

## Appendix H. Threats to Virginia's Species of Greatest Conservation Need

The following tables include data gathered from the TACs regarding stresses on Virginia's species of greatest conservation need. See Chapter 2 for details on how this information was gathered.

Appendix H1. Stresses on Virginia's fishes as identified by Fish TAC (2004). See Chapter 2 for descriptions of scope and severity ("U" indicates "unknown", "?" indicates a questionable value, generally for a stress or source that is poorly known).

Stress	Source of Stress	Scope	Severity	Stress Comments
<b>Big Sandy</b>				
Hydrologic regime alteration	Industrial - mineral extraction	4	2	Stream subsidence (dewatering)
Organic pollutants	Industrial - mineral extraction	3	3?	
Sediment load alteration	Industrial - mineral extraction	3	3	
Turbidity alteration	Industrial - mineral extraction	3	2	
Habitat fragmentation	Industrial - mineral extraction	2	3	Disjunct populations caused by water quality issues
Habitat fragmentation	Industrial - power generation	2	3	
Sediment load alteration	Forestry	2	3	
Organic pollutants	Industrial - rights-of-way	2	2	Roads and railways
Nutrient input regime alteration	Municipal development	2	1	Wastewater treatment plants; straight pipes
Turbidity alteration	Forestry	2	1	
pH regime alteration	Industrial - mineral extraction	1	4	Acid mine drainage
Toxins	Industrial - other	1	4	Spills (roads and rails); accidents at industrial sites
Channel or shoreline alteration	Municipal development	1	3	
Channel or shoreline alteration	Other land management	1	3	Landowner in stream
Metals	Industrial - power generation	1	3	
Sediment load alteration	Municipal development	1	3	
Habitat fragmentation	Municipal development	1	2	Wastewater treatment plants
Habitat fragmentation	Industrial - other	1	2	Remnant mill dams
Turbidity alteration	Municipal development	1	2	Road building/bridges
Herbicides and fungicides	Industrial - rights-of-way	1	1	Roads and rails
Organic matter input regime alteration	Forestry	1	1	
Other toxins	Industrial - mineral extraction	1	U	Products of coal processing
Other toxins	Municipal development	U	U	Pharmaceuticals and their by-products
Complications due to small populations	Source not appropriate	U	U	

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<b>Stress</b>	<b>Source of Stress</b>	<b>Scope</b>	<b>Severity</b>	<b>Stress Comments</b>
Metals	Industrial - mineral extraction	U	U	
<b>Chowan</b>				
Sediment load alteration	Forestry	4	3	
Herbicides and fungicides	Agriculture	4	2	
Insecticides	Agriculture	4	2	
Competition	Exotic or introduced species	4?	U	Effect of rock bass on Roanoke bass
Toxins	Agriculture	3	4	Pig farm lagoon spills
Sediment load alteration	Agriculture	3	3	
Dissolved oxygen regime alteration	Agriculture	3	2	Pig farms
Nutrient input regime alteration	Agriculture	3	2	Pig farms
Turbidity alteration	Industrial-mineral extraction	2	3	Gravel, titanium?, unknown possible impacts
Hydrologic regime alteration	Industrial-other	1	3	Water supply dam (Victoria)
Nutrient input regime alteration	Industrial-other	1	3	Paper mills
Turbidity alteration	Industrial-other	1	3	Paper mills
Dissolved oxygen regime alteration	Industrial-other	1	2	Paper mills
Hydrologic regime alteration	Municipal development	1	2	Water supply, extraction, potential for VA Beach water supply issues
Nutrient input regime alteration	Municipal development	1	2	Franklin, Emporia
Organic pollutants	Industrial-other	1	2	Paper mills
Sediment load alteration	Municipal development	1	2	Franklin, Emporia
Toxins	Municipal development	1	2	Franklin, Emporia
<b>Chowan (lakes, ponds, and small impoundments)</b>				
Hydrologic regime alteration		4	4	Dam failure (mill dams) and dam removal (beavers)
Habitat fragmentation		4	4	Dams
Habitat destruction	Exotic or introduced species	3	4	Grass carp alteration of vegetation
Herbicides and fungicides	Recreational use of habitat	3	4	Removing vegetation for pond access
Predation	Exotic or introduced species	3	3	Usually combined with habitat alteration
Herbicides and fungicides	Agriculture	3	2	
Insecticides	Agriculture	3	2	
Sediment load alteration	Forestry	3	1	

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<b>Stress</b>	<b>Source of Stress</b>	<b>Scope</b>	<b>Severity</b>	<b>Stress Comments</b>
<b>Clinch-Powell</b>				
Sediment load alteration	Agriculture	4	3	
Channel or shoreline alteration	Agriculture	4	2	
Hydrologic regime alteration	Industrial-mineral extraction	4	2	Stream subsidence (dewatering); smaller streams
Turbidity alteration	Agriculture	4	2	
Organic pollutants	Industrial-mineral extraction	3	3?	
Sediment load alteration	Industrial-mineral extraction	3	3	
Turbidity alteration	Industrial-mineral extraction	3	2	Gypsy moth, study in WV found no effects
Habitat fragmentation	Industrial-mineral extraction	2	3	Disjunct populations caused by water quality issues
Habitat fragmentation	Industrial-power generation	2	3	
Sediment load alteration	Forestry	2	3	
Organic pollutants	Industrial-rights-of-way	2	2	Roadways and rails
Nutrient input regime alteration	Agriculture	2	1	
Nutrient input regime alteration	Municipal development	2	1	Wastewater treatment plants; straight pipes
Organic matter input regime alteration	Agriculture	2	1	
Turbidity alteration	Forestry	2	1	
pH regime alteration	Industrial-mineral extraction	1	4	Acid mine drainage
Toxins	Industrial-other	1	4	Spills (roads and rails), accidents at industrial sites
Channel or shoreline alteration	Municipal development	1	3	
Channel or shoreline alteration	Other land management	1	3	Landowners bulldozing in streams
Metals	Industrial-power generation	1	3	
Habitat fragmentation	Municipal development	1	2	Wastewater treatment plants
Habitat fragmentation	Industrial-other	1	2	Remnant mill dams
Herbicides and fungicides	Agriculture	1	2	
Turbidity alteration	Municipal development	1	2	Road building/bridges
Herbicides and fungicides	Industrial-rights-of-way	1	1	Roads and rails
Organic matter input regime alteration	Forestry	1	1	
Other toxins	Industrial-mineral extraction	1	U	Products of coal processing
Complications due to small populations	NA	U	U	Species-specific
Metals	Industrial-mineral extraction	U	U	
Other toxins	Municipal development	U	U	Pharmaceuticals and drugs in wastewater
<b>Delmarva</b>				
Organic matter input regime alteration	Agriculture	4	4	Poultry, tomatoes
Nutrient input regime alteration	Agriculture	4	4	Poultry, tomatoes

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<b>Stress</b>	<b>Source of Stress</b>	<b>Scope</b>	<b>Severity</b>	<b>Stress Comments</b>
Dissolved oxygen regime alteration	Agriculture	4	3	Poultry, tomatoes
Herbicides and fungicides	Agriculture	4	3	Poultry, tomatoes
Insecticides	Agriculture	4	3	Tomatoes and other crops
Nutrient input regime alteration	Municipal development	2	3	Septic systems
Channel and shoreline alteration	Municipal development	2	2	Installation of bulkheads
Herbicides and fungicides	Industrial-rights-of-way	2	1	Roads and rails
Organic pollutants	Industrial-rights-of-way	2	1	Roads and rails
Toxins	Industrial-other	2	1	Spills (roadways and rails)
<b>Holston</b>				
Sediment load alteration	Agriculture	4	3	
Turbidity alteration	Agriculture	4	2	
Herbicides and fungicides	Agriculture	3	2?	Row crops
Insecticides	Agriculture	3	2?	Row crops
Channel or shoreline alteration	Agriculture	3	2	
Metals	Industrial-other	3	2	Past industry at Saltville
Other toxins	Industrial-other	2	U	Small industry
Channel or shoreline alteration	Municipal development	2	2	
Channel or shoreline alteration	Other land management	2	2	Landowners bulldozing in streams
Habitat fragmentation	Industrial-other	2	2	Remnant mill dams; TVA dam on South Holston
Organic pollutants	Industrial-rights-of-way	2	2	Roadways and rails
Sediment load alteration	Forestry	2	2	
Turbidity alteration	Municipal development	2	1	
Nutrient input regime alteration	Agriculture	2	1	
Nutrient input regime alteration	Municipal development	2	1	Wastewater treatment plants
Organic matter input regime alteration	Agriculture	2	1	
Turbidity alteration	Forestry	2	1	
Toxins	Industrial-other	1	4	Spills (roads and rails), accidents at industrial sites
Sediment load alteration	Industrial-mineral extraction	1	3?	Mining of landscape rock
Habitat fragmentation	Municipal development	1	2	Wastewater treatment plants
Organic matter input regime alteration	Forestry	1	1	
Complications due to small populations	NA	U	U	Species-specific
<b>James</b>				
Herbicides and fungicides	Agriculture	4	3	
Insecticides	Agriculture	4	3	

