

Physiological Function of Two Invasive Buckthorn Species Site Various Habitats

Philip Simonton and Dr. David Dornbos, Calvin College, Grand Rapids, Michigan

Introduction

An non-native invasive species an organism that has the capacity to dominate disturbed habitat displacing native species. Common and glossy buckthorn are non-native invasive species prevalent in U.S Midwest and on Calvin campus. Observed since the 1980's, people 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.

The objectives of this project was to

1. Describe the densities of Buckthorn and two Native species and four habitats in Calvin's college.
2. Compare Sun and Shade location
3. Compare LUE, conductivity, transpiration, and VPD of these species in each habitat

Methods

Light Use Efficiency

Net photosynthesis rates were measured using a LI6400-XTR Portable Photosynthesis System from 0 to 2000 $\mu\text{mol m}^{-2} \text{s}^{-1}$. Light use efficiency (LUE) curves measure growth, respiration, and water use efficiency each light level.



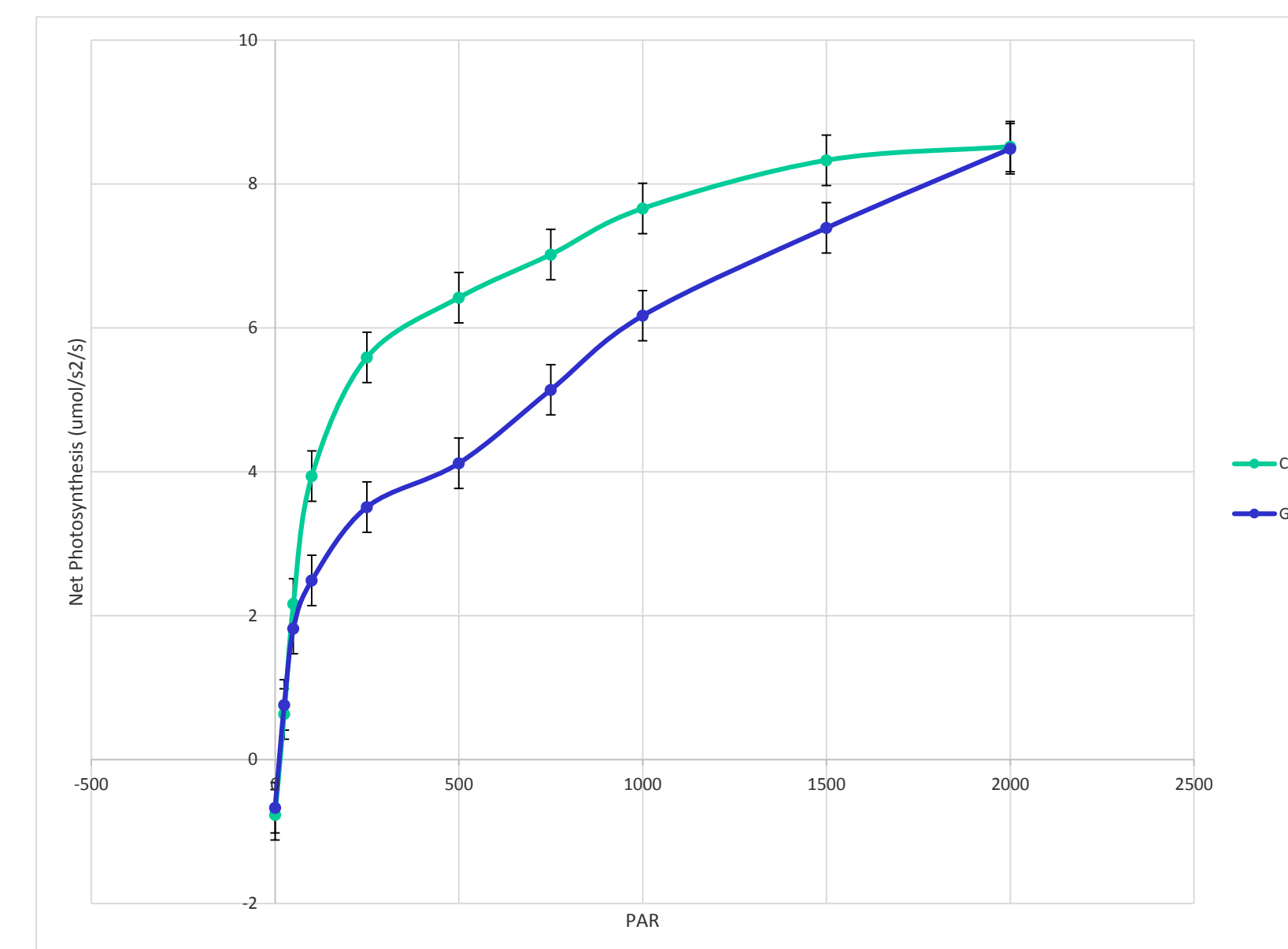
Soil Moisture

Soil water content was collected used a FeildScout TDR 300 soil probe. Average three measurements to these readings give the VWC.

