

# Appendix C Millsap Herpetofauna Ranking

## C.1 Ranking Herpetofauna of the District for selection of SGCN

The main framework for the herpetofauna ranking process comes from the Millsap paper, with supplemental variables developed based solely on data for this taxon in the District. DOEE prioritized conservation efforts for District herpetofauna utilizing national, regional, and local aspects of several other ranking systems. These aspects include population status, vulnerability, population trends, current knowledge, specialization, and ongoing management.

Since the District is severely limited in geographic size, using only national or regional data would not adequately reflect the impact conservation efforts would have for some species. To attempt a balance that would more accurately assess conservation needs, species were scored on a number of biological variables for North America and the region, as well as District-only aspects to attempt a balance that would more accurately assess conservation need.

## C.2 Scoring

### C.2.1 Biological Variables

#### Population Size – Estimated number of adults throughout North America

0–500 individuals	10
501–1,000 individuals or population suspected to be small	8
1,001–3,000 individuals	6
3,001–10,000 individuals	4
10,001–50,000 individuals, or population suspected to be large	2
> 50,000 individuals	0



**Population Trend – Overall trend in number of individuals throughout taxon’s range over last two decades (or other appropriate time interval considering taxon’s generation time)**

If population trend is unknown, consider trends in the availability and condition of the taxon’s habitat as indicative of the population.

Population size known to be decreasing	10
Trend unknown, but population suspected to be decreasing	8
Population formerly experienced serious declines, but is stable or increasing	6
Population size stable or suspected to be increasing	2
Population size known to be increasing	0

**Range Size – The size of areas over which species is distributed when most restricted**

<100 km <sup>2</sup>	10
101–1,000 km <sup>2</sup>	9
1,001–40,000 km <sup>2</sup>	7
40,001–100,000 km <sup>2</sup>	4
100,001–2,000,000 km <sup>2</sup>	1
>2,000,000 km <sup>2</sup>	0

**Distribution Trend – Percent change (since European settlement) in area occupied by the taxon**

This is an estimate of change in the portion of the total range that is occupied or utilized it may not be equal to the change in total range.

Area occupied has declined by 90%–100%	10
Area occupied has declined by 75%–89%	8
Area occupied has declined by 25%–74%	5
Area occupied has declined by 1%–24%	2
Area occupied is stable or has increased	0



**Population Concentration – Degree to which populations congregate at specific locations**

Majority concentrates in single location	10
Concentrates at 1–25 locations	6
Concentrates at >25 locations	2
Does not concentrate	0

**Reproductive Potential for Recovery – Ability of species to recover from serious population declines**

(a) Average number of eggs or young produced per adult female per year

<1 offspring/female/year	5
1–9 offspring/female/year	3
10–100 offspring/female/year	1
>100 offspring/female/year	0

(b) Minimum age at which females typically reproduce

>8 years	5
4–8 years	3
2–3 years	1
<2 years	0

**Ecological specialization – degree to which the species is dependent upon environmental factors**

(a) Dietary specialization – primary response to decrease in availability of primary food source

Number of individuals declines, no substantial shift in diet	3.3
Little change in number of individuals, shift in diet	0



(b) Reproductive specialization – primary response of local populations to decrease in preferred breeding sites

Number of individuals or breeding attempts decline, no substantial shift to alternate breeding sites	3.3
Substantial shift to alternate breeding sites with little change in number of individuals	0

(c) Other specialization – ecological or behavioral specializations (roosting, hibernacula, etc.)

