

# EFFECT OF HOT SUMMERS IN VERMONT ON TWO-STRIPED GRASSHOPPER (*MELANOPLUS PIVITTATUS*)

LUKAS KEATING, FRANCES HOLDERBY  
UVM DEPT. OF ENVIRONMENTAL STUDIES

## Background

- This summer Northern Vermont experienced a drought, a telltale sign of climate change (Current, 2020). Along with the drought Vermont saw increased heat which led to differing seasonal aspects. One thing that had changed were grasshopper populations. Northern Vermont experienced a thriving Grasshopper population during the intense drought throughout most of the summer season.
- A recent study done on the reproductive rates of different Grasshopper species showed that increased temperature correlated to increased reproductive rates (Begon, 1983). As this was an isolated study, we will attempt to observe this pattern in Vermont.

## Objectives

### • Purpose:

This study aims to highlight the potential for impacts on grasshoppers in response to warming climate trends.

### • Hypothesis:

There is a relationship between hotter and drier temperatures in Vermont and *Melanoplus Pivittatus* populations.

### • Prediction:

We predict that as temperature and dryness increases, grasshopper populations increase. Grasshoppers are known to thrive in said conditions, and those conditions are unusual for Vermont's climate.



Fig. 1: Two-Striped Grasshopper (Murray, 2017)



Fig. 3: Quadrat Sampling (Quadrat, 2020)

## Methods

- Our study will take place in one field in Northern Vermont, over the period of ten consecutive summers. We will use a ten-by-ten-foot quadrat sampling method (Fig. 3) in order to produce a population estimate of Two-Striped Grasshoppers.
- At the end of the field study, we will cross-examine the weather trends in relation to the population estimates that we have gathered.

## Intended Analysis

- As there is one dependent variable (population) and two independent variables (precipitation and temperature), we will perform a regression analysis to explore the possible correlation between variables.

## Expected Benefits, Management Implications or Greater Impact

- As shown in Fig 2, the climate is changing rapidly and bringing forth unknown results. As a result of this study, ecologists will have a better understanding of Vermont's changing climate, and how this will effect various ecosystems across the state. With the knowledge of this study, other areas with similarly changing climates as Vermont will be able to apply the knowledge to their own ecosystems. Farmers in the Midwest and Canada will be able to prepare their crops accordingly based on projected grasshopper populations (Smith, D. & Holmes, N., 1977).

