Appendix D

Vermont Species & Habitat Climate Vulnerability Assessment

Vermont's Wildlife Action Plan 2015

Introduction

During 2013 a group of Vermont Fish & Wildlife Department biologists and Chris Hilke, Climate Adaptation Program Manager for the Northeast Regional Office of National Wildlife Federation, collaborated to assess the vulnerability of fish, wildlife, plants and their habitats to climate changes. As part of this Vermont Species & Habitat Climate Vulnerability Assessment, the team investigated 18 key species, 20 upland habitats, 11 wetland habitats, and 13 freshwater habitats as shown the tables on the following pages. One Department biologist used a NatureServe tool to add in 13 more butterfly species. Species included Species of Greatest Conservation Need and important "surrogate" species that are widely considered representative of particular habitat types. Species assessments culminated in an overall vulnerability rating for climate-specific and non-climate stressors and an associated confidence score (see Rating Key at bottom of spreadsheet for details). Climate change vulnerability assessments were similarly conducted for Vermont's upland and wetland natural communities. For efficiency, the 95 natural community types were grouped into categories based on the environmental factors that drive their development and that could affect their susceptibility to climate change. Some natural community types were assessed individually and freshwater habitats were also assessed.

The most important lesson taken from this exercise is that species (and habitat) responses to climate change will not be uniform. For some, climate change may not be a significant threat, however if a species is already subjected to other stresses, climate change impacts may push that species over the edge. This is an important consideration to take into account. More information on climate change and wildlife conservation can be found in chapter 3: Climate Change & Conservation.

Vermont Species & Habitat Climate Vulnerability Assessment — Exposures & Key Climate

Species and Habitats	Climate Vulnerability Rating	Confidence Score	Vulnerability to non-climate stressors	Habitat specificity	Edge of range	Enviro or physiological tolerance	Interspecific or phenological dependence	Mobility	Exotic Pathogens or Invasive Species	A — Annual temperature - Increase	B — Seasonal temperature - Increase	C — # Hot days - More	D — # Cold days - Fewer	E — Variability - Increase	F — Annual precipitation - Increase	G — Seasonal precipitation - Variable	H — Heavy rainfall events - Increase	I — Soil moisture - Decrease	J — Snow - Decrease	K — Spring flows - Earlier	L — Summer low flow - Longers
Key Species (Bold text =SGCN)																					
Jefferson salamander	H	H	H	X	X	X		X							X	X			X	X	
Northern white cedar	M	M	H	X	X			X	X	X	X	X									
Fingernail clam	L	H	M	X				X							X	X		X	X	X	
Beaver	N	H	M																		X
Bobcat	L	M	M																		
Canada Lynx	H	H	M	X	X	X	X			X	X	X	X	X	X	X			X		
Brook Trout	H	H	H	X		X		X	X	X	X	X									X
Wood Turtle	M	H	H	X				X										X			
Pearlshell mussel	H	M	M	X			X	X		X	X										X
Fallfish	L	M	L			X															X
Smelt	M	H	M	X		X				X	X								X		
Lake trout	H	H	H	X	X	X				X	X								X		
Bald Eagle	L	M	L	X													X				
Bicknell's Thrush	H	H	H	X	X					X	X	X	X	X			X				
Common Loon	M	L	L	X	X	X															
Red Oak	N	M	N		X						X	X						X			
Sugar Maple	H	M	L		X	X		X		X	X	X	X								
West Virginia White	H	H	M					X	X	X	X	X						X			
Bog Copper	E	H																			
Edward's Hairstreak	E	H																			
Early Hairstreak	H	H																			
Hackberry Emperor	B	H																			
Tawny Emperor	B	H																			
Jutta Artic	M	H																			
Cobweb Skipper	N	L																			
Mulberry Wing	H	H																			
Broad-winged Skipper	N	H																			
Black Dash	H	H																			
Dion Skipper	H	H																			
Two-spotted Skipper	H	H																			
Dusted Skipper	N	H																			