Highly specialized	3.3
Moderately specialized	1.7
Not specialized	0

**C.2.2 Action Variables**

**Knowledge of distribution in the District**

Distribution is extrapolated from a few locations or knowledge is limited to general range maps	10
Broad range limits or habitat associations are known, but local occurrence cannot be predicted accurately	5
Distribution is well known and occurrence can be predicted accurately throughout the range	0

**Knowledge of population trend in the District**

Not currently monitored	10
Monitored locally	6
Statewide monitoring, but not with statistical sensitivity	4
Statewide monitoring with statistical sensitivity	0

**Knowledge of District population limits**

Factors affecting population size and distribution are unknown or unsustainable	10
Some factors affecting population size and distribution are known, but one or more major factors are unknown	5
All major factors affecting population size and distribution are known	0



**Ongoing management activities in the District**

None directed primarily at the taxon	10
Management mostly related to enforcement of conservation laws	5
Some direct management activities in addition to enforcement of conservation laws	0

**Supplemental Variables –Population trend/POA of taxon in the District**

Known decrease	6
Population trend unknown or suspected decline	5
Known stable or increasing, but declining in areas	4
Former serious decline, but presently stable/increasing	3
Population is stable or suspected to be stable/increasing	2
No current data/potentially extirpated	1

**Last documented**

Present–5 years	10
5–10 years	5
>10 years	0

**Range size/concentration throughout the District/POA**

0%–24%	10
25%–50%	8
>50%	6
No current species data/possibly extirpated	2

**Impacted by known emerging disease**

Known	10
Potentially	5
None	0



### Habitat specialization within the District

Highly specialized	10
Moderately specialized	8
Not specialized	6
No known habitat/possibly extirpated	2

### C.2.3 Ranking

Species were sorted based on their aggregate scores ranging from the Queen Snake (89.9) to the Eastern Hognose Snake (29) (see Table 38).

### Herpetofauna SGCN Selection

Species with the highest ranking scores were selected as SGCN for 2015, with the lowest score for selection for reptiles and amphibians being set at 40 and 50, respectively.



