

## Responses to questions from participants in the March 5, 2021 ARC Webinar: “Enduring Footprints in the Adirondacks”

Charles D. Canham, Cary Institute of Ecosystem Studies

What is one of the largest changes you have noticed in the ADK's that has had an impact on you?

Both emotionally and ecologically, this would have to be the devastation of American beech by beech bark disease (BBD). BBD arrived in the Park in the 1970's. But it had not yet spread into the magnificent oldgrowth forests of the Five Ponds Wilderness in the late 70's and early 80s when I did my graduate research there on the ecology of sugar maple and beech. Beech occurs from the Maritimes of Canada to the Highlands of Mexico, but nowhere in that vast range was it as dominant as in the presettlement forests of the Adirondacks. Cankers from the disease eventually girdle and kill the aboveground stem of beech trees larger than ~ 6 inches in diameter, but beech is a prolific root sprouter, and is currently the most common sapling in NY forests. But only the few percent that are genetically resistant to the insect that causes the disease reach maturity and produce the seed crops that are so valuable to wildlife.

What do you believe will be the landscape legacy from the increase in tourism we've seen in the Adirondacks in the last few years?

The impacts will be most strongly felt by humans seeking a wilderness experience. No one wants to hike on a heavily-eroded trail 8 feet wide. The biggest ecological risk is in the spread of invasives, not just plants, but other organisms as well. My understanding is that the white-nose syndrome that has devastated US bat populations may have arrived on the boots of a hiker visiting from Europe. This is why I never carried hiking boots to New Zealand in the decade I spent studying their forests. If the boots weren't perfectly new, border security would have confiscated my boots and treated them to be sure they were safe. We probably need to be thinking about similar protections at our borders.

Do you think that parts of the Adirondacks need more forest management?

“Forest management” typically means “logged”. And other than in a few cases where the logging is designed to stop a potentially catastrophic spread of a forest pest or pathogen, no tree “needs” to be cut down. They're perfectly capable of growing old and dying on their own, with the dead tree then providing important habitat and organic matter inputs.

But if we, as humans, have specific goals for composition and structure of the canopy, then there are indeed lots of different types of silvicultural systems that can be used to create those conditions. This is not that big of an issue in the Adirondacks, but the very light selective logging common in former oak-dominated forests to the south is undeniably favoring the more shade tolerant species like red and sugar maple. I wish it were simply a case of more deliberate logging concentrated in moderate-sized gaps, but given high deer densities to the south, you'd probably need to combine deliberate silviculture with more aggressive deer management to expect successful oak regeneration.

### How has the decrease in acid rain changed the forest composition within the Adirondacks?

The Clean Air Act amendments of 1990 were strikingly successful in reducing sulfuric acid loading, but less effective at reducing nitrogen inputs. And while those nitrogen inputs do acidify, their more direct impact on trees is through the unintentional fertilization the nitrogen provides. Northeastern trees divide up into those with ectomycorrhizal fungal associations (ECTO) (conifers, oaks, beech) and those with endomycorrhizal fungal associations (ENDO) (e.g. maples). The ECTO species are particularly well adapted to low nitrogen (and acidic) soils, and their growth generally doesn't increase with added nitrogen. In fact, they generally show higher mortality with higher N inputs. The maples and other ENDO species are just the opposite, and their growth and survival generally benefit from the added N.

It is true that N deposition has been gradually declining within the Park, but the fact remains that Adirondack soils have been getting this steady rate of fertilization (typically 5-10 kg N/ha/yr combined wet and dry deposition) for over 50 years, so my best guess is that recent changes in annual rates of deposition are not as important as the cumulative deposition over past decades.

### What are your thoughts on the footprint the Adirondack park will have 50 years from now?

A lot depends on how vigorously the citizens of NY are willing to manage and protect both the public and private lands of the Park. It seems inevitable that human pressures and human use of the Park will continue to grow. Managing that in a way that doesn't compromise the ecological integrity and wild character of the Park is the challenge.

### How do the geology and forest history affect the soil types and thus species composition in the Adirondacks?

Both the nature of the underlying bed rock and the nature (texture, mineralogy, chemistry) of the glacial till formed from the bedrock have powerful impacts on tree species composition. The two most obvious associations are (1) pine forests on really sandy soils formed from processes like glacial outwash, and (2) the abundance of "calcicoles" - species that prefer base-rich soils high in pH and the concentration of base cations like calcium - on soils derived from calcareous bedrock (i.e. limestones, marbles). In the Adirondacks, basswood and the maples, as well as conifers like northern white cedar, are the most prominent calcicoles. White ash also reaches its greatest abundance on these soils, although emerald ash borer will largely eliminate the ash species within a decade. The area around Newcomb is a great place to find calcicoles.

### What is the age of the oldest forested land in the ADKs that remains "untouched" by logging/forest services?

This is a pet peeve of mine. Trees have ages, but forests don't. And as Barbara McMartin lays out in her marvelous book "Great Forest of the Adirondacks", the region has hundreds of thousands of acres that have never been logged, thanks to Article XIV and the NYS Forest Preserve. Most other states in the Northeast can only count their "never logged" lands in the few thousands of acres. But this does not mean these forests have been "untouched" by humans, given the pervasive effects of insects, diseases, and air pollution.

### What do you believe to be the most impactful landscape legacies within the Adirondack Park? Is there a specific type of occurrence that is most common within the park?

As I mentioned at the outset, introduced forest pests and pathogens remain the greatest threat to Adirondack forests, and each native tree species that is decimated leaves a legacy (of loss) that could take millennia to recover.

How has the Adirondack's history of logging and clearcutting effected the current hydrology of the region? Has it changed drastically?

It would be interesting to ask the stream ecologists and limnologists whether they can detect legacies of the era before 1900 when logging used watercourses as highways. The tanning industry combined intensive logging and clearcutting with the dumping of incredibly toxic and acidic waste into streams. Virtually all of the now champion trout streams of the Catskills experienced that trauma in the early 1800's. So I guess I wouldn't underestimate the ability of the streams to recover.