Vermont Species & Habitat Climate Change Factors												Other	List of exposures with the greatest Negative	List of exposures that might be beneficial	Non-Climate Stressors						
	M	N	O	P	Q	R	S	T	U	V	W				A	B	C	D	E	F	G
Species and Habitats	Ice dynamics - Changing	Fluctuating lake levels - Increase	Lake stratification	Flood events - Increase	# of short-term droughts - Increase	Storms - Increase	Fire	Growing season - Longer	Onset of spring - Earlier	Onset of fall - Later	Biological interactions	Other	List of exposures with the greatest Negative	List of exposures that might be beneficial	Acidity	Habitat Alteration- Altered Hydrology	Invasive Species	Channel Erosion-Sedimentation	Encroachment	Land Erosion	Nutrient Loading
Key Species (Bold text =SGCN)																					
Jefferson salamander					X				X		X				X	X	X		X		
Northern white cedar				X		X	X				X				X	X	X				
Fingernail clam		X			X										X	X	X		X		
Beaver		X		X	X											X			X		
Bobcat																X					
Canada Lynx									X										X		
Brook Trout				X	X						X				X	X	X	X	X	X	
Wood Turtle				X	X											X	X				
Pearlshell mussel				X	X						X				X	X	X	X			
Fallfish				X	X											X	X				
Smelt	X		X		X											X	X		X		X
Lake trout	X	X	X		X						X					X	X				X
Bald Eagle						X													X		
Bicknell's Thrush					X	X	X		X						X	X			X		
Common Loon		X		X	X	X									X	X			X		
Red Oak					X	X	X				X					X	X		X		
Sugar Maple					X	X	X	X			X				X						
West Virginia White					X		X				X					X	X		X		
Bog Copper																					
Edward's Hairstreak																					
Early Hairstreak																					
Hackberry Emperor																					
Tawny Emperor																					
Jutta Artic																					
Cobweb Skipper																					
Mulberry Wing																					
Broad-winged Skipper																					
Black Dash																					
Dion Skipper																					
Two-spotted Skipper																					
Dusted Skipper																					

Species and Habitats	Thermal Stress (H)	Toxic Substances-Pollution (I)	Hanitat Fragmentation (J)	Inventory Need (K)	Notes
Vermont Species & Habitat Climate					
Key Species (Bold text =SGCN)					
Jefferson salamander					
Northern white cedar					Competition effects this species broadly
Fingernail clam	X	X			
Beaver			X		Keystone wetland builder - vulnerable via direct take
Bobcat					Coyote and fisher competition
Canada Lynx			X		trapping in Canada impacts Lynx in VT
Brook Trout	X	X	X		Rating is consistent w/ other states. Water temp is key, sedimentation also key issue
Wood Turtle			X		Other threats - Pet trade, agriculture and egg predation
Pearlshell mussel		X	X		
Fallfish			X		Risk by gravel scour when eggs present (May) 63F
Smelt					
Lake trout					Sea lamprey. Supplemental stocking
Bald Eagle		X			
Bicknell's Thrush					Red squirrel predation tied to cone production, limtited by patch size
Common Loon		X			direct impacts from fishing gear (hooks and lead)
Red Oak			X		A southern oak species so favored with CC, deer browse impacts seedling development
Sugar Maple					Likely climate loser over 100yr. Managed in sugar bushes which promotes over others
West Virginia White	X		X		
Bog Copper					Climate vulnerability and confidence score only performed for this butterfly species
Edward's Hairstreak					Climate vulnerability and confidence score only performed for this butterfly species
Early Hairstreak					Climate vulnerability and confidence score only performed for this butterfly species
Hackberry Emperor					Climate vulnerability and confidence score only performed for this butterfly species
Tawny Emperor					Climate vulnerability and confidence score only performed for this butterfly species
Jutta Artic					Climate vulnerability and confidence score only performed for this butterfly species
Cobweb Skipper					Climate vulnerability and confidence score only performed for this butterfly species
Mulberry Wing					Climate vulnerability and confidence score only performed for this butterfly species
Broad-winged Skipper					Climate vulnerability and confidence score only performed for this butterfly species
Black Dash					Climate vulnerability and confidence score only performed for this butterfly species
Dion Skipper					Climate vulnerability and confidence score only performed for this butterfly species
Two-spotted Skipper					Climate vulnerability and confidence score only performed for this butterfly species
Dusted Skipper					Climate vulnerability and confidence score only performed for this butterfly species

Vermont Species & Habitat Climate Vulnerability Assessment — Exposures & Key Climate