Table 37 Millsap Amphibian Ranking

Common Name	Biological Variables														Action Variables					Biological + Action Total Score	Supplemental Variables (specific to DC)					Species Total Score		
	Current SGCN	MD SGCN	VA SGCN	G-Rank	S-Rank	IUCN	Population Size	Population Trend	Range Size	Distribution Trend	Population Concentration	Reproductive Potential for Recovery	Ecological Specialization	Biological Total	DC Distribution	Trend in DC	DC Population Limitations	Ongoing DC Management Activities	Action Total		Population/POA	Last documented	Range Size/ Concentration	Impact of Emerging Diseases	DC Habitat Specialization		Supp. Total	
Southern Leopard Frog				G5	S2S3		e	b	f	d	c	Ad, Bd	Ab, Ba, Cb		c	c	c	a			c	a	c	a	b			
							2	8	0	2	2	0	5	19	0	4	0	10	14	33	4	10	6	10	8	38	71	
Green Treefrog				G5	SH		e	b	f	d	c	Ad, Bd	Ab, Ba, Cb		a?	b?	b?	a			d	a	a	a	b			
							2	8	0	2	2	0	5	19	10	6?	5?	10	10	29	3	10	10	10	8	41	70	
Gray Treefrog				G5	S4		e	b	f	d	c	Ad, Bd	Ab, Ba, Cb		c	c	c	a			c	a	c	a	b			
							2	8	0	2	2	0	5	19	0	4	0	10	14	33	4	10	6	10	8	38	71	
Cope's Gray Treefrog				G5	S4		e	b	f	d	c	Ad, Bd	Ab, Ba, Cb		c	c	c	a			c	a	c	a	b			
							2	8	0	2	2	0	5	19	0	4	0	10	14	33	4	10	6	10	8	38	71	
American Toad	X			G5	S5		e	b	f	d	c	Ad, Bd	Ab, Ba, Cb		c	c	c	a			c	a	c	a	c			
							2	8	0	2	2	0	5	19	0	4	0	10	14	33	4	10	6	10	6	36	69	
Bullfrog	X			G5	S5		f	e	f	e	c	Ad, Bc	Ab, Ba, Cb		c	c	c	a			e	a	c	b	c			
							0	0	0	0	2	1	5	8	0	4	0	10	14	22	2	10	6	5	6	29	51	
Fowler's Toad	X			G5	S5		e	b	f	d	c	Ad, Bd	Ab, Ba, Cb		c	c	c	a			c	a	c	a	c			
							2	8	0	2	2	0	5	19	0	4	0	10	14	33	4	10	6	10	6	36	69	
Northern Dusky Salamander	X			G5	S5		f	d	f	d	c	Ac, Bc	Ab, Ba, Cb		a?	b?	b?	a			c	a	a	a	a			
							0	2	0	2	2	2	5	13	10	6?	5?	10	10	23	4	10	10	10	10	44	67	
Marbled Salamander	X			G5	S3		e	b	f	c	c	Ad, Bd	Aa, Ba, Ca		a?	b?	b?	a			b	a	a	a	a			
							2	8	0	5	2	0	9.9	26.9	10	6?	5?	10	10	26.9	5	10	10	10	10	45	71.9	
Mud Salamander	X			G5	S3		f	d	f	d	c	Ac, Bc	Ab, Ba, Cb		c?	c?	c?	a			f	c	d	b	d			
							0	2	0	2	2	2	5	13	0	4	0	10	14	27	1	0	2	5	2	10	37	
Northern Cricket Frog	X			G5	S3										c?	c?	c?	a			f	c	d	b	d			
															13	0	4	0	10	14	27	1	0	2	5	2	10	37
Northern Two-lined Salamander	X			G5	S5		f	d	f	d	c	Ac, Bc	Ab, Ba, Cb		c	c	c	a			e	a	c	a	b			
							0	2	0	2	2	2	5	13	0	4	0	10	14	23	2	10	6	10	8	36	59	
Pickerel Frog	X			G5	S5		e	b	f	d	c	Ad, Bd	Ab, Ba, Cb		c	c	c	a			b	a	c	a	b			
							2	8	0	2	2	0	5	19	0	4	0	10	14	33	5	10	6	10	8	39	72	
Northern Red Salamander	X			G5	S3		f	d	f	d	c	Ac, Bc	Ab, Ba, Cb		a?	b?	b?	a			b	a	a	a	a			
							0	2	0	2	2	2	5	13	10	6?	5?	10	10	23	5	10	10	10	10	45	68	
Redback Salamander	X			G5	S5		f	b	f	c	c	Ac, Bc	Ab, Ba, Cb		c	c	c	a			e	a	c	b	c			
							0	8	0	5	2	2	5	22	0	4	0	10	14	36	2	10	6	5	6	29	65	
Eastern Newt	X			G5	S3		f	d	f	e	c	Ad, Bb	Ab, Ba, Cb		a?	b?	b?	a			b	a	a	b	b			
							0	2	0	0	2	3	5	12	10	6?	5?	10	10	22	5	10	10	5	8	38	60	
Northern Spring Peeper	X			G5	S4		e	b	f	d	c	Ad, Bd	Ab, Ba, Cb		c	c	c	a			e	a	c	a	c			
							2	8	0	2	2	0	5	19	0	4	0	10	14	33	2	10	6	10	6	34	67	
Upland Chorus Frog	X			G5	S3		e	b	f	d	c	Ad, Bd	Ab, Ba, Cb		a?	b?	b?	a			b	a	b	a	c			
							2	8	0	2	2	0	5	19	10	6?	5?	10	10	29	5	10	8	10	6	39	68	
Spotted Salamander	X			G5	S4		e	b	f	c	c	Ad, Bd	Aa, Ba, Ca		c	c	c	a			b	a	a	a	a			
							2	8	0	5	2	0	9.9	26.9	0	4	0	10	14	40.9	5	10	10	10	10	45	85.9	
Wood Frog	X			G5	S2?		e	b	f	d	c	Ad, Bd	Aa, Ba, Ca		c	c	c	a			b	a	a	a	a			
							2	8	0	2	2	0	9.9	23.9	0	4	0	10	14	37.9	5	10	10	10	10	45	82.9	
Spring Salamander				G5			e	b	f	c	c	Ad, Bd	Aa, Ba, Ca		a?	b?	b?	a			f	c	d	b	d			
							2	8	0	5	2	0	9.9	26.9	10	6?	5?	10	10	36.9	1	0	2	5	2	10	46.9	
Green Frog				G5	S5		e	b	f	d	c	Ad, Bd	Ab, Ba, Cb		c	c	c	a			e	a	c	a	c			
							2	8	0	2	2	0	5	19	0	4	0	10	14	33	2	10	6	10	6	34	67	

