APPENDIX H

CLIMATE CHANGE VULNERABILITY INDEX DOCUMENTATION

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The NatureServe Climate Change Vulnerability Index

Release 2.1 *7 April 2011; Bruce Young, Elizabeth Byers, Kelly Gravuer, Kim Hall, Geoff Hammerson, Alan Redder*

With input from: *Jay Cordeiro, Kristin Szabo*

Funding for Release 2.0 generously provided by the Duke Energy Corporation.

** = Required field*

Geographic Area Assessed:	Middle Rockies Ecoregion	*
Assessor:	Sarah Bresnan	
Species Scientific Name:	Ursus arctos	*
English Name:	Grizzly Bear	
Major Taxonomic Group:	Mammal	*
Relation of Species' Range to Assessment Area:	Southern edge of range	*
G-Rank:	G4	
S-Rank:		
Check if species is an obligate of caves or groundwater aquatic systems:		*(Must be marked with an "X" for accurate scoring of these species.)*

Assessment Notes (to document special methods and data sources)

S-Rank - NatureServe Explorer U.S. & Canada State/Province Status: Montana (S2S3)

Section A: Exposure to Local Climate Change *(Calculate for species' range within assessment area)*

Temperature *

Severity	**Scope** (percent of range)
>5.5° F (3.1° C) warmer	18.002
5.1-5.5° F (2.8-3.1° C) warmer	69.4715
4.5-5.0° F (2.5-2.7° C) warmer	12.5265
3.9-4.4° F (2.2-2.4° C) warmer	0
< 3.9° F (2.2° C) warmer	0
Total:	100 *(Must sum to 100)*

Hamon AET:PET Moisture Metric *

Severity	**Scope** (percent of range)
< -0.119	8.2668
-0.097 - -0.119	61.8974
-0.074 - -0.096	27.5892
-0.051 - -0.073	2.2466
-0.028 - -0.050	0
>-0.028	0
Total:	100 *(Must sum to 100)*

Section B: Indirect Exposure to Climate Change *(Evaluate for specific geographical area under consideration)*

Mark an "X" in all boxes that apply.

Effect on Vulnerability						
Greatly increase	Increase	Somewhat increase	Neutral	Somewhat decrease	Decrease	Unknown
			X			
			X			
			X			
						X

Factors that influence vulnerability *(* at least three required)*

1) Exposure to **sea level rise**
2) Distribution relative to **barriers**
   a) **Natural barriers**
   b) **Anthropogenic barriers**
3) Predicted **impact of land use changes resulting from human responses** to climate change

Section C: Sensitivity

Mark an "X" in all boxes that apply.

Effect on Vulnerability						
Greatly increase	Increase	Somewhat increase	Neutral	Somewhat decrease	Decrease	Unknown
			X	X		
				X		
		X	X			
				X		
		X	X			
			X			
		X				
				X		
			X			
			X			
						X
			X			
			X			
						X
			X			
		X				

Factors that influence vulnerability *(* at least 10 required)*

1) **Dispersal and movements**
2) Predicted **sensitivity to temperature** and **moisture changes**
   a) Predicted **sensitivity to changes in temperature**
      i) **historical thermal niche**
      ii) **physiological thermal niche**
   b) Predicted **sensitivity to changes in precipitation, hydrology, or moisture regime**
      i) **historical hydrological niche**
      ii) **physiological hydrological niche**
   c) Dependence on a **specific disturbance regime** likely to be impacted by climate change
   d) Dependence on **ice, ice-edge, or snow-cover habitats**
3) **Restriction to uncommon geological features or derivatives**
4) **Reliance on interspecific interactions**
   a) Dependence on **other species to generate habitat**
   b) **Dietary versatility** (animals only)
   c) **Pollinator versatility** (plants only)
   d) Dependence on **other species for propagule dispersal**
   e) Forms part of an **interspecific interaction** not covered by 4a-d
5) **Genetic factors**
   a) Measured **genetic variation**
   b) Occurrence of **bottlenecks** in recent evolutionary history *(use only if 5a is "unknown")*
6) **Phenological response to** changing seasonal temperature and precipitation dynamics

Section D: Documented or Modeled Response to Climate Change *(Optional; May apply across the range of a species)*

Mark an "X" in all boxes that apply.

