

Carrying Capacity

for viola and cello

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BACKGROUND

Isle Royale National Park, a fifty-mile-long island in the middle of Lake Superior, is home to only two large animal species: moose and wolves. The dynamic between these two isolated and intimately linked populations of predator and prey has been studied intensely over the last forty-eight years, in the longest-running ecological study conducted anywhere in America. The study, run by Michigan Technological University and currently overseen by John Vucetich, has revealed interesting trends: the data observed over the course of its five decades has shown that the two populations can swing apart wildly and then grow back together as the tightly bounded ecological forces on the island force the dynamic back to equilibrium. The population data for one animal shows clear echoes of the other when examined on a wide enough scale.

This predictable reversion to stability has come under serious threat, however. For years, the wolf population was ensured a certain level of stability – and genetic robustness – by the regular infusion of new blood: in the winters, ice bridges between the island and the Canadian shore would form somewhat regularly, but climate change has made the appearance of those bridges significantly less frequent. As a result, the wolf population has lately plummeted to historic lows (there were only three wolves on the island during the winter study of 2015, each of them severely hobbled by the effects of generations of inbreeding) and the moose population, accordingly, has exploded. This, in turn, has sent other ecological dominoes tumbling: understory vegetation on the island is being ravaged, profoundly altering the biological composition of the forest; with only three predators on the island, the only check on the moose population will soon be starvation.

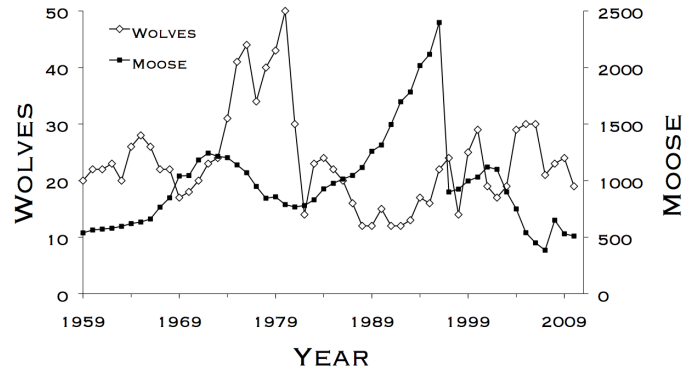
In a park where 99% of the land is a federally designated wilderness, this situation pokes uncomfortably at management policies that have become somewhat controversial: is it more important for a national park to preserve wilderness or to protect an existing ecosystem from human influence? For years, researchers and others have been calling for a “genetic rescue” of the wolves – the introduction of a new wolf to breed with the existing population and restore them to a state of genetic and existential viability – but Isle Royale’s wilderness designation proscribes any such kind of human alteration to the park’s ecology. Proponents of a genetic rescue argue, however, that because human alteration – in the form of the shift in the global climate that led to such a compromised wolf population – is precisely what caused the problem in the first place, introducing new wolf DNA would only be acting to undo manmade damage. But opponents of such a plan, which currently include the park’s administration, counter that this argument sits upon a slippery slope and holds dangerous implications for wilderness management across the country. There is hardly a cleaner example of the inherent conflict between wilderness preservation and ecosystem conservation anywhere in the country than on Isle Royale.

The moose-wolf question stands as just one challenge to the ecological philosophies that guide the stewardship of the entire island. Is managing land as wilderness – that is, in a sense, *not* managing it – indeed the most responsible method of land stewardship, or is it naïve? One participant in the study that I spoke to called it “foolish and insulting” that the park is forbidden to act on behalf of the island’s ecological health, especially when those actions would be guided by theories of environmental management that have been shaped by decades of diligent scientific research.

Whatever becomes of the wolf population – and then, whatever consequent fate befalls the moose, the understory vegetation, the soil composition, and virtually every single other component of the island’s ecosystem – the complex relationship between these two species revealed by these last several decades of research has been as elegant as it is dynamic. I hope that the piece I’ve designed will not only reflect these qualities of the study’s findings but also highlight the dangers of allowing a delicate ecological system to fall out of balance.

PERFORMANCE NOTES AND EXPLANATION OF THE WORK

My piece takes as its source material a line graph displaying the annual population data collected about the two species during the course of the study's five decades:



The points of ecological tension represented in the graph at the moments when the two populations fell out of balance are reflected in congruous points of tension in the music that drive the piece forward. To perform the piece, two players, a cellist and a violist, read the graph from left to right, each playing the “part” of one of the two species by interpreting jagged lines that represent the moose and wolf populations as they change and interact over time.

In the piece, this chart is reimagined as a graphical score in which a spectrum of musical parameters (rather than population) is plotted against time. The chart's vertical axis is a guide to volume, rhythm, and timbre all at once: at its top, players are asked to play as hard, as fast, and as loudly as they can, and at its bottom, they are asked to play slowly, gently, and at an almost imperceptible volume. All points along that axis in between those two extremes are to be interpreted as on a spectrum. (The horizontal dotted line across the middle of the chart roughly indicating the ideal carrying capacity of both populations, should be interpreted as a dynamic, rhythmic, and timbral “home base,” and a suggested rhythm is indicated.) Time in the piece is measured in minutes and seconds (that is, it proceeds irrespective of the overlapping, unrelated rhythms played by the two instruments) and it is metered out along the score's x-axis.

Below the chart are the pitches to be played at each part of the piece – these can be executed either as double stops or by moving freely between the prescribed pitches, as the performer wishes. The timing of the shifts in harmony should be approximate: it is best if the two instruments do not change chords precisely in unison. For the most part, the notes each musician plays remain consistent throughout the piece: it is primarily their rhythmic, timbral, and dynamic intensity that changes, resulting in music propelled more by texture than anything else. This emphasis on sonic color over melody or harmony seemed the most appropriate way to reflect the shifting ecological dynamics that inspired the piece: what I found so compelling about the moose-wolf data is that something as simple as the changes in two numbers over time can illustrate such an intimate, complicated relationship.

The data collected by the study concludes at the vertical dotted line toward the end of the score. Beyond that, in order to frame the ecological crisis facing the island within the sonic context established by the rest of the piece, I have artificially extended the two according to what is projected to happen to each species as the coming years unfold and the wolf population bottoms out. As such, the end of the piece finds the cello's part disappearing into oblivion as the viola ascends to a moment of unprecedented force and fury – that instrument's rhythm at this point should become frenetic and irregular. The violist determines the end of the performance by waiting for the cellist to bow out and then finishing on a forceful downbow.