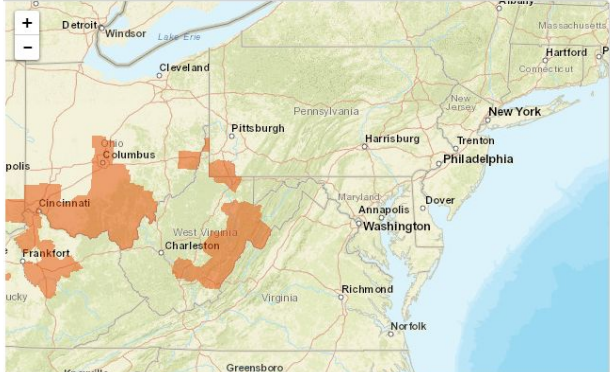
U.S. Fish & Wildlife Services. (n.d.). Species profile for Peter's mountain mallow (*Iliamna corei*). *Environmental Conservation Online System USFWS*. Retrieved from: <https://ecos.fws.gov/ecp0/profile/speciesProfile?sld=860>


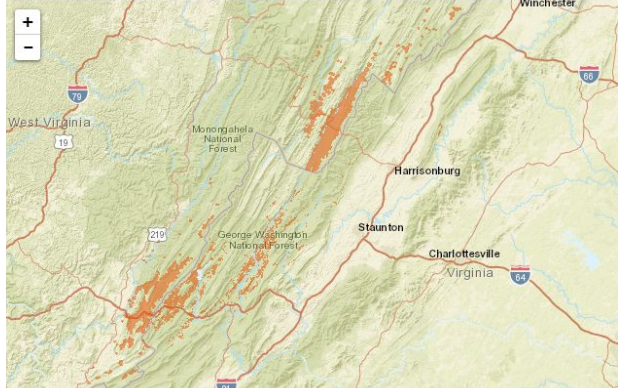
NatureServe. 2018. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Retrieved from: <http://explorer.natureserve.org>







<b>Common Name</b>	Roan Mountain Bluet	<b>Conservation Status</b>	Endangered (1990)
<b>Scientific Name</b>	<i>Hedyotis purpurea</i> var. <i>montana</i>	<b>Critical Habitat</b>	None currently designated
 <p data-bbox="168 825 415 846">Photo credit: USDA Forest Service</p>		 <p data-bbox="870 821 1166 842">Photo credit: U.S. Fish &amp; Wildlife Services</p>	
<p data-bbox="168 888 467 919"><b>Physical Description:</b></p> <p data-bbox="168 926 834 1241">Roan Mountain bluet, found on exposed mountain-top habitat, is easily distinguished from other bluets by its relatively large reddish purple flowers, small oval leaves, and compact growth form. The funnel-shaped flowers blossom from late May through August or September, with peak flowering usually in June and July. The four main flower pollinators are small staphylinid beetles, bumblebees, syrphid flies, and ants. The fruits are small, nearly round, and open in late August through September. Roan Mountain bluet grows about 8" tall.</p>		<p data-bbox="870 888 1149 919"><b>Spatial Distribution:</b></p> <p data-bbox="870 926 1479 989">Rocky exposures at high elevations of 4,600 to 6,200 feet.</p> <p data-bbox="870 1024 1049 1056">VA (Grayson)</p>	
<p data-bbox="168 1308 435 1339"><b>Factors of Decline:</b></p> <p data-bbox="168 1346 818 1518">Threats to Roan Mountain bluet come largely in three forms – commercial, residential, or recreational development at privately owned sites; and trampling of populations at accessible cliff or trail-side locations on public lands.</p>		<p data-bbox="870 1308 1268 1339"><b>Best Management Practices:</b></p> <p data-bbox="870 1346 1438 1409"><a href="#">Roan Mountain Bluet BMP's via U.S. Fish &amp; Wildlife Services</a></p>	
<p data-bbox="168 1602 337 1633"><b>References:</b></p> <p data-bbox="168 1640 1344 1717">U.S. Fish &amp; Wildlife Services. (n.d.). Species profile for Roan mountain bluet (<i>Hedyotis purpurea</i> var. <i>montana</i>). <i>Environmental Conservation Online System USFWS</i>. Retrieved from: <a href="https://ecos.fws.gov/ecp0/profile/speciesProfile?slid=1087">https://ecos.fws.gov/ecp0/profile/speciesProfile?slid=1087</a></p> <p data-bbox="168 1745 1409 1801">NatureServe. 2018. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Retrieved from: <a href="http://explorer.natureserve.org">http://explorer.natureserve.org</a></p>			





<b>Common Name</b>	Running Buffalo Clover	<b>Conservation Status</b>	Endangered (1987)
<b>Scientific Name</b>	<i>Trifolium stoloniferum</i>	<b>Critical Habitat</b>	None currently designated
 <p data-bbox="168 812 415 831">Photo credit: USDA Forest Service</p>		 <p data-bbox="870 812 1166 831">Photo credit: U.S. Fish &amp; Wildlife Services</p>	
<p data-bbox="168 863 467 898"><b>Physical Description:</b></p> <p data-bbox="168 900 829 1108">Perennial herbaceous vascular plant with creamy-white flower heads and leaves divided into three rounded leaflets, similar in appearance to the familiar Dutch clover of suburban lawns. Flowers mid-May through early June; flowering stems 1-4 dm tall.</p>		<p data-bbox="870 863 1146 898"><b>Spatial Distribution:</b></p> <p data-bbox="870 900 1479 1247">Mesic woodlands in partial to filtered sunlight, where there is a pattern of moderate periodic disturbance for a prolonged period. It is most often found in regions underlain with limestone or other calcareous bedrock, but not exclusively. It has been reported from a variety of disturbed woodland habitats, including blue-ash savannahs, floodplains, streambanks, shoals, grazed woodlots, mowed paths, old logging roads, jeep trails, skidder trails, mowed wildlife openings within mature forests, and steep, weedy ravines.</p> <p data-bbox="870 1283 1446 1373"><b>PA</b> (Greene) &amp; <b>WV</b> (Barbour, Brooke, Fayette, Greenbrier, Monongalia, Pendleton, Pocahontas, Randolph, Tucker &amp; Webster Counties)</p>	
<p data-bbox="168 1409 435 1444"><b>Factors of Decline:</b></p> <p data-bbox="168 1446 805 1633">Initial habitat destruction by the wave of new settlers, poor dispersal to new sites following the elimination of bison and other large herbivores, loss of the natural grazing regime, increased consumer pressure from increased cattle herds and rabbit populations and increased competition from exotic plants.</p>		<p data-bbox="870 1409 1268 1444"><b>Best Management Practices:</b></p> <p data-bbox="870 1446 1349 1514"><a href="#">Running Buffalo Clover Management Summary via NatureServe</a></p> <p data-bbox="870 1549 1425 1619"><a href="#">Running Buffalo Clover BMP's via Missouri Department of Conservation</a></p>	
<p data-bbox="168 1690 337 1726"><b>References:</b></p> <p data-bbox="168 1728 1414 1780">U.S. Fish &amp; Wildlife Services. (n.d.). Species profile for Running Buffalo clover (<i>Trifolium stoloniferum</i>). <i>Environmental Conservation Online System USFWS</i>. Retrieved from: <a href="https://ecos.fws.gov/ecp0/profile/speciesProfile?slid=2529">https://ecos.fws.gov/ecp0/profile/speciesProfile?slid=2529</a></p> <p data-bbox="168 1808 1409 1860">NatureServe. 2018. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Retrieved from: <a href="http://explorer.natureserve.org">http://explorer.natureserve.org</a></p>			