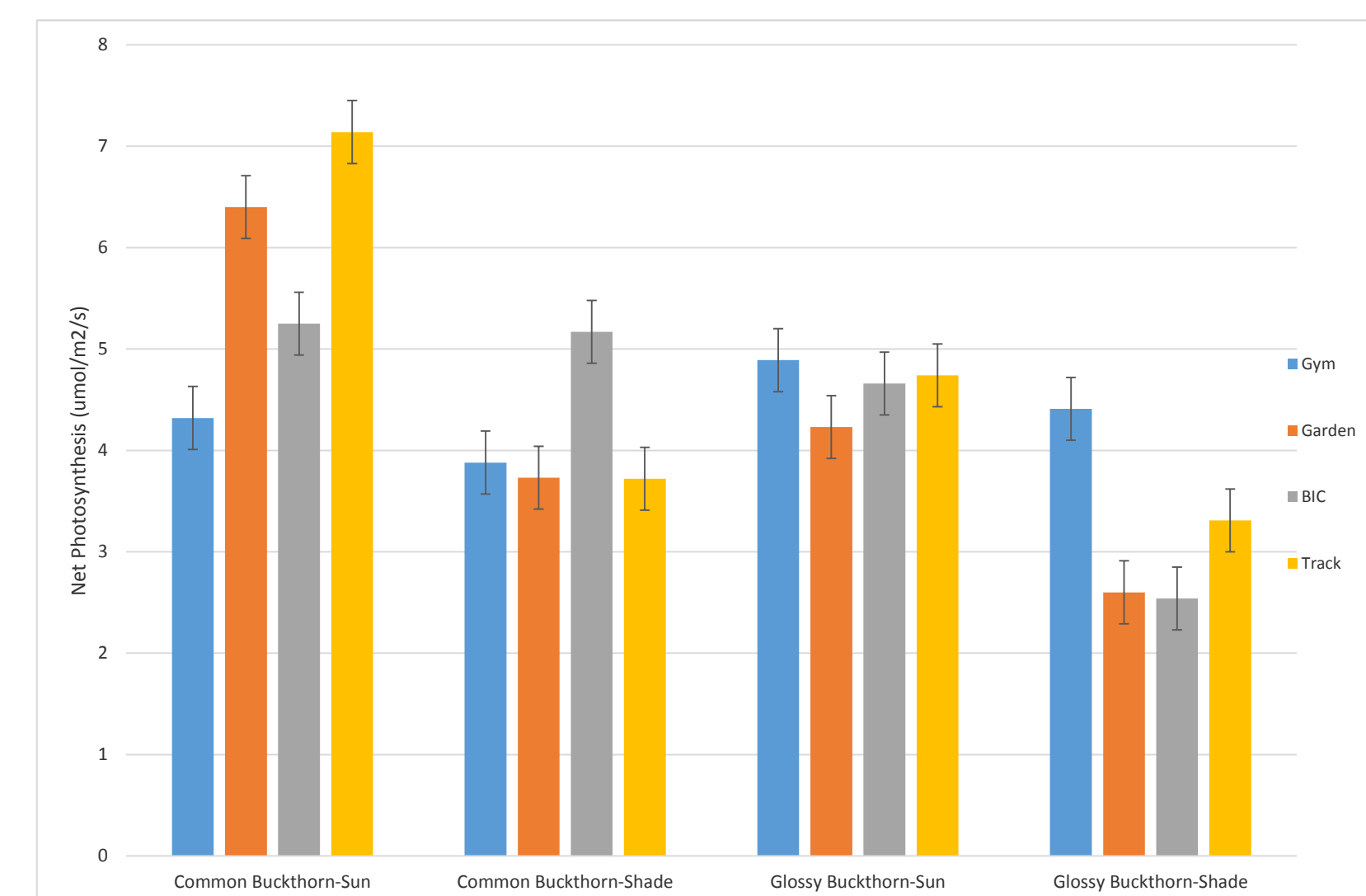


Common vs Glossy

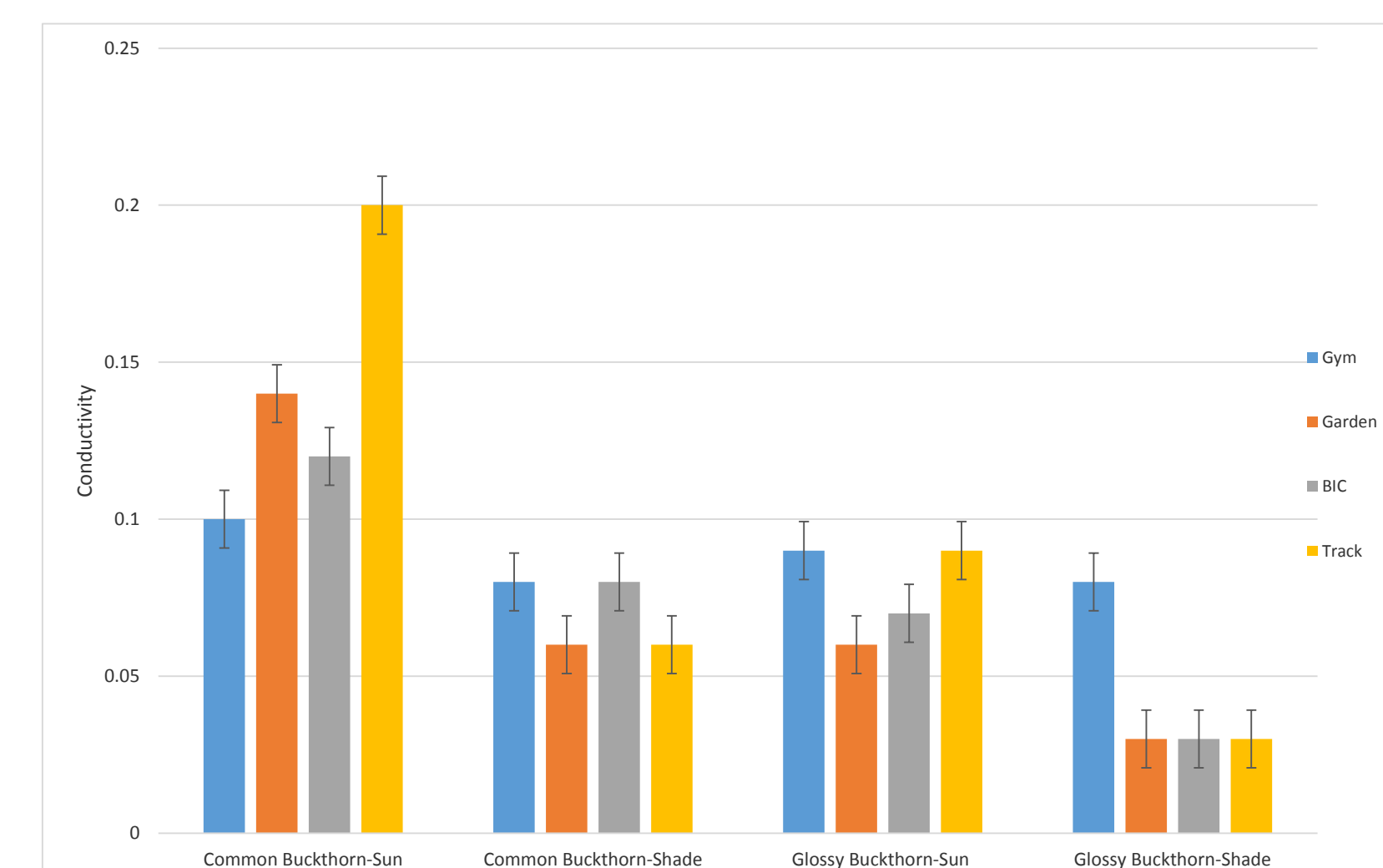
Common Buckthorn is significantly better LUE at the moderate to high light levels. Glossy Buckthorn can only do as well as Common Buckthorn at either low light levels or extremely high light levels.



