

Evolving niche of the “coy-wolf” in northeastern forests and implications for biodiversity

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<http://www.nsrcforest.org>

Project Summary

Coyotes began colonizing the Northeast in the 1920s, and are the most abundant large carnivore in the region today. We asked:

- 1) Are coyotes deer specialists, thereby filling the vacant niche of the wolf rather than co-opting the niche of extant carnivores?**
- 2) How much do coyote diets overlap native carnivores, and by what means might they establish a stable coexistence?**

We constructed a timeline of coyote diet from the 1950s to today, and related coyote use of prey to changes in prey abundance. We documented dietary overlap among coyote, bobcat, gray fox and red fox using stable isotope analysis.

Despite high use of deer, coyotes are not deer specialists. Rather, deer use depends on the abundance of primary prey, specifically snowshoe hare (historically) and beaver (currently). As coyotes increasingly exploit beaver populations, we expect use of adult deer to continue to decline. However, use of fawns remained constant despite primary prey availability, so if coyote numbers increase as a result of abundant beaver then total predation on fawns may increase too.

Native carnivores appear sufficiently flexible to achieve a stable coexistence with coyotes. Coyote, gray fox and red fox diets largely overlap, but fox coexist with coyotes by exploiting predation refuges – gray fox by climbing trees and red fox by occupying human-dominated areas. However, red fox use of human development may become problematic if it leads to increased human-wildlife conflict.

Background

- **1920s:** following extirpation of wolves, coyotes began colonizing the Northeast
- **Last 30 years:** coyotes most common large carnivore throughout the Northeast
- **Eastern coyotes share genes, morphology, and (potentially) behavior with wolves**
- **Ecological role of these “coy-wolves” of interest to scientists, managers, and public**