Effect on Vulnerability						
Greatly increase	Increase	Somewhat increase	Neutral	Somewhat decrease	Decrease	Unknown
			X			
						X
						X
						X

(Optional)

1) **Documented response** to recent climate change
2) Modeled **future (2050) change in population** or **range size**
3) **Overlap** of modeled future (2050) range with current range
4) Occurrence of **protected areas in modeled future (2050) distribution**

Middle Rockies
Grizzly Bear NSCCVI

Climate Change Vulnerability Index

for Ursus arctos in Middle Rockies Ecoregion

Not Vulnerable/Presumed Stable

Notes: **Species range may shift and perhaps leave the assessment area.**

Confidence in Species Information
High

* Histogram below

Definitions of Index Values

Extremely Vulnerable (EV): Abundance and/or range extent within geographical area assessed extremely likely to substantially decrease or disappear by 2050.

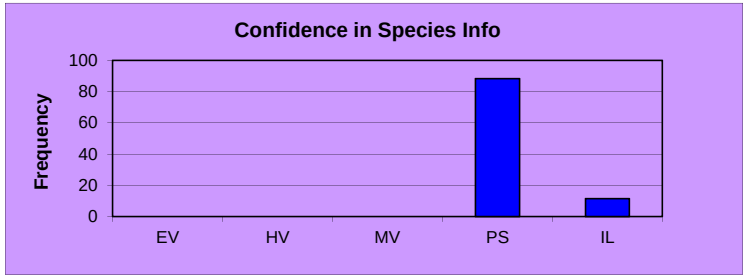
Highly Vulnerable (HV): Abundance and/or range extent within geographical area assessed likely to decrease significantly by 2050.

Moderately Vulnerable (MV): Abundance and/or range extent within geographical area assessed likely to decrease by 2050.

Not Vulnerable/Presumed Stable (PS): Available evidence does not suggest that abundance and/or range extent within the geographical area assessed will change (increase/decrease) substantially by 2050. Actual range boundaries may change.

Not Vulnerable/Increase Likely (IL): Available evidence suggests that abundance and/or range extent within geographical area assessed is likely to increase by 2050.

Insufficient Evidence (IE): Available information about a species' vulnerability is inadequate to calculate an Index score.



Results of a Monte Carlo simulation (1000 runs) of the data entered in the Index.

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The NatureServe Climate Change Vulnerability Index

Release 2.1 *7 April 2011; Bruce Young, Elizabeth Byers, Kelly Gravuer, Kim Hall, Geoff Hammerson, Alan Redder*

With input from: *Jay Cordeiro, Kristin Szabo*

Funding for Release 2.0 generously provided by the Duke Energy Corporation.

** = Required field*

Geographic Area Assessed:	Middle Rockies Ecoregion	*
Assessor:	Sarah Bresnan	
Species Scientific Name:	Centrocercus urophasianus	*
English Name:	Greater Sage-Grouse	
Major Taxonomic Group:	Bird	*
Relation of Species' Range to Assessment Area:	East/west edge of range	*
G-Rank:	G3G4	
S-Rank:		
Check if species is an obligate of caves or groundwater aquatic systems:		*(Must be marked with an "X" for accurate scoring of these species.)*

Assessment Notes (to document special methods and data sources)

S-Rank - NatureServe Explorer U.S. & Canada State/Province Status: Montana (S3), Idaho (S2), Wyoming (S4), South Dakota (S2)

Section A: Exposure to Local Climate Change *(Calculate for species' range within assessment area)*

Temperature *

Severity	Scope (percent of range)
>5.5° F (3.1° C) warmer	24.7544
5.1-5.5° F (2.8-3.1° C) warmer	57.5526
4.5-5.0° F (2.5-2.7° C) warmer	17.693
3.9-4.4° F (2.2-2.4° C) warmer	0
< 3.9° F (2.2° C) warmer	0
Total:	100 *(Must sum to 100)*

Hamon AET:PET Moisture Metric *

Severity	Scope (percent of range)
< -0.119	13.919
-0.097 - -0.119	42.1471
-0.074 - -0.096	36.3474
-0.051 - -0.073	7.5723
-0.028 - -0.050	0.000143
>-0.028	0.014057
Total:	100 *(Must sum to 100)*

Section B: Indirect Exposure to Climate Change *(Evaluate for specific geographical area under consideration)*

Mark an "X" in all boxes that apply.

