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Title: Assessing Macroalgae Farming Under Climate Change

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Assessing Macroalgae Farming Under Climate Change

John Barbish, Dean Price

Mentors: Katrina Bennett, Phil Wolfram

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John Barbish

- **Education – Virginia Tech**

- B.S. Mechanical Engineering, 2018
- B.S. Physics, 2018
- M.S. Mechanical Engineering, 2019

- **Research Interest**

- Nonlinear Dynamics
- Chaotic Systems
- Reduced Order Modeling

Hiking up Blanca Peak

HokieBird in front of Burruss Hall
<https://i0.wp.com/cligs.vt.edu/wp-content/uploads/2016/11/hokiebird-burruss-hall-1.jpg>

Dean Price

Education:

Bachelor of Science in Nuclear Engineering, 2020

University of Illinois, Urbana-Champaign

Research Interests:

- **Criticality Safety**
- **Neutron Transport**
- **Reactor Simulations**

<https://ws.engr.illinois.edu/blogs/viewphoto.aspx?id=21498&.png>

Macroalgae as a Biofuel

- **Sea Kelp, or Macroalgae, is the fastest growing plant on earth [1]**
- **Growth and survival rates depend on environmental factors**
- **Macroalgae farming has been deemed as a reasonable investment for biofuel production**

[1] Reed, D.C., Rassweiler A., Arkema, K.K., 2008. Biomass Rather than Growth Rate Determines Variation in Net Primary Production by Giant Kelp. Ecological Society of America, 89(9), 2008, 2493-2505. <https://doi.org/10.1890/07-1106.1>.

<https://rusticescentuals.com/Sea-Kelp.html>

A Changing Climate

- Most projections see a rise in global temperatures by 2 degrees in a century, this will greatly affect marine conditions
- Difficult to make plans for the future based on data from the past
- This change warrants the need for simulations to predict marine conditions

Historical Simulation

“Business as Usual” Projection

Macroalgae Production on the Coastal US

Variables of Interest

- Water Temperature
- Salinity
- Dissolved Inorganic Nitrate
- pH
- Chlorophyll

The productivity score on the coastal US

Conclusions

- The West Coast is best suited for year round macroalgae farming
- Higher spatial resolution climate models are required to more accurately assess a region's productivity