

## Testing of Flyboard Use at Coventry Lake

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### Description of Experiment

The use of “Jet Articulated Vehicles”, or flyboards, to propel a rider above and through the water is a relatively new activity. Little is known about the potential effects on a lake ecosystem and how to prevent adverse impacts. A review of the apparatus raised several concerns about potential impacts (attached) including:

- The potential to disturb and re-suspend nutrient-rich lake bottom sediments, contributing to increased turbidity, reduced light penetration, nutrient enrichment which could stimulate phytoplankton, and related effects.
- The potential to perturb the summer stratification of the lake, increasing transport of deep nutrient-rich water with high oxygen demand from the hypolimnion to the surface water.
- The potential to cause fragmentation of macrophytes, accelerating the spread of new colonies, especially of invasive species.

Potential impacts to benthic biota, zooplankton, fish habitat (especially cold water habitat) were also identified as a potential ecological concern.

An experiment is outlined in order to gather data and further information regarding potential impacts of flyboard use on Coventry. The described approach would evaluate use of the flyboard for 10 minutes at three depth locations. Underwater surveillance video clips would be taken via SCUBA. Over-bottom temperature and dissolved oxygen would be continuously recorded. Limnological sampling and water quality analysis would be conducted in each of the three depth locations. Cost estimates are provided for professional services and for lab analysis. Lab analyses would be somewhat lower if contracted directly between the UConn CESE Lab and Town, a bit higher lab charges if lab fees are paid by a consultant (both estimates are provided).

The testing would be most informative if conducted during summer stratification (temperature changes would be measurable, providing quantitative information) rather than after Fall turnover (likely to occur end of September). Testing while the lake is well mixed after stratification would still be useful for determining whether sediments are disturbed and water quality effected. Subsequent testing during summer stratification may be needed to determine whether adverse impacts to the thermocline occur if testing in a deep location reveals no sediment disturbance and re-suspension.



## **Attachment- Preliminary Review of Potential Impacts**

Re: Potential Environmental and Ecological Impacts of Water Jet "Flyboards" and similar devices on Lakes:

Per your request, I have done a preliminary investigation into the possible impacts of water jet devices on lake ecosystem structure and function. The devices include apparatus that create a water jet with enough thrust to propel a person into the air and through the water at high velocity. Some of the devices are self-contained, others are tethered to a personal water craft - using the engine to create thrust. The apparatus I've seen can generate 500-700 lbs of thrust (about 3150 N) through water jet nozzles.

The use of these devices is very new, little research has been conducted regarding the risk of injury and physiological effects on users. There are a variety of potential health and safety issues of concern. The risks of injury due to accidental impacts appear to be very significant. Additionally, having been a SCUBA diver since 1973, I believe there are also physiological stresses and risks involved with being propelled upto 30+ ft over and under water rapidly, pressure changes, etc.

There are a variety of potentially very serious environmental and ecological impacts of these water jet devices on lake ecosystems. Like a wave runner or jet ski the devices use a water jet through a nozzle to generate very high thrust. Unlike a jet ski in which the thrust is horizontal, the high thrust of these devices is directed in multiple vector directions- often a downward vector in order to propel the user into the air. That poses very significant potential impacts to a lake ecosystem, including:

Mortality to entrained organisms, such as zooplankton animals, which are not likely to survive the cavitation resulting from the ejection through water jet nozzles.

Sediment resuspension is likely to be a very serious impact in lakes. A water jet directed downward with 500-700 lbs of thrust will undoubtedly cause unconsolidated bottom sediments to be disturbed and suspended into the water column. That would result in significant nutrient enrichment and would likely stimulate phytoplankton growth (probably stimulating Cyanobacteria). My research and development work has included use of downward directed circulation apparatus to expand epilimnetic mixing depth to manage stratified lake ecosystems prone to Cyanobacteria blooms. The thrust of the apparatus I've studied is approximately 30-40 lbs, and creates a significant water flow velocity 20-30 ft from the motor that can scour bottom sediment if directed improperly. A downward thrust of 500-700 lb would undoubtedly disturb bottom sediments in all but the deepest lake locations, mixing it, nutrients, and other sediment constituents into the water column. In lakes where bottom sediments contain other contaminants such as PCBs or Methyl Mercury additional ecological impacts could occur. Lake sediments also exhibit a very high oxygen demand due to the accumulation of anaerobic respiration products. Disturbing and resuspending bottom sediments by a high velocity, high thrust downward water jet can deplete dissolved oxygen in the water column, eliminating aerobic habitat suitable for aquatic organisms.

The substantial downward thrust of nozzle water jets could also impact the summer thermal stratification structure of lakes, "poking a hole in the thermocline" and upwelling nutrient-rich anoxic hypolimnetic water from the tropholytic zone into the surface trophogenic zone where phytoplanktonic productivity occurs. That could stimulate eutrophication, increased algae growth, and Cyanobacteria.