### **Project Proposal**

# Time-Resolved Analysis of Invasive Species Trends at Candlewood Lake

**Objective**: Analyze historical trends (2007–2020) of invasive species (e.g., Eurasian watermilfoil, minor naiad) while integrating preliminary insights and research on zebra mussel spread.

Visualize these trends dynamically and predict changes for 2025 to support Scuba.Tech’s collaboration with CT DEEP.

### **Scope:**

1. **Data Preparation**:
   1. Organize historical data (2007–2020) on invasive plant occurrence, abundance, depth, and substrate types.
   2. Incorporate known zebra mussel sightings and map their distribution to establish baseline trends.
2. **Visualizations**:
   1. Develop yearly GIS-based maps for invasive plant species and zebra mussel presence.
   2. Create an animated time-series visualization (GIF) showing the spread of invasive plants and zebra mussels over time.
   3. Annotate trends with key events (e.g., drawdowns, grass carp introductions).
3. **Zebra Mussel Research Component**:
   1. Investigate preferred zebra mussel conditions for growth and breeding (e.g., water clarity, calcium-rich substrates, alkalinity, and temperature).
   2. Identify high-risk zones within Candlewood Lake using water chemistry and substrate data.
4. **Predictive Analysis**:
   1. Use statistical models to forecast invasive plant growth and zebra mussel colonization areas for 2025.
   2. Overlay zebra mussel preferences with depth, substrate, and existing invasive species patterns.
5. **Deliverables**:
   1. Animated GIF showing invasive species and zebra mussel trends (2007–2020).
   2. Predictive map for 2025 highlighting invasive spread and zebra mussel hotspots.
   3. Summary report including findings, trends, and **r**ecommendations for monitoring zebra mussel risks.

**Outcome**: This project will deliver actionable insights into the spread of invasive species and the emerging zebra mussel threat, identifying conditions conducive to their growth. Results will support Scuba.Tech’s conservation strategy and inform CT DEEP on priority monitoring zones for 2025.

**Tools**: R, GIS, gganimate, and statistical modeling frameworks.

Resources:

* OAIS GIS: <https://experience.arcgis.com/experience/39f2d565ea304c0aa97335ad2d3c7f0d?org=CAES&views=Instructions-1#data_s=id%3AdataSource_1-191e7884efc-layer-5%3A42>
* CAES Survey (2007-2020): <https://portal.ct.gov/caes/oais/c/candlewood-lake-survey-results>
* CLA Zebra Mussel Status: <https://candlewoodlakeauthority.org/Zebra-Mussels>
* CLA Zebra Mussel Updates (2021+): <https://news.hamlethub.com/new-fairfield-connecticut/48968-candlewood-lake-authority-update-on-zebra-mussels>
* Video update Feb 2021: <https://www.youtube.com/watch?v=ngvsdJP2CXw>
* Video update Mar 2024: <https://www.youtube.com/watch?v=T_oXu4kn_70>

**Timeline**: 2–3 weeks (Winter Break).

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