DRAFT – Successional Wetlands

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Ecosystem 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 manmade. Most examples occur in floodplains and this ecosystem group overlaps to some extent with the Coastal Plain blackwater and brownwater floodplains and Piedmont and Mountain floodplains groups. Those groups, however, deal primarily with forested habitats and their associated species.

This ecosystem group focuses specifically on non-forested habitats that 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, power lines, 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.

Several priority habitats described in the 2005 Wildlife Action Plan could be considered components of the successional wetland community. These include Floodplain Forests, which are found in all three ecoregions of the state. Other priority habitats that contain successional wetland components are Mid-Atlantic Coastal Plain and Piedmont Small Wetland Communities and Southern Blue Ridge Mountain Bogs and Associated Wetlands (see Chapter 5A) (NCWRC 2005).

Table 1 at the end of this report provides of summary of expected climate change impacts to these communities.

Predicted Effects to Wildlife Species

Tables 2 through 5 at the end of this report identify the species of conservation concern and priority species that use habitats in this ecosystem.

With stable beaver populations, beaver ponds can be maintained for decades. Beaver ponds are a natural community, but result from modification of other community types (NCWRC 2005). With or without climate change, beaver pond ecosystems are likely to further spread across the state, recreating 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 beaver activities and competition with humans for use of bottomlands. A reduction of beaver ponds will place more importance on man-made ponds as the primary habitat for many lentic aquatic species (NCWRC 2005).

Changes in insect species composition, especially among herbivorous groups, are likely to occur due to changes in plant composition as well as the direct effects of climate change on the insects themselves. Eight very rare species associated with this habitat group are entirely confined to these habitats in North Carolina, including the federally Endangered Saint Francis's satyr (*Neonympha mitchellii francisci*). Vertebrate composition is less likely to change, at least so long as habitat structure remains fairly constant.

While often small in size, cumulatively these habitats provide critical breeding habitat for many species. Wetland habitats are especially important as breeding sites for amphibian species. Small wetlands can also be important breeding habitat for crayfishes. Wading birds, waterfowl, and songbirds, too, may also use small wetland communities for nesting and feeding areas. Dead trees in beaver ponds are important foraging and nesting habitat for woodpeckers, such as the red-headed woodpecker, and for wood duck nesting.

Freshwater wetlands near coastal communities provide an important source of fresh drinking water for wildlife, which will become more important in areas subject to salt water intrusion. Depending on geographic siting in the landscape, successional wetlands may also provide connectivity between adjacent upland habitats.

Nutria are considered a serious pest species in the U.S. because they eat a variety of wetland and agricultural plants and their burrowing damages stream banks, impoundments, and drainage systems. As warming trends increase, the range of nutria, a non-native and often invasive mammal, is likely to expand and populations currently limited by intolerance to cold winters will quickly expand.

Climate Change Compared to Other Threats

Successional habitats associated with beaver pond complexes are likely to be fairly well-buffered from most effects of climate change. The outlook for successional wetlands that are more dependent on high ground water levels is less certain.

Table 7 compares climate change with other existing threats.

Table 7. Comparison Of Climate Change With Other Threats		
Threat	**Rank Order**	**Comments**
Beaver eradication	1	Beaver ponds can be a nuisance to landowners when they flood farm fields or commercial timber. Their activities cause damage to trees and property, which often results in the destruction of beaver dams. Several techniques have been developed to minimize beaver damage while maintaining some benefit from impounded waters. 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.
Impoundments/Flood Regime Alteration	2	Wetlands associated with riparian floodplains may be affected by impoundments that prevent overbank flooding, thereby preventing floodwaters from recharging these systems.
Conversion to agriculture/ silviculture	2	Includes conversion of pastures, hayfields, and power lines from low management types to more completely artificial systems maintained through herbicides, pesticides, non-native grass plantings, increased mowing, etc.
Infrastructure (Utilities, Roads)	2	Construction of new infrastructure to support development or to move facilities inland in response to sea level rise can lead to destruction of successional wetlands, especially smaller isolated patches. The hydrologic connectivity of larger wetlands may be effected when crossed by roads or underground utilities. Roads can cause heavy mortality for reptiles and amphibians and can effectively isolate breeding populations, or separate wetland habitats from upland habitats that are used during non-breeding portions of amphibian and reptile life cycles (NCWRC 2005).
Water Withdrawals/ Groundwater Depletion	3	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.
Climate Change	3	These systems store water during times of drought and can also recover quickly following floods.
Invasive Species	4	Herbivory and burrowing damage from nutria are concerns when these wetland communities are connected to riverine and coastal systems. If species that are lost in this process are replaced with species from farther south but from similar habitats, the ecosystems overall are likely to remain fairly robust. However, invasion by exotic species, such as *Murdannia keisak* and *Polygonum cuspidatum*, can lead to large changes in composition as well as structure in wetland communities and represent a major threat.