Table 38 Millsap Reptile Ranking

Common Name	Biological Variables													Action Variables				Biological + Action Total Score	Supplemental Variables (specific to DC)					Species Total Score		
	Current SGCN	MD SGCN	VA SGCN	G-Rank	S-Rank	IUCN	Population Size	Population Trend	Range Size	Distribution Trend	Population Concentration	Reproductive Potential for Recovery	Ecological Specialization	Biological Total	Trend in DC	DC Population Limitations	Ongoing DC Management Activities		Action Total	Population/POA	Last documented	Range Size/Concentration	Impact of Emerging Diseases		DC Habitat Specialization	Supplemental Total
Common Musk Turtle	X			G5	S4		f	d	f	d	d	Ab, Bb	Ab, Bb, Cc	10	c	c	a	14	24	c	a	c	b	b	33	57
Bog Turtle	X	X	X	G3	SX	Critically Endangered	b	a	a	b	d	Aa, Ba	Ab, Ba, Ca	52.6	c?	c?	a	14	66.6	f	c	d	b	d	10	76.6
Corn Snake	X	X		G5			e	d	e	d	d	Ac, Bd	Ab, Bb, Cc	6	c?	c?	a	14	20	f	c	d	b	d	10	30
Eastern Box Turtle	X	X	X	G5	S3		f	a	f	c	d	Ab, Ba	Ab, Ba, Cc	26.3	c	c	a	14	40.3	a	a	b	a	b	42	82.3
Eastern Garter Snake	X			G5	S4		f	d	f	e	c	Ac, Bd	Ab, Bb, Cb	6.7	c	c	a	14	20.7	c	a	c	a	c	36	56.7
Eastern Hognose Snake	X	X	X	G5	SH		f	d	f	d	d	Ac, Bd	Ab, Bb, Cc	5	c?	c?	a	14	19	f	c	d	b	d	10	29
Eastern Mud Turtle	X			G5	S4		f	d	f	d	d	Ab, Bb	Ab, Bb, Cc	10	c	c	a	14	24	c	a	c	b	b	33	57
Spotted Turtle	X	X	X	G5	S1	Endangered	e	a	f	c	c	Ab, Bb	Ab, Ba, Cb	30	c	c	a	14	44	a	a	a	b	a	41	85
Eastern Ribbon Snake	X	X	X	G5	S4		f	d	f	d	c	Ac, Bc	Ab, Bb, Cb	9.7	c?	c?	a	14	23.7	f	c	d	6	d	10	33.7
Eastern Worm Snake	X			G5	S4		f	d	f	d	c	Ab, Bc	Aa, Bb, Cb	15	c	c	a	14	29	c	a	c	a	c	36	65
Eastern Fence Lizard	X			G5	SH		f	d	f	d	d	Ac, Bc	Ab, Bb, Cb	7.7	c?	c?	a	14	21.7	f	b	d	c	d	10	31.7
Five-lined Skink	X			G5	S4		f	d	f	d	d	Ac, Bc	Ab, Bb, Cb	7.7	c	c	a	14	21.7	e	a	c	c	c	24	44.7
Northern Black Racer	X			G5			f	d	f	d	d	Ac, Bc	Ab, Bb, Cb	7.7	c?	c?	a	14	21.7	f	c	d	b	d	10	31.7
Northern Brown Snake	X			G5	S4		f	d	f	e	c	Ac, Bd	Ab, Bb, Cb	6.7	c	c	a	14	20.7	c	a	c	b	c	31	51.7
Northern Copperhead	X			G5	S1		f	d	f	d	c	Ab, Bc	Aa, Ba, Cb	18.3	c	c	a	14	32.3	a	a	a	b	a	41	73.3
Eastern Painted Turtle	X			G5	S5		f	d	f	d	d	Ab, Bb	Ab, Bb, Cc	10	c	c	a	14	24	b	a	c	b	b	34	58
Northern Ringneck Snake	X			G5	S4		f	d	f	d	c	Ab, Bc	Aa, Bb, Cb	15	c	c	a	14	29	c	a	c	a	c	36	65
Queen Snake	X	X	X	G5	S1		e	b	e	c	c	Ac, Bc	Aa, Ba, Ca	29.9	c	c	a	14	43.9	a	a	a	a	a	46	89.9
Eastern Redbelly Turtle	X	X		G5	S4		f	b	f	c	c	Ac, Bb	Ab, Ba, Cb	24	c	c	a	14	38	a	a	b	b	b	37	75
Rough Green Snake	X			G5	S4		f	d	f	d	c	Ab, Bc	Ab, Ba, Cb		c	c	a			c	a	c	b	c		