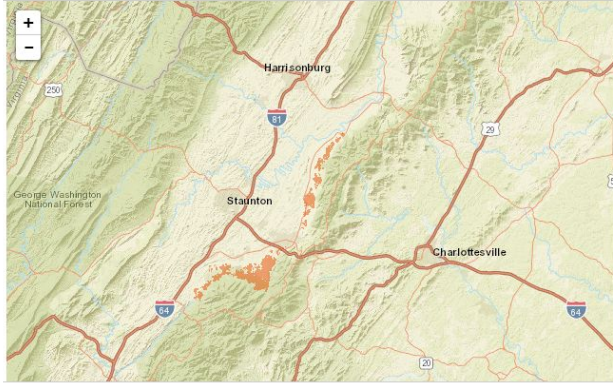
<b>Common Name</b>	Shale Barren Rock Cress	<b>Conservation Status</b>	Endangered (1989)
<b>Scientific Name</b>	<i>Arabis serotina</i>	<b>Critical Habitat</b>	None currently designated
 <p>Photo credit: USDA Forest Service</p>		 <p>Photo credit: U.S. Fish &amp; Wildlife Services</p>	
<p><b>Physical Description:</b>  A biennial herb, typically reaching 40-60 cm in height (sometimes up to 100 cm) and producing a wide, highly branched inflorescence and tiny white flowers. In bloom mid-July to October. Small whitish flowers, with calyxes from less than 2.0 to 3.3 mm long, bear fruits (silicles) which range from 4.3 to 7.94 cm. Seeds are usually yellowish brown, with a narrowly elliptic body, 1.5 to 2.0 times longer than broad with a narrow wing measuring from 0.1 to 0.2 mm.</p>		<p><b>Spatial Distribution:</b>  Mid-Appalachian shale barrens are characterized by an open, scrubby growth of pine, oak, red cedar, and other woody species adapted to dry conditions and are found most frequently on eroding slopes undercut by a stream. Shale barrens are isolated islands of habitat with steep southern exposures with elevations of 1099 to 2494 feet, dry, relatively sparse vegetative cover, high temperatures, and low moisture in the summer.</p> <p><b>VA</b> (Alleghany, Augusta, Bath, Botetourt, Covington, Highland, Page, Rockbridge, Rockingham &amp; Shenandoah Counties) &amp; <b>WV</b> (Grant, Greenbrier, Hampshire, Hardy, Monroe, Pendleton &amp; Pocahontas Counties)</p>	
<p><b>Factors of Decline:</b>  Habitat alteration and degradation. Occurs in very stressed environment and therefore cannot tolerate much disturbance.</p>		<p><b>Best Management Practices:</b>  <a href="#">Shale Barren Rock Cress BMP's via U.S. Fish &amp; Wildlife Services</a></p>	
<p><b>References:</b>  U.S. Fish &amp; Wildlife Services. (n.d.). Species profile for Shale barren rock cress (<i>Arabis serotina</i>). <i>Environmental Conservation Online System USFWS</i>. Retrieved from: <a href="https://ecos.fws.gov/ecp0/profile/speciesProfile?sld=6018">https://ecos.fws.gov/ecp0/profile/speciesProfile?sld=6018</a></p> <p>NatureServe. 2018. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Retrieved from: <a href="http://explorer.natureserve.org">http://explorer.natureserve.org</a></p>			


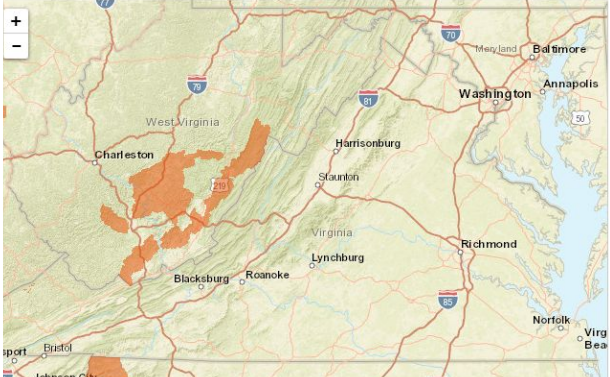
<b>Common Name</b>	Small-anthered Bittercress	<b>Conservation Status</b>	Endangered (1989)
<b>Scientific Name</b>	<i>Cardamine micranthera</i>	<b>Critical Habitat</b>	None currently designated
 <p>Photo credit: U.S. Fish &amp; Wildlife Services</p>		 <p>Photo credit: U.S. Fish &amp; Wildlife Services</p>	
<p><b>Physical Description:</b> A slender, erect perennial herb with fibrous roots and one (rarely more) simple or branched stem(s), growing up to 4 dm tall, that produce white flowers in April and May.</p>		<p><b>Spatial Distribution:</b> Occupies seepages, wet rock crevices, stream banks, sandbars, and wet woods along small streams that are fully to partially shaded. More specifically, the wet, boggy soils where it is typically found are in deciduous woodlands and in moist to wet soils along the edge of small to intermediate sized streams and within the stream bed plants also inhabit sand and gravel bars and wet rock crevices.</p> <p>VA (Henry &amp; Patrick Counties)</p>	
<p><b>Factors of Decline:</b> Habitat alteration through continued conversion and degradation of habitat. Additional threats include flooding and encroachment of exotic species such as Japanese honeysuckle or Japanese Stiltgrass.</p>		<p><b>Best Management Practices:</b> N/A</p>	
<p><b>References:</b> U.S. Fish &amp; Wildlife Services. (n.d.). Species profile for Small-anthered bittercress (<i>Cardamine micranthera</i>). <i>Environmental Conservation Online System USFWS</i>. Retrieved from: <a href="https://ecos.fws.gov/ecp0/profile/speciesProfile?slid=3462">https://ecos.fws.gov/ecp0/profile/speciesProfile?slid=3462</a> NatureServe. 2018. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Retrieved from: <a href="http://explorer.natureserve.org">http://explorer.natureserve.org</a></p>			

<b>Common Name</b>	Smooth Coneflower	<b>Conservation Status</b>	Endangered (1992)
<b>Scientific Name</b>	<i>Echinacea laevigata</i>	<b>Critical Habitat</b>	None currently designated
 <p>Photo credit: North Carolina Department of Agriculture</p>		 <p>Photo credit: U.S. Fish &amp; Wildlife Services</p>	
<p><b>Physical Description:</b> A rhizomatous perennial herb, which grows to a height of about 1.5 m, with smooth stems, few leaves and pink to purplish flowers. This species flowers from May to mid-July and fruits from late June to September. The flower is smooth, with longer, narrower corollas.</p>		<p><b>Spatial Distribution:</b> Primarily occurs in openings in woods, such as cedar barrens and clear cuts, along roadsides and utility line rights-of-way, and on dry limestone bluffs. Usually found in areas with magnesium- and calcium-rich soils. Requires full or partial sun.</p> <p>VA (Alleghany, Amherst, Appomattox, Bath, Botetourt, Campbell, Charlotte, Franklin, Halifax, Lynchburg, Montgomery, Pulaski, Radford &amp; Roanoke Counties)</p>	
<p><b>Factors of Decline:</b> Habitat loss and degradation from the growth of woody vegetation as a result of prolonged fire suppression is the primary threat to the species' habitat.</p>		<p><b>Best Management Practices:</b> <a href="#">Smooth Coneflower Conservation Practices via Virginia Department of Conservation and Recreation</a></p>	
<p><b>References:</b> U.S. Fish &amp; Wildlife Services. (n.d.). Species profile for Smooth coneflower (<i>Echinacea laevigata</i>). <i>Environmental Conservation Online System USFWS</i>. Retrieved from: <a href="https://ecos.fws.gov/ecp0/profile/speciesProfile?sld=3473">https://ecos.fws.gov/ecp0/profile/speciesProfile?sld=3473</a> NatureServe. 2018. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Retrieved from: <a href="http://explorer.natureserve.org">http://explorer.natureserve.org</a></p>			





<b>Common Name</b>	Virginia Round-leaf Birch	<b>Conservation Status</b>	Threatened (1978)
<b>Scientific Name</b>	<i>Betula uber</i>	<b>Critical Habitat</b>	None currently designated
 <p>Photo credit: U.S. Fish &amp; Wildlife Services</p>		 <p>Photo credit: U.S. Fish &amp; Wildlife Services</p>	
<p><b>Physical Description:</b> Deciduous, single-trunked tree reaching a height of approximately 50 feet. The bark is dark brownish-black and has a wintergreen aroma when bruised.</p>		<p><b>Spatial Distribution:</b> The only known natural population was found along the floodplain of a creek at an elevation of about 1160 m. The site is within a narrow strip of second-growth forest that includes many sweet and yellow birches. The band of forest is nearly surrounded by agricultural land.</p> <p>VA (Smyth) (Cressy Creek)</p>	
<p><b>Factors of Decline:</b> Threatened by the absence of forest openings and exposed mineral soil which seem to be requirements for natural reproduction, small/limited distribution.</p>		<p><b>Best Management Practices:</b> <a href="#">Virginia Round-leaf Birch BMP's via USDA Forest Service</a></p>	
<p><b>References:</b> U.S. Fish &amp; Wildlife Services. (n.d.). Species profile for Virginia round-leaf birch (<i>Betula uber</i>). <i>Environmental Conservation Online System USFWS</i>. Retrieved from: <a href="https://ecos.fws.gov/ecp0/profile/speciesProfile?slid=2736">https://ecos.fws.gov/ecp0/profile/speciesProfile?slid=2736</a>  NatureServe. 2018. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Retrieved from: <a href="http://explorer.natureserve.org">http://explorer.natureserve.org</a></p>			