Common Buckthorn tends to do significantly better in most locations than Glossy Buckthorn.

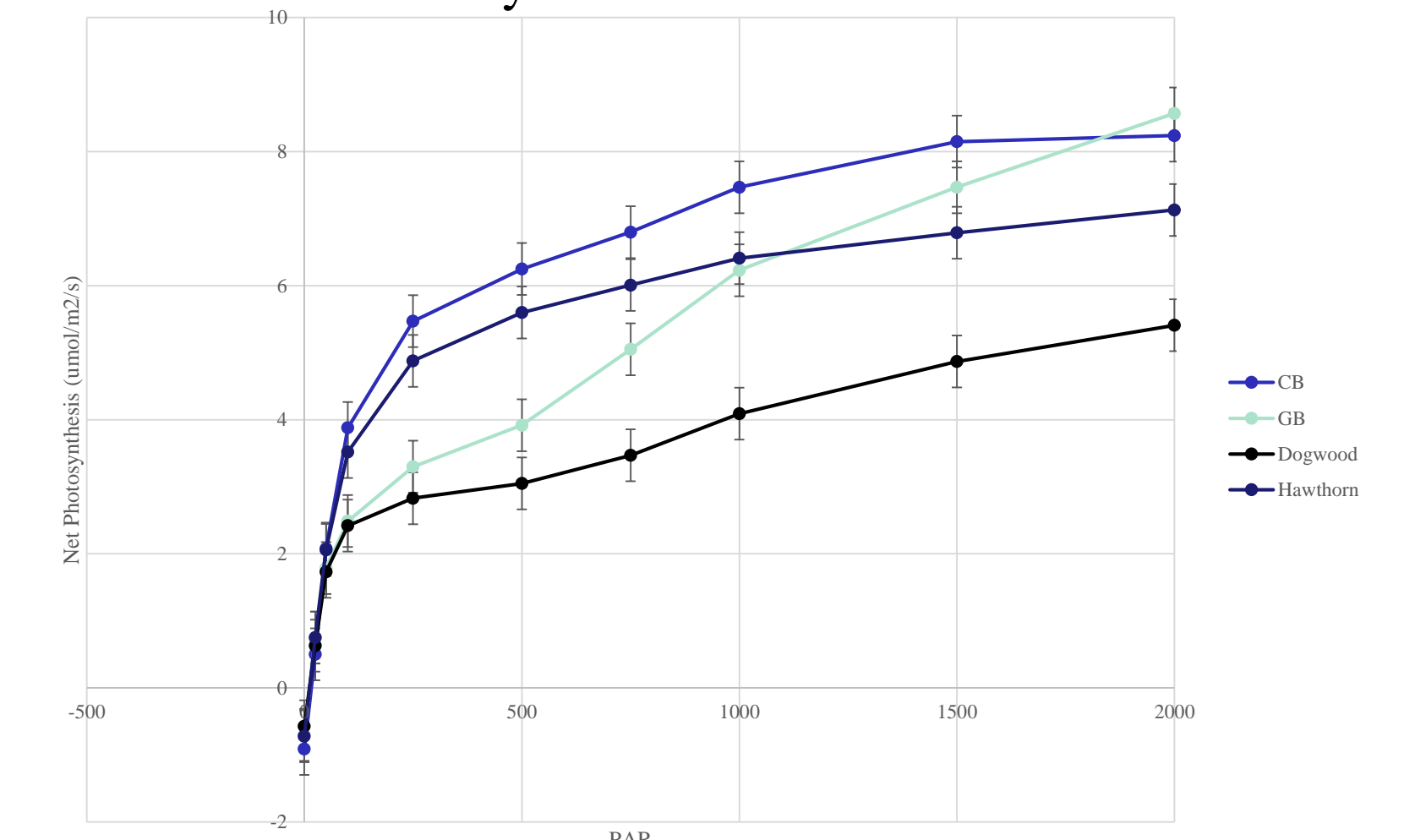


Glossy buckthorn conductivity is significantly lower than Common Buckthorns Sun locations. This advantage allows Common Buckthorn have a leg up on Glossy Buckthorn especially in sunny locations.

