

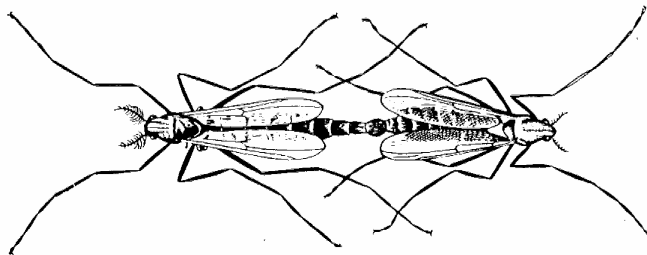
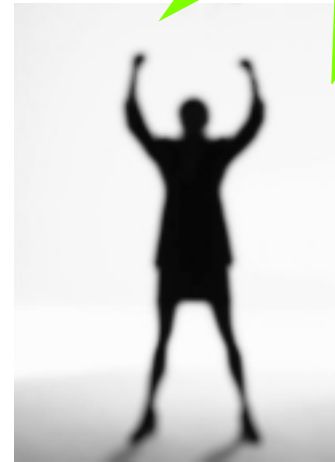


Presentation to

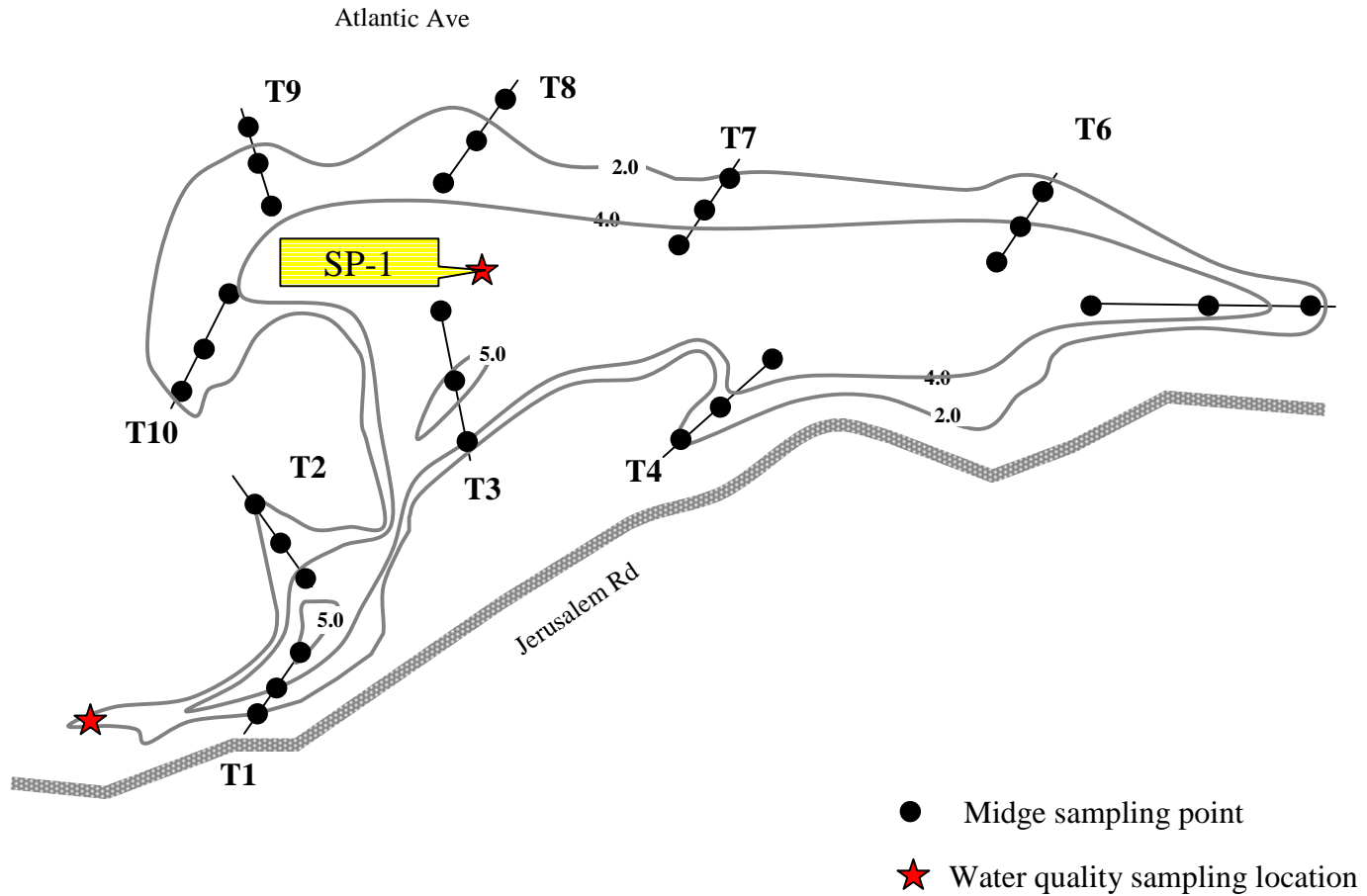
Straits Pond Area
Residents
Hull and Cohasset, MA