<b>Common Name</b>	Virginia Sneezeweed	<b>Conservation Status</b>	Threatened (1998)
<b>Scientific Name</b>	<i>Helenium virginicum</i>	<b>Critical Habitat</b>	None currently designated
 <p>Photo credit: Virginia Department of Conservation and Recreation</p>		 <p>Photo credit: U.S. Fish &amp; Wildlife Services</p>	
<p><b>Physical Description:</b>  A perennial herb, 7-11 dm tall. Basal leaves form a rosette and may be broad in the middle tapering toward the ends, but otherwise may appear oblong. Stem leaves are lanceolate and become progressively smaller from the base to the tip of the stem. Stems are winged, wings being continuous with the base of the stem leaves. Flower ray petals are yellow and wedge shaped with three lobes at the ends. Central disk is nearly ball-shaped. Clusters of golden-yellow flower heads bloom from July to September.</p>		<p><b>Spatial Distribution:</b>  <i>Helenium virginicum</i> is a wetland plant restricted to shallow, seasonally inundated ponds (which are in or near sinkholes) in Augusta and Rockingham Counties, Virginia. The pond basins in which this species occurs are usually flooded from January to July. The substrate at most <i>H. virginicum</i> sites consists of poorly drained, acidic, low fertility Purdy silt loams underlain by gray clays and dolomitic bedrock.</p> <p>VA (Augusta, Rockbridge, Rockingham &amp; Waynesboro Counties)</p>	
<p><b>Factors of Decline:</b>  In Virginia the long-term viability of existing populations is primarily threatened by human-induced disruptions of hydrologic regimes, particularly by encroaching agriculture, residential land development, and logging. In addition, a private site and adjacent sites on the George Washington National Forest are sporadically impacted by off road vehicles.</p>		<p><b>Best Management Practices:</b>  <a href="#">Virginia Sneezeweed BMP's via Missouri Department of Conservation</a></p>	
<p><b>References:</b>  U.S. Fish &amp; Wildlife Services. (n.d.). Species profile for Virginia sneezeweed (<i>Helenium virginicum</i>). <i>Environmental Conservation Online System USFWS</i>. Retrieved from: <a href="https://ecos.fws.gov/ecp0/profile/speciesProfile?sld=6297">https://ecos.fws.gov/ecp0/profile/speciesProfile?sld=6297</a>  NatureServe. 2018. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Retrieved from: <a href="http://explorer.natureserve.org">http://explorer.natureserve.org</a></p>			


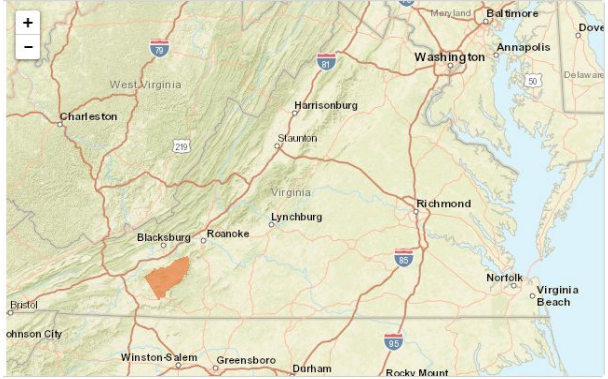
<b>Common Name</b>	Virginia Spiraea	<b>Conservation Status</b>	Threatened (1990)
<b>Scientific Name</b>	<i>Spiraea virginiana</i>	<b>Critical Habitat</b>	None currently designated
 <p>Photo credit: U.S. Fish &amp; Wildlife Services</p>		 <p>Photo credit: U.S. Fish &amp; Wildlife Services</p>	
<p><b>Physical Description:</b> A shrub with upright, arching branches, usually 1-3 m tall. Leaves are acute at the apex and entire or sparingly toothed. Produces showy clusters of small white flowers. Fruit is a follicle. Flowering in June and July. Fruiting in August and September.</p>		<p><b>Spatial Distribution:</b> Periodically flood-scoured banks of high-gradient mountain streams, meander scrolls, point bars, natural levees, and braided features of lower stream reaches, and occasionally near disturbed rights-of-way. Geologically active areas with erosion, deposition, and slumping, along rivers with dynamic flooding regimes, sandbars, scoured river shore and flatrock habitat with crevices. These areas also are associated with cobbles, boulders, and massive rock outcrops with sandy or clay soils. The areas can be periodically xeric. Plants are often seen in silt mud and sand.</p> <p><b>VA</b> (Buchanan, Carroll, Dickenson, Grayson, Russell &amp; Wise Counties) &amp; <b>WV</b> (Boone, Fayette, Greenbrier, McDowell, Mercer, Monroe, Nicholas, Pendleton, Pocahontas, Raleigh, Randolph, Summers, Webster &amp; Wyoming Counties)</p>	
<p><b>Factors of Decline:</b> Limited range, small number of populations, high habitat fidelity and low genetic variation, making it especially vulnerable to land-use conversion and habitat fragmentation. Populations of this riparian species are isolated, consisting of sterile clones, and damming of rivers has increased this isolation over time.</p>		<p><b>Best Management Practices:</b> N/A</p>	
<p><b>References:</b> U.S. Fish &amp; Wildlife Services. (n.d.). Species profile for Virginia spiraea (<i>Spiraea virginiana</i>). <i>Environmental Conservation Online System USFWS</i>. Retrieved from: <a href="https://ecos.fws.gov/ecp0/profile/speciesProfile?sld=1728">https://ecos.fws.gov/ecp0/profile/speciesProfile?sld=1728</a></p> <p>NatureServe. 2018. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Retrieved from: <a href="http://explorer.natureserve.org">http://explorer.natureserve.org</a></p>			






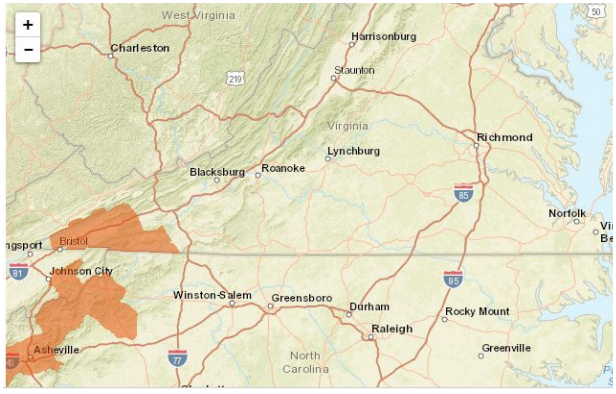
<b>Common Name</b>	Northeastern Beach Tiger Beetle	<b>Conservation Status</b>	Threatened (1990)
<b>Scientific Name</b>	<i>Cicindela dorsalis dorsalis</i>	<b>Critical Habitat</b>	None currently designated
 <p data-bbox="168 810 466 829">Photo credit: U.S. Fish &amp; Wildlife Services</p>	 <p data-bbox="867 810 1164 829">Photo credit: U.S. Fish &amp; Wildlife Services</p>		
<p data-bbox="168 863 466 892"><b>Physical Description:</b></p> <p data-bbox="168 898 841 1310">The largest (13-15 mm) of the recognized subspecies, the Northeastern beach tiger beetle is bronze to greenish with extensive maculations that run the length of the elytra. The maculations are wide, cream-colored, and frequently are expanded to cover much of the elytral surface. Abrasion by sand makes elytra of older individuals lighter. Below it is dark bronze to dark green with dense, white hair-like setae covering the sides of the abdomen. The last pair of legs is exceptionally long. The males and females are visibly different in the shape of the thorax (cylindrical in males, trapezoidal in females), and the shape of the elytral tip (rounded in males, broadly notched in females).</p>	<p data-bbox="867 863 1148 892"><b>Spatial Distribution:</b></p> <p data-bbox="867 898 1429 999">Occurs from about the foredune to the high tide line on ocean and bay beaches only. Larvae live in burrows in the sand.</p> <p data-bbox="867 1041 1474 1180"><b>MD</b> (Calvert, Somerset &amp; St. Mary's Counties), <b>NJ</b> (Monmouth) &amp; <b>VA</b> (Accomack, Hampton, Lancaster, Mathews, Middlesex, Northampton, Northumberland &amp; Poquoson Counties)</p>		
<p data-bbox="168 1373 433 1402"><b>Factors of Decline:</b></p> <p data-bbox="168 1409 834 1499">Main cause of decline was extensive vehicular use of nearly all beaches, in many places foot traffic was also a major factor, but species can tolerate some human use.</p>	<p data-bbox="867 1373 1268 1402"><b>Best Management Practices:</b></p> <p data-bbox="867 1409 920 1438">N/A</p>		
<p data-bbox="168 1629 336 1659"><b>References:</b></p> <p data-bbox="168 1665 1401 1713">U.S. Fish &amp; Wildlife Services. (n.d.). Species profile for Northeastern beach tiger beetle (<i>Cicindela dorsalis dorsalis</i>). <i>Environmental Conservation Online System USFWS</i>. Retrieved from: <a href="https://ecos.fws.gov/ecp0/profile/speciesProfile?slid=8105">https://ecos.fws.gov/ecp0/profile/speciesProfile?slid=8105</a></p> <p data-bbox="168 1738 1450 1787">NatureServe. 2018. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Retrieved from: <a href="http://explorer.natureserve.org">http://explorer.natureserve.org</a></p>			