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<b>Stress</b>	<b>Source of Stress</b>	<b>Scope</b>	<b>Severity</b>	<b>Stress Comments</b>
Nutrient input regime alteration	Municipal development	4	3	
Sediment load alteration	Agriculture	4	3	
Turbidity alteration	Agriculture	4	3	
Channel or shoreline alteration	Agriculture	4	2	
Habitat fragmentation	Industrial-power generation	3	3	Dams, severity depends on species (high for American shad)
Habitat fragmentation	Industrial-other	3	3	Remnant mill dams
Organic pollutants	Industrial-rights-of-way	3	3	Roads and rails
Sediment load alteration	Forestry	3	3	
Herbicides and fungicides	Industrial-rights-of-way	3	2	Roads and rails
Channel or shoreline alteration	Municipal development	2	4	
Nutrient input regime alteration	Municipal development	2	4	Wastewater treatment plants, straight pipes
Toxins	Industrial-other	2	4	Industry particularly around Hopewell
Dissolved oxygen regime alteration	Agriculture	2	3	
Dissolved oxygen regime alteration	Municipal development	2	3	
Metals	Industrial-power generation	2	3	
pH regime alteration	Atmospheric deposition	2	3	
Organic matter input regime alteration	Agriculture	2	1	
Turbidity alteration	Forestry	2	1	
Competition	Exotic or introduced species	2	1	Blue and flathead catfish; severity of impact for species that use the mainstem is higher (3)
Predation	Exotic or introduced species	2	1	Blue and flathead catfish; severity of impact for species that use the mainstem is higher (3) Spills (roadways and rails); accidents at industrial sites
Toxins	Industrial-other	1	4	
Channel or shoreline alteration	Other land management	1	3	Landowner bulldozing in streams
Hydrologic regime alteration	Municipal development	1	3	Dam installation for water sources
Hydrologic regime alteration	Municipal development	1	3	Water withdrawal
Turbidity alteration	Municipal development	1	2	Road building and bridges
Organic matter input regime alteration	Forestry	1	1	
Sediment load alteration	Industrial-mineral extraction	1	1	Sand mines in Coastal Plain
Turbidity alteration	Industrial –mineral extraction	1	1	Sand mines in Coastal Plain
Complications due to small populations	N/A	U	U	Species specific
Other toxins	Municipal development	U	U	Pharmaceuticals/drugs in wastewater

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<b>Stress</b>	<b>Source of Stress</b>	<b>Scope</b>	<b>Severity</b>	<b>Stress Comments</b>
<b>James (lakes, ponds, and small impoundments)</b>				
Habitat fragmentation	Agriculture	4	4	Dams Dam failure (mill dams) and dam removal (beaver dams)
Hydrologic regime alteration	Agriculture	4	4	
Habitat destruction	Exotic or introduced species	3	4	Alteration of habitat by grass carp
Herbicides and fungicides	Recreational use of habitat	3	4	Removing vegetation for access to water
Predation	Exotic or introduced species	3	3	Often combined with habitat alteration for fishing
Herbicides and fungicides	Agriculture	3	2	
Insecticides	Agriculture	3	2	
Sediment load alteration	Forestry	3	1	
<b>New</b>				
Sediment load alteration	Agriculture	4	3	Livestock
Turbidity alteration	Agriculture	4	3	Livestock
Hydrologic regime alteration	Dam	4	2	Reservoir used for urban and agricultural water needs
Nutrient input regime alteration	Agriculture	3	3	Livestock
Sediment load alteration	Municipal development	3	3	
Turbidity alteration	Municipal development	3	3	
Channel or shoreline alteration	Agriculture	3	2	
Hydrologic regime alteration	Municipal development	3	2	
Hydrologic regime alteration	Industrial-power generation	3	2	Claytor Dam
Nutrient input regime alteration	Municipal development	3	2	Inadequate wastewater treatment
Herbicides and fungicides	Agriculture	2	2	
Insecticides	Agriculture	2	2	Row crops, tree farming
Toxins	Industrial-other	2	2	Military installations, chemical manufacturing
Turbidity regime alteration	Industrial-mineral extraction	2	2	Limestone
Toxins	Industrial-power generation	1	1	
<b>Pee Dee</b>				
Channel or shoreline alteration	Agriculture	4	2	
Sediment load alteration	Agriculture	4	2	
Turbidity regime alteration	Agriculture	4	2	
Nutrient load alteration	Agriculture	4	2	Livestock
Sediment load alteration	Forestry	2	2	

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<b>Stress</b>	<b>Source of Stress</b>	<b>Scope</b>	<b>Severity</b>	<b>Stress Comments</b>
<b>Piankatank</b>				
Toxins	Atmospheric deposition	4	2	Aerial mercury from power plants
Sediment load alteration	Forestry	3	2	
Sediment load alteration	Agriculture	2	2	
<b>Potomac</b>				
Herbicides and fungicides	Agriculture	4	3	
Insecticides	Agriculture	4	3	
Sediment load alteration	Agriculture	4	3	
Turbidity regime alteration	Agriculture	4	3	
Channel or shoreline alteration	Agriculture	4	2	
Channel or shoreline alteration	Municipal development	3	4	
Hydrologic regime alteration	Municipal development	3	4	Impervious surface
Nutrient input regime alteration	Agriculture	3	4	Poultry farms, other livestock
Dissolved oxygen regime alteration	Agriculture	3	3	
Dissolved oxygen regime alteration	Municipal development	3	3	
Habitat fragmentation	Industrial-power generation	3	3	Dams, severity depends on species
Habitat fragmentation	Industrial-other	3	3	Remnant mill dams
Organic pollutants	Industrial-rights-of-way	3	3	Roads and rails
Sediment load alteration	Forestry	3	3	
Herbicides and fungicides	Industrial-rights-of-way	3	2	Roads and rails
Herbicides and fungicides	Municipal development	3	2	
Insecticides	Municipal development	3	2	
Nutrient input regime alteration	Municipal development	3	2	
Toxins	Industrial-other	3	2	Shenandoah spill and others
Toxins	Agriculture	3	2	Poultry farms, other livestock
Nutrient input regime alteration	Municipal development	2	4	Wastewater treatment plants, straight pipes
Toxins	Industrial-other	2	4	
Hydrologic regime alteration	Municipal development	2	3	Dam installation for water source
Hydrologic regime alteration	Municipal development	2	3	Water withdrawal
Metals	Industrial-power generation	2	3	Atmospheric deposition
pH regime alteration	Industrial-power generation	2	3	Acid precipitation
Unintentional capture or killing	Industrial-power generation	2	2	Eels killed in turbines
Organic matter input regime alteration	Forestry	2	1	
Organic matter input regime alteration	Agriculture	2	1	
Turbidity regime alteration	Forestry	2	1	