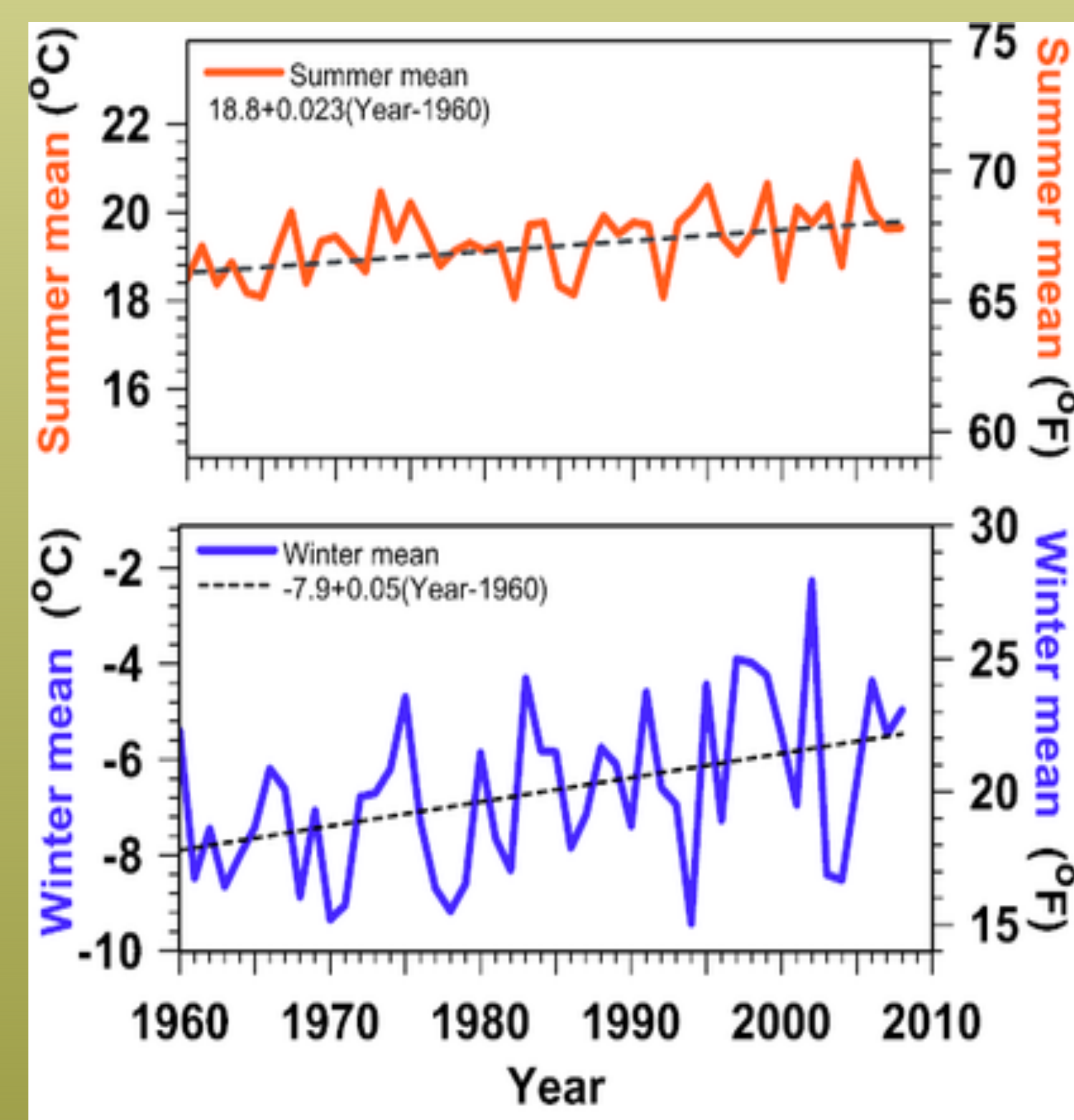


Fig. 2: Temperature trends in Vermont (Betts, 2011)

### Literature cited:

Begon, Michael. "Grasshopper Populations and Weather: the Effects of Insolation on Chorthippus Brunneus." *Ecological Entomology*, vol. 8, no. 4, Nov. 1983, doi:https://doi.org/10.1111/j.1365-2311.1983.tb00516.x.  
Betts, A. K., 2011: Vermont Climate Change Indicators. *Wea. Climate Soc.*, 3, 106–115, <https://doi.org/10.1175/2011WCAS1096.1>.  
Current Map. (2020) Retrieved November 27, 2020, from <https://droughtmonitor.unl.edu/CurrentMap/StateDroughtMonitor.aspx?VT>  
Murray, Tom. "Two-Striped Grasshopper - *Melanoplus Bivittatus*." Bug Guide, 31 July 2017, [bugguide.net/node/view/133200](http://bugguide.net/node/view/133200)  
Smith, D., & Holmes, N. (1977). THE DISTRIBUTION AND ABUNDANCE OF ADULT GRASSHOPPERS (ACRIDIDAE) IN CROPS IN ALBERTA, 1918–1975. *The Canadian Entomologist*, 109(4), 575-592. doi:10.4039/Ent109575-4  
Quadrat Results. (2020). Retrieved November 27, 2020, from <https://scienceforshottaz.weebly.com/quadrat-results.html>

### Bibliography:

D. M. Hunter and R. J. Elder . 1999. Rainfall sequences leading to population increases of *Austracris guttulosa* (Walker) (Orthoptera: Acrididae) in arid north-eastern Australia. *Australian Journal of Entomology* 38:204–218.  
Dupigny-Giroux, Lesley-Ann. "Towards Characterizing and Planning for Drought in Vermont." *Journal of the American Water Resources*, vol. 37, no. 3, 8 June 2007, doi: <https://doi.org/10.1111/j.1752-1688.2001.tb05489.x>.  
John L. Capinera, David R. Horton, Geographic Variation in Effects of Weather on Grasshopper Infestation, *Environmental Entomology*, Volume 18, Issue 1, 1 February 1989, Pages 8–14, <https://doi.org/10.1093/ee/18.1.8>