<b>Common Name</b>	Puritan Tiger Beetle	<b>Conservation Status</b>	Threatened (1990)
<b>Scientific Name</b>	<i>Cicindela puritana</i>	<b>Critical Habitat</b>	None currently designated
 <p>Photo credit: U.S. Fish &amp; Wildlife Services</p>		 <p>Photo credit: U.S. Fish &amp; Wildlife Services</p>	
<p><b>Physical Description:</b> 12-14mm in length, bronze in color, wing covers marked in transverse and marginal white bands and long slender legs.</p>		<p><b>Spatial Distribution:</b> Adults and larvae have been found on the upper portions of sandy beaches near either fresh or saltwater. The habitat for the larvae are cliffs that were relatively extensive with little vegetation. All areas where this beetle has recently been found are characterized by the presence of "narrow sandy beaches with adjacent well-developed cliffs of sand and clay soil."  MD (Calvert, Cecil &amp; Kent Counties)</p>	
<p><b>Factors of Decline:</b> Threats include cliff stabilization and resultant vegetative encroachment, excessive human disturbance.</p>		<p><b>Best Management Practices:</b> N/A</p>	
<p><b>References:</b> U.S. Fish &amp; Wildlife Services. (n.d.). Species profile for Puritan tiger beetle (<i>Cicindela puritana</i>). <i>Environmental Conservation Online System USFWS</i>. Retrieved from: <a href="https://ecos.fws.gov/ecp0/profile/speciesProfile?sld=6073">https://ecos.fws.gov/ecp0/profile/speciesProfile?sld=6073</a>  NatureServe. 2018. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Retrieved from: <a href="http://explorer.natureserve.org">http://explorer.natureserve.org</a></p>			


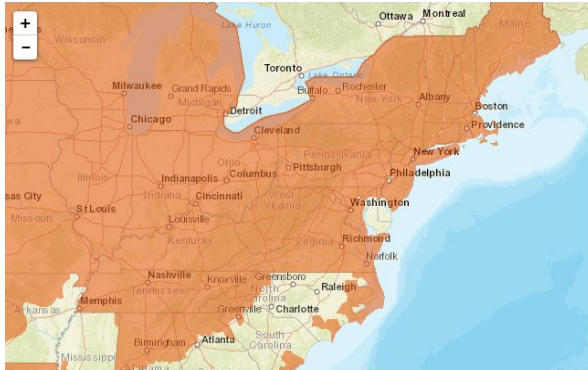
<b>Common Name</b>	Mitchell's Satyr Butterfly	<b>Conservation Status</b>	Endangered (1991)
<b>Scientific Name</b>	<i>Neonympha mitchellii mitchellii</i>	<b>Critical Habitat</b>	None currently designated
 <p>Photo credit: U.S. Fish &amp; Wildlife Services</p>		 <p>Photo credit: U.S. Fish &amp; Wildlife Services</p>	
<p><b>Physical Description:</b> A small fragile looking weak flying satyr butterfly found in a very few northern limestone wetlands. Smaller and darker than a wood satyr the only slightly similar species found within its range. Within its range this subspecies is very easily distinguished by the somewhat dull but definite orange bands before and after the closely packed rounded eyespots on the hindwings beneath. Usually a few eyespots on the forewing as well.</p>		<p><b>Spatial Distribution:</b> Restricted to calcareous sedge wetlands, usually true fens, sometimes sedge meadows in fen complexes.</p> <p>VA (Floyd)</p>	
<p><b>Factors of Decline:</b> Habitat alteration and unstable climate</p>		<p><b>Best Management Practices:</b> <a href="#">Mitchell's Satyr Butterfly Management Recommendations via U.S. Fish &amp; Wildlife Services</a></p>	
<p><b>References:</b> U.S. Fish &amp; Wildlife Services. (n.d.). Species profile for Mitchell's satyr butterfly (<i>Neonympha mitchellii mitchellii</i>). <i>Environmental Conservation Online System USFWS</i>. Retrieved from: <a href="https://ecos.fws.gov/ecp0/profile/speciesProfile?slid=8062">https://ecos.fws.gov/ecp0/profile/speciesProfile?slid=8062</a></p> <p>NatureServe. 2018. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Retrieved from: <a href="http://explorer.natureserve.org">http://explorer.natureserve.org</a></p>			

<b>Common Name</b>	Rusty Patched Bumble Bee	<b>Conservation Status</b>	Endangered (2017)
<b>Scientific Name</b>	<i>Bombus affinis</i>	<b>Critical Habitat</b>	None currently designated
 <p>Photo credit: U.S. Fish &amp; Wildlife Services</p>		 <p>Photo credit: U.S. Fish &amp; Wildlife Services</p>	
<p><b>Physical Description:</b> Rusty patched bumble bees live in colonies that include a single queen and female workers. The colony produces males and new queens in late summer. Queens are the largest bees in the colony, and workers are the smallest. All rusty patched bumble bees have entirely black heads, but only workers and males have a rusty reddish patch centrally located on the back.</p>		<p><b>Spatial Distribution:</b> Rusty patched bumble bees once occupied grasslands and tallgrass prairies of the Upper Midwest and Northeast, but most grasslands and prairies have been lost, degraded, or fragmented by conversion to other uses. Bumble bees need areas that provide nectar and pollen from flowers, nesting sites (underground and abandoned rodent cavities or clumps of grasses), and overwintering sites for hibernating queens (undisturbed soil).</p> <p>VA (Bath, Clarke, Fauquier &amp; Loudoun Counties) &amp; WV (Mineral)</p>	
<p><b>Factors of Decline:</b> Land use changes and other forms of habitat loss, changes in nectar flora etc. Pathogen spillover of an especially virulent strain of the imported microsporidian (<i>Nosema bombi</i>) and an imported protozoan parasite (<i>Crithidia bombi</i>) from domesticated bumblebees.</p>		<p><b>Best Management Practices:</b> <a href="#">Conservation Management Guidelines for the Rusty Patched Bumble Bee via U.S. Fish &amp; Wildlife Services</a></p>	
<p><b>References:</b> U.S. Fish &amp; Wildlife Services. (n.d.). Species profile for Rusty patched bumble bee (<i>Bombus affinis</i>). <i>Environmental Conservation Online System USFWS</i>. Retrieved from: <a href="https://ecos.fws.gov/ecp0/profile/speciesProfile?sld=9383">https://ecos.fws.gov/ecp0/profile/speciesProfile?sld=9383</a> U.S. Fish &amp; Wildlife Services. (2018). Fact Sheet: Rusty Patched Bumble Bee. USFWS. Retrieved from: <a href="https://www.fws.gov/midwest/endangered/insects/rpbb/factsheetrpbb.html">https://www.fws.gov/midwest/endangered/insects/rpbb/factsheetrpbb.html</a> NatureServe. 2018. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Retrieved from: <a href="http://explorer.natureserve.org">http://explorer.natureserve.org</a></p>			

