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

DRAFT

Sparsely Settled Mixed Habitats

Ecosystem Group Description:

Wide -ranging animal species -- particularly carnivores near the top of the food web -- often utilize a wide variety of habitat types in their pursuit of food, mates and other resources. Their lack of habitat specificity prevents assigning them to any of the other Ecosystem Groups, all of which represent distinguishable habitat categories. Nonetheless, many of these species are in decline, primarily due to loss, degradation, and fragmentation of all habitats, natural as well as semi-natural. The effects of climate change will exacerbate these already ongoing impacts and for at least a few of these species -- especially the red wolf and least weasel -- may ultimately outweigh all other factors in determining whether they persist within the state, or, in the case of the red wolf, whether any wild populations remain on earth.

Ecosystem Level Effects:

Predicted Impacts of Climate Change:

Climate Change Factor:	Likelihood:	Effect:	Magnitude:	Comments:
Increased Temperature	High	Neg	Low	
Sea Level Rise -- Inundation	High	Neg	High	

Sea level rise is likely to affect large areas of the Outer Coastal Plain where many important wildlife refuges are located. Increased temperatures are likely to have only a minimal effect on this group overall, although a northward shift in range can be expected for the least weasel -- a primarily boreal species -- perhaps leading to its extirpation from the mountains of North Carolina.

Predicted Ecosystem Reponses:

Ecosystem Response:	Likelihood:	Effect:	Magnitude:	Comments:
Inland Migration	Med	Mix	Uncer	
Acreage Change	Med	Mix	Uncer	

Sea level rise may lead to inundation of large parts of the Coastal Plain, including the Albemarle-Pamlico Peninsula where large reserves have been set aside for red wolves, black bear, and other wildlife. While some movement inland can be expected, there are far fewer potential refuge areas in the Inner Coastal Plain and Piedmont to support viable populations of large predators or venomous snakes than there currently are in portions of the Outer Coastal Plain.

Increased temperatures may cause some latitudinal shifts in the ranges occupied by members of this group, but the effects are likely to be mixed. In the Mountains, least weasels may retreat towards the north, becoming less common or even potentially extirpated from the state. In the Coastal Plain, eastern diamond backed rattlesnakes -- currently at the very northern edge of their range and very rare in the state -- have the potential to increase in abundance. However, that potential could very well be offset by increased development and fragmentation, as well as persecution.

Habitat Level Effects:

LHI Guilds:

Guilds with Significant Concentration in Ecosystem Group:	Comments:
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This Ecosystem Group is based on a single LHI Guild. Although there are regional variations in its membership, most of the species range over the entire state and the analysis of this group, consequently, takes a statewide perspective.

Species Level Effects:

Terrestrial Animals Species:	Element Rank:	Endemic	Major Disjunct	Extinction/ Extirpation Prone	Status: US/NC/ WAP	Comments:
Canis rufus	G1Q/S1	Yes		Yes	LE, XN/SR/	The sole free-roaming population of this species may be imperiled by sea-level rise.
Crotalus horridus	G4/S3				/SC/P	
Sistrurus miliarius	G5/S3				/SC/P	
Mustela nivalis	G5/S2				/SR/P	
Mustela frenata	G5/S3S4				/W3/P	

Although all of the species included within this guild are highly adaptable, making use of a wide range of habitat types, the majority are considered rare or threatened in North Carolina, including red wolf, least weasel, eastern diamondback rattlesnake, timber rattlesnake, and pigmy rattlesnake. The status of bobcat and long-tailed weasel is unknown, but they are likely to be declining at least in urbanizing areas. Although the black bear is currently expanding its range across the state, it was also considered to be of conservation concern until the late 1990s.

Combined Threats and Synergistic Impacts:

Importance of Climate Change Factors Compared to Other Ecosystem Threats:

Threat:	Rank Order:	Comments:
Development	1	
Persecution	1	
Climate Change	2	

As large predators, poisonous snakes, or just "varmints", members of this habitat group have long been persecuted by humans. Additionally, bears have always been hunted for food, and like all of the other mammals in this group, have also been hunted for their fur or hides. While modern game laws regulate hunting of these species and at least some -- including the snakes and red wolf -- are given special protection as state or federally listed species, direct persecution remains the largest limiting factor on their abundance and range.

