There are many benefits to designing a biodiverse roof over the typical sedum roof. Biodiverse roofs are more beneficial to native wildlife and can sequester higher rates of carbon than sedum roofs once established. Once established, these roofs can be very resilient. There are several important things to consider when designing a biodiverse roof, including plant selection, ecotype templates, and application methods.

1. Using native plants can serve to preserve and spread rare and native species (Coffman, 2009, Coffman, Cech, & Gettig, 2014). Sedum is widely used on green roofs (Snodgrass & Snodgrass, 2006, Snodgrass & McIntyre, 2011, Dunnett & Kingsbury, 2008), but is not native to Ohio, and does not provide as many benefits to Ohio species.

2. Many prairie species have been shown to thrive on green roofs. A diverse mix of prairie species can provide just as many benefits as sedum once they are established (Sutton et al., 2012). Prairie can be dry, and rocky, with high wind and high sun exposure, just like green roofs. (MacDonagh and Shanstrom, 2015). Other habitats to consider are dunes, rocky beaches, grasslands, savannahs, and many more.

3. Ruderal roofs & Contouring: Contouring is the method of incorporating diverse topographical features to promote biodiversity (Brenneisen, 2006). Seeding can also fill gaps and promote biodiversity on roofs, especially when combined with contouring (Sutton, 2013, MacDonagh and Shanstrom, 2015).

Study 1: Native Green Roof Plants of the Great Lakes

**Question:** What native plants grow on green roofs?
- What plants grow in green roofs in the Great Lakes region?
- What ecotypes can be used in plant selection?

**Method:** Literature review

**Expected outcome:** Plant database selection tool

Using literature review, I am compiling data from Chicago, Minnesota, Cleveland, Connecticut, Surveys, and the USDA plant database. The result will be an excel-based tool that can be used to create starting plant palettes based on design factors such as bloom time, substrate depth, etc.

Study 2: Plant Diversity and Seed Emergence

**Question:** What seeds germinate on green roofs?
- What species are growing from seed in the restoration and horticultural plant communities?
- Are there less plants emerging from seed than in previous years?

**Method:** Data analysis, field data collection

**Expected outcome:** Weeds decrease over time as native plant communities establishes-based on competitive exclusion principle. This portion will consist of analyzing data from PhD student Anna Droz’s native plant study (2015-2018, unpublished). The study collected data on 39 experimental roof plots (Figure 6), with treatments including native plant palettes and a horticultural mix. I will be looking at the weed data collected and comparing the two plot treatments. I will also be collecting new data for the 2020 growing season. I will see if the rate of emerging plants decreases.

Study 3: Installation approaches for biodiversity

**Question:** What are the applications of biodiverse roofs?
- What installation methods promote biodiversity?
- What seeded species germinate best in one growing season?

**Method:** Experiential, Observation
- Learning to lead a project
- Documentation methods such as drone photography, etc.
- Plant count, NDVI photo

**Expected outcome:** Professional lessons learned, potential creation on guidelines, observational data on plant survivability.

This section is a collaboration with the Cleveland Metroparks to design a biodiverse roof on the Cleveland Lakefront. The design may include experimental plots with a variety of substrates and depths to be seeded. The plots will be monitored for germination, species, etc. The goal is to find out what species will germinate in what substrate conditions, and if that relates to the data.

**Schedule**

- **Roof installation:** May 17
- **Observation/data collection (field):** May-August 2020
- **Weekly visits to roof:** Bi-weekly visits to CIC site (study 2)
- **Thesis defense:** January 2021
- **Thesis submission:** December 2020
- **Graduation:** May 2021