Species and Habitats	Climate Vulnerability Rating	Confidence Score	Vulnerability to non-climate stressors	Habitat specificity	Edge of range	Enviro or physiological tolerance	Interspecific or phenological dependence	Mobility	Exotic Pathogens or Invasive Species	A - Annual temperature Increase	B - Seasonal temperature Increase	C - # Hot days More	D - # Cold days Fewer	E - Variability Increase	F - Annual precipitation Increase	G - Seasonal precipitation Variable	H - Heavy rainfall events Increase	I - Soil moisture Decrease	J - Snow Decrease	K - Spring flows Earlier	L - Summer low flow Longers
Wetland Habitats																					
Cattail Marsh	L	M	L								X				X	X					
Shallow Emergent Marsh	M	M	M								X				X	X		X			
Marsh and Sedge Meadow (Formation)	M	M	M								X				X	X					X
Alluvial Shrub Swamp	M	M	L								X				X			X			
Basin swamps & wetlands	H	M	M								X	X					X	X			X
Floodplains	H	M	M								X		X			X	X	X		X	
Ground water seepage & Flood swamp	L	M	L								X		X			X		X		X	X
Open peatlands (precip-dependent)	M	M	L							X	X	X		X		X		X	X		
Open peatlands (ground-fed)	L	M	M								X	X				X		X			
Floodplain Forests	H	M	M								X		X			X	X	X		X	
Wet Shores	H	M	M								X	X					X	X			X
Upland Habitats																					
Alpine Meadow	E	M	M							X	X	X	X		X	X		X	X		
Spruce-Fir-Northern Hardwood	M	M	M							X	X	X	X		X	X		X	X		
Northern Hardwood Forest	L	M	L								X	X	X	X		X		X			
Oak-Pine - Dry Mesic Forests & Woodlands with deeper soils	L	M	M								X	X				X	X				
Rocky Forests and Woodlands	L	M	L								X	X				X		X			
Oak-Pine Southern Rocky - Southern Dry Rocky Forests and Woodlands	M	L	L								X	X				X		X			
Outcrops and upland meadows	N	L	L								X	X				X		X			
Cliffs and Talus	L	M	L								X	X				X		X			
Upland shores	M	M	H								X	X						X		X	
Subalpine Krummholz	E	M								X	X	X			X	X			X	X		
Montane Spruce-fir	M	M								X	X	X			X	X			X	X		
Red Spruce-Heath Rocky Ridge	M	M								X	X	X			X	X			X	X		
Montane Yellow Birch-Red Spruce Forest	M	M								X	X	X			X	X			X	X		
Red Spruce-Northern Hardwood	L	M								X	X	X			X	X			X	X		
Lowland Spruce-Fir Forest	M	M								X	X	X			X	X			X	X		
Boreal Talus Woodland	M	M								X	X	X			X	X			X	X		
Cold-Air Talus Woodland	H	M								X	X	X			X	X			X	X		
Limestone Bluff Cedar-Pine Forest	L	M									X	X					X	X	X		
Transition Hardwood Talus Woodland	L	M									X	X					X	X			
Dry Oak Woodland	H	L									X	X					X	X			

Species and Habitats	M Ice dynamics - Changing	N Fluctuating lake levels - Increase	O Lake stratification	P Flood events - Increase	Q # of short-term droughts - Increase	R Storms - Increase	S Fire	T Growing season - Longer	U Onset of spring - Earlier	V Onset of fall - Later	W Biological interactions	Other	List of exposures with the greatest Negative	List of exposures that might be beneficial	A Acidity	B Habitat Alteration- Altered Hydrology	C Invasive Species	D Channel Erosion- Sedimentation	E Encroachment	F Land Erosion	G Nutrient Loading
Wetland Habitats																					
Cattail Marsh		X									X		N	T, U, V		X	X		X		
Shallow Emergent Marsh		X		X	X						X		I	T		X	X		X		
Marsh and Sedge Meadow (Formation)		X		X	X						X					X	X		X		
Alluvial Shrub Swamp				X							X	X	I, S, C	U, T			X		X		
Basin swamps & wetlands	X	X		X				X					M, P				X	X	X		
Floodplains	X	X		X		X		X	X	X	X	K					X	X	X		
Ground water seepage & Flood swamp					X	X		X			X	X		X			X		X		
Open peatlands (precip-dependent)					X	X	X				X		G, Q								
Open peatlands (ground-fed)		X			X						X		G, I, Q				X				
Floodplain Forests	X	X		X		X		X	X	X	X		K, P, N,				X	X	X		
Wet Shores	X	X		X				X	X	X	X		M, P, W				X	X	X		
Upland Habitats																					
Alpine Meadow					X	X		X	X		X		B, C, J				X		X		
Spruce-Fir-Northern Hardwood					X	X		X	X				D, I, J, T	F	X					X	
Northern Hardwood Forest					X	X			X		X		B, C, D, I, Q, W						X		
Oak-Pine - Dry Mesic Forests & Woodlands with deeper soils					X	X	X						Q, Z				X		X		
Rocky Forests and Woodlands					X	X	X						Q, Z			X			X		
Oak-Pine Southern Rocky - Southern Dry Rocky Forests and Woodlands					X	X	X						C, Q						X		
Outcrops and upland meadows					X							X	B, C, J				X			X	
Cliffs and Talus					X	X							C, I							X	
Upland shores	X			X	X						X		M, N, P				X		X		
Subalpine Krummholz					X							X	I, A	F							
Montane Spruce-fir					X				X		X		I, A	F							
Red Spruce-Heath Rocky Ridge					X	X	X		X		X		I, A, S	F							
Montane Yellow Birch-Red Spruce Forest					X	X			X	X	X		I, A	F							
Red Spruce-Northern Hardwood					X	X	X	X	X	X	X		I, A	F							
Lowland Spruce-Fir Forest				X	X	X	X		X		X		I, A	F							
Boreal Talus Woodland					X				X	X	X		I, A	F							
Cold-Air Talus Woodland					X	X		X	X	X	X		I, A	F							
Limestone Bluff Cedar-Pine Forest					X	X	X				X		Q, W						X		
Transition Hardwood Talus Woodland					X	X	X				X		Q, W						X		
Dry Oak Woodland					X	X	X						Q, C						X		

Vermont Species & Habitat Climate					Notes
	H	**I**	**J**	**K**	
Species and Habitats	Thermal Stress	Toxic Substances-Pollution	Hanitat Fragmentation	Inventory Need	**Notes**
Wetland Habitats					
Cattail Marsh		X	X		invasives - Phragmites
Shallow Emergent Marsh		X	X		invasives
Marsh and Sedge Meadow (Formation)		X	X		invasives
Alluvial Shrub Swamp		X	X		
Basin swamps & wetlands		X	X		Variability of water level could impact dragonfly transformation.
Floodplains		X	X		Elm was once an important component to floodplains
Ground water seepage & Flood swamp			X		Most vulnerable species include Black ash (AB) & Hemlock (WA)
Open peatlands (precip-dependent)					Black spruce and Sphagnum - Impacts of drying
Open peatlands (ground-fed)					Sphagnum is most vulnerable species
Floodplain Forests		X	X		Boxelder is non-native and likely to expand
Wet Shores					
Upland Habitats					
Alpine Meadow					More krumholz?
Spruce-Fir-Northern Hardwood			X		Most vulnerable species include Spruce & Fir
Northern Hardwood Forest			X		Most vul is Hemlock. Oaks & hickory will benefit
Oak-Pine - Dry Mesic Forests & Woodlands with deeper soils			X		Hemlock (HWA) will decrease; oaks and hickories will increase
Rocky Forests and Woodlands			X		Possible increase in red pine; possible decrease in N. white cedar due to drought and temp increase
Oak-Pine Southern Rocky - Southern Dry Rocky Forests and Woodlands			X		increase in oaks, hickories, white pine, and pitch pine
Outcrops and upland meadows					All woody species are likely to decrease in abundance due to heat and drought stress.
Cliffs and Talus					
Upland shores					Encroachment of woody species if there is less ice-scour and flooding.
Subalpine Krummholz					Less spruce and fir - area compressed
Montane Spruce-fir					Less spruce and fir, more hardwood
Red Spruce-Heath Rocky Ridge					Less spruce and fir, more hardwood
Montane Yellow Birch-Red Spruce Forest					Less spruce and fir, more hardwood
Red Spruce-Northern Hardwood					Less spruce and fir, more hardwood
Lowland Spruce-Fir Forest					Less spruce and fir, more hardwood
Boreal Talus Woodland					Less spruce and fir, more hardwood
Cold-Air Talus Woodland					Less spruce and fir, more hardwood
Limestone Bluff Cedar-Pine Forest					
Transition Hardwood Talus Woodland					less cedar more red pine
Dry Oak Woodland					< hemlock, more pitch pine if more fires, more hickory if not