Effect on Vulnerability						
Greatly increase	Increase	Somewhat increase	Neutral	Somewhat decrease	Decrease	Unknown
			X			
		X	X			
		X				
		X				

Factors that influence vulnerability *(* at least three required)*

1) Exposure to **sea level rise**
2) Distribution relative to **barriers**
   a) **Natural barriers**
   b) **Anthropogenic barriers**
3) Predicted **impact of land use changes resulting from human responses** to climate change

Section C: Sensitivity

Mark an "X" in all boxes that apply.

Effect on Vulnerability						
Greatly increase	Increase	Somewhat increase	Neutral	Somewhat decrease	Decrease	Unknown
			X			
				X		
			X			
				X		
			X			
		X				
			X			
				X		
	X	X				
			X			
						X
			X			
			X			
						X
		X				
	X	X				

Factors that influence vulnerability *(* at least 10 required)*

1) **Dispersal and movements**
2) Predicted **sensitivity to temperature** and **moisture changes**
   a) Predicted **sensitivity to changes in temperature**
      i) **historical thermal niche**
      ii) **physiological thermal niche**
   b) Predicted **sensitivity to changes in precipitation, hydrology, or moisture regime**
      i) **historical hydrological niche**
      ii) **physiological hydrological niche**
   c) Dependence on a **specific disturbance regime** likely to be impacted by climate change
   d) Dependence on **ice, ice-edge, or snow-cover habitats**
3) **Restriction to uncommon geological features or derivatives**
4) **Reliance on interspecific interactions**
   a) Dependence on **other species to generate habitat**
   b) **Dietary versatility** (animals only)
   c) **Pollinator versatility** (plants only)
   d) Dependence on **other species for propagule dispersal**
   e) Forms part of an **interspecific interaction** not covered by 4a-d
5) **Genetic factors**
   a) Measured **genetic variation**
   b) Occurrence of **bottlenecks** in recent evolutionary history *(use only if 5a is "unknown")*
6) **Phenological response to** changing seasonal temperature and precipitation dynamics

Section D: Documented or Modeled Response to Climate Change *(Optional; May apply across the range of a species)*

Mark an "X" in all boxes that apply.

Effect on Vulnerability						
Greatly increase	Increase	Somewhat increase	Neutral	Somewhat decrease	Decrease	Unknown
						X
						X
						X
						X

(Optional)

1) **Documented response** to recent climate change
2) Modeled **future (2050) change in population** or **range size**
3) **Overlap** of modeled future (2050) range with current range
4) Occurrence of **protected areas in modeled future (2050) distribution**

Climate Change Vulnerability Index

for Centrocercus urophasianus in Middle Rockies Ecoregion

Moderately Vulnerable

Notes:

Confidence in Species Information
Low

* Histogram below

Definitions of Index Values

Extremely Vulnerable (EV): Abundance and/or range extent within geographical area assessed extremely likely to substantially decrease or disappear by 2050.

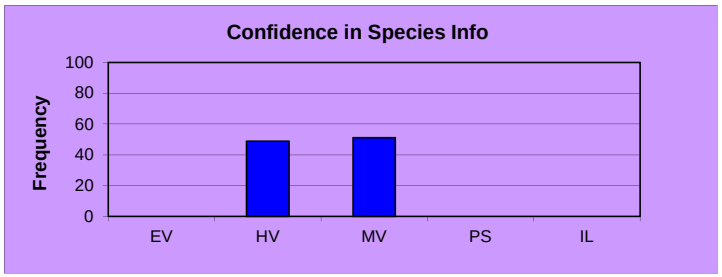
Highly Vulnerable (HV): Abundance and/or range extent within geographical area assessed likely to decrease significantly by 2050.

