Update on mountain golden heather research project

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Overview of project:

The objective of this project is to study the effects of anthropogenic disturbances on mountain golden heather (*Hudsonia montana*, Cistaceae), a federally threatened subshrub endemic to North Carolina. Mountain golden heather has a present range limited to a handful of rock outcrops along the eastern rim of the Linville Gorge in Burke County, NC, as well as two isolated populations near the Blue Ridge Parkway in neighboring McDowell County. Prior work (Frost 1990; Gross et al., 1998) has identified two crucial forms of human disturbance in this system: fire suppression that allows overtopping shrubs and trees to outcompete mountain golden heather and trampling of individual plants by by hikers and rock climbers. My work reassesses the effects of these drivers on mountain golden heather and aims to further extend our knowledge of its population dynamics in light of historical and projected climatic changes in Western NC.

Work conducted:

Over the past few summers, I have conducted three annual censuses of the same transects containing ~300 mountain golden heather individuals and will have completed the fourth and final census by the end of this summer. The transects are located at three separate sites, each with different wildfire histories and levels of human visitation, which will allow me to assess the impact of varying magnitudes of these drivers. For each plant in the transects, I am recording three key vital rates – year-to-year survival, year-to-year growth, and annual reproductive output – that will ultimately be used to build a population model that projects population size over time under anticipated environmental conditions.

I have also been conducting an experiment in which I removed overtopping heterospecific vegetation around focal mountain golden heather plants. I recorded vital rates (survival, growth, and reproduction) of these individuals before and after removing the overtopping vegetation and will be comparing those values with the same vital rates recorded for a set of control plants in order to determine the response to a reduction in competitive pressure (which is typically provided by regular wildfires, though is often inhibited due to wildfire suppression practices).

Lastly, there was a recent wildfire at one of my study sites, which will allow me to see the immediate effects of fire in this system and incorporate that response into the population model.

Remaining work:

In the upcoming months, I will be creating models of each of the vital rates that incorporate the potential effects of fire history, overtopping vegetation, trampling, and climate conditions (temperature and precipitation), which will allow us to see how these drivers affect present-day populations. Additionally, I will be incorporating data that were collected in the mid-1980s by Cecil Frost of UNC Chapel Hill (then working for the NC Department of Agriculture) and later used to build a population model by Kevin Gross et al. in 1998. These

combined datasets – my own and the one collected by Cecil Frost – will allow me to characterize how *Hudsonia* has responded to over 30 years of rising global temperatures. With these vital rate models, I will develop integral projection models (IPMs) that will be used to explore the long-term population-level effects of human disturbance on *Hudsonia*.

Finally, while the models above will capture the current population dynamics of *Hudsonia*, this species is likely sensitive to future climate change given the significance of wildfire to its life cycle; therefore, I plan to model fire frequency at my study sites under different climate change scenarios and use these different fire regimes to predict the response of *Hudsonia* to the most likely, as well as the best- and worst-case, climate projections.

The ultimate goal of this work is to collaborate with land managers to design management strategies that are best suited to prevent further population declines of mountain golden heather under present-day conditions and to safeguard against future declines under the conditions that this species is likely to inhabit in the future.

I would like to thank the members and leadership of the North Carolina Native Plant Society for their support of this work. Receiving the Tom and Bruce Shinn Grant allowed me to establish and maintain this study over the course of the past few years. This has been critical to my progress in graduate school, yet it is also likely to shape our understanding of mountain golden heather populations and, ideally, will be used to improve the long-term prospects of this rare North Carolina endemic.