<b>Common Name</b>	Spruce-fir Moss Spider	<b>Conservation Status</b>	Endangered (1995)
<b>Scientific Name</b>	<i>Microhexura montivaga</i>	<b>Critical Habitat</b>	None currently designated in RRT3
 <p>Photo credit: National Wildlife Federation</p>		 <p>Photo credit: U.S. Fish &amp; Wildlife Services</p>	
<p><b>Physical Description:</b> A small mygalomorph spider (2.5 - 3.8 mm adult size) ranging in color from light brown to a darker reddish brown. There are no markings on the abdomen and the carapace is generally yellowish brown.</p>		<p><b>Spatial Distribution:</b> Lives in high-elevation spruce-fir forest communities on moist but well-drained moss mats growing on rocks and boulders in well-shaded locations. It is known from conifer forests dominated by red spruce.</p> <p>VA (Bristol, Grayson, Smyth &amp; Washington Counties)</p>	
<p><b>Factors of Decline:</b> The primary threat is loss of suitable moss habitat. Other threats are complex and controversial and include regional-scale air pollution (acid rain), past land use history, vulnerability to extirpation from a single event or activity (i.e. drought, wildfire or timber harvesting) and human trampling/disturbance of the moss mats and surrounding vegetation shading the moss mats.</p>		<p><b>Best Management Practices:</b> N/A</p>	
<p><b>References:</b> U.S. Fish &amp; Wildlife Services. (n.d.). Species profile for Spruce-fir moss spider (<i>Microhexura montivaga</i>). <i>Environmental Conservation Online System USFWS</i>. Retrieved from: <a href="https://ecos.fws.gov/ecp0/profile/speciesProfile?slid=4801">https://ecos.fws.gov/ecp0/profile/speciesProfile?slid=4801</a></p> <p>NatureServe. 2018. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Retrieved from: <a href="http://explorer.natureserve.org">http://explorer.natureserve.org</a></p>			



<b>Common Name</b>	Indiana Bat	<b>Conservation Status</b>	Endangered (1967)
<b>Scientific Name</b>	<i>Myotis sodalis</i>	<b>Critical Habitat</b>	FR listing report ID 42 FR 47840 47845 (1977)
 <p>Photo credit: USDA Forest Service</p>		 <p>Photo credit: NatureServe</p>	
<p><b>Physical Description:</b> A small bat. Pelage very fine and fluffy, dull grayish chestnut above (hair tips slightly glossy; basal two-thirds blackish, followed by a grayish band and cinnamon tip), pinkish white underparts; membranes and ears blackish-brown; total length 75-102 mm; tail length 27-44 mm; wingspread 240-267 mm; length of head and body 41-49 mm; ear 10-15 mm, does not extend past end of nose when laid forward.</p>		<p><b>Spatial Distribution:</b> Hibernates primarily in caves (about 70 percent of population), maternity sites generally are behind loose bark of dead or dying trees or in tree cavities, foraging habitats include riparian areas, upland forests, ponds, and fields.</p> <p><b>MD</b> (Baltimore, Carroll, Frederick, Garrett, Howard, Montgomery &amp; Washington Counties), <b>NJ</b> (Bergen, Essex, Hunterdon, Mercer, Middlesex, Morris, Passaic, Somerset, Sussex, Union &amp; Warren Counties), <b>PA</b> (Adams, Allegheny, Armstrong, Beaver, Bedford, Berks, Blair, Bucks, Butler, Cambria, Carbon, Centre, Chester, Clarion, Clearfield, Clinton, Columbia, Crawford, Cumberland, Dauphin, Delaware, Erie, Fayette, Franklin, Fulton, Greene, Huntingdon, Indiana, Juniata, Lancaster, Lawrence, Lebanon, Lehigh, Luzerne, Mercer, Mifflin, Monroe, Montgomery, Montour, Northampton, Northumberland, Perry, Pike, Schuylkill, Snyder, Somerset, Union, Washington, Wayne, Westmoreland &amp; York Counties), <b>VA</b> (Alleghany, Augusta, Bath, Bland, Botetourt, Bristol, Buchanan, Buena Vista, Caroline, Carroll, Clarke, Covington, Craig, Dickenson, Floyd, Frederick, Galax, Giles, Grayson, Harrisonburg, Highland, Lee, Lexington, Montgomery, Norton, Page, Pulaski, Radford, Roanoke, Rockbridge, Rockingham, Russell, Salem, Scott, Shenandoah, Smyth, Staunton, Tazewell, Warren, Washington, Waynesboro, Winchester, Wise &amp; Wythe Counties) &amp; <b>WV</b> (All Counties)</p>	
<p><b>Factors of Decline:</b> Habitat loss/degradation, forest fragmentation, winter disturbance, and environmental contaminants.</p>		<p><b>Best Management Practices:</b> <a href="#">Indiana Bat BMP's via U.S. Fish &amp; Wildlife Services, New Jersey Field Office</a></p>	
<p><b>References:</b> U.S. Fish &amp; Wildlife Services. (n.d.). Species profile for Indiana bat (<i>Myotis sodalis</i>). <i>Environmental Conservation Online System USFWS</i>. Retrieved from: <a href="https://ecos.fws.gov/ecp0/profile/speciesProfile?slid=5949">https://ecos.fws.gov/ecp0/profile/speciesProfile?slid=5949</a> NatureServe. 2018. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Retrieved from: <a href="http://explorer.natureserve.org">http://explorer.natureserve.org</a></p>			

<b>Common Name</b>	Northern Long-eared Bat	<b>Conservation Status</b>	Threatened (2015)
<b>Scientific Name</b>	<i>Myotis septentrionalis</i>	<b>Critical Habitat</b>	None currently designated
 <p>Photo credit: U.S. Fish &amp; Wildlife Services</p>		 <p>Photo credit: U.S. Fish &amp; Wildlife Services</p>	
<p><b>Physical Description:</b> The northern long-eared bat is a medium-sized bat about 3 to 3.7 inches in length but with a wingspan of 9 to 10 inches. As its name suggests, this bat is distinguished by its long ears, particularly as compared to other bats in its genus.</p>		<p><b>Spatial Distribution:</b> During summer, roost singly or in colonies underneath bark, in cavities, or in crevices of both live and dead trees. Males and non-reproductive females may also roost in cooler places, like caves and mines. This bat seems opportunistic in selecting roosts, using tree species based on suitability to retain bark or provide cavities or crevices. It has also been found, rarely, roosting in structures like barns and sheds. Northern long-eared bats spend winter hibernating in caves and mines. Large caves or mines with large passages and entrances; constant temperatures; and high humidity with no air currents.</p> <p><b>DE</b> (New Castle), <b>DC</b> (District of Columbia), <b>MD</b> (Allegany, Anne Arundel, Baltimore, Calvert, Carroll, Cecil, Charles, Frederick, Garrett, Harford, Howard, Montgomery, Prince George's, St. Mary's &amp; Washington Counties), <b>NJ</b> (All Counties), <b>PA</b>, (All Counties), <b>VA</b> (All Counties) &amp; <b>WV</b> (All Counties)</p>	
<p><b>Factors of Decline:</b> Loss, degradation, and fragmentation of mature forest habitat (associated with various kinds of human activities, such as logging; oil, gas, and mineral development; and wind energy development), White-nose syndrome. Noise sensitivity and human disturbance during hibernation.</p>		<p><b>Best Management Practices:</b> <a href="#">Northern Long-eared Bat BMP's via U.S. Fish &amp; Wildlife Services</a></p>	
<p><b>References:</b> U.S. Fish &amp; Wildlife Services. (n.d.). Species profile for Northern long-eared bat (<i>Myotis septentrionalis</i>). <i>Environmental Conservation Online System USFWS</i>. Retrieved from: <a href="https://ecos.fws.gov/ecp0/profile/speciesProfile?slid=9045">https://ecos.fws.gov/ecp0/profile/speciesProfile?slid=9045</a></p> <p>NatureServe. 2018. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Retrieved from: <a href="http://explorer.natureserve.org">http://explorer.natureserve.org</a></p>			

<b>Common Name</b>	Gray Bat	<b>Conservation Status</b>	Endangered (1976)
<b>Scientific Name</b>	<i>Myotis grisescens</i>	<b>Critical Habitat</b>	None currently designated



Photo credit: U.S. Fish & Wildlife Services

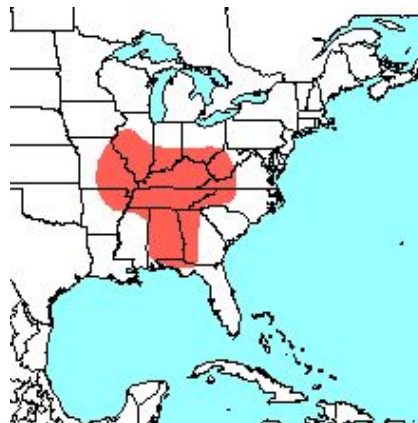


Photo credit: National Museum of Natural History

**Physical Description:**

A bat with unicolored dorsal fur (gray after the mid-summer molt, at other times sometimes chestnut brown or russet); paler below, with hairs darker basally; wing membrane (gray) connects to the foot at the ankle; calcar is unkeeled; total length 80-105 mm; forearm length 40-46 mm; ear length 14-16 mm; tail length 33-45 mm; hind foot 9-12 mm; mass 7-16 g (usually 8-10 g). wingspread 275-300. Distinct sagittal crest on skull. Distinguished from these by uniform-colored dorsal fur from base to tip (all others have contrasting shades, bi- or tri-colored dorsal fur) and by attachment of wing membrane at ankle, not at base of toe.

**Spatial Distribution:**

Roost sites are nearly exclusively restricted to caves throughout the year, though only a few percent of available caves are suitable. 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. Winter caves are deep and vertical and provide a large volume of air below the lowest entrance that acts as a cold air trap.

**VA** (Appomattox, Bath, Bland, Bristol, Buchanan, Lee, Norton, Russell, Scott, Smyth, Washington, Wise & Wythe Counties) & **WV** (Boone, Fayette, Kanawha, Lincoln, Logan, McDowell, Mercer, Mingo, Monroe, Raleigh, Summers, Wayne & Wyoming Counties)

**Factors of Decline:**

Cave disturbance, habitat degradation, human interference, light sensitivity, deforestation and impoundment of waterways (and subsequent cave inundation).

**Best Management Practices:**

[Gray Bat BMP's via Missouri Department of Conservation](#)

**References:**

U.S. Fish & Wildlife Services. (n.d.). Species profile for Gray bat (*Myotis grisescens*). *Environmental Conservation Online System USFWS*. Retrieved from: <https://ecos.fws.gov/ecp0/profile/speciesProfile?sld=6329>

NatureServe. 2018. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Retrieved from: <http://explorer.natureserve.org>



<b>Common Name</b>	Virginia Big-eared Bat	<b>Conservation Status</b>	Endangered (1979)
<b>Scientific Name</b>	<i>Corynorhinus townsendii virginianus</i>	<b>Critical Habitat</b>	FR listing report ID 44 FR 69206 69208 (1979)



Photo credit: U.S. Fish & Wildlife Services

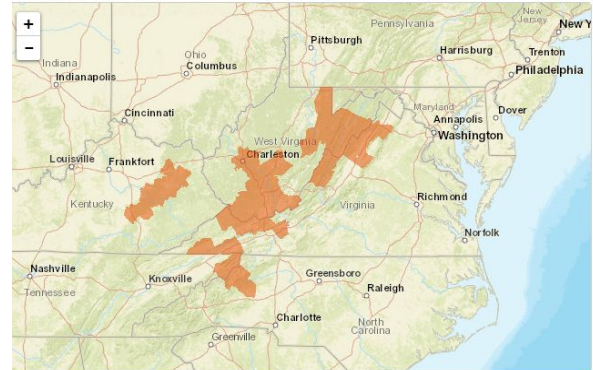


Photo credit: U.S. Fish & Wildlife Services

**Physical Description:**

A medium-sized bat with forearms measuring 39 to 48 millimeters (mm) long and weighing 7 to 12 grams. Total body length is 98 mm, the tail is 46 mm, and the hind foot is 11 mm long. This bat's long ears (over 2.5 centimeters) and facial glands on either side of the snout are quite distinctive. Fur is light to dark brown depending upon the age of the individual and the subspecies.

**Spatial Distribution:**

This nonmigratory bat resides in caves year round. Virginia big-eared bats prefer caves in karst regions (areas underlain with limestone bedrock and many caves and sinkholes) dominated by oak-hickory or beech-maple-hemlock forest. These bats usually hibernate in tight clusters near entrances of caves that are well-ventilated and where temperatures range from 32 to 54 degrees F.

**VA** (Bath, Bland, Buchanan, Highland, Pulaski, Rockingham, Scott, Shenandoah, Tazewell, Warren & Washington Counties) & **WV** (Fayette, Grant, Hardy, Kanawha, McDowell, Mercer, Monroe, Nicholas, Pendleton, Preston, Raleigh, Randolph, Summers, Tucker & Wyoming Counties)

**Factors of Decline:**

Human disturbance is probably the biggest factor contributing to the decline of these bats. Disturbance during hibernation causes bats to lose stored fat reserves, and repeated disturbance can cause the bats to die before spring (when insect prey are again available).

**Best Management Practices:**


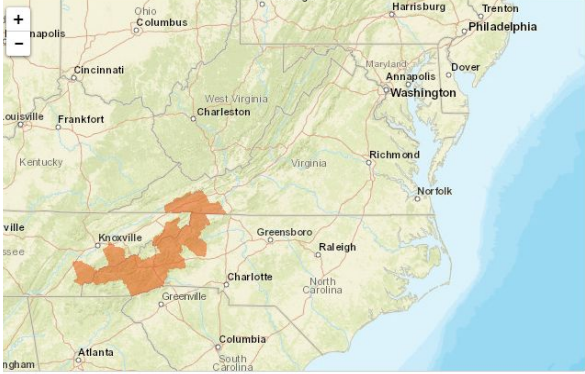
[Conservation and Management of Northeastern Big-Eared Bats via USDA Forest Service](#)


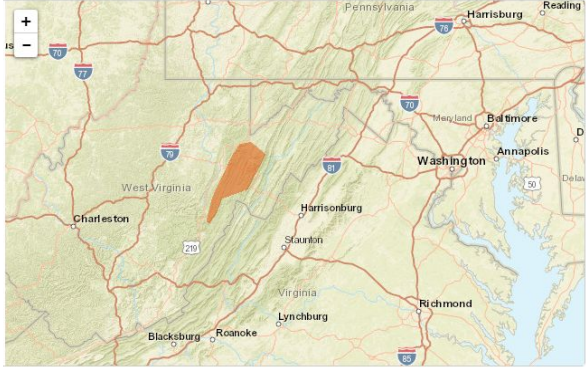
**References:**


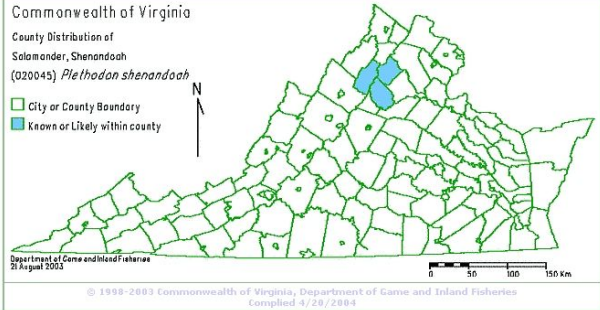
U.S. Fish & Wildlife Services. (n.d.). Species profile for Virginia big-eared bat (*Corynorhinus townsendii virginianus*). *Environmental Conservation Online System USFWS*. Retrieved from: <https://ecos.fws.gov/ecp0/profile/speciesProfile?slid=8369>

Kentucky Department of Fish & Wildlife Resources. (n.d.). Virginia Big-eared Bat. *Kentucky Department of Fish & Wildlife Resources*. Retrieved from: <https://fw.ky.gov/Wildlife/Pages/Virginia-Big-Eared-Bat.aspx>