ESS Midge and Plant Studies at Straits Pond

- Looked at historic studies of pond
- Mapped aquatic plant beds
- Monitored water quality
- Collected/analyzed midge population data from 2001-2003
- Analyzed trends
- Designed stormwater BMPs in two sub-basins

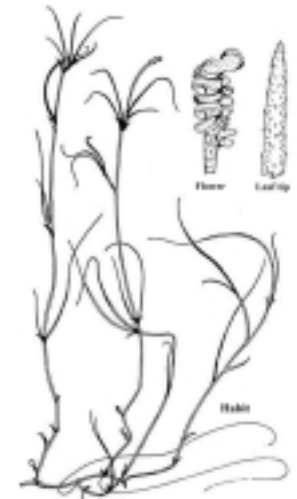


Transect/Sample Locations

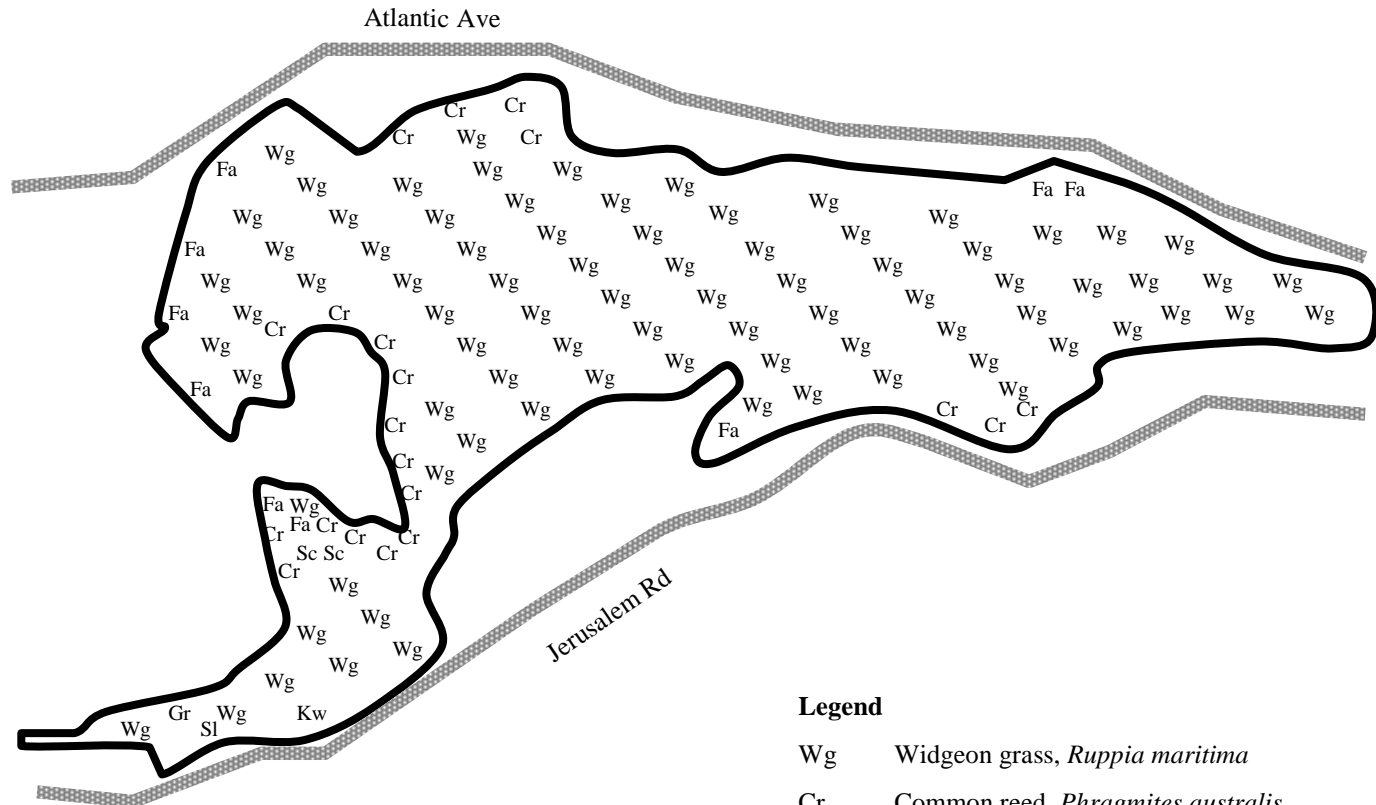


Aquatic Plant Mapping

- Aq plants mapped 8/13/01
- Aquatic vegetation and macroscopic algae were surveyed
- Percent cover and biovolume recorded
- Widgeon grass primary aq plant over most of pond bottom