Species and Habitats	Climate Vulnerability Rating	Confidence Score	Vulnerability to non-climate stressors	Habitat specificity	Edge of range	Enviro or physiological tolerance	Interspecific or phenological dependence	Mobility	Exotic Pathogens or Invasive Species	A Annual temperature - Increase	B Seasonal temperature - Increase	C # Hot days - More	D # Cold days - Fewer	E Variability - Increase	F Annual precipitation - Increase	G Seasonal precipitation - Variable	H Heavy rainfall events - Increase	I Soil moisture - Decrease	J Snow - Decrease	K Spring flows - Earlier	L Summer low flow - Longers
Vermont Species & Habitat Climate Vulnerability Assessment — *Vulnerability* / *Sensitivity Factors* / *Exposures & Key Climate*																					
Freshwater Habitats																					
Medium-sized river (4-6 order)	M	M								X	X	X					X				X
Large river (7+ stream order)	L	M									X	X					X				X
High gradient, coldwater acidic, 1-2 order	H	H								X	X	X	X	X		X	X		X	X	X
High gradient, coldwater, not acidic, 1-2 order	H	H								X	X	X		X		X	X			X	X
Low gradient marsh	M	M								X	X	X	X			X	X				X
Lake Champlain valley	M	M								X	X	X		X			X			X	X
High Elevation Lake	M	L	L								X	X		X						X	
Dystrophic Lake	M	L	L								X	X		X							
Lake - Oligotrophic, Stratified	L	H	L							X	X	X	X								
Mesotrophic-Eutrophic Lake (stratified)	M	M	M							X	X	X	X			X			X		
Mesotrophic-Eutrophic Lake (unstratified)	H	M	M							X	X	X	X	X			X		X		
Unstratified lakes	M	H	H							X	X	X	X	X	X	X	X		X	X	X
Stratified Lakes	M	H	H							X	X	X	X	X	X	X	X		X	X	X

Vermont Species & Habitat Climate Change Factors															Non-Climate Stressors						
	M	N	O	P	Q	R	S	T	U	V	W	Other	List of exposures with the greatest Negative	List of exposures that might be beneficial	A	B	C	D	E	F	G
Species and Habitats	Ice dynamics - Changing	Fluctuating lake levels - Increase	Lake stratification	Flood events - Increase	# of short-term droughts - Increase	Storms - Increase	Fire	Growing season - Longer	Onset of spring - Earlier	Onset of fall - Later	Biological interactions				Acidity	Habitat Alteration- Altered Hydrology	Invasive Species	Channel Erosion-Sedimentation	Encroachment	Land Erosion	Nutrient Loading
Freshwater Habitats																					
Medium-sized river (4-6 order)				X	X								L, C, P	F							
Large river (7+ stream order)				X	X								L, C, P	F, T							
High gradient, coldwater acidic, 1-2 order				X	X								F, H								
High gradient, coldwater, not acidic, 1-2 order				X	X	X							C, H, L	F, H							
Low gradient marsh				X	X								C, L	F							
Lake Champlain valley				X	X								C, L	F							
High Elevation Lake		X			X									B, M	X	X					
Dystrophic Lake		X		X	X							X	P, Q	B, M	X	X					
Lake - Oligotrophic, Stratified	X	X	X	X	X							X	A, B, C, D						X	X	X
Mesotrophic-Eutrophic Lake (stratified)	X	X	X	X	X	X		X			X		A, B, C, D, N				X		X	X	X
Mesotrophic-Eutrophic Lake (unstratified)	X	X		X	X	X		X			X		B, C, N	X			X		X	X	X
Unstratified lakes	X	X	X	X	X	X		X	X	X	X						X	X	X		X
Stratified Lakes	X	X	X	X		X											X	X	X		

Vermont Species & Habitat Climate					Notes
	H	**I**	**J**	**K**	
Species and Habitats	Thermal Stress	Toxic Substances- Pollution	Hanitat Fragmentation	Inventory Need	**Notes**
Freshwater Habitats					
Medium-sized river (4-6 order)					Compositional changes may include loss of pearlshell
Large river (7+ stream order)					Compositional changes include an increase in the number of warm water species
High gradient, coldwater acidic, 1-2 order					Potential loss of coldwater stenotherms
High gradient, coldwater, not acidic, 1-2 order					Potential loss of coldwater stenotherms
Low gradient marsh					Potential loss of coldwater stenotherms
Lake Champlain valley					
High Elevation Lake					Most vulnerable species include brook trout
Dystrophic Lake					Most vulnerable species include brook trout
Lake - Oligotrophic, Stratified		X			Most vulnerable species include Lake trout & Round Whitefish
Mesotrophic-Eutrophic Lake (stratified)		X			Lake trout, smelt & pike will be most vulnerable
Mesotrophic-Eutrophic Lake (unstratified)		X			
Unstratified lakes					
Stratified Lakes					