Moderately Vulnerable (MV): Abundance and/or range extent within geographical area assessed likely to decrease by 2050.

Not Vulnerable/Presumed Stable (PS): Available evidence does not suggest that abundance and/or range extent within the geographical area assessed will change (increase/decrease) substantially by 2050. Actual range boundaries may change.

Not Vulnerable/Increase Likely (IL): Available evidence suggests that abundance and/or range extent within geographical area assessed is likely to increase by 2050.

Insufficient Evidence (IE): Available information about a species' vulnerability is inadequate to calculate an Index score.



Results of a Monte Carlo simulation (1000 runs) of the data entered in the Index.

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** = Required field*

Geographic Area Assessed:	Middle Rockies Ecoregion	*
Assessor:	Sarah Bresnan	
Species Scientific Name:	Aquila chrysaetos	*
English Name:	Golden Eagle	
Major Taxonomic Group:	Bird	*
Relation of Species' Range to Assessment Area:	Entire range	*
G-Rank:	G5	
S-Rank:		
Check if species is an obligate of caves or groundwater aquatic systems:		*(Must be marked with an "X" for accurate scoring of these species.)*

Assessment Notes (to document special methods and data sources)

S-Rank - NatureServe Explorer U.S. & Canada State/Province Status: Montana (S4), Idaho (S4B, S4N), Wyoming (S3B, S3N), South Dakota (S3S4B,S3N)

Section A: Exposure to Local Climate Change *(Calculate for species' range within assessment area)*

Temperature *

Severity	**Scope** (percent of range)
>5.5° F (3.1° C) warmer	20.5
5.1-5.5° F (2.8-3.1° C) warmer	59.7
4.5-5.0° F (2.5-2.7° C) warmer	19.8
3.9-4.4° F (2.2-2.4° C) warmer	0
< 3.9° F (2.2° C) warmer	0
Total:	100 *(Must sum to 100)*

Hamon AET:PET Moisture Metric *

Severity	**Scope** (percent of range)
< -0.119	12.7224
-0.097 - -0.119	43.7861
-0.074 - -0.096	32.2697
-0.051 - -0.073	10.9624
-0.028 - -0.050	0.2594
>-0.028	0
Total:	100 *(Must sum to 100)*

Section B: Indirect Exposure to Climate Change *(Evaluate for specific geographical area under consideration)*

Mark an "X" in all boxes that apply.

Effect on Vulnerability						
Greatly increase	Increase	Somewhat increase	Neutral	Somewhat decrease	Decrease	Unknown
			X			
			X			
			X			
		X				

Factors that influence vulnerability *(* at least three required)*

1) Exposure to **sea level rise**
2) Distribution relative to **barriers**
   a) **Natural barriers**
   b) **Anthropogenic barriers**
3) Predicted **impact of land use changes resulting from human responses** to climate change

Section C: Sensitivity

Mark an "X" in all boxes that apply.

Effect on Vulnerability						
Greatly increase	Increase	Somewhat increase	Neutral	Somewhat decrease	Decrease	Unknown
					X	
				X		
			X			
				X		
			X			
		X				
						X
				X		
			X			
			X			
						X
			X			
			X			
						X
			X			
			X			

Factors that influence vulnerability *(* at least 10 required)*

1) **Dispersal and movements**
2) Predicted **sensitivity to temperature** and **moisture changes**
   a) Predicted **sensitivity to changes in temperature**
      i) **historical thermal niche**
      ii) **physiological thermal niche**
   b) Predicted **sensitivity to changes in precipitation, hydrology, or moisture regime**
      i) **historical hydrological niche**
      ii) **physiological hydrological niche**
   c) Dependence on a **specific disturbance regime** likely to be impacted by climate change
   d) Dependence on **ice, ice-edge, or snow-cover habitats**
3) **Restriction to uncommon geological features or derivatives**
4) **Reliance on interspecific interactions**
   a) Dependence on **other species to generate habitat**
   b) **Dietary versatility** (animals only)
   c) **Pollinator versatility** (plants only)
   d) Dependence on **other species for propagule dispersal**
   e) Forms part of an **interspecific interaction** not covered by 4a-d
5) **Genetic factors**
   a) Measured **genetic variation**
   b) Occurrence of **bottlenecks** in recent evolutionary history *(use only if 5a is "unknown")*
6) **Phenological response to** changing seasonal temperature and precipitation dynamics