- Filamentous floating algae common in flow-restricted coves
- Common reed found on banks of flow-restricted coves
- Somewhat more cover/biovolume in nearshore areas



Distribution of Major Plant Beds

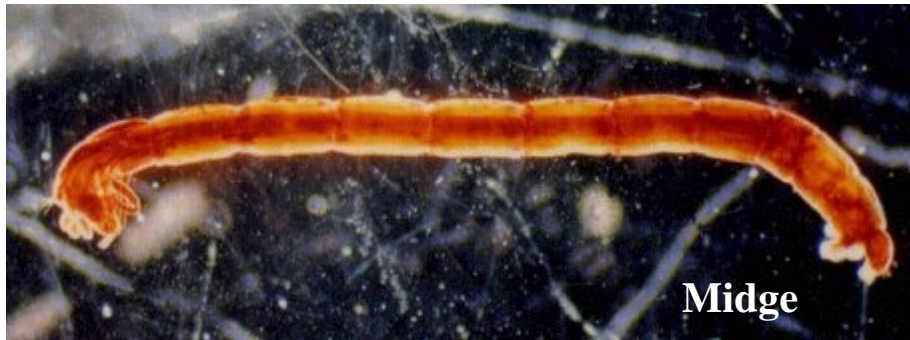
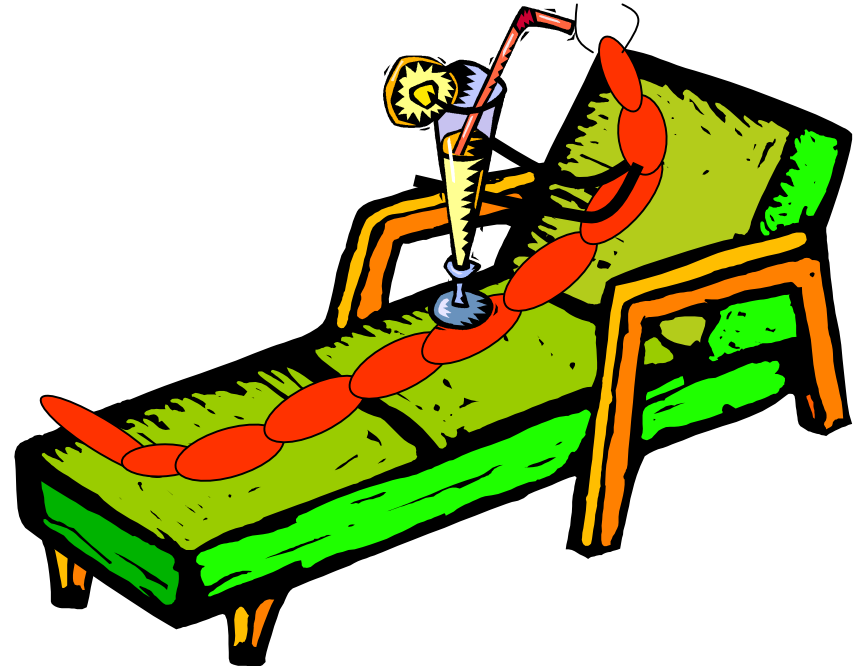


Legend

- Wg Widgeon grass, *Ruppia maritima*
- Cr Common reed, *Phragmites australis*
- Fa Filamentous floating algae, *Chlorophyta* spp.
- Sc Saltmarsh cordgrass, *Spartina alterniflora*
- Sl Sea lettuce, *Ulva lactuca*
- Kw Knotted wrack, *Ascophyllum nodosum*
- Gr Graceful redweed, *Gracilaria foliifera*

