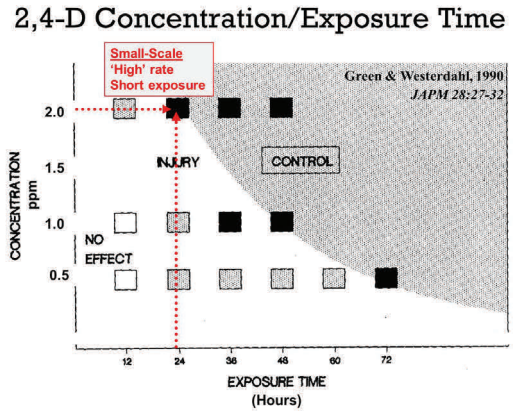
SMALL-SCALE HERBICIDE TREATMENTS FOR CONTROL OF INVASIVE AQUATIC PLANTS

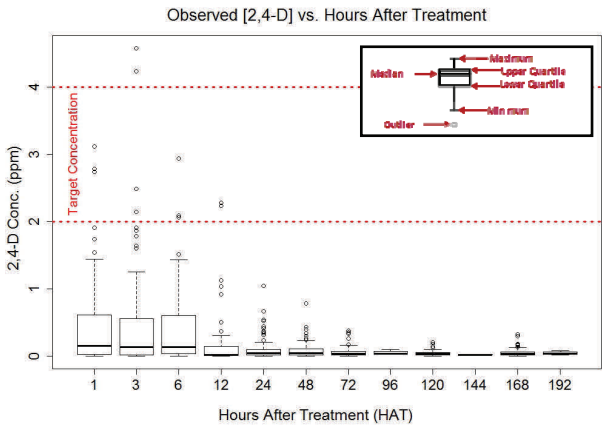
The Wisconsin Department of Natural Resources and U.S. Army Corps of Engineers have been evaluating small-scale herbicide treatments for managing invasive aquatic plants. Monitoring of 2,4-D applications for control of Eurasian watermilfoil (EWM) and endothall for curly-leaf pondweed (CLP) are ongoing, and preliminary information is already available regarding large-scale applications[1,2]. This fact sheet summarizes what researchers have learned so far from monitoring herbicide concentrations following small-scale treatments.

Concentration and exposure times of 2,4-D required for effective EWM control have been studied in the laboratory.



Treatments targeting small areas typically use higher rates of herbicide, since exposure time with the plants will be short. Recommended 2,4-D label rates for a small-scale treatment range from 2 to 4 parts per million (ppm), and based upon laboratory studies, require 12-24 hours of contact time to control EWM effectively.

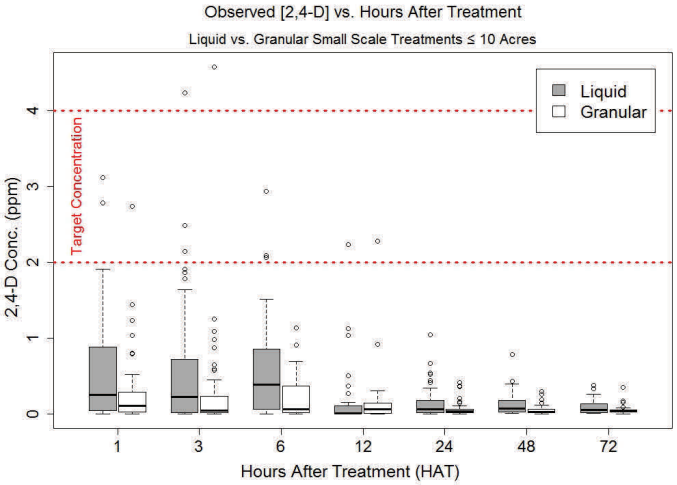
Herbicides can dissipate off of a small treatment site very rapidly.



This graph shows 2,4-D dissipation measured over hours after treatment (HAT) after it was applied to 98 small (0.1-10 acre) treatment areas across 22 study lakes with application rates of 2-4 ppm.

- Initial 2,4-D concentrations detected in the water column were well below application targets.
- Herbicide moved quickly away from treatment sites within a few hours after treatment.
- The rapid dissipation of herbicide indicates that the concentrations in target areas may be lower than what is needed for effective EWM control.

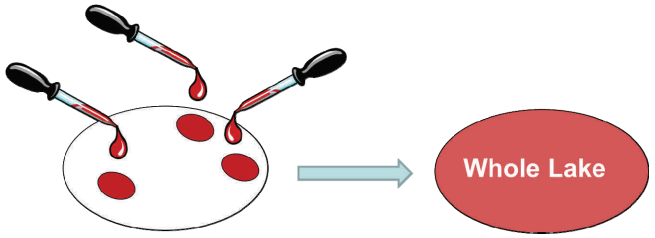
Granular and liquid formulations dissipate similarly when applied at a small-scale.



This graph shows the concentrations of granular and liquid 2,4-D detected in the water column after small-scale treatments with application rates of 2-4 ppm.

- Initial concentrations (1-6 HAT) were higher with liquid formulations, however, both formulations dissipated quickly from the treatment area.
- Under most conditions, concentrations of 2,4-D were below detectable limits by 24 HAT.
- Attaining target concentrations and maintaining exposure times required for control is more difficult to achieve in small-scale treatments.
- Dissipation is affected by multiple factors such as treatment size and location, wind, and water flow.

Treatment of many small-scale areas on a lake may result in cumulative lake-wide effects due to rapid dissipation and dilution off multiple sites.



If the volume of all waters treated is more than 5% of the volume of the waterbody, impacts may be expected at a whole-lake scale.

[1]Nault et al. 2012. Herbicide treatments in Wisconsin lakes. *LakeLine* 32:1-5.
[2]Nault et al. 2014. Efficacy, selectivity, and herbicide concentrations following a whole-lake 2,4-D application targeting Eurasian watermilfoil in two adjacent northern Wisconsin lakes. *Lake and Reservoir Management* 30:1-10.

SMALL-SCALE TREATMENT RESULTS

Effects on Target Invasives

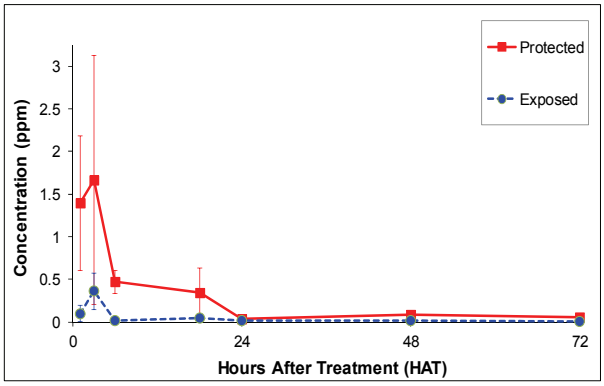
Short-term EWM and CLP control using small-scale treatments is variable and not predictable due to many different environmental factors contributing to outcomes.

- The chemical producers of endothall have provided guidance that targeted treatment areas be greater than 5 acres for effective CLP control.
- Similar treatment size limitations may be appropriate for other aquatic herbicides.

Long-term EWM or CLP control using small-scale treatments is not well studied.

- EWM or CLP may undergo short-term seasonal injury, however the entire plant may not be completely killed and may rebound later in the growing season or the following year.
- Interannual and spatial variation observed in EWM and CLP populations can further confound analysis of long-term control .
- CLP control may require multiple years of treatments in order to deplete the winter bud (turion) bank.

Spatial location of treatment areas may affect the rate of herbicide dissipation.



This graph shows that the average concentrations observed in protected areas (such as enclosed bays or channels) were initially higher than those observed in exposed open water areas, which are more susceptible to waves and water movement.

Effects on Native Plants

Short- and long-term, non-target impacts on native plants are not well-studied.

- Native aquatic plant data are more difficult to collect and analyze in small-scale treatments.
- Success of EWM or CLP management is dependent on native plant populations recovering at least as fast as, or faster than, the recovery of the invasives following treatment.

Timing of Invasive Plant Control

Conducting chemical treatments in early spring allows for targeting of exotic species while minimizing adverse, non-target impacts.

- Newly emerging invasive species are small and most vulnerable to herbicides, while many native plant species are still dormant.
- Treating while plant biomass is low minimizes decomposition, which prevents reductions in water quality such as dissolved oxygen declines, algae blooms, and reduced water clarity.
- Cool water temperatures result in slower microbial degradation of herbicides.

Planning Invasive Plant Control

Decisions regarding control of AIS need to be evaluated relative to overall lake management goals.

- EWM or CLP eradication is more than likely unrealistic and an up-to-date lake management plan with clearly outlined goals can help guide management decisions.
- Management plans should consider other non-chemical control strategies (such as handpulling, biocontrol, or mechanical harvesting) as potential alternatives or to augment chemical strategies.
- Collecting good quality data is essential to assess and potentially revise management techniques.

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PRINTED ON RECYCLED PAPER

Miscellaneous Publication PUB-SS-1143 2014