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<b>Stress</b>	<b>Source of Stress</b>	<b>Scope</b>	<b>Severity</b>	<b>Stress Comments</b>
Competition	Exotic or introduced species	1	2?	Snakehead
Predation	Exotic or introduced species	1	2?	Snakehead
Competition	Exotic or introduced species	1	4	Zebra mussels
Toxins	Industrial-other	1	4	Spills, accidents at industrial sites
Channel or shoreline alteration	Other land management	1	3	Landowner bulldozing in streams
Turbidity regime alteration	Municipal development	1	2	Road and bridge building
Sediment load alteration	Industrial-mineral extraction	1	1	
Turbidity regime alteration	Industrial-mineral extraction	1	1	
Complications due to small populations		U	U	Species-specific
Toxins	Municipal development	U	U	Pharmaceuticals and their by-products
<b>Rappahannock</b>				
Herbicides and fungicides	Agriculture	4	3	
Insecticides	Agriculture	4	3	
Nutrient input regime alteration	Agriculture	4	3	
Sediment load alteration	Agriculture	4	3	
Turbidity regime alteration	Agriculture	4	3	
Channel or shoreline alteration	Agriculture	4	2	
Habitat fragmentation	Industrial-other	3	3	Remnant mill dams
Organic pollutants	Industrial-rights-of-way	3	2	Roads and rails
Channel or shoreline alteration	Municipal development	2	4	
Nutrient input regime alteration	Municipal development	2	4	Wastewater treatment plants, straight pipes
Metals	Industrial-power generation	2	3	
pH regime alteration	Industrial-power generation	2	3	Acid precipitation
Dissolved oxygen regime alteration	Agriculture	2	2	
Dissolved oxygen regime alteration	Municipal development	2	2	
Herbicides and fungicides	Industrial-rights-of-way	2	2	Roads and rails
Sediment load alteration	Forestry	2	2	
Competition	Exotic or introduced species	2	1	Blue catfish
Predation	Exotic or introduced species	2	1	Blue catfish
Turbidity regime alteration	Forestry	2	1	
Toxins	Industrial-other	1	4	Spills, accidents at industrial sites
Channel or shoreline alteration	Other land management	1	3	Landowner bulldozing in streams
Toxins	Industrial-other	1	2	Various industry in and below Fredericksburg
Turbidity regime alteration	Municipal development	1	2	Road and bridge building
Habitat fragmentation	Industrial-power generation	1	1	Dams, severity depends on species



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<b>Stress</b>	<b>Source of Stress</b>	<b>Scope</b>	<b>Severity</b>	<b>Stress Comments</b>
Hydrologic regime alteration	Municipal development	1	1	Water withdrawal
Metals	Industrial-power generation	2	3	Atmospheric deposition
Organic matter input regime alteration	Forestry	1	1	
Sediment load alteration	Industrial-mineral extraction	1	1	Sand mines in Coastal Plain
Complications due to small populations		U	U	Species-specific
Toxins	Municipal development	U	U	Pharmaceuticals and their by-products
<b>Roanoke</b>				
Competition	Introduced/exotic species	4	3	Rock bass competing with Roanoke bass (SGCN)
Habitat fragmentation	Industrial-power generation	4	3	Dams, severity depends on species
Herbicides and fungicides	Agriculture	4	3	
Hydrologic regime	Industrial-power generation	4	3	Dams, severity depends on species
Insecticides	Agriculture	4	3	
Nutrient input regime alteration	Agriculture	4	3	
Sediment load alteration	Agriculture	4	3	
Turbidity alteration	Agriculture	4	3	
Channel or shoreline alteration	Agriculture	4	2	
Habitat fragmentation	Industrial-other	3	3	Remnant mill dams
Sediment load alteration	Forestry	3	3	
Herbicides and fungicides	Industrial-rights-of-way	3	2	Roads and rails
Turbidity alteration	Forestry	3	2	
Channel or shoreline alteration	Municipal development	2	4	
Nutrient input regime alteration	Municipal development	2	4	Wastewater treatment plants, straight pipes
Metals	Industrial-power generation	2	3	
Toxins	Industrial-other	2	3	
Dissolved oxygen regime alteration	Agriculture	2	2	
Dissolved oxygen regime alteration	Municipal development	2	2	
Organic pollutants	Industrial-rights-of-way	2	2	Roads and rails
Sediment load alteration	Industrial-mineral extraction	2	2	Sand mines in Coastal Plain
Turbidity alteration	Municipal development	2	2	Road and bridge building
Turbidity alteration	Industrial-mineral extraction	2	2	Sand mines in Coastal Plain
Organic matter input regime alteration	Agriculture	2	1	
Competition	Introduced/exotic species	2	1	Blue and flathead catfish; scope of effects on mainstem species is higher (3)
Predation	Introduced/exotic species	2	1	Blue and flathead catfish; scope of effects on mainstem species is higher (3)

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<b>Stress</b>	<b>Source of Stress</b>	<b>Scope</b>	<b>Severity</b>	<b>Stress Comments</b>
Toxins	Industrial-other	1	4	Spills (roadways and rails), accidents at industrial sites
Water temperature regime alteration	Industrial-power generation	1	4	Philpott Dam operations
Channel or shoreline alteration	Other land management	1	3	Landowner bulldozing in streams
Channel or shoreline alteration	Municipal development	1	2	Alteration of Roanoke River at Roanoke
Hydrologic regime alteration	Municipal development	1	2	Water withdrawal
Nutrient input regime alteration	Agriculture	1	1	Aquaculture
Organic matter input regime alteration	Forestry	1	1	
Parasitism	Agriculture	1	1	Aquaculture
Complication due to small populations	N/A	U	U	Species specific
Other toxins	Municipal development	U	U	Pharmaceuticals/drugs and their by-products
<b>York</b>				
Herbicides and fungicides	Agriculture	4	3	
Insecticides	Agriculture	4	3	
Nutrient input regime alteration	Agriculture	4	3	
Sediment load alteration	Agriculture	4	3	
Channel or shoreline alteration	Agriculture	4	2	
Habitat fragmentation	Industrial-other	3	3	Remnant mill dams
Organic matter input regime alteration	Forestry	3	2	
Organic matter input regime alteration	Agriculture	3	2	
Organic pollutants	Industrial-rights-of-way	3	2	Roads and rails
Turbidity alteration	Agriculture	3	2	
Turbidity alteration	Forestry	3	2	
Channel of shoreline alteration	Municipal development	2	4	
Metals	Industrial-power generation	2	3	Atmospheric mercury
Toxins	Industrial-other	2	3	Paper mill, oil refinery at mouth
Dissolved oxygen regime alteration	Agriculture	2	2	
Herbicides and fungicides	Industrial-rights-of-way	2	2	Roads and rails
Sediment load alteration	Forestry	2	2	
Competition	Introduced/exotic species	2	1	Blue catfish
Predation	Introduced/exotic species	2	1	Blue catfish
Toxins	Industrial-other	1	4	Spills (roadways and rails), accidents at industrial sites
Channel or shoreline alteration	Other land management	1	3	Landowner bulldozing in stream
Habitat fragmentation	Industrial-power generation	1	2	Lake Anna

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Stress	Source of Stress	Scope	Severity	Stress Comments
Hydrologic regime alteration	Municipal development	1	2	Water withdrawal, proposed King William Reservoir
Nutrient input regime alteration	Municipal development	1	2	Wastewater treatment plants, straight pipes
Turbidity alteration	Municipal development	1	2	Road and bridge building
Dissolved oxygen regime alteration	Municipal development	1	1	
Sediment load alteration	Industrial-mineral extraction	1	1	Sand mines in Coastal Plain
Complications due to small populations	N/A	U	U	Species specific
Other toxins	Municipal	U	U	Pharmaceuticals/drugs and their by-products

Appendix H2. Stresses on Virginia's herpetofauna as identified by Herpetofauna TAC (2004). See Chapter 2 for descriptions of scope and severity ("U" indicates "unknown", "?" indicates a questionable value, generally for a stress or source that is poorly known).

Stress	Source of Stress	Scope	Severity	Stress Comments
<b>Coastal Plain Aquatics</b>				
Habitat destruction	Municipal development	4	4	
Habitat fragmentation	Roadways	4	4	
Habitat fragmentation	Municipal development	4	4	
Herbicides and fungicides	Agriculture	4	3	
Insecticides	Agriculture	4	3	
Organic pollutants	Agriculture	4	3	
Other toxin (specify)	Roadways	4	3?	Runoff
Habitat destruction	Agriculture	3	4	
Habitat destruction	Forestry	3	4	
Habitat fragmentation	Agriculture	3	4	
Habitat fragmentation	Forestry	3	4	
Genetic alteration (e.g., hybridization)	Exotic or introduced species	3	4	Yellow-bellied sliders affected by red-eared sliders
Herbicides and fungicides	Municipal development	3	3	
Insecticides	Municipal development	3	3	
Unintentional capture or killing	Economic use of species	3	3?	By-catch, boat propellers
Unintentional capture or killing	Roadways	3	3	
Nutrient input regime alteration	Agriculture	3	2	
Habitat destruction	Roadways	2	4	
Metals	Industrial - power generation	2	2	
Nutrient input regime alteration	Municipal development	2	2	Waste water treatment plants

