

# North Carolina Ecosystem Response to Climate Change: DENR Assessment of Effects and Adaptation Measures

DRAFT

## Successional Wetlands

### Ecosystem Group Description:

Successional wetlands comprise herb and shrub dominated communities that develop on frequently flooded, semi-permanently flooded, or other wetland sites following disturbance, either natural or man-made. Most examples occur in floodplains and this Ecosystem Group overlaps to some extent with the Blackwater Coastal Plain Floodplains, Brownwater Coastal Plain Floodplains, and Piedmont and Mountain Floodplains. Those groups, however, deal primarily with forested habitats and their associated species. This group focuses more specifically on non-forested habitats, whose ecosystems and species differ structurally, compositionally, and ecologically from those of the forest and lotic aquatic communities occupying adjacent portions of the floodplains. Additionally, this group comprises a greater range of artificially-maintained habitats than are included within the three floodplain groups.

Natural examples of successional wetlands include the marshes, sedge mires, willow and alder thickets that form as beaver ponds become filled-in with sediments, particularly following abandonment of a pond by the beavers. Artificial examples include similar marsh and mire habitats that form as borrow pits, farm ponds, drainage ditches, or larger reservoirs become filled-in. All of these habitat types are included within the Coastal Plain Semipermanent Impoundments and Piedmont/Mountain Semipermanent Impoundments, which are covered by the three floodplain Groups mentioned above.

Other artificially maintained examples occur in wetlands that are not the result of prior impoundments, at least not within recent times. Examples include open herbaceous or shrubby habitats associated with wet pastures, hayfields, powerlines, or abandoned rice paddies. Improved pastures and hayfields, however, are excluded, since active management typically prevents the establishment of the native species that are the main concern of this analysis.

### Ecosystem Level Effects:

#### Predicted Impacts of Climate Change:

Climate Change Factor:	Likelihood:	Effect:	Magnitude:	Comments:
Flooding	High	Neg	Med	Increased severe flooding is likely to speed up the erosion of sediments in drained impoundments. However, channel deepening may also facilitate recolonization by beavers, starting the successional cycle over.
Increased Temperature	High	Mix	Low	Some compositional changes are likely to occur but are unlikely to have a major impact on the ecological stability of these habitats
Drought	High	Neg	Low	Wetlands associated with beaver-pond complexes are among the best buffered against the effects of drought. However, wet pastures, powerlines, and other open habitats isolated from stream inputs are likely to be strongly affected by droughts.



The two marsh guilds currently have a large concentration of their habitats in tidewater areas along the coast. Species such as the rare skipper and Duke's skipper, that only occur in coastal marshes are not considered here, since their habitats are permanent rather than successional. More generally, only inland examples of marsh and mire habitats are considered under this habitat group.

## Species Level Effects:

### Terrestrial Animals

Species:	Element Rank:	Endemic	Major Disjunct	Extinction/ Extirpation Prone	Status: US/NC/ WAP	Comments:
<i>Neonympha mitchellii francisci</i>	G1G2T1/S1	Yes		Yes	LE/SR/	This subspecies of the federally Endangered Mitchell's satyr is entirely confined to Fort Bragg.
<i>Glyptemys muhlenbergii</i>	G3/S2			Yes	LT(S/A)/T/P	Currently occurs in small, isolated populations. This is an essentially northern species that may be adversely affected by increased temperatures. Populations associated with wet pastures may be at special risk due to increased frequency and severity of droughts.
<i>Macrochilo n. sp. 1 nr. absorptalis</i>	G3/S1S2		Yes	Yes	/SR/	Currently known in North Carolina from only a few sites in Fort Bragg. Except for these records, this species is only known from states from New Jersey northward. As a primarily northern species, it may be particularly susceptible to increases in temperature.
<i>Apamea inebriata</i>	G3G4/S1S2		Yes	Yes	/SR/	Currently known in North Carolina only from two sites in Fort Bragg and one additional site in the Sandhills. Except for these three records, this species is only known from states from New Jersey northward. As a primarily northern species, it may be particularly susceptible to increases in temperature.
<i>Macrochilo louisiana</i>	G4/S2S3				/SR/	
<i>Botaurus lentiginosus</i>	G4/S1B,S3N				/SR/P	
<i>Euphydryas phaeton</i>	G4/S2				/SR/	
<i>Euphyes bimacula</i>	G4/S2				/SR/	
<i>Euphyes bimacula</i>	G4/S2				/SR/	
<i>Macrochilo louisiana</i>	G4/S2S3				/SR/	
<i>Macrochilo louisiana</i>	G4/S2S3				/SR/	
<i>Meropleon diversicolor</i>	G4/SU				/W3/	
<i>Meropleon diversicolor</i>	G4/SU				/W3/	
<i>Rallus elegans</i>	G4/S3B,S3N				/W1,W3/P	
<i>Scopula purata</i>	G4/S3?				/W3/	