Conflicts with humans have resulted in the restriction of these species to large blocks of mixed habitat where human density and intrusion are minimal. Even black bears, which in some areas have adapted to human presence as garbage raiders, are highly unlikely to persist without these large sparsely settled blocks of habitat. Large blocks of even mixed natural, semi-natural, and working lands are themselves becoming rare, however. This trend will continue so long as the human population continues to grow and new ways are found to exploit even the most marginal of lands for human uses.

As habitat generalists, species in this group may adjust fairly well to most aspects of climate change. Least weasels are probably the only species likely to shift its range as a consequence of increased warming. However, climate change will also contribute to the loss of the large blocks of habitat that are critical for the survival of this group of species. Direct effects in this regard are primarily limited to the Outer Coastal Plain, where sea-level rise may cause the inundation of several large wildlife refuges clustered around the sounds, including Alligator River, Pocosin Lakes, Lake Mattumuskeet, Swanquarter, Cedar Island, and Mackay's Island National Wildlife Refuges, and the North River, Gull Rock, and Goose Creek Game Lands. Loss or even moderate reduction of these refuges is likely to strongly affect the survival of the pack of red wolves that has been restored on Albemarle-Pamlico Peninsula, as well as the largest population of black bears along the North Carolina coast.

Indirect effects of climate change on this group primarily include increased exploitation of wildlands, particularly for development of new energy resources. While species in this group can adapt to some changes in habitats -- they may, for instance be relatively insensitive to the construction of wind turbine farms -- they are among the most likely to be affected by construction of highways, increases in traffic, and other effects associated with infrastructural or industrial development needed to support new forms of energy extraction.

Recommendations for Action:

Interventive Measures:

Intervention:	Importance:	Feasibility:	Comments:
Restore/Maintain Landscape Connections	High	High	
Protect/Expand Remaining Examples	High	Medium	
Protect Future Sites	High	Medium	

More than any other, this group requires landscape-level conservation, particularly the protection of large areas of habitat -- natural or mixed -- from increased density of human settlement. Within the Coastal Plain, where loss of existing refuges is most likely to occur, efforts should be made to conserve similar sized blocks of habitat located farther inland. These blocks of habitat, however, do not have to be pristine natural areas; this group of species can do well in landscapes comprising large areas of working lands, either agricultural or sylvicultural. The main goal at the state or local levels should be to limit the development of roads within these blocks or other infrastructure that would promote the development of denser human settlement.

Maintaining and restoring connections between habitat blocks is also critical, not only for allowing adjustments in range in response to climate change, but to maintain population resilience and adaptability more generally. In the Coastal Plain, a high priority should be given to protecting movement corridors that allow inland migration away from inundating areas along the sounds and seacoast. Over the state as a whole, a high priority should be given to restoring connections that are lost due to construction of four-lane highways and other roads that create near-impassible barriers for all animals except those capable of flight.

Ecosystem Group Summary:

The high-level predators composing this group are habitat generalists that have declined in both abundance and range due to conflicts with humans, with the majority now considered to be of conservation concern. These species require large blocks of habitat where density of human settlement or intensity of human intrusion is relatively low. While reduction and fragmentation of large areas of open space will continue to accompany the expansion of the human population, climate change is likely to exacerbate these ongoing impacts. The most important direct impact of climate change is likely to be the loss of a large number of coastal refuges due to sea level rise. Across the state more generally, increased exploitation of wild or semi-wild lands for energy production is likely to be the most important indirect effect of climate change on this group.

By regulating the abundance of species lower down in the food chain -- particularly herbivorous mammals -- the predatory species in this group play an important ecological role in all the ecosystems they occupy, including virtually all of the other more specialized ecosystem groups covered in this analysis. Protecting existing large blocks of habitat and restoring connections between these blocks will therefore benefit not only the species in this group, but will enhance the viability of the state's native biodiversity overall.

References: