NUTRIENT MANAGEMENT

Nutrient Inactivation

STRATEGY SCALE

THREATS ADDRESSED

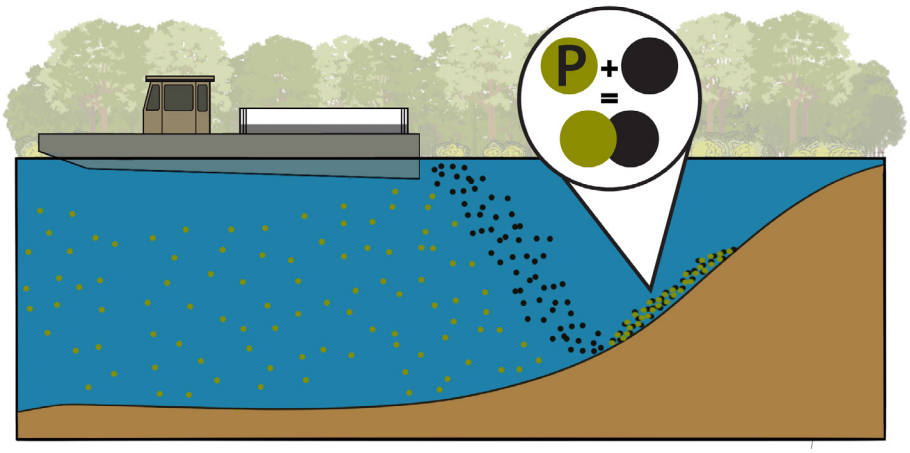
- ✓ Excess Nutrients
- ✗ Pollutant Inputs
- ✓ Algal Blooms
- ✗ Erosion
- ✗ Invasive/Nuisance Species

STRATEGY GOALS

Protect	Manage	Rehabilitate
○	✓	✓

STRATEGY CO-BENEFITS

Habitat	Aesthetics	Recreation
⊖ Neutral	⊖ Neutral	⊖ Neutral



- ✓ **Permittable in Massachusetts**
  Local review through the Conservation Commission required. List of potential permits available here.
- ✓ **Implemented on Cape Cod**
  See examples of pond projects implemented on Cape Cod here.
- ✗ **Listed in 208 Plan Technologies Matrix**
  Learn more about the nutrient management strategies in the Tech Matrix here.
- ✓ **Can be Performed at Homeowner Scale**
  In small, private ponds. Local review and permitting may be required.
- ✗ **Nature-based Solution**

DURATION OF BENEFITS

Less than one month	One season or year	Multiple seasons or years
○	○	●

MAINTENANCE REQUIREMENTS

Monthly	Annually	Infrequent
○	○	●

DESCRIPTION Nutrient inactivation involves the use of phosphorus-complexing compounds, especially aluminum sulfate (alum), to mitigate excess phosphorus in ponds by converting mobile forms of sediment phosphorus into more stable/inactive forms. There are several different approaches to phosphorus inactivation. Water column phosphorus stripping uses a low dose of alum to strip an active algae bloom and phosphorus in the water column; maintenance is a seasonal low dose treatment on a recurring basis to remove phosphorus; sediment dosing is a high dose treatment targeted at reducing release of phosphorus from the sediment; and dosing stations are alum injections targeted at reducing an influx of phosphorus from a known surface source. These actions reduce phosphorus concentrations in the water or sediment and often result in decreased algae levels and increased water clarity. Other materials such as polyacrylamide, forms of iron, bentonite, clay powder and modified clays (e.g. Phoslock) may also be used to bind with and inactivate phosphorus. Inactivation of other nutrients (e.g., nitrogen) is not as well studied.

ADVANTAGES

- Provides rapid removal or inactivation of available phosphorus from the water column or sediment
- Good for lakes with low or no external phosphorus load and high internal phosphorus load (release from sediment) and high natural alkalinity to provide pH buffering
- Relative low cost per unit phosphorus (as low as a few hundred dollars per kg phosphorus removed)
- Addresses typical cause of cyanobacteria dominance (excess phosphorus)
- Works quickly and can be effective for extended periods of time (months for low dose and years for high dose)

CONSTRAINTS

- Need to know the source or reservoir of phosphorus
- Reapplication interval will depend on dose, whether target is sediment or water column phosphorus, and level of external loading of phosphorus
- Limited duration of effect if external loading is significant - benefits may be short-lived if external nutrient sources are not "turned off"
- Potential for elevated aluminum levels and low pH which may adversely impact aquatic life if proper dosing/buffering not used
- The toxic effects of dissolved aluminum on non-algal, aquatic organisms and humans are not well documented
- If not well-designed or monitored, may result in non-target species impacts (typically at higher doses)
- Time of year issues may need to be considered (e.g., if herring present)

Nutrient Inactivation

CAPE COD COMMISSION

IMPLEMENTATION

POTENTIAL ACTORS

- **Towns:** Towns may propose nutrient inactivation in town-managed ponds
- **Pond Groups:** May propose nutrient inactivation in public or private ponds and provide a supportive role through education
- **Private Landowners:** May propose nutrient inactivation in private ponds
- **Land Trusts:** Land trusts may provide a supportive role through education

SITING REQUIREMENTS

- Most effective for deeper ponds with high internal versus external phosphorus loading
- Deeper ponds with stable thermal stratification
- Used primarily on lakes with significant internal nutrient loading and where the external nutrient loads have been reduced as much as possible
- Poorly buffered lakes may not be good candidates for alum addition
- Access/launch site for dosing vessel and an area for chemical storage accessible for tanker truck deliveries

INFORMATION NEEDS

- Nutrient (total phosphorus) loading, pH and alkalinity analyses
- Dosing study and sediment coring to account for site constraints and determine appropriate dosing/buffering to minimize impacts to aquatic life
- Survey of potentially sensitive populations

IMPLEMENTATION EXAMPLES

Multiple nutrient inactivation projects have been implemented on Cape Cod as identified in the *Pond Restoration Projects Viewer* and as reviewed in *"Aluminum treatments to control internal phosphorus loading in lakes on Cape Cod, Massachusetts."*

- Cape ponds treated include: Great Pond and Herring Pond, Eastham; Cliff Pond and Upper Mill Pond, Brewster; Uncle Harvey's Pond, Orleans; Lovers Lake and Stillwater Pond, Chatham; Hinckleys and Skinequit Pond, Harwich; Long Pond, Brewster/Harwich; Hamblin, Mystic, Lovells, and Shubael Ponds, Barnstable; Ashumet Pond, Mashpee/Falmouth.

RESOURCES

- For more information on the use of aluminum treatment to control phosphorus in lakes and ponds, see the *North American Lake Management Society's Alum Position Statement*
- The Massachusetts' Department of Conservation and Recreation's *Lakes and Ponds Program* provides related resources.

COST ESTIMATE

**$$**$$

Relative to other in-pond strategies

Varies by dose, treatment area, and price of products used

ADDITIONAL FINANCIAL CONSIDERATIONS

Assessment: Planning, design, and permitting, including required studies (e.g., dosing studies)

Implementation: Equipment and supplies

Maintenance: Monitoring, reapplication, as needed

POTENTIAL FUNDING SOURCES

- **Community Preservation Act**
- **Capital Budget**
- **Grants**
- **Private Funding**

Additional information regarding potential funding sources is available ***here***.