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<b>Stress</b>	<b>Source of Stress</b>	<b>Scope</b>	<b>Severity</b>	<b>Stress Comments</b>
Metals	Industrial - other	1	4	Various industries around Hopewell
Metals		1	4	Military installations
Organic pollutants	Industrial – other	1	4	
Other toxin		1	4	Military installations
Other toxin (specify)	Roadways	1	4	Spills
Intentional take	Economic use of species	1?	1?	Mostly diamond-backed terrapin, some by-catch
Food supply or trophic structure changes		?	U	Decreases in crayfish, eels, amphiuma
Salinity regime alteration	Municipal development	U	U	Drinking water removal, desalinization waste
<b>Coastal Plain Wetland and Terrestrial Species</b>				
Herbicides and fungicides	Agriculture	4	4	
Insecticides	Agriculture	4	4	
Habitat destruction	Municipal development	4	4	
Habitat fragmentation	Roadways	4	4	
Habitat fragmentation	Municipal development	4	4	
Other toxin (specify)	Roadways	4	4	Runoff
Unintentional capture or killing	Roadways	4	4	
Complications due to small populations		4	4	Several species
Insecticides	Municipal development	4	4?	
Organic pollutants	Agriculture	4	3	
Natural succession	Other land management	4	3	Fire suppression
Habitat destruction	Roadways	3	4	
Habitat destruction	Agriculture	3	4	
Habitat destruction	Forestry	3	4	
Habitat fragmentation	Agriculture	3	4	
Habitat fragmentation	Forestry	3	4	
Predation	Exotic or introduced species	3	4	Introduction of fish affects reproduction
Predation	Native species	3	4	Introduction of fish affects reproduction
Herbicides and fungicides	Municipal development	3	3	
Nutrient input regime alteration	Agriculture	3	2	
Intentional take	Other sources of stress	2	4	Killing of rattlesnakes
Unintentional capture or killing	Other land management	2	3	Discing roads (Back Bay/Great Dismal Swamp NWRs)
Intentional take	Economic use of species	2	3?	Several species
Insecticides	Municipal development	2	3?	Bt mosquito control donuts
Nutrient input regime alteration	Municipal development	2	2	Waste water treatment plants; unsure of problem
Metals	Industrial – other	1	4	Various industries around Hopewell

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<b>Stress</b>	<b>Source of Stress</b>	<b>Scope</b>	<b>Severity</b>	<b>Stress Comments</b>
Metals		1	4	Military installations
Organic pollutants	Industrial – other	1	4?	Unknown effects
Other toxin (specify)		1	4	Military installations
Other toxin (specify)	Roadways	1	4	Spills
Salinity regime alteration	Municipal development	U	U	Drinking water removal, desalinization waste
Food supply or trophic structure changes		U	U	Decreases in crayfish and toads
<b>Mount Rogers Area Terrestrials</b>				
Habitat degradation	Exotic or introduced species	4	3	Balsam and hemlock adelgids
Air temperature changes	Climate alteration or atmospheric change	4	3?	Direct and indirect effects
Habitat degradation	Atmospheric deposition	4	2	
Water temperature regime alteration	Climate alteration or atmospheric change	3	3	Habitat degradation and destruction
Habitat degradation	Recreational use of habitat	2	2	Horses compacting soil, trampling (?)
Complications due to small populations		U	U	Largely unknown
<b>Mountain Forest Terrestrials</b>				
Water temperature regime alteration	Climate alteration or atmospheric change	4	3	Habitat degradation and destruction
Natural succession	Other land management	4	3	Lack of land management, fire suppression
Habitat degradation	Atmospheric deposition	4	2	
Air temperature changes	Climate alteration or atmospheric change	4	2	Direct and indirect effects
Intentional take		4	2	USFS, VDOT, others; mostly rattlesnakes, all snakes affected
Unintentional capture or killing	Roadways	4	2	
Insecticides	Forestry	4	1	Gypsy moth, study in WV found no effects
Food supply or trophic structure changes	Exotic or introduced species	4	1	Spraying for gypsy moth, nontarget species affected
Intentional take	Economic use of species	3	4	Pet trade
Habitat destruction	Forestry	2	4	
Habitat fragmentation	Forestry	2	3	
Habitat fragmentation	Roadways	2	3	
Channel or shoreline alteration	Forestry	2	3	Forestry practices
Habitat degradation	Exotic or introduced species	2	2	Hemlock woolly adelgid
Habitat degradation	Recreational use of habitat	2	2	Horses, ATVs, mountain bikes
Intentional take		1	4	Den destruction
Habitat destruction		1	4	Den destruction
Intentional take	Scientific use of species	1	1	
Complications due to small populations		U	U	Largely unknown

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Stress	Source of Stress	Scope	Severity	Stress Comments
<b>Statewide</b>				
Herbicides and fungicides	Agriculture	4	4	
Insecticides	Agriculture	4	4	
Habitat destruction	Municipal development	4	4	
Habitat fragmentation	Roadways	4	4	
Habitat fragmentation	Municipal development	4	4	
Insecticides	Municipal development	4	4?	
Habitat destruction	Roadways	3	4	
Habitat destruction	Agriculture	3	4	
Habitat destruction	Forestry	3	4	
Habitat fragmentation	Agriculture	3	4	
Habitat fragmentation	Forestry	3	4	
Intentional take	Economic use of species	3	4	Pet trade
Herbicides and fungicides	Municipal development	3	3	
Channel or shoreline alteration	Forestry	2	3	Forestry practices
Unintentional capture or killing	Roadways	2	2	
<b>Tennessee and New River Drainage Aquatics</b>				
Intentional take	Economic use of species	4	3?	Asian food markets, pet trade (turtles)
Sediment load alteration	Agriculture	4	2	
Channel or shoreline alteration	Agriculture	4	2	
Turbidity alteration	Agriculture	4	2	
Hydrologic regime alteration	Dam for water use and water withdrawal	4	2	
Organic pollutants	Industrial - mineral extraction	3	3?	
Habitat fragmentation	Industrial - mineral extraction	3	3	Disjunct populations due to water quality
Sediment load alteration	Industrial - mineral extraction	3	2	
Turbidity alteration	Industrial - mineral extraction	3	2	
Hydrologic regime alteration	Municipal development	3	2	
Habitat fragmentation	Industrial – power generation	2	3	
Intentional take	Recreational use of species	2	2	Shooting turtles, hooking hellbenders, mudpuppies, etc.
Organic pollutants	Industrial - rights-of-way	2	2	Roads and rails
Insecticides	Agriculture	2	2	Row crops, tree farming
Sediment load alteration	Forestry	2	1	
Nutrient input regime alteration	Agriculture	2	1	
Nutrient input regime alteration	Municipal development	2	1	Waste water treatment plants, straight pipes
Organic matter input regime alteration	Agriculture	2	1	

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<b>Stress</b>	<b>Source of Stress</b>	<b>Scope</b>	<b>Severity</b>	<b>Stress Comments</b>
Turbidity alteration	Forestry	2	1	
Other toxins	Industrial - mineral extraction	1	U	Products of coal processing
Toxins	Industrial – other	1	4	Spills (roadway and rails), industrial accidents
Channel or shoreline alteration	Municipal development	1	3	
Metals	Industrial – power generation	1	3	
Channel or shoreline alteration	Other land management	1	3	Landowner alteration of streams
Turbidity alteration	Municipal development	1	2	
Habitat fragmentation	Municipal development	1	2	Waste water treatment plants
Organic matter input regime alteration	Forestry	1	1	
Food supply or trophic structure changes		U	U	Loss of crayfish/mussels, many possible sources
Parasitism		U	U	Bacterial, fungal infections; affects amphibians
Other toxins		U	U	Pharmaceuticals, drugs
<b>West Piedmont Upland Terrestrials</b>				
Herbicides and fungicides	Agriculture	4	4	
Insecticides	Agriculture	4	4	
Habitat destruction	Municipal development	4	4	
Habitat fragmentation	Roadways	4	4	
Habitat fragmentation	Municipal development	4	4	
Insecticides	Municipal development	4	4?	
Habitat destruction	Roadways	3	4	
Habitat destruction	Agriculture	3	4	
Habitat destruction	Forestry	3	4	
Habitat fragmentation	Agriculture	3	4	
Habitat fragmentation	Forestry	3	4	
Intentional take	Economic use of species	3	4	Pet trade
Herbicides and fungicides	Municipal development	3	3	
Channel or shoreline alteration	Forestry	2	3	Forestry practices
Unintentional capture or killing	Roadways	2	2	
<b>Unique (Bog Turtle)</b>				
Habitat destruction	Agriculture	4	3	
Hydrologic regime alteration	Agriculture	4	3	Wetland drainage, stream channelization
Intentional take	Pet trade	3	4	
Unintentional capture or killing	Agriculture	3	2	Livestock trampling (?)

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Appendix H3. Stresses on Virginia's avian fauna as identified by Bird TAC (2004). See Chapter 2 for descriptions of scope and severity ("U" indicates "unknown", "?" indicates a questionable value, generally for a stress or source that is poorly known).

Stress	Source of Stress	Scope	Severity	Comments
<b>Barrier Island and Other Beaches</b>				
Predation	Native species	4	4	Sort out jurisdictional issues
Predation	Exotic or introduced species	4	4	
Sea level rise	Climate alteration or atmospheric change	4	2	
Human disturbance	Recreational use of habitat	2	3	
Human disturbance	Recreational use of species	1	3	
Aquaculture	Agriculture	4	U	High percentage of intertidal zone but small percentage of overall barrier island
<b>Coastal Marsh</b>				
Predation	Native species	4	4	
Predation	Exotic or introduced species	4	4	
Sea level rise	Climate alteration or atmospheric change	4	4	Future problem, beginning to show up
Habitat destruction	Exotic or introduced species	2	3	<i>Phragmites</i>
Hydrologic regime alteration	Municipal development	3	U	Potential to increase
Hydrologic regime alteration	Roadways	3	U	Potential to increase
Hydrologic regime alteration	Agriculture	3	U	Potential to increase
Nutrient input regime alteration	Agriculture	3	U	Potential to increase
Nutrient input regime alteration	Roadways	3	U	Potential to increase
Nutrient input regime alteration	Municipal development	3	U	Potential to increase
Habitat destruction	Exotic or introduced species	1	2	Mute swans: increasing, potential future problem
<b>Early Successional</b>				
Habitat degradation	Exotic or introduced species	U	U	Possible biological implications
Habitat fragmentation	Agriculture	4	3	
Habitat destruction	Agriculture	4	4	
Habitat destruction	Municipal development	3	4	
Natural succession	Agriculture	2	4	
Predation	Native species	4	2	
Predation	Exotic or introduced species	4	2	



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<b>Stress</b>	<b>Source of Stress</b>	<b>Scope</b>	<b>Severity</b>	<b>Comments</b>
Insecticides	Agriculture	U	U	
Herbicides and fungicides	Agriculture	U	U	
Unintentional capture or killing	Roadways	1	3	Roadside shrubs as habitat/roadside shrub promotion
Natural succession	Forestry	2	3	Artificial succession, quick canopy closure due to high stocking density
Natural succession	Forestry	1	3	Reduction in cutting (letting forest grow)
<b>Grassland</b>				
Habitat degradation	Exotic or introduced species	4	3	Cool season grasses
Habitat fragmentation	Agriculture	4	3	Require large patches
Habitat destruction	Agriculture	4	4	Increase in agricultural efficiency, clean farming
Habitat destruction	Municipal development	3	4	
Natural succession	Agriculture	2	4	Farm abandonment
Predation	Native species	4	2	As patch size decreases, severity increases
Predation	Exotic or introduced species	4	2	As patch size decreases, severity increases; cats
Insecticides	Agriculture	U	U	Investigate
Herbicides and fungicides	Agriculture	U	U	Investigate
<b>High Elevation Coniferous (spruce-fir)</b>				
Habitat destruction	Exotic or introduced species	2	4	Balsam woolly adelgid
Habitat destruction	Industrial: power generation	1	1	
Unintentional capture or killing	Industrial: power generation	1	1	Mostly problem for migrants, not breeders
Fire: manipulation of timing or frequency	Other land management	4	U	Reduction of fire is the problem, and other land management practices
Other toxin	Atmospheric deposition	4	3?	Acid rain/fog
Habitat destruction	Forestry	historical 4	historical 4	
Habitat fragmentation	Forestry	4	4	Artifact from past forestry practices
Air temperature changes	Climate alteration or atmospheric change	4	1?	Possible large future threat

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<b>Stress</b>	<b>Source of Stress</b>	<b>Scope</b>	<b>Severity</b>	<b>Comments</b>
<b>High Elevation Deciduous</b>				
Habitat destruction	Forestry	2	4	High-grading veneer trees
Habitat destruction	Exotic or introduced species	4	2?	<i>Ailanthus</i> , garlic mustard, etc.
Habitat destruction	Native species	4	3	Deer
Other toxin	Atmospheric deposition	4	3?	Acid rain/fog
Air temperature changes	Climate alteration or atmospheric change	4	1?	Possible large future threat
Habitat destruction	Municipal development	2	3	N. Blue Ridge, n/a for YBSA
Habitat destruction	Industrial: power generation	1	1	
Unintentional capture or killing	Industrial: power generation	1	1	Mostly problem for migrants, not breeders
Habitat destruction	Industrial: mineral extraction	1	4	more in WV than VA
<b>Mature Deciduous</b>				
Habitat fragmentation	Forestry	4	4	
Habitat fragmentation	Agriculture	4	4	
Habitat fragmentation	Municipal development	4	4	
Habitat destruction	Forestry	4	4	
Habitat destruction	Agriculture	4	4	
Habitat destruction	Municipal development	4	4	
Predation	Native species	4	3	
Habitat degradation	Exotic or introduced species	U	U	
Habitat degradation	Native species	4	3	Deer densities
<b>Pine Savannah</b>				
Fire: manipulation of timing or frequency	Forestry	4	4	
Habitat destruction	Forestry	4	4	
Habitat fragmentation	Forestry	4	4	
Natural succession	Forestry	4	4	
Habitat destruction	Agriculture	3	2	
Habitat fragmentation	Agriculture	3	2	
Habitat destruction	Municipal development	2	2	
Habitat fragmentation	Municipal development	2	2	

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Stress	Source of Stress	Scope	Severity	Comments
<b>Wooded Wetlands</b>				
Habitat fragmentation	Forestry	4	4	
Habitat fragmentation	Municipal development	4	4	
Loss of ecological functions	Municipal development	4	4	Destruction of surrounding upland matrix
Loss of ecological functions	Forestry	4	4	Destruction of surrounding upland matrix
Predation	Exotic or introduced species	1	1	Cats
Predation	Native species	4	3	
Habitat degradation	Forestry	4	4	High-grading
Hydrologic regime alteration	Agriculture	historical	historical	
Habitat destruction	Municipal development	4	4	Dams and land conversion
Habitat destruction	Forestry	2	4	Drained areas for pine plantation
Hydrologic regime alteration	Municipal development	U	U	May increase water levels

Appendix H3 continued. Bird species of greatest conservation need with individual threats.

Stress	Source of Stress	Scope	Severity	Stress Comments
<b>Henslow's sparrow <i>Ammodramus henslowii</i></b>				
Habitat destruction	Exotic or introduced species	4	4	<i>Phragmites</i>
<b>American black duck <i>Anas rubripes</i></b>				
Competition	Exotic or introduced species	4	3	Mallards
Competition	Native species	4	3	Geese
Habitat destruction	Municipal development	3	4	
Habitat degradation	Native species	3	4	
Predation	Exotic or introduced species	3	4	
Genetic alteration	Exotic or introduced species	3	2	Mallards
<b>Redhead <i>Aythya americana</i></b>				
Habitat degradation	Source not appropriate	3	3	Decline in SAV
Organic pollutants	Industrial: Power generation	1	4	Oil spills
<b>Greater scaup <i>Aythya marila</i></b>				
Habitat degradation	Source not appropriate	3	3	Decline in SAV

