Water Flow and Water Temperature in Lozelle and Dowsville Brooks and Mean Watershed Elevation and Land-Use Versus Mean August Stream Temperature.

Sophia Minter, Emma Jean, and Jeff Robins
Harwood Union High School

Introduction

Lake Champlain and its tributary streams are valuable natural resources. A general question of how climate change will affect the stream ecosystems of Vermont's watersheds is of vital interest. One purpose of this study was to gather baseline data on temperature in Vermont streams. Another purpose was to get experience using the recent technology of data loggers, which use small digital devices to record stream conditions almost continuously, over an extended period of time. Water temperature and stage elevation over time were collected and compared for Lozelle and Dowsville Brooks. The relationship between mean watershed elevation and mean August stream temperature (MAST) was studied using the RACC online data. The relationship between Land use and MAST was investigated at various sites using the RACC online data.

Methods and Materials

All methods were described in more detail in "Independent Projects for High School Students", at http://www.uvm.edu/~epscor/new02/?=node/900
The sample sites used for stream temperature data were on Gold Brook, Munroe Brook, Allen Brook, West Branch Little River Tributary A, Dowsville Brook, Lozelle Brook, Black Creek (Figure 1).

Figure 1. Stream Temperature Sample Locations (map by Katie Chang).

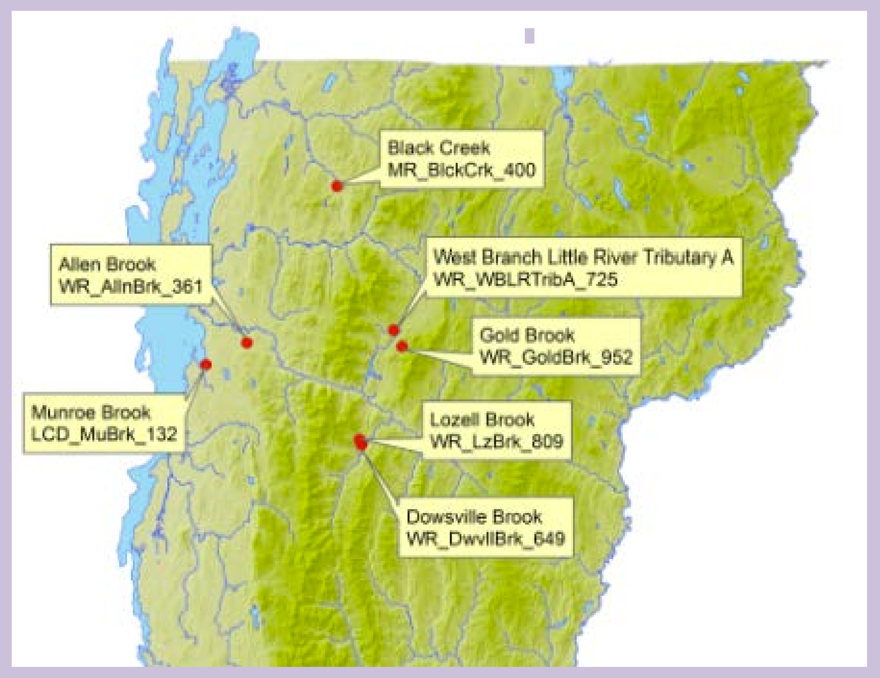
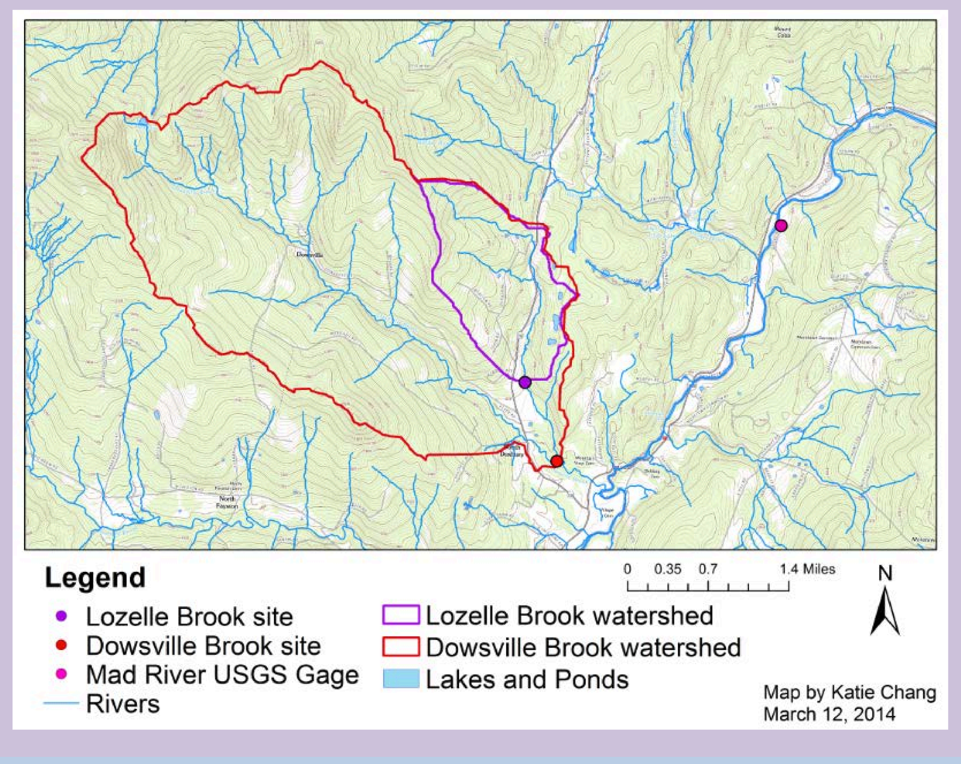


Figure 2. Lozelle and Dowsville Brooks Watersheds and Mad River Stage Monitor.



Results

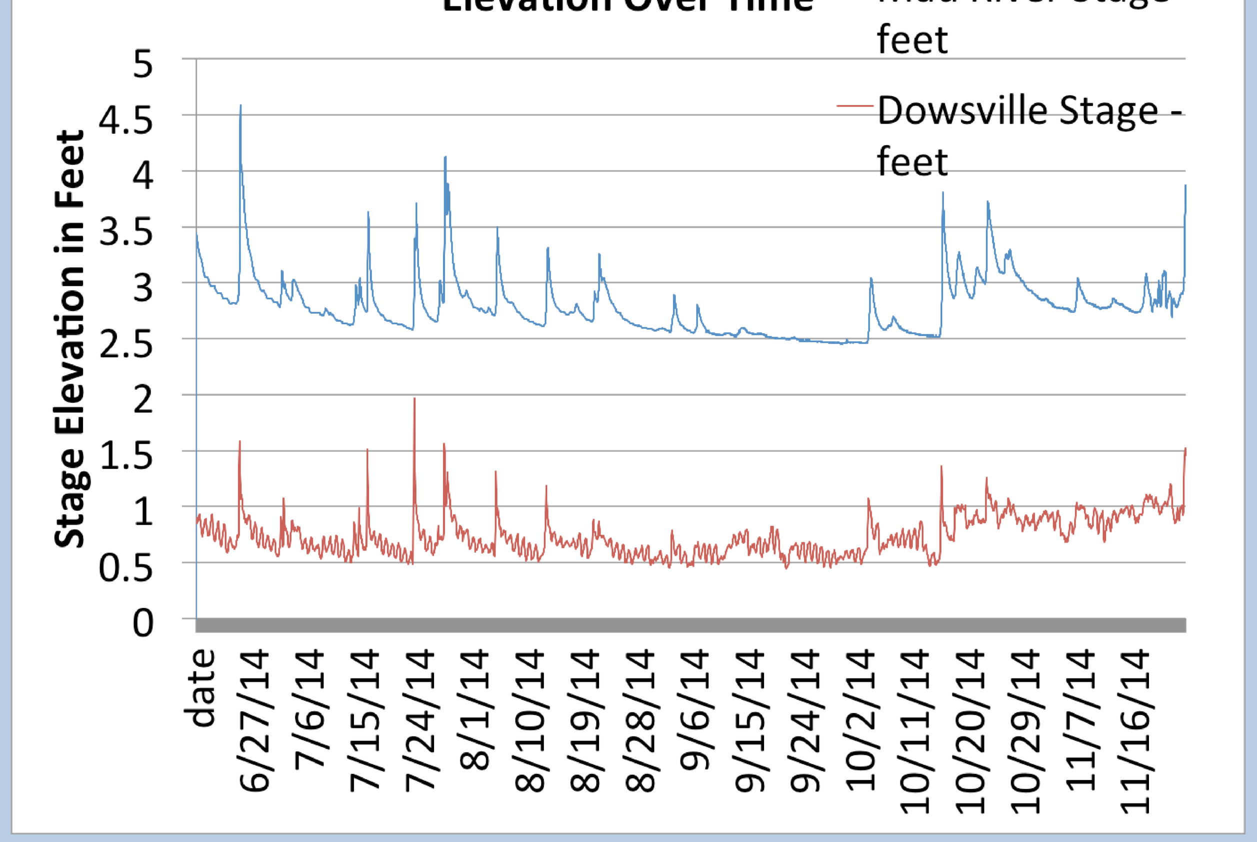


Figure 3. Mad River and Dowsville