Section D: Documented or Modeled Response to Climate Change *(Optional; May apply across the range of a species)*

Mark an "X" in all boxes that apply.

Effect on Vulnerability						
Greatly increase	Increase	Somewhat increase	Neutral	Somewhat decrease	Decrease	Unknown
						X
						X
						X
						X

(Optional)

1) **Documented response** to recent climate change
2) Modeled **future (2050) change in population** or **range size**
3) **Overlap** of modeled future (2050) range with current range
4) Occurrence of **protected areas in modeled future (2050) distribution**

Climate Change Vulnerability Index

for Aquila chrysaetos in Middle Rockies Ecoregion

Not Vulnerable/Increase Likely

Notes: **Species range may shift and perhaps leave the assessment area.**

Confidence in Species Information
Very High

* Histogram below

Definitions of Index Values

Extremely Vulnerable (EV): Abundance and/or range extent within geographical area assessed extremely likely to substantially decrease or disappear by 2050.

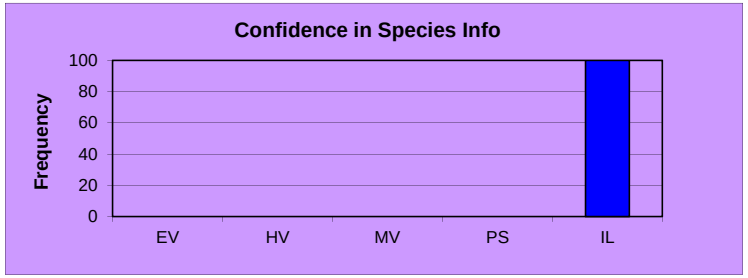
Highly Vulnerable (HV): Abundance and/or range extent within geographical area assessed likely to decrease significantly by 2050.

Moderately Vulnerable (MV): Abundance and/or range extent within geographical area assessed likely to decrease by 2050.

Not Vulnerable/Presumed Stable (PS): Available evidence does not suggest that abundance and/or range extent within the geographical area assessed will change (increase/decrease) substantially by 2050. Actual range boundaries may change.

Not Vulnerable/Increase Likely (IL): Available evidence suggests that abundance and/or range extent within geographical area assessed is likely to increase by 2050.

Insufficient Evidence (IE): Available information about a species' vulnerability is inadequate to calculate an Index score.



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With input from: *Jay Cordeiro, Kristin Szabo*

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** = Required field*

Geographic Area Assessed:	Middle Rockies Ecoregion	*
Assessor:	Sarah Bresnan	
Species Scientific Name:	Odocoileus hemionus	*
English Name:	Mule Deer	
Major Taxonomic Group:	Mammal	*
Relation of Species' Range to Assessment Area:	Entire range	*
G-Rank:	G5	
S-Rank:	S5	
Check if species is an obligate of caves or groundwater aquatic systems:		*(Must be marked with an "X" for accurate scoring of these species.)*

Assessment Notes (to document special methods and data sources)

S-Rank - NatureServe Explorer U.S. & Canada State/Province Status: Montana (S5), Idaho (S5), Wyoming (S5), South Dakota (S5)

Section A: Exposure to Local Climate Change *(Calculate for species' range within assessment area)*

Temperature *

Severity	**Scope** (percent of range)
>5.5° F (3.1° C) warmer	4.2661984
5.1-5.5° F (2.8-3.1° C) warmer	47.753053
4.5-5.0° F (2.5-2.7° C) warmer	47.980749
3.9-4.4° F (2.2-2.4° C) warmer	0
< 3.9° F (2.2° C) warmer	0
Total:	100 *(Must sum to 100)*