Coyote Range



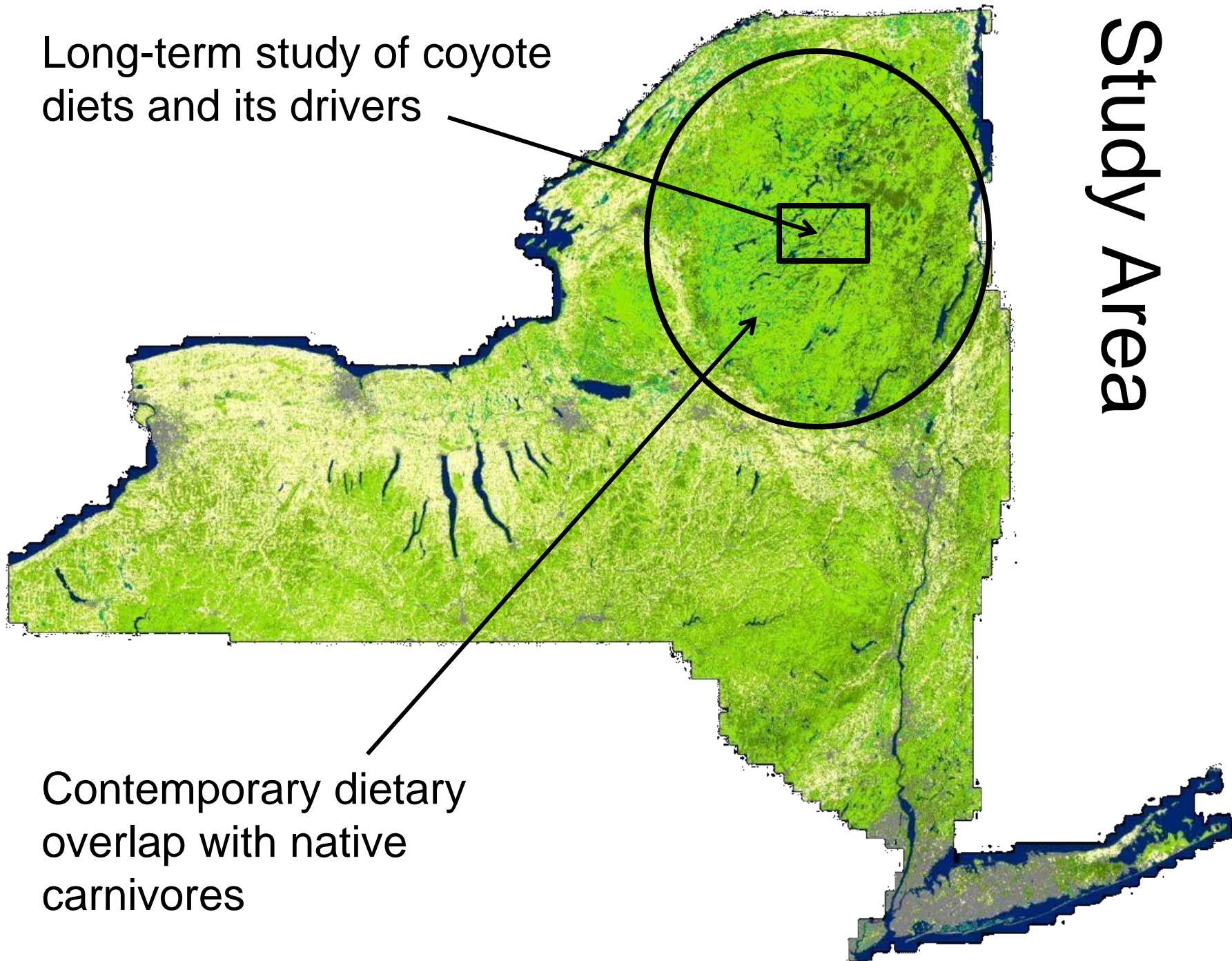
Background

- **Potentially large ecological impact through:**
 - competition with native carnivores (red fox, gray fox, bobcat)
 - predation on deer and other species
- **Requires study of drivers of prey consumed by coyotes and dietary overlap with native carnivores**
 - H₁ Deer specialist → filling vacant niche of wolf
 - H₂ Mid-sized prey specialist → displacing native carnivores



Study Area

Long-term study of coyote diets and its drivers



Contemporary dietary overlap with native carnivores

Methods – evolving coyote diet

1. Walk transects



2. Collect coyote scat



3. Dessicate then wash scats

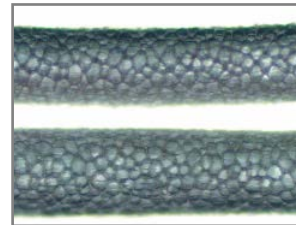


4. Sort prey remains

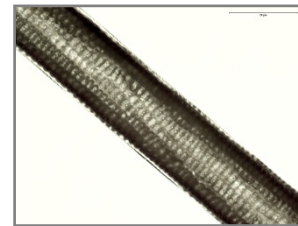
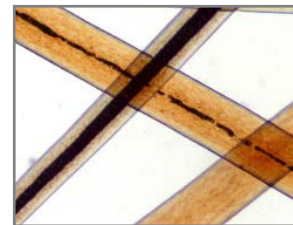


5. Identify species by hair patterns

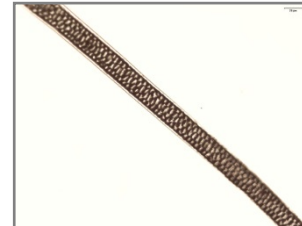
WT Deer



Beaver



Snowshoe hare



Red squirrel



6. Compare to past studies (1956-61, 1975-80, and 1986-89) and prey abundance

Methods – niche overlap

You are what you eat:

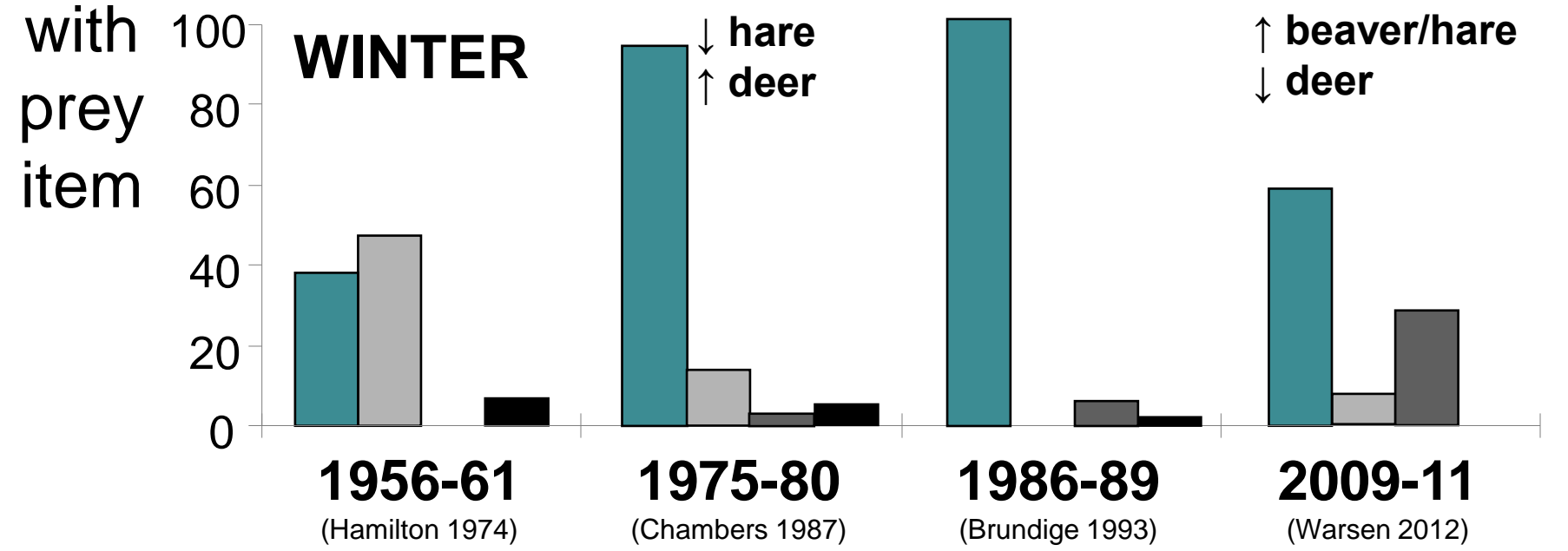
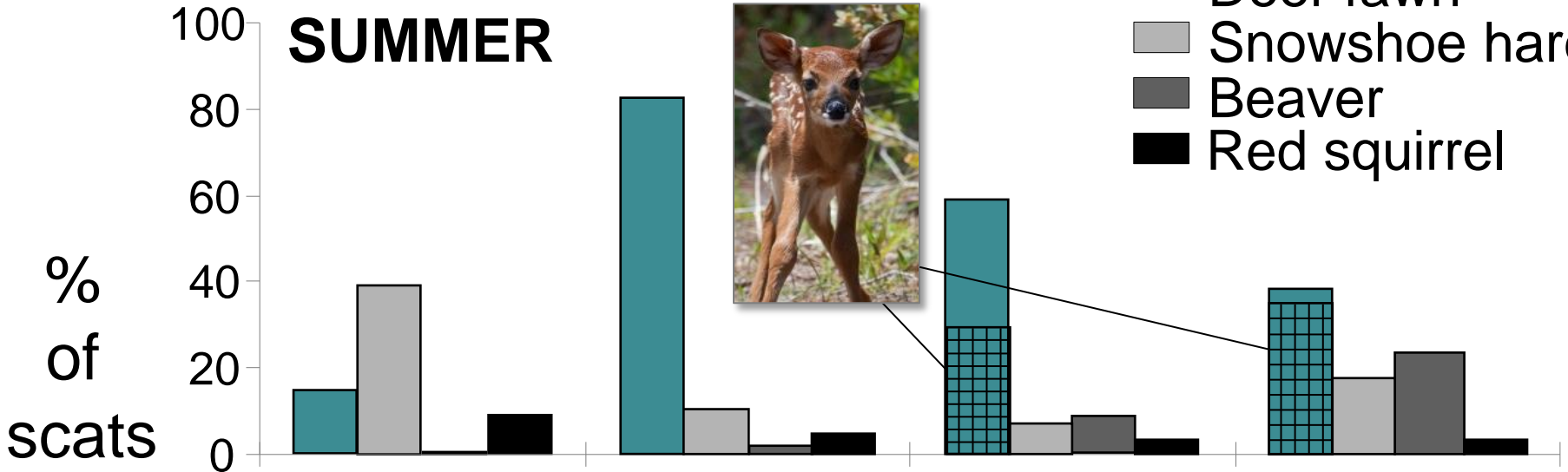
Stable isotopes in mammalian hair reflect diet composition for period of hair growth

- Hair of Adirondack carnivores acquired from registered fur trappers
- Nitrogen isotope ($\delta^{15}\text{N}$) reflects trophic level (level of carnivory vs. herbivory)
- Carbon isotope ($\delta^{13}\text{C}$) reflects photosynthetic pathway – Native plants at one end and corn (human food sources) at the other



Key Results

- Deer adult
- Deer fawn
- Snowshoe hare
- Beaver
- Red squirrel



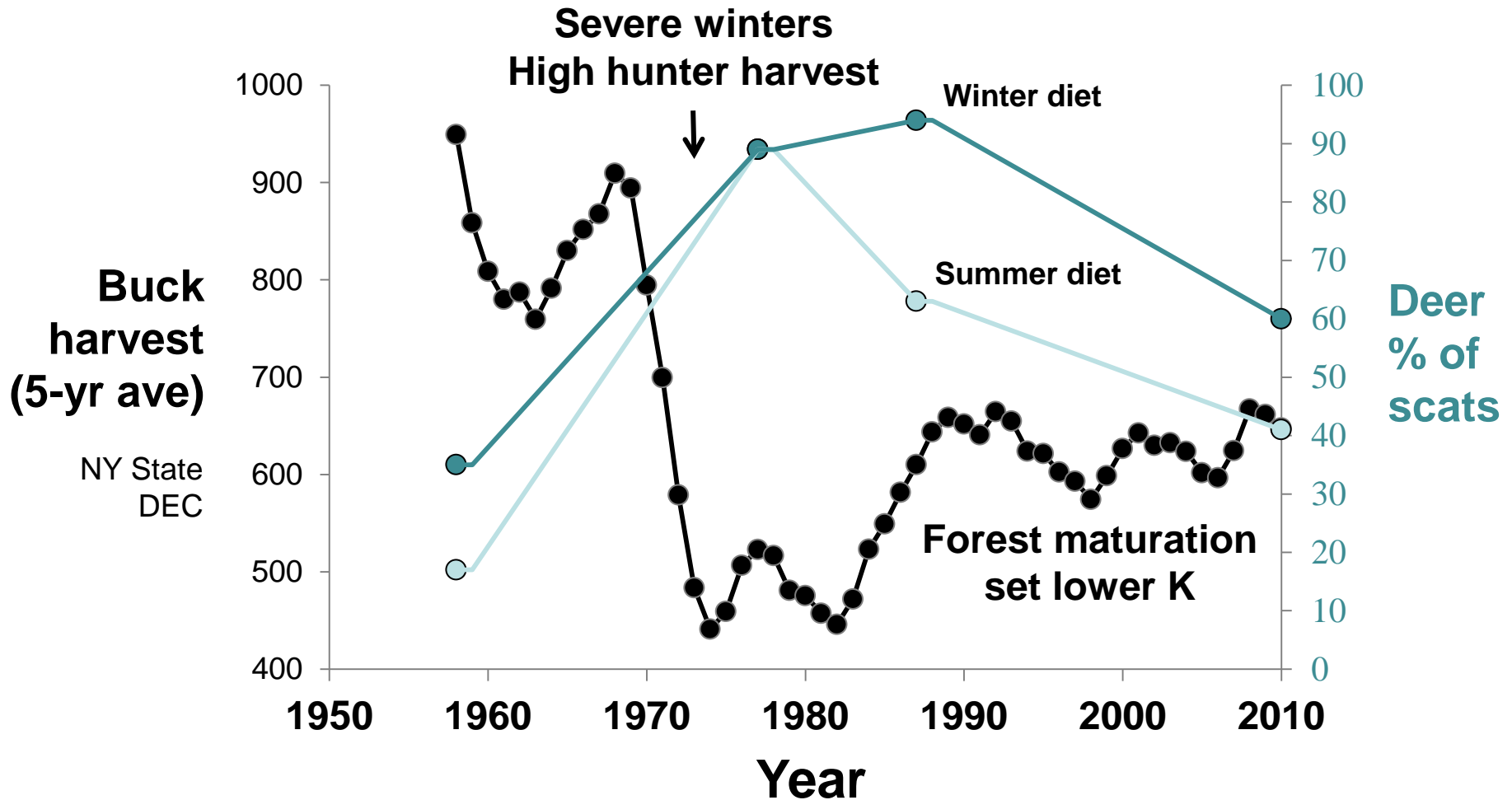
1956-61
(Hamilton 1974)

1975-80
(Chambers 1987)

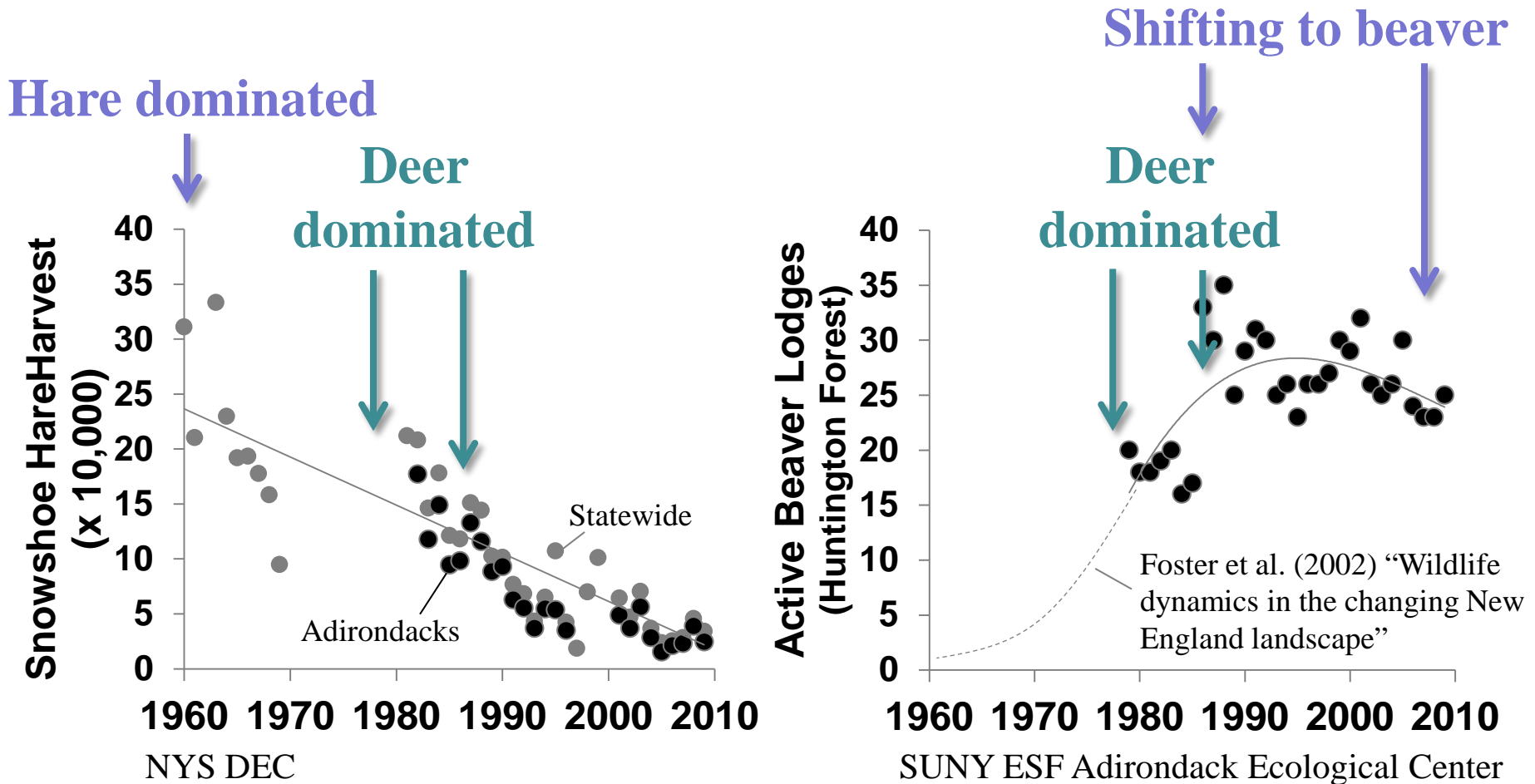
1986-89
(Brundige 1993)