Vulnerability Rating Key

Code		Description
E	Extremely Vulnerable	Abundance and/or range extent in Vermont extremely likely to substantially decrease (>75% loss) or disappear by 2050
H	Highly Vulnerable	Abundance and/or range extent in Vermont likely to decrease significantly (25-75% loss) by 2050
M	Moderately Vulnerable	Abundance and/or range extent in Vermont likely to decrease (10-25% loss) by 2050
L	Slightly Vulnerable	Available evidence does not suggest that abundance and/or range extent in Vermont will change (decrease, 5 - 10% loss) by 2050
N	Not Vulnerable, No Effect	Abundance and/or range extent in Vermont likely to increase or decrease by less than 5% by 2050
B	Increase Possible or Likely	Available evidence suggests that abundance and/or range extent in Vermont is likely to increase (>15% increase) by 2050
U	Unknown/Uncertain	Available evidence not available or not conclusive at this time

Confidence Ratings

Code		Description
L	Low	Not very confident (0-30% certainty in vulnerability score)
M	Moderate	Somewhat confident (30-60% certainty in vulnerability score)
H	High	Very confident (>60% certainty in vulnerability score)

Non-Climate Stressors

Code	Description
A	Acidity/Pollution
B	Habitat Alteration/Altered Hydrology
C	Invasive Species
D	Channel Erosion/Sedimentation
E	Encroachments
F	Land Erosion
G	Nutrient loading
H	Thermal Stress
I	Toxic Substances/Pollution
J	Habitat Fragmentation
Enter as free text	Other

Exposures & Key Climate Change Factors

	Code	Parameter	Trend	Projections (range = low to high emissions scenario)
Temperature	A	Annual temperature	increase	by 2050, projected increase 3.7 to 5.8°F; by 2100, 5.0 to 9.5°F
	B	Seasonal temperature	increase	by 2050, projected increase in winter (DJF) 4.3 to 6.1°F; summer (JJA) 3.8 to 6.4°F
	C	# Hot days	more	more frequent and more intense; by end of century, northern cities can expect 30-60+ days of temperatures >90°F
	D	# Cold days	fewer	reduction in days with cold (<0° F) temperatures
	E	Variability	increase	greater variability (more ups and downs)
Hydrology	F	Annual precipitation	increase	by end of century, projected total increase of 10% (about 4 inches per year)
	G	Seasonal precipitation	variable	more winter rain, less snow; by 2050, winter precipitation could increase by 11 to 16% on average; little change expected in summer, but projections are highly variable
	H	Heavy rainfall events	increase	more frequent and intense
	I	Soil moisture	decrease	reduction in soil moisture and increase in evaporation rates in the summer
	J	Snow	decrease	fewer days with snow cover (by end of century could lose 1/4 to 1/2+ of snow-covered days; increased snow density
	K	Spring flows	earlier	earlier snowmelt, earlier high spring flows; could occur 10 days to >2 weeks earlier
	L	Summer low flows	longer	extended summer low-flow periods; could increase by nearly a month under high emissions scenario
	M	Ice dynamics	changing	less ice cover, reduced ice thickness
	N	Fluctuating lake levels	increase	greater variability, greater amount of change in lake levels
	O	Lake stratification		some lakes may stratify earlier
Extreme events	P	Flood events	increase	more likely, particularly in winter and particularly under the high emissions scenario
	Q	# of short-term droughts	increase	by end of century, under high emissions scenario, short terms droughts could occur as much as once per year in some places
	R	Storms	increase	more frequent and intense (ice, wind, etc.)
	S	Fire		more likely
Phenology	T	Growing season	longer	by end of century, projected to be 4 to 6 weeks longer
	U	Onset of spring	earlier	by end of century, could be 1 to almost 3 weeks earlier
	V	Onset of fall	later	by end of century, could arrive 2 to 3 weeks later
	W	Biological interactions		could potentially be disrupted