Brook Stage Elevation Over Time

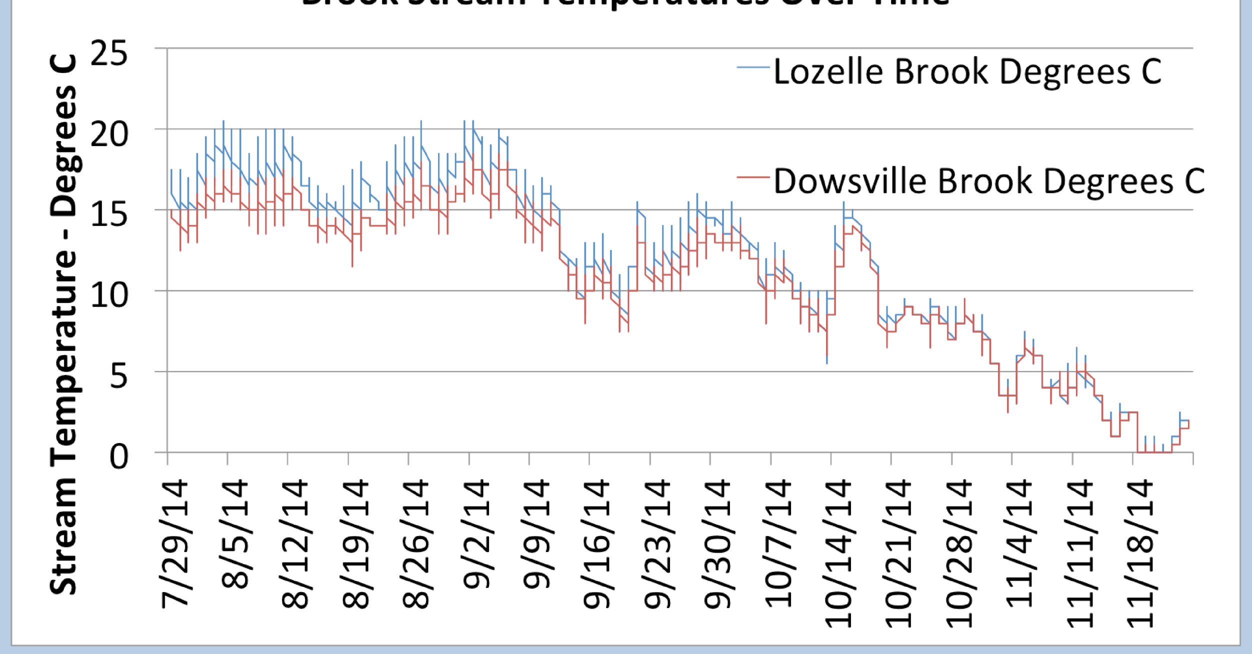


Figure 4 Comparison of Lozelle Brook and Dowsville Brook Stream Temperatures Over Time

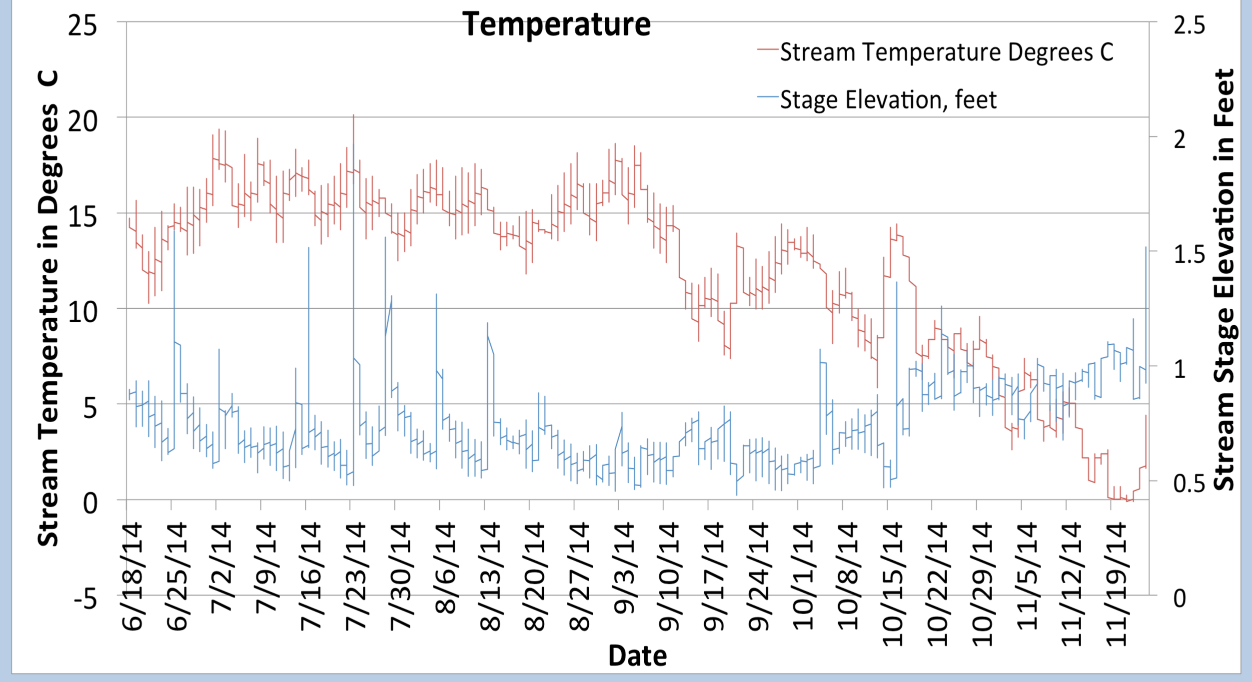


Figure 5. Dowsville Brook - Time Versus Stream Stage Elevation and Temperature

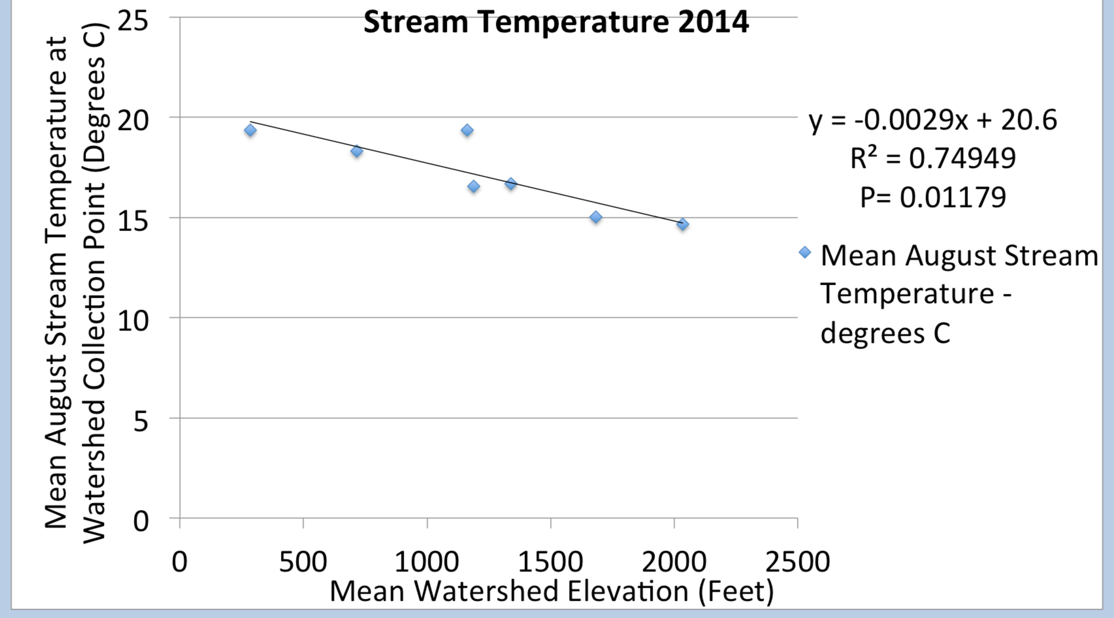


Figure 6. Mean Watershed Elevation Versus Mean August Stream Temperature 2014

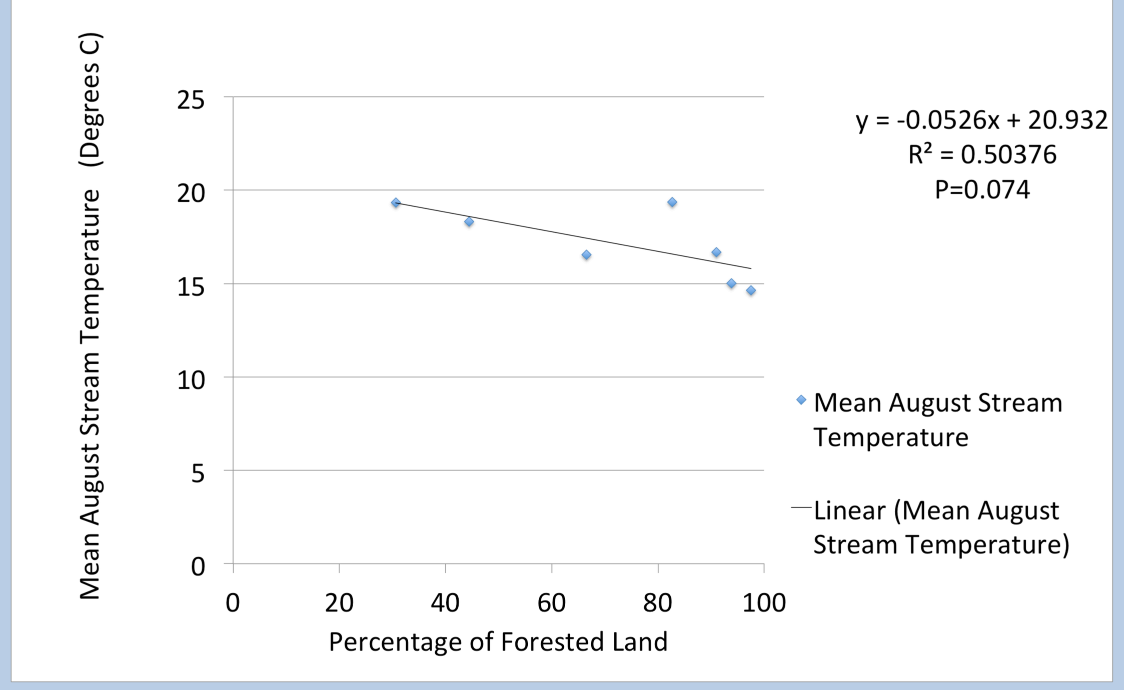


Figure 7. Percent of Forested Land Versus Mean August Stream Temperature - 2014

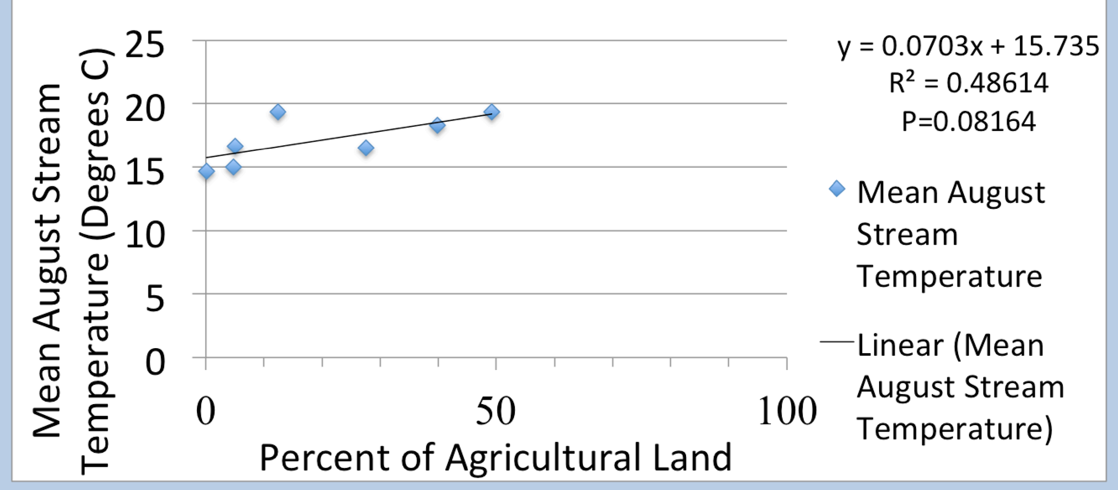


Figure 8. Percentage of Agricultural Land Versus Mean August Stream Temperature 2014

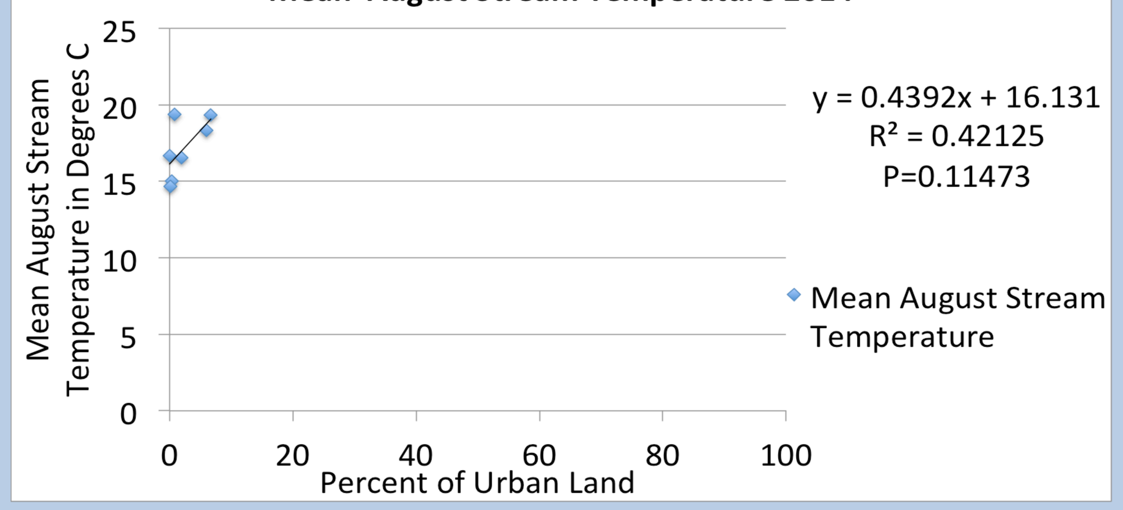


Figure 9. Percent of Urban Land Versus Mean August Stream Temperature 2014

Discussion

Figure 3 - The Dowsville Brook (DB) water level sensor matched well with and was a good predictor for Mad River USGS water level sensor.