2009-11
(Warsen 2012)

Coyote use of deer does not track changes in deer herd



Coyote use of deer (secondary prey) driven by availability of primary prey



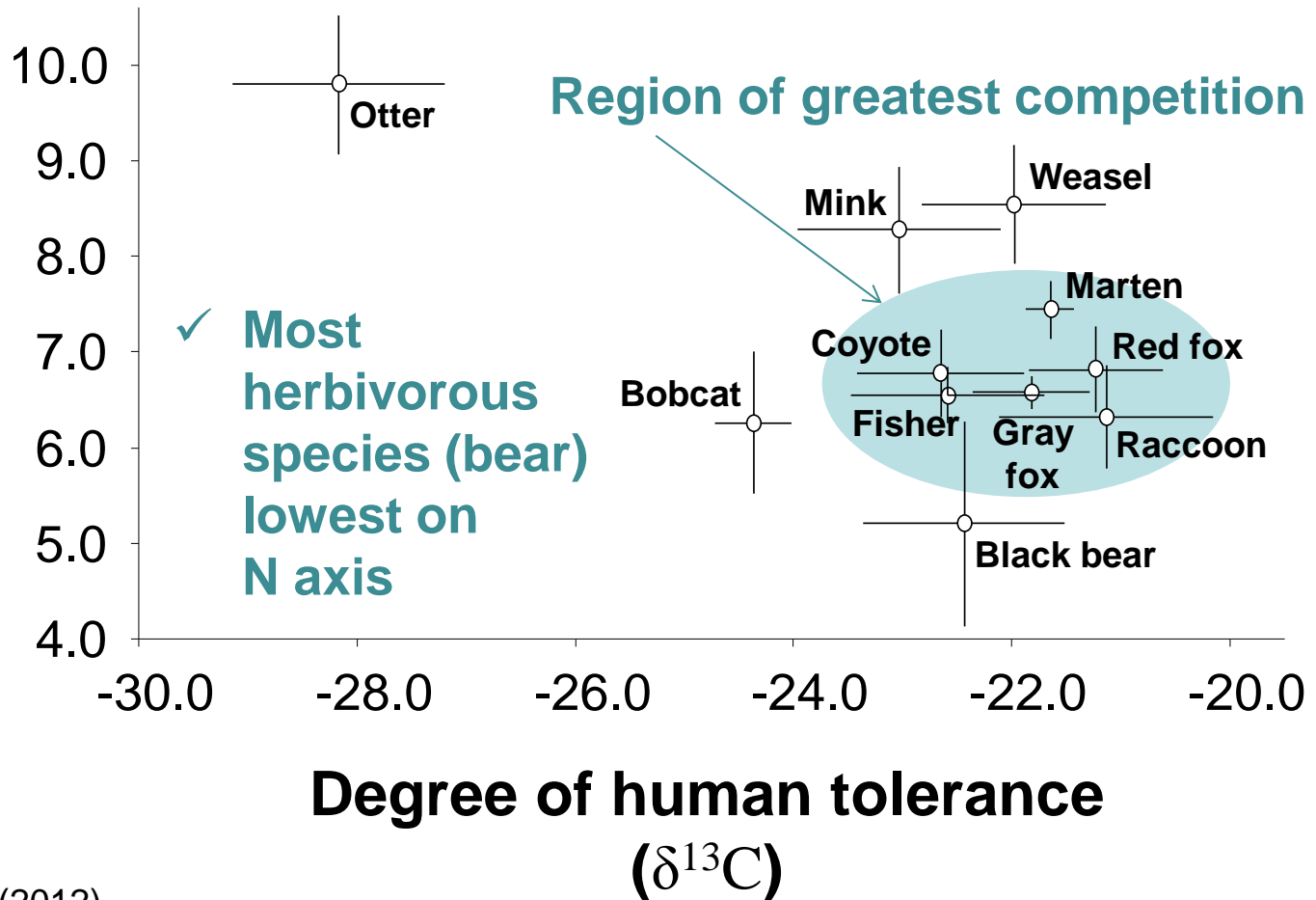
Niche competition

✓ Fish eaters highest on N axis
(longer food chains)