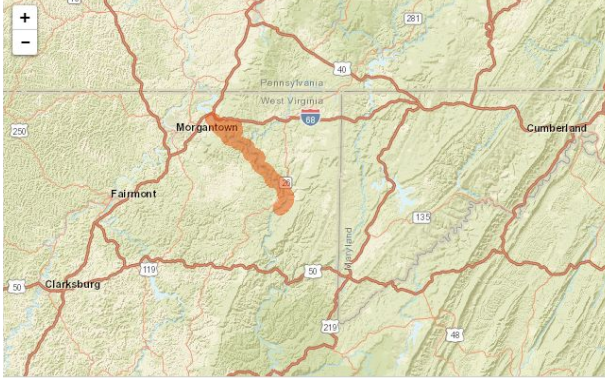


<b>Common Name</b>	Carolina Northern Flying Squirrel	<b>Conservation Status</b>	Endangered (1985)
<b>Scientific Name</b>	<i>Glaucomys sabrinus coloratus</i>	<b>Critical Habitat</b>	None currently designated
 <p>Photo credit: North Carolina Wildlife Resources Committee</p>		 <p>Photo credit: U.S. Fish &amp; Wildlife Services</p>	
<p><b>Physical Description:</b>  The northern flying squirrel is a small nocturnal gliding mammal some 10-12 inches in total length and 3-5 ounces in weight. It possesses a long, broad, flattened tail (80 percent of head and body length), prominent eyes, and dense, silky fur. The broad tail and folds of skin between the wrist and ankle form the aerodynamic surface used for gliding. Adults are gray with a brownish, tan, or reddish wash on the back, and grayish white or buffy white ventrally. Juveniles have uniform dark, slate-gray backs, and off-white undersides. The northern flying squirrel can be distinguished from the southern flying squirrel by its larger size; the gray base of its ventral hairs as opposed to a white base in the southern species; the relatively longer upper tooth row; and the short, stout baculum (penis bone) of the males.</p>		<p><b>Spatial Distribution:</b>  Prefers coniferous and mixed forest with 'boreal' characteristics (Weigl et al. 1992), but will utilize deciduous woods and riparian woods; optimal conditions: cool, moist, mature forest (especially older Red Spruce) with abundant standing and down snags. Occupies tree cavities, leaf nests, underground burrows. Prefers cavities in mature trees as den sites. Small outside twig nests sometimes used for den sites. Will use nest boxes.</p> <p>VA (Grayson, Smyth &amp; Washington Counties)</p>	
<p><b>Factors of Decline:</b>  Climate change is a serious potential threat, since this species is adapted to the cool, wet conditions of the boreal zone, and their mountaintop refuges are shrinking as the climate warms. Habitat degradation and human disturbance.</p>		<p><b>Best Management Practices:</b>  <a href="#">Carolina Northern Flying Squirrel Management Recommendations via U.S. Fish &amp; Wildlife Services</a></p>	
<p><b>References:</b>  U.S. Fish &amp; Wildlife Services. (n.d.). Species profile for Carolina northern flying squirrel (<i>Glaucomys sabrinus coloratus</i>). <i>Environmental Conservation Online System USFWS</i>. Retrieved from: <a href="https://ecos.fws.gov/ecp0/profile/speciesProfile?slid=2657">https://ecos.fws.gov/ecp0/profile/speciesProfile?slid=2657</a></p> <p>NatureServe. 2018. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Retrieved from: <a href="http://explorer.natureserve.org">http://explorer.natureserve.org</a></p>			


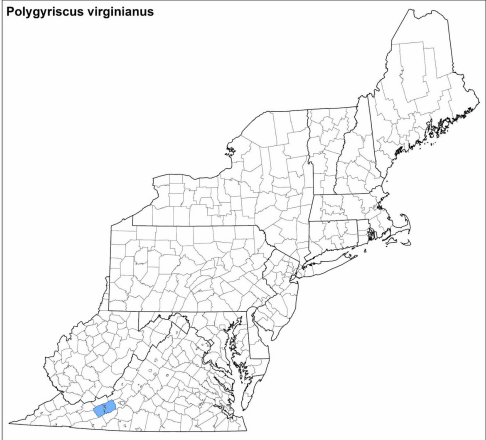
<b>Common Name</b>	Cheat Mountain Salamander	<b>Conservation Status</b>	Threatened (1989)
<b>Scientific Name</b>	<i>Plethodon nettingi</i>	<b>Critical Habitat</b>	None currently designated
 <p>Photo credit: U.S. Fish &amp; Wildlife Services</p>		 <p>Photo credit: U.S. Fish &amp; Wildlife Services</p>	
<p><b>Physical Description:</b> The Cheat Mountain salamander is one of the small woodland species attaining a length of 4 inches from the tip of the snout to the tip of the tail. It is black or dark brown with brassy or silvery flecks above and uniformly dark gray beneath. The tail of this species is about the same length as its body, and the body has 17 to 19 costal grooves (vertical grooves along its sides).</p>		<p><b>Spatial Distribution:</b> Allegheny Mountains from Cheat Mountain north to Back Allegheny and Cabin mountains, much of remaining habitat is within Monongahela National Forest. Primarily in red spruce-yellow birch or spruce-dominated forests; occasionally collected in mixed deciduous hardwoods. Occurs under rocks and in or under logs during day; sometimes among wet leaves. Active on forest floor at night; may climb lower portions of tree trunks. Eggs have been found in and under rotting logs, and under rocks.</p> <p>WV (Grant, Pendleton, Pocahontas, Randolph &amp; Tucker Counties)</p>	
<p><b>Factors of Decline:</b> Habitat modifications such as timbering, mining, recreational development, and road construction.</p>		<p><b>Best Management Practices:</b> N/A</p>	
<p><b>References:</b> U.S. Fish &amp; Wildlife Services. (n.d.). Species profile for Cheat mountain salamander (<i>Plethodon nettingi</i>). <i>Environmental Conservation Online System USFWS</i>. Retrieved from: <a href="https://ecos.fws.gov/ecp0/profile/speciesProfile?sld=6057">https://ecos.fws.gov/ecp0/profile/speciesProfile?sld=6057</a></p> <p>NatureServe. 2018. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Retrieved from: <a href="http://explorer.natureserve.org">http://explorer.natureserve.org</a></p> <p>West Virginia Division of Natural Resources. (n.d.). Wildlife Diversity Notebook: Cheat Mountain Salamander. <i>WVDNR</i>. Retrieved from: <a href="http://www.wvdnr.gov/wildlife/magazine/archive/05Summer/wildlife_diversity_salamander.shtm">http://www.wvdnr.gov/wildlife/magazine/archive/05Summer/wildlife_diversity_salamander.shtm</a></p>			


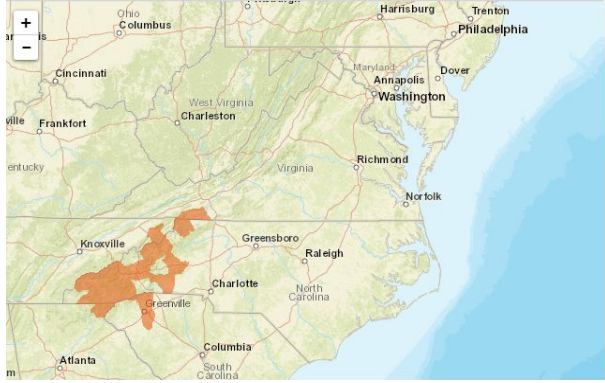
<b>Common Name</b>	Shenandoah Salamander	<b>Conservation Status</b>	Endangered (1989)
<b>Scientific Name</b>	<i>Plethodon shenandoah</i>	<b>Critical Habitat</b>	None currently designated
 <p>Photo credit: Shenandoah National Parks Service</p>		<p>County occurrence maps chapter for Salamander, Shenandoah (020045)</p>  <p>Department of Game and Inland Fisheries 28 August 2004</p> <p>© 1998-2003 Commonwealth of Virginia, Department of Game and Inland Fisheries Compiled 3/20/2004</p> <p>Photo credit: Virginia Department of Game &amp; Inland Fisheries</p>	
<p><b>Physical Description:</b> Slender, moderate-sized salamander with a total length of 3.5 to 4.5 inches. The body is dark brown, with two colors phases. The striped color phase has a narrow red to yellow stripe down the center of the back. In the unstriped phase, the back is dark brown with scattered brass-colored flecks. In both phases, white or yellow spots occur along the sides.</p>		<p><b>Spatial Distribution:</b> Highest mountains of Shenandoah National Park; steep, northerly facing talus slopes in forested situations. Tolerant of relatively dry conditions. Mostly confined to pockets of soil and/or vegetative debris. Apparently, talus is suboptimal habitat.</p> <p>VA (Madison, Page &amp; Rappahannock Counties)</p>	
<p><b>Factors of Decline:</b> Human-related factors, including acid deposition (direct effects and vegetation defoliation) and tree defoliation caused by introduced insect pests such as gypsy moths and woolly adelgids.</p>		<p><b>Best Management Practices:</b> N/A</p>	
<p><b>References:</b> U.S. Fish &amp; Wildlife Services. (n.d.). Species profile for Shenandoah salamander (<i>Plethodon shenandoah</i>). <i>Environmental Conservation Online System USFWS</i>. Retrieved from: <a href="https://ecos.fws.gov/ecp0/profile/speciesProfile?sld=4097">https://ecos.fws.gov/ecp0/profile/speciesProfile?sld=4097</a> NatureServe. 2018. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Retrieved from: <a href="http://explorer.natureserve.org">http://explorer.natureserve.org</a></p>			