Nutrients, Plants and Midges

- Nutrients, aq plants (algae) and midges are interrelated
- Plant respiration, death, and decay reduce DO
- Creates conditions favorable to midges but little else
- Midge predator populations are reduced
- Zooplankton (algae grazer) populations are reduced



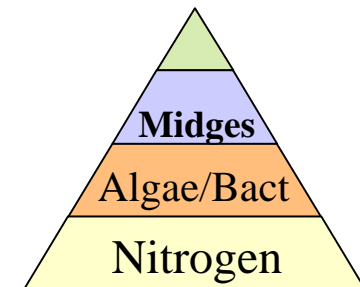
Midge



Zooplankton

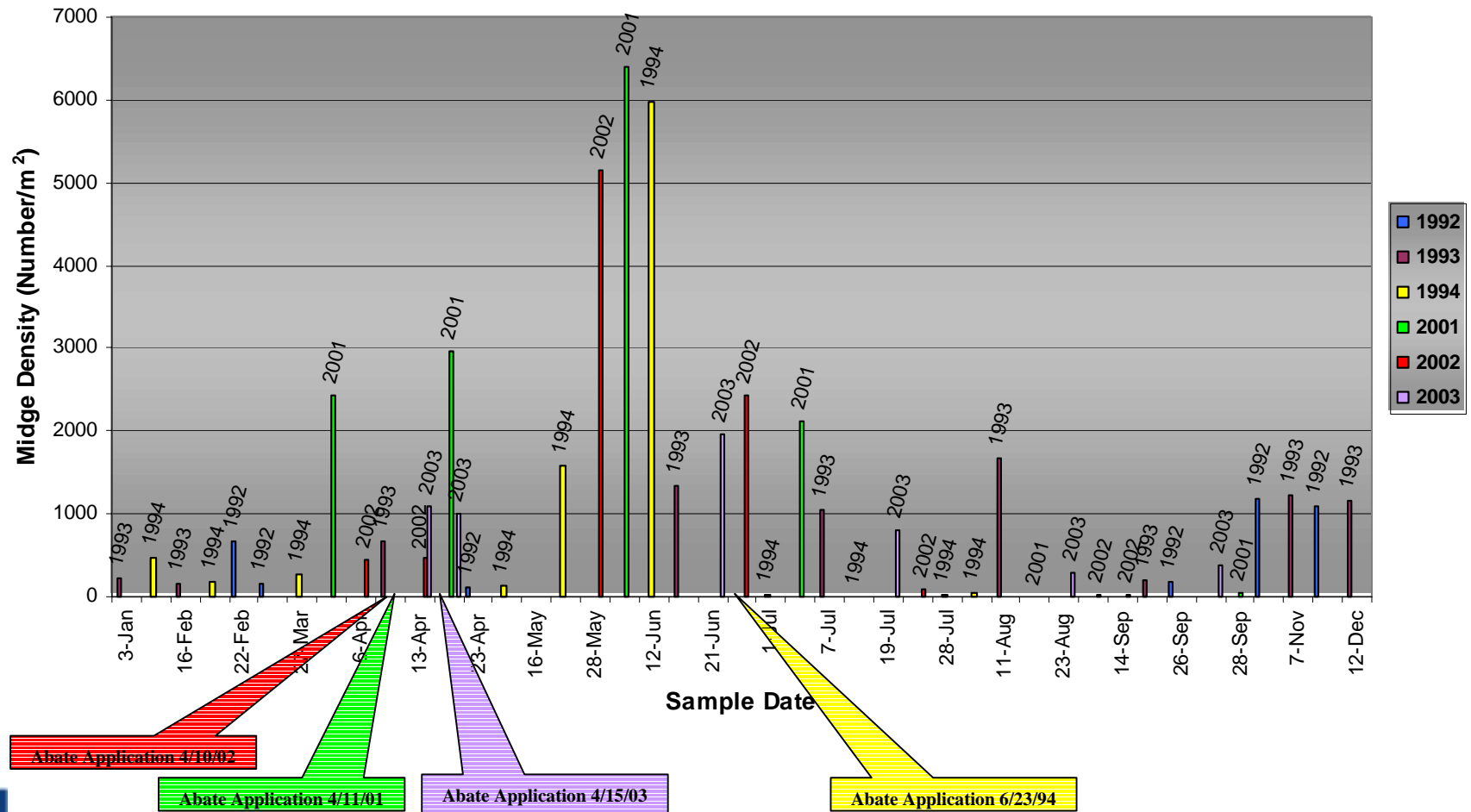
Nutrients come from...