Summary and Recommendations

Successional wetland communities associated with beaver pond complexes are adapted to frequent disturbances and 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.

Recommended Actions

Surveys

- Initiate distribution surveys for all amphibian species associated with small wetland communities, but especially the mole salamander, eastern tiger salamander, dwarf salamander, and four-toed salamander (NCWRC 2005).
- Gather better information about the status and distribution of more common species associated with Piedmont wetland habitats (*e.g.,* three-lined salamander, common ribbonsnake) (NCWRC 2005).

Monitoring

- Determine population trends and persistence of small wetland breeding amphibian populations, particularly mole salamander, eastern tiger salamander, dwarf salamander, and four-toed salamander (NCWRC 2005).
- Monitor amphibian populations to detect incidence of fungal and viral infections (*e.g*., iridoviruses, chytridiomycosis).
- Research is needed to investigate nutria population densities, population growth rates, dispersal range, and extent of property damage from burrowing and herbivory.
- Investigate minimum hydroperiods needed by priority amphibian species that utilize ephemeral pools and wetlands. Results can be used to determine when supplemental or interventive measures are needed to support breeding periods and metamorphosis during drought periods.

Research

- Focus habitat use studies on bats and small mammals to clarify how small mammals and bats use these wetlands; little is known about the value of small wetland communities in the Piedmont for those groups (NCWRC 2005).
- Study the efficacy and practicality of “toad tunnels” and other wildlife crossings that allow passage under roadways and help maintain connectivity between wetland metapopulations (NCWRC 2005).
- Determine minimum upland buffers required to sustain at-risk amphibian populations (NCWRC 2005).

Management Practices

- Allow beaver pond complexes to develop in natural areas where direct impacts to rare species are not at issue.
- Work with partners to develop property tax incentives to mitigate damages

suffered by landowners.

- Strategies to promote techniques for managing beaver damage that minimize the loss of quantity and quality of beaver ponds should be explored (NCWRC 2005).
- Explore management strategies to eradicate undesirable species, such as bullfrogs, from wetlands (NCWRC 2005).
- Seasonal wetlands must have sufficient surrounding habitat in order to support the life history requirements of amphibian and reptile populations. Every effort should made to maintain continuous gradients between wetland and upland sites; roads, agriculture, or forestry operations between complimentary sites may render them ineffective at supporting amphibian and reptile populations (Bailey *et al*. 2004).

Land Protection

- Preserve riparian buffers and floodplains, especially where clearcutting near wetlands causes higher solar radiation and an increase in probability of wetlands drying out (NCWRC 2005).
- A high priority should be placed on protecting wetlands and adjacent uplands through acquisition or easement.

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Table 1. Predicted Impacts of Climate Change	
Climate Change Factor	**Comments**
Flooding	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	Some compositional changes are likely to occur but are unlikely to have a major impact on the ecological stability of these habitats
Drought	Wetlands associated with beaver-pond complexes are among the best buffered against the effects of drought. However, wet pastures, power lines, and other open habitats isolated from stream inputs are likely to be strongly affected by droughts. Prolonged droughts may cause significant local extirpation and hydrologic instability, with increased frequency of severe flooding as well as severe droughts likely to lead to depauperization of these habitats.
Exotic species invasion	With milder winters and warmer average temperatures, nutria populations could expand their range and become more invasive.
Compositional Change	Some changes in species composition are likely to occur due to changes in temperature regime, these changes will probably be slower than in successional habitats in uplands, since a greater proportion of the plant species associated with beaver pond systems are perennial rather than annual.

Table 2. Bird Species Utilizing Successional Wetlands							
Species	**Common Name**	**Element Rank**	**Endemic**	**Major Disjunct**	**Extinction/ Extirpation Prone**	**US/ NC/ WAP***	**Comments**
BIRDS							
Aix sponsa	Wood Duck						
Botaurus lentiginosus	American bittern	G4/S1B, S3N				/SR/P	
Empidonax alnorum	Alder flycatcher	G5/S2B		YES	YES	/SR/P	A northern species that nests only in a few scattered places in the mountains of NC.
Empidonax traillii	Willow flycatcher	G5/S3B				/W2/P	
Ixobrychus exilis	Least bittern	G5/S3B				/SR/P	
Melanerpes erythrocephalus	Red-headed Woodpecker					/ /P	
Nyctanassa violacea	Yellow-crowned Night-heron					/ /P	
Rallus elegans	King rail	G4/S3B, S3N				/W1, W3/P	

Table 3. Mammal Species Utilizing Successional Wetlands							
Species	**Common Name**	**Element Rank:**	**Endemic**	**Major Disjunct**	**Extinction/ Extirpation Prone**	**US/ NC/ WAP***	**Comments**
MAMMALS							
Condylura cristata	Star-nosed Mole					/SC/P	
Synaptomys cooperi helaletes	Southern Bog Lemming					/SR/P	