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<b>Stress</b>	<b>Source of Stress</b>	<b>Scope</b>	<b>Severity</b>	<b>Stress Comments</b>
Organic pollutants	Industrial: power generation	1	4	Oil spills
Metals	Industrial: Other	1	2	
Unintentional take	Non-target species management	1	2	Bycatch
<b>Brant <i>Branta bernicla</i></b>				
Habitat degradation	Source not appropriate	3	3	Decline in SAV Cultivation of shallow water clam beds
Competition	Agriculture	2	3	(competition with aquaculture)
Organic pollutants	Industrial: Power generation	1	4	Oil spills
<b>Peregrine falcon <i>Falco peregrinus</i></b>				
Other toxin	Industrial: Other	4	3	Thin eggshells continue; responsible contaminant unknown
Other toxin	Industrial: Other	U	U	Potential: flame retardants
<b>Black rail <i>Laterallus jamaicensis</i></b>				
Habitat destruction	Exotic or introduced species	4	4	<i>Phragmites</i>
<b>Horned grebe <i>Podiceps auritus</i></b>				
Organic pollutants	Industrial: power generation	1	4	Oil spills
<b>Northern rough-winged swallow <i>Stelgidopteryx serripennis</i></b>				
Channel or shoreline alteration	Erosion control	4	3	Grading of bank nesting habitat
<b>Eastern kingbird <i>Tyrannus tyrannus</i></b>				
Food supply or trophic structure changes	Loss of honeybees	U	U	Investigate
<b>Barn owl <i>Tyto alba</i></b>				
Habitat destruction	Agriculture	4	4	Clean farming (loss of silos and old farm structures)
<b>Golden-winged warbler <i>Vermivora chrysoptera</i></b>				
Genetic alteration	Native species	2	2	Blue-winged warbler hybridization

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Appendix H4. Stresses on Virginia's mammalian fauna as identified by Mammal TAC (2004). See Chapter 2 for descriptions of scope and severity ("U" indicates "unknown", "?" indicates a questionable value, generally for a stress or source that is poorly known).

Stress	Source of Stress	Scope	Severity	Comments
<b>Eastern big-eared bat <i>Corynorhinus rafinesquii macrotis</i></b>				
Habitat destruction	Municipal development	3	3	
Habitat destruction	Forestry	3	3	mainly through loss of large bottomland forest with roost trees
Toxins	Municipal development	3	3	magnification of toxins through food chain may affect long term survival, reproductive success
Insecticides	Agriculture	3	3	may affect food availability/bioaccumulation from prey to predator could affect long term survival
Metals	Atmospheric deposition	3	3	Could affect reproductive success through bioaccumulation through the food chain
<b>Virginia big-eared bat <i>Corynorhinus townsendii virginianus</i></b>				
Human disturbance of hibernacula	Recreational use of habitat	4	4	
Unintentional capture or killing	Industrial: power generation	U	U	wind power effects from turbines not completely known
<b>Carolina northern flying squirrel <i>Glaucomys sabrinus coloratus</i></b>				
Habitat degradation	Atmospheric deposition	3	3	
Habitat degradation	Exotic or introduced species	3	3	woolly adelgid infestation
Habitat degradation	Climate alteration or atmospheric change	2	2	
Competition	Native species	2	2	
<b>Virginia northern flying squirrel <i>Glaucomys sabrinus fuscus</i></b>				
Habitat degradation	Exotic or introduced species	3	3	woolly adelgid infestation
Habitat destruction	Forestry	2	4	
Habitat degradation	Climate alteration or atmospheric change	2	2	
Competition	Native species	2	2	
Habitat destruction	Industrial: power generation	U	U	

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<b>Stress</b>	<b>Source of Stress</b>	<b>Scope</b>	<b>Severity</b>	<b>Comments</b>
<b>Snowshoe hare <i>Lepus americanus</i></b>				
Natural succession	Other land management	4	4	
Lack of snow cover	Climate alteration or atmospheric change	2	2	
<b>Fisher <i>Martes pennanti</i></b>				
Habitat destruction	Forestry	4	4	
<b>Southern rock vole <i>Microtus chrotorrhinus carolinensis</i></b>				
Habitat destruction	Forestry	4	3	
Hydrologic regime alteration	Climate alteration or atmospheric change	4	3	
<b>Least weasel <i>Mustela nivalis</i></b>				
Threats not known, this species may be more common than currently thought				
<b>Southeastern myotis <i>Myotis austroriparius</i></b>				
Habitat destruction	Municipal development	3	3	
Toxins	Municipal development	3	3	magnification of toxins through food chain may affect long term survival, reproductive success
Habitat destruction	Forestry	3	2	mainly through loss of large bottomland forest with roost trees Could affect reproductive success through bioaccumulation through the food chain
Metals	Atmospheric deposition	3	2	may affect food availability/bioaccumulation from prey to predator could affect long term survival
Insecticides	Agriculture	2	3	
<b>Eastern small-footed myotis <i>Myotis leibii</i></b>				
Human disturbance of hibernacula	Recreational use of habitat	3	3	
Unintentional capture or killing	Industrial: power generation	U	U	wind power effects from turbines not completely known
<b>Gray myotis <i>Myotis grisescens</i></b>				
Habitat destruction	Municipal development	4	4	
Human disturbance of caves	Recreational use of habitat	4	3	
Unintentional capture or killing	Industrial: power generation	U	U	wind power effects from turbines not completely known

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<b>Stress</b>	<b>Source of Stress</b>	<b>Scope</b>	<b>Severity</b>	<b>Comments</b>
<b>Indiana myotis <i>Myotis sodalis</i></b>				
Human disturbance of hibernacula	Recreational use of habitat	3	3	
Unintentional capture or killing	Industrial: power generation	U	U	wind power effects from turbines not completely known
<b>Allegheny woodrat <i>Neotoma magister</i></b>				
Parasitism	Native species	2	1	
Habitat destruction	Municipal development	2	1	
<b>Cotton mouse <i>Peromyscus gossypinus</i></b>				
Habitat destruction	Other land management	U	U	
Hydrologic regime alteration	Other land management	U	U	
Competition	Native species	U	U	
<b>Pungo white-footed mouse <i>Peromyscus leucopus easti</i></b>				
Habitat destruction	Municipal development	4	4	
<b>Delmarva fox squirrel <i>Sciurus niger cinereus</i></b>				
Habitat destruction	Municipal development	3	4	
Habitat destruction	Forestry	3	4	
Habitat destruction	Forest pests	3	4	
Habitat destruction	Sea level rise	3	4	
Habitat fragmentation	Municipal development	3	3	
Habitat fragmentation	Agriculture	3	3	
Habitat fragmentation	Forestry	3	3	
Habitat fragmentation	Roadways	3	3	
Other organism stressors (vehicle strikes)	Roadways	2	2	
Intentional take	Recreational use of species	1	1	misidentification of species by hunters
predation	Native species	1	1	
Other organism stressors (disease)	Unknown	U	1	
<b>Southeastern fox squirrel <i>Sciurus niger niger</i></b>				
Habitat destruction	Forestry	4	3	

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Stress	Source of Stress	Scope	Severity	Comments
<b>Long-tailed shrew <i>Sorex dispar</i></b>				
Similar to rock voles in terms of habitat, not much known about threats				
<b>Dismal Swamp southeastern shrew <i>Sorex longirostris fisheri</i></b>				
Habitat destruction	Municipal development	3	2	
Habitat fragmentation	Municipal development	3	2	
Habitat destruction	Roadways	2	2	
Habitat fragmentation	Roadways	2	2	
Habitat fragmentation	Forestry	2	2	
Hydrologic regime alteration	Forestry	2	2	
<b>Southern water shrew <i>Sorex palustris punctulatus</i></b>				
Food supply or trophic structure changes	Forestry	4	3	
Habitat degradation	Forestry	4	3	somehow unknown: general declines in water quality affecting habitat, food supply, hydrologic regime
Hydrologic regime alteration	Climate alteration or atmospheric change	4	3	
<b>Eastern spotted skunk <i>Spilogale putorius</i></b>				
Competition	Native species	3	3	Habitat alteration allows invasion of striped skunks
<b>Appalachian cottontail <i>Sylvilagus obscurus</i></b>				
Natural succession	Other land management	2	2	
Competition	Native species	2	2	
<b>Marsh rabbit <i>Sylvilagus palustris</i></b>				
Habitat destruction	Municipal development	3	4	
Habitat destruction	Agriculture	2	4	
Competition	Native species	U	U	



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Stress	Source of Stress	Scope	Severity	Comments
<b>Southern bog lemming <i>Synaptomys cooperi</i></b>				
Natural succession	Other land management	2	3	
Predation	Exotic or introduced species	2	2	

Appendix H5. Stresses on Virginia's aquatic mollusks as identified by Mussel TAC (2004). See Chapter 2 for descriptions of scope and severity ("U" indicates "unknown", "?" indicates a questionable value, generally for a stress or source that is poorly known). The Mussel TAC also identified the interbasin transfer of species through water withdrawal as a general concern for all species.

