ENVIRONMENTAL
Fact Sheet

NEW HAMPSHIRE DEPARTMENT OF Environmental Services

29 Hazen Drive, Concord, New Hampshire 03301 • (603) 271-3503 • www.des.nh.gov

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Lake Drawdown for Aquatic Plant Control

Lake level drawdown and the subsequent exposure of sediments to prolonged freezing and/or drying is an inexpensive means to attempt aquatic plant control. Drawdowns may stress plants and could physically remove them from their habitat due to ice scouring. Low water levels will expose the plants to desiccation and could ultimately affect plant vascular structure, thereby rendering the plant incapable of nutrient transport and function. This can temporarily reduce plant density for an undetermined period of time.

While being an economical means of plant control, lake drawdown is also rather unpredictable, and may cause some species to actually increase in abundance, or not affect some target species at all. Further, draining the water from an aquatic system can be detrimental to non-target organisms in the lake basin.

Factors Necessary to Increase Potential for Drawdown Success

Several factors are necessary to increase the potential for drawdown success. The amount and degree of the drawdown are probably the foremost important factors to consider. Most importantly, the capability to draw down the lake to a level suitable to maximize the exposed littoral zone is necessary.

Fall/winter drawdowns are conducted in New Hampshire from October through early spring. The length of winter drawdown is based on ice and snow cover, water uses and expected water renewal rates. It is imperative that the water level be brought down slowly, in order to allow for aquatic fauna (like mollusks and amphibians) to adapt to the changing water levels. It is also important that the lake be brought back to normal full-lake levels before the summer season begins for a variety of reasons, including ecological, recreational and aesthetic purposes, and for keeping terrestrial species from encroaching on the lake bed. Water level fluctuations should always be coordinated through the NHDES Dam Bureau (hearings and approvals may be needed) and in consultation with the NHDES Biology Section.

Fall/winter drawdowns can be beneficial in that some desiccation takes place as the waterbody is dewatering, but thorough freezing of the plants and the lake sediments is the key. Freezing of the plants can damage the structure and integrity of the vegetative material. Freezing of the lake sediments can impact rooting systems and rhizomes by freeze damage, scouring and subsequent uplifting of the rooting systems. Scouring action of ice moving over the exposed lakebed may force tubers and rooting systems from the substrate. When the water level is again

raised, these anchoring plant structures will often float downstream and discharge through the lake basin, or they can be hand-removed as they float around.

Adverse Impacts of Drawdown

Though drawdowns may be a relatively low-cost technique to reduce the abundance of some littoral zone aquatic macrophytes, there may be several unanticipated problems associated with drawdowns.

Large amounts of aquatic plants and organisms that succumb to the drawdown begin to decay shortly after drawdown but nutrient release to the waterbody may not occur until full-pond level is achieved. Nutrients released from decayed material will quickly be utilized by algae and cyanobacteria, leading to increased cell production. Waterbodies, particularly shallow systems, tend to maintain a balance between macrophyte and algal growth. Once plant populations diminish, the degree of nutrient competition in the waterbody favors increased algal populations due to their ability to quickly uptake available nutrients. Shallow lakes have shown shifts from clear, plant-dominated conditions to turbid, algal dominated systems following a drawdown.

Algal or cyanobacteria blooms may follow a drawdown. Cyanobacteria blooms may be toxic, while an increase of green filamentous algae may decrease aesthetic values of the waterbody. Planktonic blooms of cyanobacteria typically turn the water a bluish or greenish color, while filamentous algae blooms form large green billowing masses in the shallows. Other algae may also bloom, causing taste and/or odor problems.

Aquatic food web changes may result in shifts in plant and animal structure due to drawdown. Impacts to organisms lower in the food web (plants, algae and insects) will have negative impacts on those organisms higher in the aquatic food web (fish, animals and waterfowl).

Oxygen concentrations throughout the water column may be impacted by the drawdown. As bacteria further decompose the accumulated detritus, they create an oxygen demand to the water. During summer stratification, hypolimnetic oxygen levels and even mid-thermocline oxygen levels may be dramatically reduced, resulting in large-scale fish kills.

The difficulty of achieving complete sediment dewatering in target areas of the waterbody is also a potential problem. Physical constraints due to dam construction, underground springs, weather conditions and inflowing water may limit the degree of drawdown, lessening the expected range of impacts to the littoral zone.

Changes in the bottom sediment may also occur as a result of drawdown. Softer sediments may become compacted or frozen segments that are now lighter than water could loosen and float around in large masses or as floating islands in the waterbody, only to settle once again in a new location. Several notable drawdowns resulted in the formation of floating islands that settled at the public access, blocking all ingress and egress. These are extremely difficult to move or remove, and a Wetlands Permit would be necessary for any removal activities.

Impacts to, and even mortality of, aquatic animal species is a big risk during drawdown. The impacts may result from leaving animals stranded ‘in the dry’ as a result of drawdown, or could involve more complex impacts that result from modifications in the food chain or various stressors associated with the drawdown. Many organisms that make their home in the aquatic environment, including fish, frogs, salamanders, turtles, aquatic insect larvae, mussels and others can all feel the impacts of drawdown. Agile and faster moving organisms (like fish) may be able to move upstream or downstream to other unimpacted habitats; still, these fish may be confined to smaller, shallower areas where they become easy prey to consumers or suffer from oxygen deprivation. Slower moving, more sedentary organisms have a greater risk to negative impacts. Freshwater mussels, snails, insects and crayfish may not be able to find suitable habitat, and may succumb to the drawdown.

Finally, there may also be a long-term change in plant species composition from “drawdown-susceptible” plants to “drawdown-resistant” plants. Several studies show that annual drawdowns can actually influence the growth of these resistant plant species.

A study of lake drawdown conducted by Dennis Cooke (1980) found that various aquatic plants responded differently to drawdown.

Summary of Winter Drawdown Study Findings (Cooke, 1980)

Decrease in Abundance	Increase in Abundance	No Change
Watershield (*Brasenia*)	Bulrush (*Scirpus*)	Bladderwort (*Utricularia*)
Pondweed (*Potamogeton*)	Arrowhead (*Sagittaria*)	Bur-reed (*Sparganium*)
Yellow water lily (*Nuphar*)	3-way sedge (*Dulichium*)	Tape grass (*Vallisneria*)
White water lily (*Nymphea*)		
Spike rush (*Eleocharis*)		
Water milfoil (*Myriophyllum spp*)		
Pickerelweed (*Pontedaria*)		

Summary

Water level drawdown may be an effective technique for at least the short-term control of susceptible aquatic plants, and can be accomplished at low costs without the introduction of chemicals or machinery. However, this technique may or may not affect target species with a predictable outcome; it requires careful identification of the target plants before drawdown to avoid rapid establishment of resistant species, and it could have long-lasting effects on non-target biota like freshwater mussels, macroinvertebrate populations, the fishery and other organisms.

For More Information

Form more information about lake drawdowns, please see https://www.des.nh.gov/.