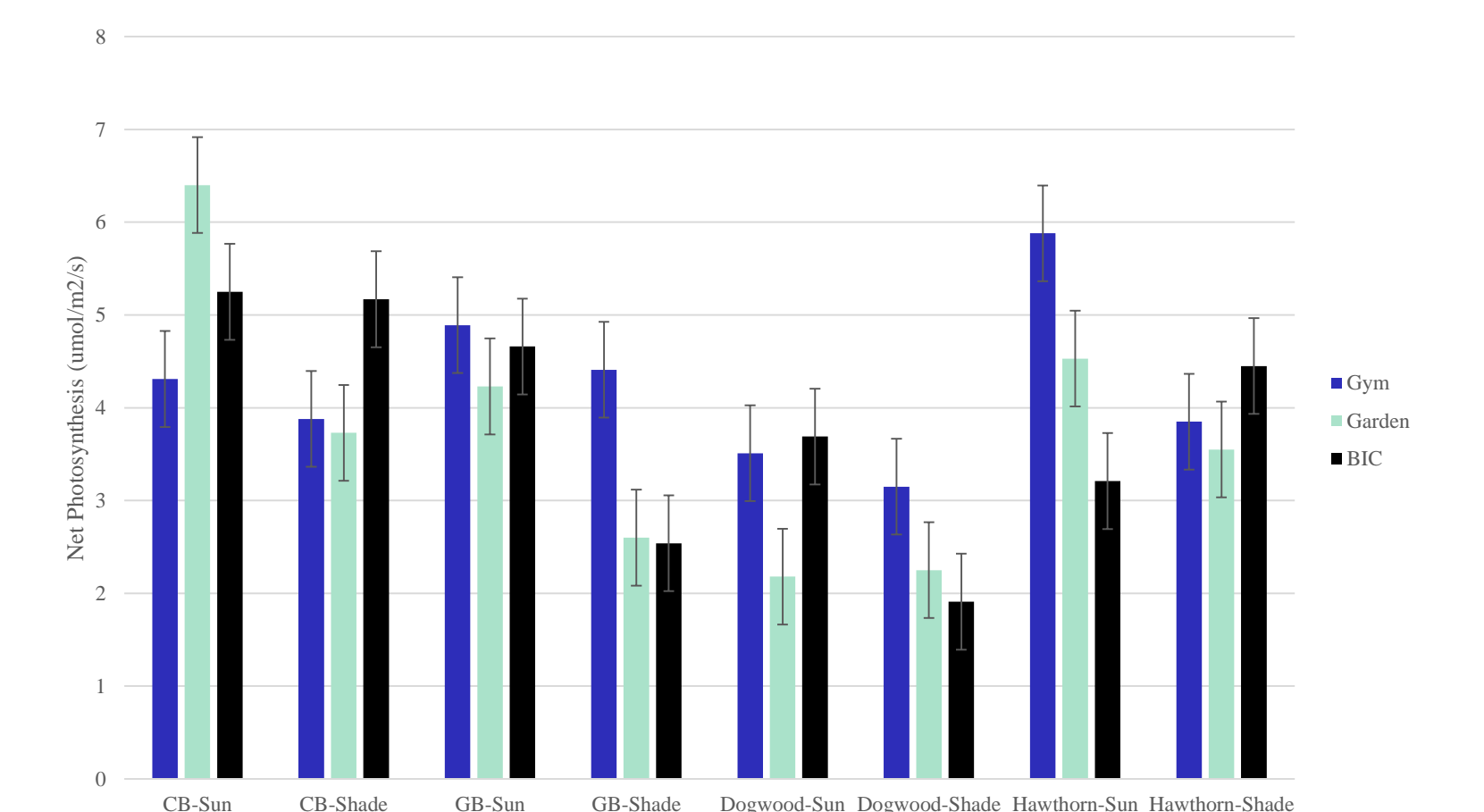


Buckthorn vs Natives

Hawthorn is the best competitor with the Buckthorns, superior to Glossy at lower light levels but eventually at higher light levels loses that advantage. While Dogwood is low along most of the spectrum expect at the lowest light levels where it does stay close with the other species. Glossy Buckthorn has an uncharacteristically curved than the other of the LUE.



Common Buckthorn. Extremely low moisture levels explain why there are low levels of photosynthesis for Common Buckthorn at the Gym site. Hawthorn in the shade is superior than any of the Buckthorns in the shade. Relative to these competitor Dogwood is a weak in competitor both sun and shade.



Conclusions

Common Buckthorn seems to prefer open meadows and the edges of forest where it can get a lot of sun light. It does well their because it opens its stomates, which allows it to collect the energy it needs to grow. Glossy Buckthorn does do better in shaded and moist areas, because of its reservations it has about opening up it's stomates, it brings in a consistently low source of energy. This ability to take in more energy gives Common Buckthorn an edge that allows it to spread more easily.

The native species did not perform as well as the Buckthorns, though in certain areas they did perform as well or better than the Buckthorns. Dogwood did do well in lower light levels, and did perform better in wetter areas. Hawthorn could compete with Glossy buckthorn in sun environments, but not in shaded areas as well.

Methods



- Four locations- sun and shade
 - Four species in each location (except Track)
1. Common Buckthorn
 2. Glossy Buckthorn
 3. Dogwood
 4. Hawthorn

Common vs Glossy

Species	Exposure	Net Photo	Pmax	Respiration	Cond	Trans	WUE	VPD
CB	Sun	5.78	10.32	1.40	0.14	3.61	1.60	2.91
CB	Shade	4.13	6.16	.41	0.072	2.2	1.88	3.09
GB	Sun	4.63	10.45	1.81	0.079	2.3	2.01	3.13
GB	Shade	3.21	6.70	0.54	0.044	1.34	2.40	3.07
SE		0.22	.66	.66	0.005	0.15		0.05
Pr>F		0.46			0.0004	0.0352		0.0008

- The Net photosynthesis of Common Buckthorn is significantly better than that of Glossy buckthorn at either light exposure. With such high Net photosynthesis Common Buckthorn produces more energy than Glossy Buckthorn.
- Common Buckthorn has a lower Water use efficiency than Glossy Buckthorn and other resources that will help it photosynthesize, allowing its stomates to open up more frequently. With open stomates it can take in more resources that will allow it to grow faster.