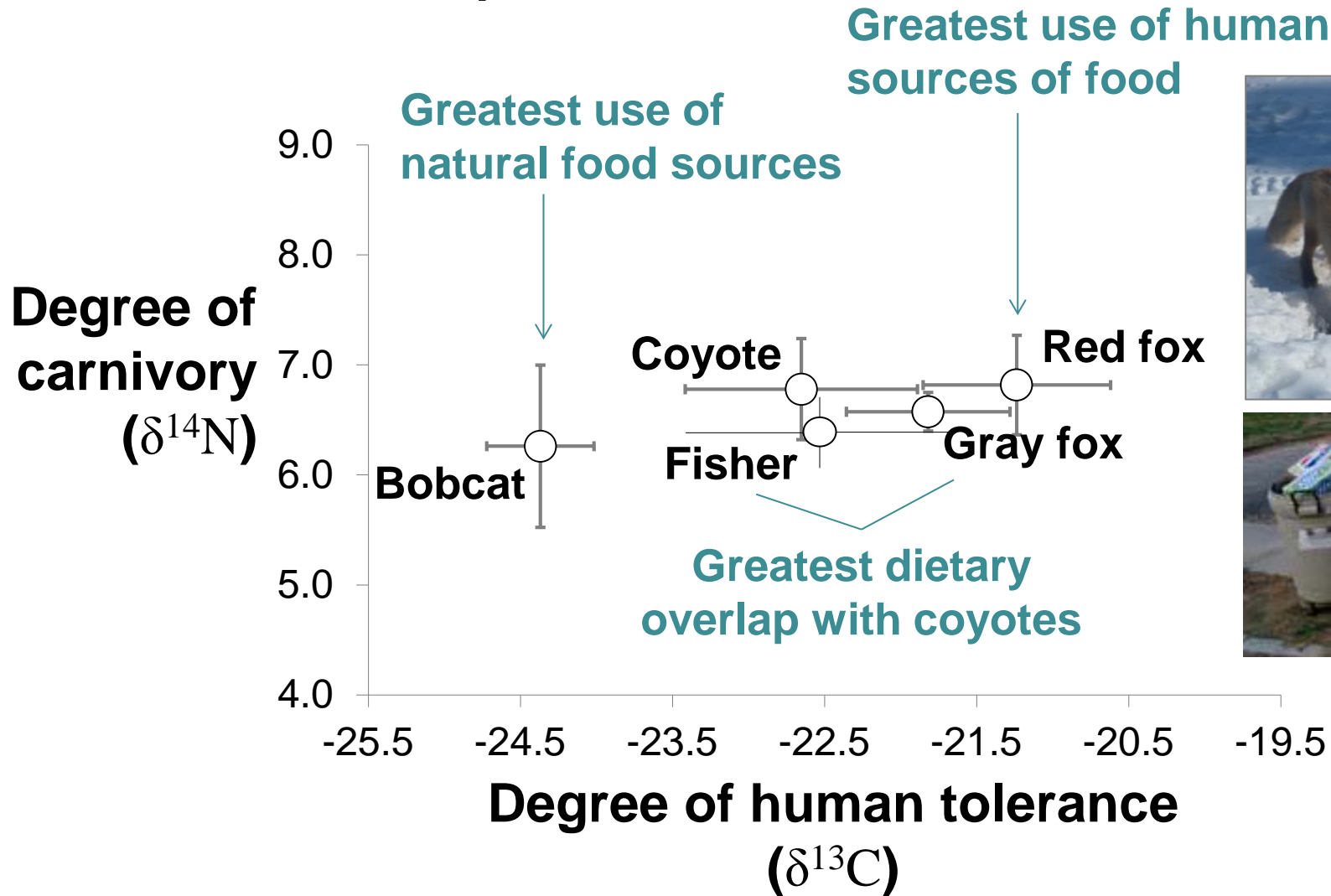
**Degree of
carnivory
($\delta^{14}\text{N}$)**