Table 4. Reptile Species Utilizing Successional Wetlands							
Species	**Common Name**	**Element Rank**	**Endemic**	**Major Disjunct**	**Extinction/ Extirpation Prone**	**US/ NC/ WAP***	**Comments**
REPTILES							
Clemmys guttata	Spotted Turtle					/ /P	
Deirochelys reticularia	Eastern Chicken Turtle					/SR/P	
Farancia abacura abacura	Eastern Mudsnake					/ /P	
Glyptemys muhlenbergii	Bog turtle	G3/S2			YES	T(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.
Regina rigida	Glossy Crayfish Snake					/SR/P	
Seminatrix pygaea	Black Swamp Snake					/SR/P	
Thamnophis sauritus	Northern ribbon snake	G5/S4				/ /P	

Table 5. Amphibian Species Utilizing Successional Wetlands							
Species	**Common Name**	**Element Rank:**	**Endemic**	**Major Disjunct**	**Extinction/ Extirpation Prone**	**US/ NC/ WAP***	**Comments**
AMPHIBIANS							
Ambystoma mabeei	Mabee's Salamander	G4/S3				/SR/P	
Ambystoma maculatum	Spotted Salamander	G5/S5				/ /P	
Ambystoma opacum	Marbled Salamander	G5/S5				/ /P	
Ambystoma talpoideum	Mole Salamander	G5/S2				/SC/P	
Ambystoma tigrinum	Eastern Tiger Salamander	G5/S2				/T/P	
Eurycea guttolineata	Three-lined Salamander	G5/S5				/ /P	
Eurycea quadridigitata	Dwarf Salamander	G5/S2				/SC/P	
Hemidactylium scutatum	Four-toed Salamander	G5/S3				/SC/P	
Hyla gratiosa	Barking Treefrog					/ /P	
Hyla versicolor	Northern Gray Treefrog	G5/S2?				/SR/P	
Scaphiopus holbrookii	Eastern Spadefoot					/ /P	
	Mountain Chorus Frog						
	Mud Salamander						

Table 6. Invertebrate Species Utilizing Successional Wetlands							
Species	**Common Name**	**Element Rank**	**Endemic**	**Major Disjunct**	**Extinction/ Extirpation Prone**	**US/ NC/ WAP***	**Comments**
INVERTEBRATES							
Apamea inebriata	A noctuid moth	G3G4/ S1S2		YES	YES	/SR/	Currenly known in NC 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 NJ northward. As a primarily northern species, it may be particularly susceptible to increases in temperature.
Apamea mixta	A noctuid moth	GU/S1S2				/SR/	
Euphydryas phaeton	Baltimore checkerspot	G4/S2				/SR/	
Euphyes bimacula	Two-spotted skipper	G4/S2				/SR/	
Gabara distema humeralis	An owlet moth	G4T4/S3?				/W3/	
Lemmeria digitalis	A noctuid moth	G4/S1S3		YES	YES	/SR/	Currenly known in NC from only a single site in Fort Bragg . Except for this record, this species is only known from states from NJ northward. As a primarily northern species, it may be particularly susceptible to increases in temperature

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INVERTEBRATES							
Macrochilo louisiana	Louisiana owlet moth	G4/S2S3				/SR/	
Macrochilo n. sp. 1 nr. absorptalis	An owlet moth	G3/S1S2		YES	YES	/SR/	Currenly known in NC from only a few sites in Fort Bragg. Except for these records, this species is only known from states from NJ northward. As a primarily northern species, it may be particularly susceptible to increases in temperature.
Meropleon diversicolor	An owlet moth	G4/SU				/W3/	
Metanema determinata	Dark metanema (moth)	GNR/SU		YES	YES	/W3/	A northern species currently known only from New River State Park in NC.
Neonympha mitchellii francisci	Saint Francis's satyr	G1G2T1/ S1	YES		YES	LE/SR/	This subspecies of the federally Endangered Mitchell's satyr is entirely confined to Fort Bragg.
Scopula purata	Chalky wave (moth)	G4/S3?				/W3/	

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INVERTEBRATES							
Stethophyma celatum	Broad-winged sedge grasshopper	G4/S1S2		YES	YES	/SR/	Currently known in NC 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 SC and New England in addition to NC along the Atlantic Slope.

*** US/ NC/ WAP Abbreviations (species are subject to reclassification by USFWS, NHP, or WRC).**

E	Endangered	SC	Special Concern	P	WAP Priority Species
T	Threatened	SR	Significantly Rare		
FSC	Federal Species of Concern	W	Watch Category		
T(S/A)	Threatened due to Similarity of Appearance				

NatureServe Element Rank: http://www.natureserve.org/explorer/ranking.htm

USFWS Endangered Species Listing Status: http://www.fws.gov/raleigh/es_tes.html

NC Natural Heritage Program Status:
http://www.ncnhp.org/Images/2010%20Rare%20Animal%20List.pdf

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