Hamon AET:PET Moisture Metric *

Severity	**Scope** (percent of range)
< -0.119	0.349484
-0.097 - -0.119	43.70727
-0.074 - -0.096	40.69229
-0.051 - -0.073	14.89858
-0.028 - -0.050	0.352378
>-0.028	0
Total:	100 *(Must sum to 100)*

Section B: Indirect Exposure to Climate Change *(Evaluate for specific geographical area under consideration)*

Mark an "X" in all boxes that apply.

Effect on Vulnerability						
Greatly increase	Increase	Somewhat increase	Neutral	Somewhat decrease	Decrease	Unknown
			X			
			X			
		X	X			
			X			

Factors that influence vulnerability *(* at least three required)*

1) Exposure to **sea level rise**
2) Distribution relative to **barriers**
   a) **Natural barriers**
   b) **Anthropogenic barriers**
3) Predicted **impact of land use changes resulting from human responses** to climate change

Section C: Sensitivity

Mark an "X" in all boxes that apply.

Effect on Vulnerability						
Greatly increase	Increase	Somewhat increase	Neutral	Somewhat decrease	Decrease	Unknown
				X	X	
				X		
			X			
				X		
			X			
			X			
			X			
				X		
			X			
			X			
						X
			X			
			X			
						X
			X			
						X

Factors that influence vulnerability *(* at least 10 required)*

1) **Dispersal and movements**
2) Predicted **sensitivity to temperature** and **moisture changes**
   a) Predicted **sensitivity to changes in temperature**
      i) **historical thermal niche**
      ii) **physiological thermal niche**
   b) Predicted **sensitivity to changes in precipitation, hydrology, or moisture regime**
      i) **historical hydrological niche**
      ii) **physiological hydrological niche**
   c) Dependence on a **specific disturbance regime** likely to be impacted by climate change
   d) Dependence on **ice, ice-edge, or snow-cover habitats**
3) **Restriction to uncommon geological features or derivatives**
4) **Reliance on interspecific interactions**
   a) Dependence on **other species to generate habitat**
   b) **Dietary versatility** (animals only)
   c) **Pollinator versatility** (plants only)
   d) Dependence on **other species for propagule dispersal**
   e) Forms part of an **interspecific interaction** not covered by 4a-d
5) **Genetic factors**
   a) Measured **genetic variation**
   b) Occurrence of **bottlenecks** in recent evolutionary history *(use only if 5a is "unknown")*
6) **Phenological response to** changing seasonal temperature and precipitation dynamics

Section D: Documented or Modeled Response to Climate Change *(Optional; May apply across the range of a species)*

Mark an "X" in all boxes that apply.

Effect on Vulnerability						
Greatly increase	Increase	Somewhat increase	Neutral	Somewhat decrease	Decrease	Unknown
						X
						X
						X
						X

(Optional)

1) **Documented response** to recent climate change
2) Modeled **future (2050) change in population** or **range size**
3) **Overlap** of modeled future (2050) range with current range
4) Occurrence of **protected areas in modeled future (2050) distribution**

Climate Change Vulnerability Index

for Odocoileus hemionus in Middle Rockies Ecoregion

Not Vulnerable/Increase Likely

Notes: **Species range may shift and perhaps leave the assessment area.**

Confidence in Species Information
Very High

* Histogram below

Definitions of Index Values

Extremely Vulnerable (EV): Abundance and/or range extent within geographical area assessed extremely likely to substantially decrease or disappear by 2050.

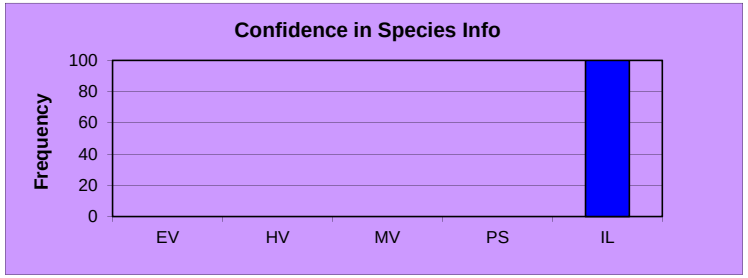
Highly Vulnerable (HV): Abundance and/or range extent within geographical area assessed likely to decrease significantly by 2050.

Moderately Vulnerable (MV): Abundance and/or range extent within geographical area assessed likely to decrease by 2050.

Not Vulnerable/Presumed Stable (PS): Available evidence does not suggest that abundance and/or range extent within the geographical area assessed will change (increase/decrease) substantially by 2050. Actual range boundaries may change.

Not Vulnerable/Increase Likely (IL): Available evidence suggests that abundance and/or range extent within geographical area assessed is likely to increase by 2050.

Insufficient Evidence (IE): Available information about a species' vulnerability is inadequate to calculate an Index score.



Results of a Monte Carlo simulation (1000 runs) of the data entered in the Index.

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With input from: *Jay Cordeiro, Kristin Szabo*

Funding for Release 2.0 generously provided by the Duke Energy Corporation.

** = Required field*

Geographic Area Assessed:	Middle Rockies Ecoregion	*
Assessor:	Sarah Bresnan	
Species Scientific Name:	Cervus canadensis	*
English Name:	Elk	
Major Taxonomic Group:	Mammal	*
Relation of Species' Range to Assessment Area:	Entire range	*
G-Rank:	G5	
S-Rank:	S5	
Check if species is an obligate of caves or groundwater aquatic systems:		*(Must be marked with an "X" for accurate scoring of these species.)*

Assessment Notes (to document special methods and data sources)

S-Rank - NatureServe Explorer U.S. & Canada State/Province Status: Montana (S5), Idaho (S5), Wyoming (S5), South Dakota (S5)

Section A: Exposure to Local Climate Change *(Calculate for species' range within assessment area)*

Temperature *

Severity	**Scope** (percent of range)
>5.5° F (3.1° C) warmer	16.63
5.1-5.5° F (2.8-3.1° C) warmer	51.94
4.5-5.0° F (2.5-2.7° C) warmer	31.43
3.9-4.4° F (2.2-2.4° C) warmer	0
< 3.9° F (2.2° C) warmer	0
Total:	100 *(Must sum to 100)*

Hamon AET:PET Moisture Metric *

Severity	**Scope** (percent of range)
< -0.119	14.41
-0.097 - -0.119	56.46
-0.074 - -0.096	26.69
-0.051 - -0.073	2.44
-0.028 - -0.050	0
>-0.028	0
Total:	100 *(Must sum to 100)*

Section B: Indirect Exposure to Climate Change *(Evaluate for specific geographical area under consideration)*

Mark an "X" in all boxes that apply.

Effect on Vulnerability						
Greatly increase	Increase	Somewhat increase	Neutral	Somewhat decrease	Decrease	Unknown
			X			
			X			
			X			
			X			

Factors that influence vulnerability *(* at least three required)*

1) Exposure to **sea level rise**
2) Distribution relative to **barriers**
   a) **Natural barriers**
   b) **Anthropogenic barriers**
3) Predicted **impact of land use changes resulting from human responses** to climate change

Section C: Sensitivity

Mark an "X" in all boxes that apply.

Effect on Vulnerability						
Greatly increase	Increase	Somewhat increase	Neutral	Somewhat decrease	Decrease	Unknown
					X	
				X		
			X			
				X		
			X			
			X			
			X			
		X				
			X			
			X			
						X
			X			
			X			
						X
			X			
						X

Factors that influence vulnerability *(* at least 10 required)*

1) **Dispersal and movements**
2) Predicted **sensitivity to temperature** and **moisture changes**
   a) Predicted **sensitivity to changes in temperature**
      i) **historical thermal niche**
      ii) **physiological thermal niche**
   b) Predicted **sensitivity to changes in precipitation, hydrology, or moisture regime**
      i) **historical hydrological niche**
      ii) **physiological hydrological niche**
   c) Dependence on a **specific disturbance regime** likely to be impacted by climate change
   d) Dependence on **ice, ice-edge, or snow-cover habitats**
3) **Restriction to uncommon geological features or derivatives**
4) **Reliance on interspecific interactions**
   a) Dependence on **other species to generate habitat**
   b) **Dietary versatility** (animals only)
   c) **Pollinator versatility** (plants only)
   d) Dependence on **other species for propagule dispersal**
   e) Forms part of an **interspecific interaction** not covered by 4a-d
5) **Genetic factors**
   a) Measured **genetic variation**
   b) Occurrence of **bottlenecks** in recent evolutionary history *(use only if 5a is "unknown")*
6) **Phenological response to** changing seasonal temperature and precipitation dynamics

Section D: Documented or Modeled Response to Climate Change *(Optional; May apply across the range of a species)*

Mark an "X" in all boxes that apply.

Effect on Vulnerability						
Greatly increase	Increase	Somewhat increase	Neutral	Somewhat decrease	Decrease	Unknown
						X
						X
						X
						X

(Optional)

1) **Documented response** to recent climate change
2) Modeled **future (2050) change in population** or **range size**
3) **Overlap** of modeled future (2050) range with current range
4) Occurrence of **protected areas in modeled future (2050) distribution**

Climate Change Vulnerability Index

for Cervus canadensis in Middle Rockies Ecoregion

Not Vulnerable/Increase Likely

Notes: Species range may shift and perhaps leave the assessment area.

Confidence in Species Information
Very High

* Histogram below

Definitions of Index Values

Extremely Vulnerable (EV): Abundance and/or range extent within geographical area assessed extremely likely to substantially decrease or disappear by 2050.

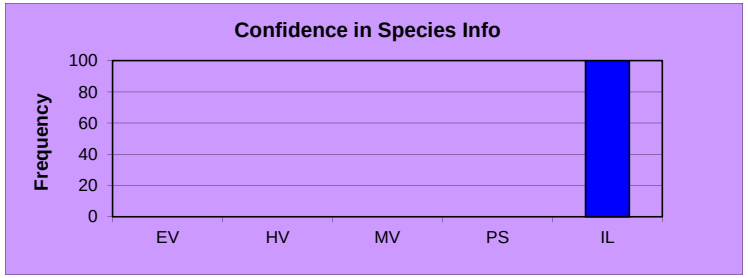
Highly Vulnerable (HV): Abundance and/or range extent within geographical area assessed likely to decrease significantly by 2050.

Moderately Vulnerable (MV): Abundance and/or range extent within geographical area assessed likely to decrease by 2050.

Not Vulnerable/Presumed Stable (PS): Available evidence does not suggest that abundance and/or range extent within the geographical area assessed will change (increase/decrease) substantially by 2050. Actual range boundaries may change.

Not Vulnerable/Increase Likely (IL): Available evidence suggests that abundance and/or range extent within geographical area assessed is likely to increase by 2050.

Insufficient Evidence (IE): Available information about a species' vulnerability is inadequate to calculate an Index score.



Results of a Monte Carlo simulation (1000 runs) of the data entered in the Index.

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U.S. Department of the Interior
Bureau of Land Management

Data Request Method

Rapid Ecoregional Assessments (REAs)—National Operations Center, CO

Individual REA data layers and some other products are still available but are no longer being published.

If you would like to obtain more information, including data and model zip files* (containing Esri ModelBuilder files for ArcGIS 10.x and relevant Python scripts), please email **BLM_OC_REA_Data_Portal_Feedback_Team@blm.gov**.
*Note that a few models require software that BLM does not provide such as R, Maxent, and TauDEM.

Models associated with individual REAs may require data links to be updated to function properly. REA reports, technical appendices, and model overviews (for some REAs) contain detailed information to determine what products are available and what datasets are necessary to run a certain model.

Please include the report name and any specific data information that you can provide with your request.

Other BLM data can be found on the Geospatial Business Platform Hub (https://gbp-blm-egis.hub.arcgis.com).