Common Name	Biological Variables													Action Variables				Biological + Action Total Score	Supplemental Variables (specific to DC)					Species Total Score		
	Current SGCN	MD SGCN	VA SGCN	G-Rank	S-Rank	IUCN	Population Size	Population Trend	Range Size	Distribution Trend	Population Concentration	Reproductive Potential for Recovery	Ecological Specialization	Biological Total	Trend in DC	DC Population Limitations	Ongoing DC Management Activities		Action Total	Population/POA	Last documented	Range Size/Concentration	Impact of Emerging Diseases		DC Habitat Specialization	Supplement Total
							0	2	0	2	2	4	5	15	4	0	10	14	29	4	10	6	5	6	31	60
Northern Scarlet Snake	X	X	X	G5	SH		e	d	e	d	d	Ac, Bd	Ab, Bb, Cc	6	c?	c?	a	14	20	f	c	d	b	d	10	30
Timber Rattlesnake	X	X	X	G4	SH		f	a	f	c	c	Ab, Bb	Aa, Ba, Cb	6	c?	c?	a	14	20	f	c	d	b	d	10	30
							0	10	0	5	2	6	8.3	31.3	4	0	10	14	45.3	1	0	2	5	2	10	55.3
Wood Turtle	X	X	X	G3	SH	Endangered	e	a	f	c	c	Ab, Bb	Aa, Bb, Cb	6	c?	c?	a	14	20	f	b	d	b	d	10	30
							2	10	0	5	2	6	5	30	4	0	10	14	44	1	5	2	5	2	15	59
Common Snapping Turtle				G5	S5		f	d	f	d	d	Ab, Bb	Ab, Bb, Cc	6	c	c	a	14	24				b			
							0	2	0	2	0	6	0	10	4	0	10	14	24				5			
Broadhead Skink				G5	S1		f	d	f	d	d	Ac, Bc	Ab, Bb, Cb	6	c	c	a	14	24				c			
							0	2	0	2	0	2	1.7	7.7	4	0	10	14	21.7				0			
Eastern Spiny Softshell		X	X											7.7	a	b	a	14	21.7				b			
														7.7	10	5	10	14	21.7				5			
Black Rat Snake							f	d	f	e	c	Ac, Bd	Ab, Bb, Cb	6	c	c	a	14	20.7				b			
							0	2	0	0	2	1	1.7	6.7	4	0	10	14	20.7				5			
Northern Water Snake							f	d	f	d	c	Ac, Bb	Aa, Bb, Cb	6	c	c	a	14	20.7				b			
							0	2	0	2	2	4	5	15	4	0	10	14	29				5			