<b>Common Name</b>	Flat-spired Three-toothed Snail	<b>Conservation Status</b>	Threatened (1978)
<b>Scientific Name</b>	<i>Triodopsis platysayoides</i>	<b>Critical Habitat</b>	None currently designated
 <p>Photo credit: West Virginia Division of Natural Resources</p>	 <p>Photo credit: U.S. Fish &amp; Wildlife Services</p>		
<p><b>Physical Description:</b>  Snail. Shell is heliciform and flattened. It is brown, finely and obliquely striate, has five whorls, and has a whitish, reflected lip at the aperture. A single short tooth is present on the parietal wall. Color is pale gray.</p>	<p><b>Spatial Distribution:</b>  Crevices of exposed sandstone and talus of rock and caves; also feed in deep litter at base of major rocks. Close association with massive sandstone outcrops and talus; also at cave mouths and on limestone. Plants frequently found associated include sweet birch, eastern hemlock, yellow birch and great Laurel.</p> <p>WV (Mongolia &amp; Preston Counties)</p>		
<p><b>Factors of Decline:</b>  Threats include site warming/ drying/ litter reduction, increased surface water/ sedimentation, site compaction/ litter loss/ shell crushing, increased small mammal predation, soil calcium loss, isolation. Causes of said threats include logging, invasion by gypsy moths, deer overbrowsing, great laurel dieback, road building, mining, hiking, and acid rain.</p>	<p><b>Best Management Practices:</b>  <a href="#">Flat-spired Three-toothed Snail Management Recommendations via U.S. Fish &amp; Wildlife Services</a></p>		
<p><b>References:</b>  U.S. Fish &amp; Wildlife Services. (n.d.). Species profile for Flat-spired three-toothed snail (<i>Triodopsis platysayoides</i>). <i>Environmental Conservation Online System USFWS</i>. Retrieved from: <a href="https://ecos.fws.gov/ecp0/profile/speciesProfile?sld=464">https://ecos.fws.gov/ecp0/profile/speciesProfile?sld=464</a></p> <p>NatureServe. 2018. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Retrieved from: <a href="http://explorer.natureserve.org">http://explorer.natureserve.org</a></p>			



<b>Common Name</b>	Virginia Fringed Mountain Snail	<b>Conservation Status</b>	Endangered (1978)
<b>Scientific Name</b>	<i>Polygyriscus virginianus</i>	<b>Critical Habitat</b>	None currently designated
 <p>Photo credit: U.S. Fish &amp; Wildlife Services</p>		 <p>Photo credit: Carnegie Museum of Natural History</p>	
<p><b>Physical Description:</b> Remnants of 8-10 periostracal spiral rows on body whorl above periphery while those on shell base eroded. Strongly deflected aperture (last 1/4 of body whorl detached from rest of shell and deflected toward the umbilicate side at about a 60 degree angle). The shell is a pale greenish color and has four prominent raised spiral lines with less prominent spiral lines between them. The shell is 0.18 inches in diameter and 0.06 inches in height. The animal inside, is white and probably blind.</p>		<p><b>Spatial Distribution:</b> From only a 9.9 km region along the bluffs of the New River in Pulaski county, Virginia. Burrowing calcifile (10 to 45 cm deep) that is not found in leaf litter but burrows in loose, damp, dolomitic limestone talus mixed with rootlets and clay.. Look for loose talus at the base of high bluffs, talus heavily shaded by overhanging tree canopy, talus surface partially or completely covered by honeysuckle vines, and talus rocks which are permanently moist. It can live up to 2 m beneath the surface of talus slope at an elevation of 1800 feet; and needs a place with moist, loosely compacted soil with high calcium content and moderate temperature.</p> <p>VA (Pulaski)</p>	
<p><b>Factors of Decline:</b> Human interference, habitat degradation and limited distribution.</p>		<p><b>Best Management Practices:</b> N/A</p>	
<p><b>References:</b> U.S. Fish &amp; Wildlife Services. (n.d.). Species profile for Virginia fringed mountain snail (<i>Polygyriscus virginianus</i>). <i>Environmental Conservation Online System USFWS</i>. Retrieved from: <a href="https://ecos.fws.gov/ecp0/profile/speciesProfile?sld=6905">https://ecos.fws.gov/ecp0/profile/speciesProfile?sld=6905</a></p> <p>NatureServe. 2018. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Retrieved from: <a href="http://explorer.natureserve.org">http://explorer.natureserve.org</a></p>			

<b>Common Name</b>	Rock Gnome Lichen	<b>Conservation Status</b>	Endangered (1995)
<b>Scientific Name</b>	<i>Gymnoderma lineare</i>	<b>Critical Habitat</b>	None currently designated
 <p data-bbox="168 814 415 831">Photo credit: USDA Forest Service</p>		 <p data-bbox="870 814 1166 831">Photo credit: U.S. Fish &amp; Wildlife Services</p>	
<p data-bbox="168 863 467 894"><b>Physical Description:</b></p> <p data-bbox="168 900 831 1220">A fruticose lichen in Cladoniaceae. Rock gnome lichen occurs in dense colonies of narrow strap-like lobes that are about 0.04 inch (1 millimeter) across and generally one to two centimeters long. These lobes are blue gray on the terminal upper surface, and generally shiny white on the lower surface, grading to black near the base. The fruiting bodies are born on the tips of these lobes, are black, and have been found from July through September.</p>		<p data-bbox="870 863 1146 894"><b>Spatial Distribution:</b></p> <p data-bbox="870 900 1481 1213">On shady rock or shady moss-covered rock. Further, it is found in areas of high humidity, either on high-elevation cliffs, where it is frequently bathed in fog, or in deep river gorges at lower elevations. It is primarily limited to vertical rock faces, where seepage water from forest soils above flows at (and only at) very wet times, and large stream side boulders, where it receives a moderate amount of light but not high-intensity solar radiation.</p> <p data-bbox="870 1251 1032 1283">VA (Grayson)</p>	
<p data-bbox="168 1329 431 1360"><b>Factors of Decline:</b></p> <p data-bbox="168 1367 837 1587">Threatened by trampling and associated soil erosion and compaction, other forms of habitat disturbance due to heavy recreational use of the habitat by hikers, climbers, and sightseers, as well as by development for commercial recreational facilities and residential purposes. Potentially threatened by logging, collectors, and air pollution.</p>		<p data-bbox="870 1329 1268 1360"><b>Best Management Practices:</b></p> <p data-bbox="870 1367 1419 1465"><a href="#">Rock Gnome Lichen Management Recommendations via U.S. Fish &amp; Wildlife Services</a></p>	
<p data-bbox="168 1617 334 1648"><b>References:</b></p> <p data-bbox="168 1654 1435 1703">U.S. Fish &amp; Wildlife Services. (n.d.). Species profile for Rock gnome lichen (<i>Gymnoderma lineare</i>). <i>Environmental Conservation Online System</i> USFWS. Retrieved from: <a href="https://ecos.fws.gov/ecp0/profile/speciesProfile?sld=3933">https://ecos.fws.gov/ecp0/profile/speciesProfile?sld=3933</a></p> <p data-bbox="168 1730 1065 1778">Raleigh Ecological Services Field Office. (2017). Rock Gnome Lichen. USFWS. Retrieved from: <a href="https://www.fws.gov/raleigh/species/es_rock_gnome_lichen.html">https://www.fws.gov/raleigh/species/es_rock_gnome_lichen.html</a></p> <p data-bbox="168 1806 1451 1854">NatureServe. 2018. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Retrieved from: <a href="http://explorer.natureserve.org">http://explorer.natureserve.org</a></p>			