Stress	Source of Stress	Scope	Severity	Comments
<b>Clinch River</b>				
Sediment load alteration	Agriculture	4	2	
Channel or shoreline alteration	Agriculture	4	2	
Turbidity alteration	Agriculture	4	2	
Loss of ecological functions		4	2	Loss of fish hosts (particularly abundance)
Habitat fragmentation	Industrial: mineral extraction	3	3	Disjunct populations caused by water quality issues
Organic pollutants	Industrial: mineral extraction	3	3?	
Sediment load alteration	Industrial: mineral extraction	3	2	
Turbidity alteration	Industrial: mineral extraction	3	2	
Habitat fragmentation	Industrial: power generation	2	3	
Organic pollutants	Industrial: rights-of-way	2	2	Roads and rails
Sediment load alteration	Forestry	2	1	
Nutrient input regime alteration	Agriculture	2	1	
Nutrient input regime alteration	Municipal development	2	1	Waste water treatment plants, straight pipes
Organic matter input regime alteration	Agriculture	2	1	
Turbidity alteration	Forestry	2	1	
Toxins	Industrial: other	1	4	Spills (roadway and rails), accidents at industrial sites
Channel or shoreline alteration	Municipal development	1	3	
Metals	Industrial: power generation	1	3	
Channel or shoreline alteration	Other land management	1	3	Landowner in streams
Turbidity alteration	Municipal development	1	2	

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<b>Stress</b>	<b>Source of Stress</b>	<b>Scope</b>	<b>Severity</b>	<b>Comments</b>
Habitat fragmentation	Municipal development	1	2	Waste water treatment plants
Habitat fragmentation	Industrial: other	1	2	Remnant mill dams
Predation	Native species	1	2	Muskrats
Organic matter input regime alteration	Forestry	1	1	
Hydrologic regime alteration	Industrial: mineral extraction	1	1	Stream subsidence: purple bean, Tennessee heelsplitter; tan riffleshell
Other toxins	Industrial: mineral extraction	1	U	Products of coal processing
Metals	Industrial: mineral extraction			
Complications due to small populations				Species-specific
Other toxins		U	U	Pharmaceuticals, drugs, etc.
<b>Holston River</b>				
Sediment load alteration	Agriculture	4	3	
Loss of ecological functions		4	2	Loss of fish hosts (particularly abundance)
Turbidity alteration	Agriculture	4	2	
Metals	Industrial: other	3	3	Past industry at Saltville
Channel or shoreline alteration	Agriculture	3	2	
Other organismal stressor		3	2?	Bacterial infection
Parasitism	Native species	3	2?	Increased infestation/load
Channel or shoreline alteration	Other land management	2	3	Landowner in streams
Biocides	Agriculture	2	2	Pesticides and herbicides (row crops)
Channel or shoreline alteration	Municipal development	2	2	
Habitat fragmentation	Industrial: other	2	2	Remnant mill dams; TVA dam on South Holston
Organic pollutants	Industrial: rights-of-way	2	2	Roads and rails
Sediment load alteration	Forestry	2	2	
Turbidity alteration	Municipal development	2	2	
Nutrient input regime alteration	Agriculture	2	1	
Nutrient input regime alteration	Municipal development	2	1	Waste water treatment plants
Organic matter input regime alteration	Agriculture	2	1	
Turbidity alteration	Forestry	2	1	
Other toxins	Industrial: other	2	U	Small industry, unknown impacts

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<b>Stress</b>	<b>Source of Stress</b>	<b>Scope</b>	<b>Severity</b>	<b>Comments</b>
Toxins	Industrial: other	1	4	Spills (roadway and rails), accidents at industrial sites
Habitat fragmentation	Municipal development	1	2	Waste water treatment plants
Predation	Native species	1	2	Muskrats
Sediment load alteration	Industrial: mineral extraction	1	2	Mining of landscape rock (unknown impacts)
Organic matter input regime alteration	Forestry	1	1	
Complications due to small populations				Species-specific
<b>New River</b>				
Sediment load alteration	Agriculture	4	3	Livestock
Turbidity alteration	Agriculture	4	3	Livestock
Hydrologic regime alteration	Dam for water use and water withdrawal	4	2	
Nutrient input regime alteration	Agriculture	3	3	Livestock
Sediment load alteration	Municipal development	3	3	
Turbidity alteration	Municipal development	3	3	
Channel or shoreline alteration	Agriculture	3	2	
Hydrologic regime alteration	Municipal development	3	2	
Hydrologic regime alteration	Industrial: power generation	3	2	Claytor dam
Nutrient input regime alteration	Municipal development	3	2	Wastewater treatment
Insecticides	Agriculture	2	2	Row crops, tree farming
Toxins	Industrial: other	2	2	Radford arsenal
Toxins	Industrial: other	2	2	Celanese factory at narrows
Toxins	Industrial: power generation	1	1	Glen Lyn power plant
<b>Powell River</b>				
Sediment load alteration	Industrial: mineral extraction	4	3	
Loss of ecological functions		4	2	Loss of fish hosts (particularly abundance)
Sediment load alteration	Agriculture	3	2	
Turbidity alteration	Agriculture	3	2	
Turbidity alteration	Industrial: mineral extraction	3	2	
Other toxins	Industrial: mineral extraction	2	U	Products of coal processing

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<b>Stress</b>	<b>Source of Stress</b>	<b>Scope</b>	<b>Severity</b>	<b>Comments</b>
Channel or shoreline alteration	Municipal development	2	2	
Channel or shoreline alteration	Agriculture	2	2	
Metals	Industrial: mineral extraction	2	2	
Nutrient input regime alteration	Municipal development	2	2	Waste water treatment plants, straight pipes
Organic pollutants	Industrial: mineral extraction	2	2	
Organic pollutants	Industrial: rights-of-way	2	2	Roads and rails
Nutrient input regime alteration	Agriculture	2	1	
Turbidity alteration	Municipal development	2	1	
Toxins	Industrial: other	1	4	Spills (roadway and rails), accidents at industrial sites
Channel or shoreline alteration	Other land management	1	3	Landowner in streams
Organic pollutants	Forestry	1	2	Processing (sawdust leachate)
Predation	Native species	1	2	Muskrats
Sediment load alteration	Forestry	1	2	
Organic matter input regime alteration	Forestry	1	1	
Turbidity alteration	Forestry	1	1	
Complications due to small populations				Species-specific
Other toxins		U	U	Drugs, pharmaceuticals, etc.
<b>Southeastern Coastal Plain and Lower Piedmont</b>				
Sediment load alteration	Agriculture	3	2	Row crops
Insecticides	Agriculture	2	3	Row crops
Complications due to small populations		2	2	<i>L. cariosa</i> most impacted
Hydrologic regime alteration	Municipal development	2	2	
Sediment load alteration	Municipal development	2	2	
Sediment load alteration	Forestry	2	2	
Toxins	Industrial: other	1	4	Spills from trucks or industrial accidents
Toxins	Industrial: other	1	4	General discharge
Hydrologic regime alteration	Dam for water use and water withdrawal	1	2	Possible habitat destruction
Nutrient input regime alteration	Agriculture	1	1	Livestock

Appendix H5 continued. Aquatic mollusk species of greatest conservation need with individual threats.

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Appendix H — Threats to Species of Greatest Conservation Need

<b>Stress</b>	<b>Source</b>	<b>Scope</b>	<b>Severity</b>	<b>Comments</b>
<b>Dwarf wedgemussel <i>Alasmidonta heterodon</i></b>				
Complications due to small populations		4	3	
Sediment load alteration	Agriculture	3	3	
Sediment load alteration	Municipal development	3	3	
Toxins	Roadways	3	1	Most populations affected by roadway crossings to some degree
Habitat fragmentation	Municipal development	2	2	
Hydrologic regime alteration	Municipal development	2	2	Particularly along middle of Po River and in headwaters of Aquia Creek
Hydrologic regime alteration	Other sources of stress	2	2	Dams (Nottoway and Po rivers)
Nutrient input regime alteration	Agriculture	2	2	Primarily from cattle, especially in lower Po River
Toxins	Municipal development	2	2	
<b>Triangle floater <i>Alasmidonta undulata</i></b>				
Sediment load alteration	Agriculture	3	2	
Turbidity alteration	Forestry	3	2	
Turbidity alteration	Agriculture	3	2	
Hydrologic regime alteration	Municipal development	2	2	
Sediment load alteration	Forestry	2	2	
Sediment load alteration	Municipal development	2	2	
Channel or shoreline alteration	Agriculture	1	1	
Toxins	Roadways	1	1	
Toxins	Municipal development	1	1	
<b>Brook floater <i>Alasmidonta varicosa</i></b>				
Channel or shoreline alteration	Agriculture	4	3	Significant impact in the Shenandoah drainage
Sediment load alteration	Agriculture	3	4	Significant impact in the Shenandoah drainage
Habitat fragmentation	Municipal development	3	3	
Habitat fragmentation	Agriculture	3	3	
Hydrologic regime alteration	Municipal development	3	3	More of an impact in the Potomac drainage