✓ Most
herbivorous
species (bear)
lowest on
N axis

Region of greatest competition



Niche competition



Implications

- **Coyote not deer specialists, not filling niche of wolf**
 - Use of deer driven by primary prey, hare and beaver
 - Increasing use of abundant beaver may increase coyote numbers
 - Coyote use of adult deer likely to decline, but use of fawns stable or potentially increasing with implications for herd productivity and management
- **Strong diet competition among coyotes and native carnivores, but mechanisms for co-existence exist**
 - Tree climbers (fisher, gray fox) able to maintain traditional niche
 - Red fox and bobcat may be pushed to diet/habitat extremes due to coyote interference
 - Red fox may find refugia in human-dominated areas, but that might increase human-fox conflict

Future directions

- Mechanisms of red fox – coyote competition and potential displacement currently under study at Fort Drum
- Continued long-term monitoring of coyote diets in Adirondacks needed to evaluate importance of beaver to coyote population dynamics and its implications for spill-over predation on deer

Products

Peer-reviewed publications

Warsen, S.A., Frair, J.L., and Teece, M.A. (2014) Isotopic investigation of niche partitioning among native carnivores and the non-native coyote (*Canis latrans*). *Isotopes in Environmental and Health Studies*, DOI: 10.1080/10256016.2014.897946.

Warsen, S.A. and Frair, J.L. (in prep; anticipated submission fall 2015) Evolving dietary niche of coyotes in the Adirondack Mountains of New York. Intended for submission to *Wildlife Society Bulletin*.

Other publications

Frair, J.L., Gibbs, J.P., Batcheller, G., and Jensen P. (2014) Population status and foraging ecology of eastern coyotes in New York State. Progress report 2007-2014, http://frair.weebly.com/uploads/3/1/7/8/31787235/coyote_progress_report_2014.pdf

Warsen, S.A. (2012) Evolving niche of coyotes in the Adirondack Mountains of New York: long-term dietary trends and interspecific competition. M.S. Thesis, SUNY ESF, Syracuse, NY. 90 pp.

Conference presentations

Frair, J.L. (2014) Top dog? The ecological role of the coyote in the Northeastern U.S. (invited presentation). The Wildlife Society Annual Conference, Pittsburgh, PA.

Seminars, webinars, and other tangible products

Frair, J.L. (2015) Top dog? The ecological role of the coyote in the Northeastern U.S. (invited seminar). Cayuga County Federation of Conservation Clubs – Auburn, NY.

Frair, J.L. (2014) Top dog? The ecological role of the coyote in the Northeastern U.S. (invited seminar). Biology Department Seminar Series, University of Alberta, Edmonton, Alberta, Canada.

Frair, J.L. (2014) Top dog? The ecological role of the coyote in the Northeastern U.S. (invited seminar). Earth Lecture Series, SUNY ESF, Syracuse, NY.

Frair, J.L. (2014) Top dog? The ecological role of the coyote in the Northeastern U.S. (invited seminar). NYS Department of Environmental Conservation Indian Nations Meeting, SUNY ESF, Syracuse, NY.

Frair, J.L. (2014) Top dog? The ecological role of the coyote in the Northeastern U.S. (invited seminar). Safari Club International, Central NY Chapter – Oneonta, NY.

Frair, J.L. (2014) Top dog? The ecological role of the coyote in the Northeastern U.S. (invited seminar). New York State Fish and Wildlife Management Advisory Board – Pulaski, NY.

Frair, J.L. (2014) Top dog? The ecological role of the coyote in the Northeastern U.S. (invited seminar). New York State Conservation Council – Utica, NY.

Frair, J.L. (2014) Top dog? The ecological role of the coyote in the Northeastern U.S. (invited seminar). American Wildlife Conservation Foundation – Smyrna, NY.

Leveraged grants

Research for carnivore management on Fort Drum, PI: J. Frair. Source: US Army Corps of Engineers, \$141,000, 2013-2016.