Figure 4 - Lozelle Brook (LB) and DB had similar temperature profiles. From late July to early September, LB was 1-3.5°C warmer than DB and its daily temperature cycle of variation was about 3°C compared to about 2°C daily variation for DB. By early-October the stream temperatures were similar and daily variation was about 2°C or less. In the study period, the maximum temperature for LB was 20.5°C and maximum temperature for DB was 18.0°C.

Figure 5 - Often stream temperatures were relatively low immediately following a short-term peak stream flow. Stream temperature appeared to rise following rain events, as the stream elevation declined. Nonstorm-event water level appeared to be slowly decreasing from mid-June to late-September. Nonstorm-event water level appeared to be slightly increasing after early-October, perhaps due to the loss of leaves on the trees, reduced photosynthesis and reduced transpiration.

Figure 6 – As the mean watershed elevation increased, the Mean August Stream Temperature (MAST) at the watershed collection point decreased and was statistically significant (R^2 = 0.74949 and p= 0.01179).

Figure 7 - As percent of Forested Land increased, MAST decreased, but was not statistically significant (R^2 = 0.50376 and p= 0.074).

Figure 8 - As percent of Agricultural Land increased, MAST increased, but was not statistically significant (R^2 = 0.48614 and p= 0.08164).

Figure 9 - As percent of Urban Land increased, MAST increased, but was not statistically significant (R^2 = 0.42125 and p= 0.11473).

Acknowledgements

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