

Philip Simonton

David Dornbos

July 26, 2016

### Physiological Function of Two Invasive Buckthorn Species in Various Habitats

An invasive species is typically a non-native organism that has the capacity to dominate a habitat displacing native species. What allows invasive species to gain control over an area?

Invasive species have: certain characteristics that natives do not have; no natural enemies, not effected by diseases, can reproduce at high levels and possibly has a strong defense mechanism. These factors make invasive species a large threat to native species.

Common and glossy buckthorn are non-native invasive species prevalent in U.S Midwest. These two shrubs, are a common part of Calvin College's flora. Observed since the 1980's, scientists have noticed that Common buckthorn thrives in sunny areas like open meadows and forest edges whereas Glossy buckthorn is more prevalent in moist shaded areas.

Our research objective is to identify habitat preferences of Common buckthorn and Glossy buckthorn, largely as a function of light intensity, comparing light use efficiency of the buckthorn species with one another, and two native species that co-habiting the same locations, open sun and shaded understory. These results seek to confirm popular understanding of buckthorn habitat preferences and could provide insight about future invasions could be prevented or invaded sites restored.

Results were collected at six locations, half in sun and shaded locations. Each location, contained both buckthorn species, gray dogwood, and hawthorn Net photosynthesis rates were measured using a LI6400-XTR Portable Photosynthesis System through a series of light levels; starting in complete darkness to 2000  $\mu\text{mol m}^{-2} \text{s}^{-1}$ . Expressing net photosynthesis rate as function of light intensity produces a light use efficiency (LUE) curve showing how much potential growth that a specimen can produce at each light level. Significant differences between rates of growth and photosynthetic light use efficiency between Common buckthorn, favoring the sun sites, and Glossy buckthorn, preferring shaded ones. When analyzing the light curves Glossy buckthorn produced a curve significantly different than expected, indicating that it competes very well at low and high light levels, not so strongly at intermediate light intensities. As for the co-habiting native species performance was considerably poorer than natives; gray dogwood especially had a tendency to produces low chlorophyll concentration affecting its ability to do as well. Hawthorn appears to have the greatest ability to compete with the buckthorn species across the range of light intensities, particularly at the high end.

I benefited from this project in many ways, one of which is getting a better understanding of what it would be like to be a researcher as a career option. What I feel I benefited the most from in the project is the relationship I created with Doctor Dornbos. His carefully constructed boundaries allowed me to have my own space while performing the research, at the same time guiding me whenever I needed help.