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<b>Stress</b>	<b>Source</b>	<b>Scope</b>	<b>Severity</b>	<b>Comments</b>
Nutrient input regime alteration	Agriculture	3	3	Mainly in Shenandoah drainage with large-scale farming operations
Toxins	Roadways	3	1	
Sediment load alteration	Municipal development	2	3	
Insecticides	Agriculture	2	2	
Sediment load alteration	Forestry	2	2	
Toxins	Municipal development	2	2	
Turbidity alteration	Agriculture			Mainly in Shenandoah drainage with large-scale farming operations
<b>Carolina lance mussel <i>Elliptio angustata</i> and Atlantic spike <i>Elliptio producta</i></b>				
Hydrologic regime alteration	Municipal development	4	2	
Sediment load alteration	Municipal development	3	3	
Toxins	Municipal development	3	3	
Sediment load alteration	Agriculture	3	2	
Sediment load alteration	Forestry	3	2	
Turbidity alteration	Forestry	3	2	
Turbidity alteration	Agriculture	3	2	
Water temperature regime alteration	Municipal development	3	2	
Hydrologic regime alteration	Municipal development	2	2	
Sediment load alteration	Municipal development	2	2	
Sediment load alteration	Agriculture	2	2	
Toxins	Roadways	2	2	
Turbidity alteration	Agriculture	2	2	
Channel or shoreline alteration	Agriculture	1	1	
Sediment load alteration	Forestry	1	1	
Toxins	Roadways	1	1	
Toxins	Municipal development	1	1	
Turbidity alteration	Forestry	1	1	

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<b>Stress</b>	<b>Source</b>	<b>Scope</b>	<b>Severity</b>	<b>Comments</b>
<b>Northern lance mussel <i>Elliptio fisheriana</i></b>				
Hydrologic regime alteration	Municipal development	4	2	Hydrologic regime alteration
Sediment load alteration	Municipal development	3	3	Sediment load alteration
Toxins	Municipal development	3	3	Toxins
Water temperature regime alteration	Municipal development	3	2	Water temperature regime alteration
Sediment load alteration	Agriculture	2	2	Sediment load alteration
Toxins	Roadways	2	2	Toxins
Turbidity alteration	Agriculture	2	2	Turbidity alteration
Sediment load alteration	Forestry	1	1	Sediment load alteration
Turbidity alteration	Forestry	1	1	Turbidity alteration
<b>Yellow lance <i>Elliptio lanceolata</i></b>				
Sediment load alteration	Municipal development	3	2	
Sediment load alteration	Agriculture	3	2	
Toxins	Roadways	3	2	
Hydrologic regime alteration	Municipal development	2	3	
Toxins	Municipal development	2	3	
Channel or shoreline alteration	Agriculture	2	2	
Organic matter input regime alteration	Agriculture	2	1	
Sediment load alteration	Forestry	2	1	
<b>Atlantic pigtoe <i>Fusconaia masoni</i></b>				
Habitat fragmentation	Agriculture	3	2	
Sediment load alteration	Forestry	3	2	
Sediment load alteration	Agriculture	3	2	
Turbidity alteration	Forestry	3	1	
Turbidity alteration	Agriculture	3	1	
Habitat fragmentation	Municipal development	2	2	
Hydrologic regime alteration	Municipal development	2	2	
Insecticides	Agriculture	2	2	
Insecticides	Municipal development	2	2	

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<b>Stress</b>	<b>Source</b>	<b>Scope</b>	<b>Severity</b>	<b>Comments</b>
Nutrient input regime alteration	Agriculture	2	2	
Sediment load alteration	Municipal development	2	2	
Toxins	Roadways	2	2	
Organic matter input regime alteration	Forestry	2	1	
Hydrologic regime alteration	Industrial: other	1	2	Dams - old mill dams
<b>Tennessee heelsplitter <i>Lasmigona holstonia</i></b>				
Sediment load alteration	Agriculture	4	3	Livestock
Turbidity alteration	Agriculture	4	3	Livestock
Nutrient input regime alteration	Agriculture	3	3	Livestock
Sediment load alteration	Municipal development	3	3	
Channel or shoreline alteration	Agriculture	3	2	
Nutrient input regime alteration	Municipal development	3	2	Wastewater treatment
<b>Green floater <i>Lasmigona subviridis</i></b>				
Complications due to small populations		4	U	
Sediment load alteration	Agriculture	3	2	
Turbidity alteration	Agriculture	3	2	
Hydrologic regime alteration	Municipal development	2	2	
Sediment load alteration	Forestry	2	2	
Toxins	Municipal development	2	2	
Turbidity alteration	Forestry	2	2	
Toxins	Roadways	2	1	
Water temperature regime alteration		1	1	
<b>Virginia pigtoe <i>Lexingtonia subplana</i></b>				
Sediment load alteration	Forestry	4	2	
Habitat fragmentation	Agriculture	3	2	
Sediment load alteration	Agriculture	3	2	
Organic matter input regime alteration	Forestry	3	1	
Turbidity alteration	Forestry	3	1	



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<b>Stress</b>	<b>Source</b>	<b>Scope</b>	<b>Severity</b>	<b>Comments</b>
Turbidity alteration	Agriculture	3	1	
Hydrologic regime alteration	Municipal development	2	2	
Nutrient input regime alteration	Agriculture	2	2	
Toxins	Roadways	2	2	

**Round peaclam *Pisidium equilaterale***

No review possible

**James spiny mussel *Pleurobema collina***

Nutrient input regime alteration		4	4	
Hydrologic regime alteration	Municipal development	4	3	
Salinity regime alteration	Agriculture	3	2	Livestock
Sediment load alteration	Forestry	3	2	
Sediment load alteration	Agriculture	3	2	
Toxins	Roadways	3	2	
Turbidity alteration	Forestry	3	2	
Turbidity alteration	Agriculture	3	2	
Toxins	Dam for water use and water withdrawal	2	4 dam, 2 withdrawal	Possible habitat destruction
Hydrologic regime alteration	Municipal development	2	3	
Toxins	Municipal development	2	3	
Hydrologic regime alteration	Municipal development	2	2	
Sediment load alteration	Municipal development	2	2	
Nutrient input regime alteration	Municipal development	2	1	
Sediment load alteration	Municipal development	2	1	Could be molluscicides (slugs)
Organic pollutants	Roadways	2	1?	
Hydrologic regime alteration	Industrial: other	1	4	Spills from trucks or industrial accidents
Channel or shoreline alteration	Municipal development	1	3	
Complications due to small populations	Native species	1	1	Beaver activity, reduces amount of habitat available
Water temperature regime alteration	Municipal development	1	1	
Insecticides	Roadways	1	1?	Creosote

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<b>Stress</b>	<b>Source</b>	<b>Scope</b>	<b>Severity</b>	<b>Comments</b>
<b>Creeper <i>Strophitus undulatus</i></b>				
Sediment load alteration	Forestry	3	2	
Sediment load alteration	Agriculture	3	2	
Toxins	Roadways	3	2	
Turbidity alteration	Forestry	3	2	
Turbidity alteration	Agriculture	3	2	
Toxins	Municipal development	2	3	
Hydrologic regime alteration	Municipal development	2	2	
Sediment load alteration	Municipal development	2	2	
Nutrient input regime alteration	Municipal development	2	1	
Channel or shoreline alteration	Municipal development	1	3	
Water temperature regime alteration	Municipal development	1	1	
<b>Notched rainbow <i>Villosa constricta</i></b>				
Sediment load alteration	Agriculture	3	2	
Sediment load alteration	Forestry	3	2	
Turbidity alteration	Forestry	3	2	
Turbidity alteration	Agriculture	3	2	
Hydrologic regime alteration	Municipal development	2	2	
Sediment load alteration	Municipal development	2	2	
Channel or shoreline alteration	Agriculture	1	1	
Toxins	Roadways	1	1	
Toxins	Municipal development	1	1	