Stethophyma celatum	G4/S1S2	Yes	Yes	/SR/	Currently known in North Carolina only from a few sites within Fort Bragg and from three populations associated with very wet clay savannas in the Outer Coastal Plain. This species is highly disjunct in the East, having only been recorded in South Carolina and New England in addition to North Carolina along the Atlantic Slope.
Lemmeria digitalis	G4/S1S3	Yes	Yes	/SR/	Currently known in North Carolina from only a single site in Fort Bragg. Except for this record, this species is only known from states from New Jersey northward. As a primarily northern species, it may be particularly susceptible to increases in temperature.
Gabara distema humeralis	G4T4/S3?			/W3/	
Thamnophis sauritus	G5/S4			//P	
Ixobrychus exilis	G5/S3B			/SR/P	
Empidonax traillii	G5/S3B			/W2/P	
Empidonax alnorum	G5/S2B	Yes	Yes	/SR/P	A northern species that nests only in a few scattered places in the mountains of North Carolina
Thamnophis sauritus	G5/S4			//P	
Metanema determinata	GNR/SU	Yes	Yes	/W3/	A northern species currently known only from New River State Park in North Carolina
Apamea mixta	GU/S1S2			/SR/	

Eight very rare species are associated with this habitat group, including one, the federally Endangered Saint Francis's satyr (*Neonympha mitchellii francisci*), that is entirely confined to these habitats in North Carolina.

## Combined Threats and Synergistic Impacts:

### Importance of Climate Change Factors Compared to Other Ecosystem Threats:

Threat:	Rank Order:	Comments:
Beaver eradication	1	
Impoundments	2	
Conversion to agriculture/sylvicu	2	Includes conversion of pastures, hayfields, and powerlines from low-management types to more completely artificial systems maintained through herbicides, pesticides, non-native grass plantings, increased mowing, etc.
Water Withdrawals	3	
Groundwater Depletion	3	
Flood Regime Alteration	3	
Climate Change	3	

With or without climate change, beaver pond ecosystems are likely to further spread across the state, re-creating habitat conditions that existed prior to the great loss of beavers and their associated species that began with European settlement of North America. This spread will likely have a positive effect on Successional Wetland inhabitants. The main limiting factor for this re-occupation is human tolerance for their activities and competition with humans for bottomland space.

Successional wetlands located away from stream valleys and that depend on high water tables for their existence are much more likely to be affected by climate change. Along with the direct effects of increased drought, there are also likely to be indirect effects due to greater human consumption of ground water resources.

## Recommendations for Action:

### Interventive Measures:

Intervention:	Importance:	Feasibility:	Comments:
Protect keystone species	High	High	Allow beaver pond complexes to develop in natural areas where direct impacts to rare species are not at issue
Reduce groundwater extraction	High	Medium	
Preservation of Riparian Buffers/Floodplains	High	High	

Tolerance for beaver activities is the key factor for restoration of marshes, sedge mires, small pond, and other related habitat types across the state. If allowed to continue their expansion, ecosystems in this group are likely to gain resilience and adaptability in the face of climate change, one of the few habitat groups for which this claim can be made.

## Ecosystem Group Summary:

Successional wetland communities associated with beaver pond complexes are gradually returning to the prominence they held prior to European settlement of North America. These ecosystems -- adapted to frequent disturbances -- are likely to be among the most resilient and adaptable to the effects of climate change. By storing water during times of drought and mitigating the effects of flooding, they are also likely to enhance the survival of species found in adjoining habitats as well. Non-riparian successional wetlands may also benefit from "rescue effects" and gene flow emanating from nearby beaver pond complexes. These non-riparian communities composed of herbs and shrubs are otherwise likely to be among the hardest hit by the effects of climate change.

## References: