



Tri-C Metro – 2016 eXtreme Green Experience

SUSTAINABLE • RENEWABLE • ALTERNATIVE



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A Self-Sustainable Ecosystem Utilizing eXtreme Green Concepts

ABSTRACT

The three most important global resources are water, food, and energy. We investigated using an eXtreme Green solution that can potentially optimize the world's water and food resources. eXtreme Green is a concept originally developed at NASA's GreenLab Research Facility and focuses on combining renewable, alternative, and sustainable techniques. We conducted an 8-week feasibility study optimizing a portable self-sustainable renewable ecosystem by evaluating three plant species (Lima camelina, Salicornia virginica, and Salicornia subterminalis). We used Poecilia species (freshwater Mollies) fish waste as a natural fertilizer to provide essential nutrients for the plants. Our goal is to develop portable self-sustainable renewable ecosystems that can be implemented worldwide. We present the results of our 8-week study, and our recommendations for adapting our ecosystem to future eXtreme Green Concepts.



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FUTURE GOALS

We hope to climatically adapt the entire portable ecosystem to salt water levels. We also hope to have our portable ecosystem replicated and used in STEM classrooms across the United States to promote eXtreme Green concepts.

SAND

Week 1



Sand	pH	Temp
Week 1	7.02	75.4°
Week 2	7.62	73.9°
Week 3	7.64	76.4°
Week 4	7.92	78.5°
Week 5	7.64	78.5°
Week 6	8.12	74.0°
Week 7	8.42	78.0°
Week 8	8.47	76.3°

Week 4



Sand	Phosphate
Week 1	NA
Week 2	0.13 ppm
Week 3	2.5+ ppm
Week 4	2.43 ppm
Week 5	0.66 ppm
Week 6	0.77 ppm
Week 7	0.20 ppm
Week 8	0.13 ppm

Week 8



Sand	Phosphate
Week 1	NA
Week 2	0.13 ppm
Week 3	2.5+ ppm
Week 4	2.43 ppm
Week 5	0.66 ppm
Week 6	0.77 ppm
Week 7	0.20 ppm
Week 8	0.13 ppm

SAND VS. SOIL



Sustainable

The ability of an ecosystem to maintain ecological processes, functions, biodiversity and productivity into the future

Renewable

Energy from natural sources that are naturally replenished (e.g., sunlight, wind, rain, tides)

Alternative

Energy sources that have no undesired consequences and have lower carbon emissions when compared to conventional energy sources (e.g., biomass, wind, solar, geothermal, and hydroelectric)

SOIL

Week 1



Soil	pH	Temp
Week 1	6.89	77.4°
Week 2	7.39	74.6°
Week 3	7.46	76.6°
Week 4	7.85	76.2°
Week 5	7.63	78.5°
Week 6	8.14	75.3°
Week 7	8.37	78.4°
Week 8	8.49	76.4°

Week 4



Soil	Phosphate
Week 1	NA
Week 2	2.5+ ppm
Week 3	24.5 ppm
Week 4	30.0+ ppm
Week 5	30.0+ ppm
Week 6	29.1 ppm
Week 7	27.5 ppm
Week 8	26.3 ppm

Week 8



Soil	Phosphate
Week 1	NA
Week 2	2.5+ ppm
Week 3	24.5 ppm
Week 4	30.0+ ppm
Week 5	30.0+ ppm
Week 6	29.1 ppm
Week 7	27.5 ppm
Week 8	26.3 ppm

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REFERENCES

Bomani McDowell, B. M., Hendricks, R. C., Elbuluk, M., Okon M., Lee, E., Gigante, B. (2011). NASA's GreenLab Research Facility: A Guide for a Self-Sustainable Renewable Energy Ecosystem. NASA Technical Publication (NASA/TP-2011-217208).