- Nutrient influences in coastal ponds are complex
 - Fresh and salt water inputs
 - Numerous sources: lawn fertilizers, septic systems, waterfowl, pets, atmospheric deposition
 - Nutrients reach pond via groundwater or stormwater runoff
 - In-pond nutrient cycling: aq plant life decay and sediment release
 - In a well connected coastal pond flushing with seawater would mitigate effects of excessive nutrients
- Ponds >10 ppt salinity tend to be Nitrogen-limited
- Straits Pond salinity is generally around 20 ppt



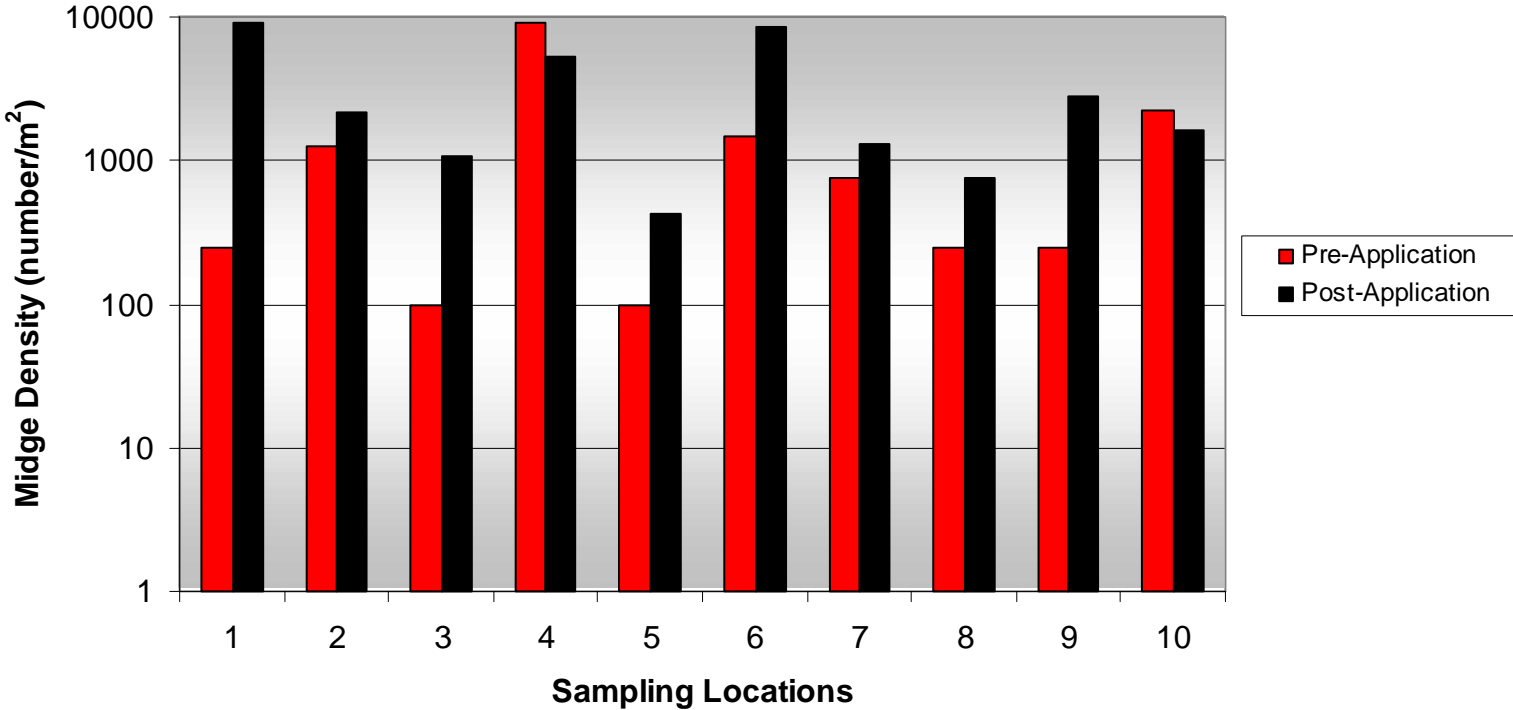
Midge Counts: 1992-2003

Figure 2. Mean Number of Midges per m² per sample date (1992-2003)



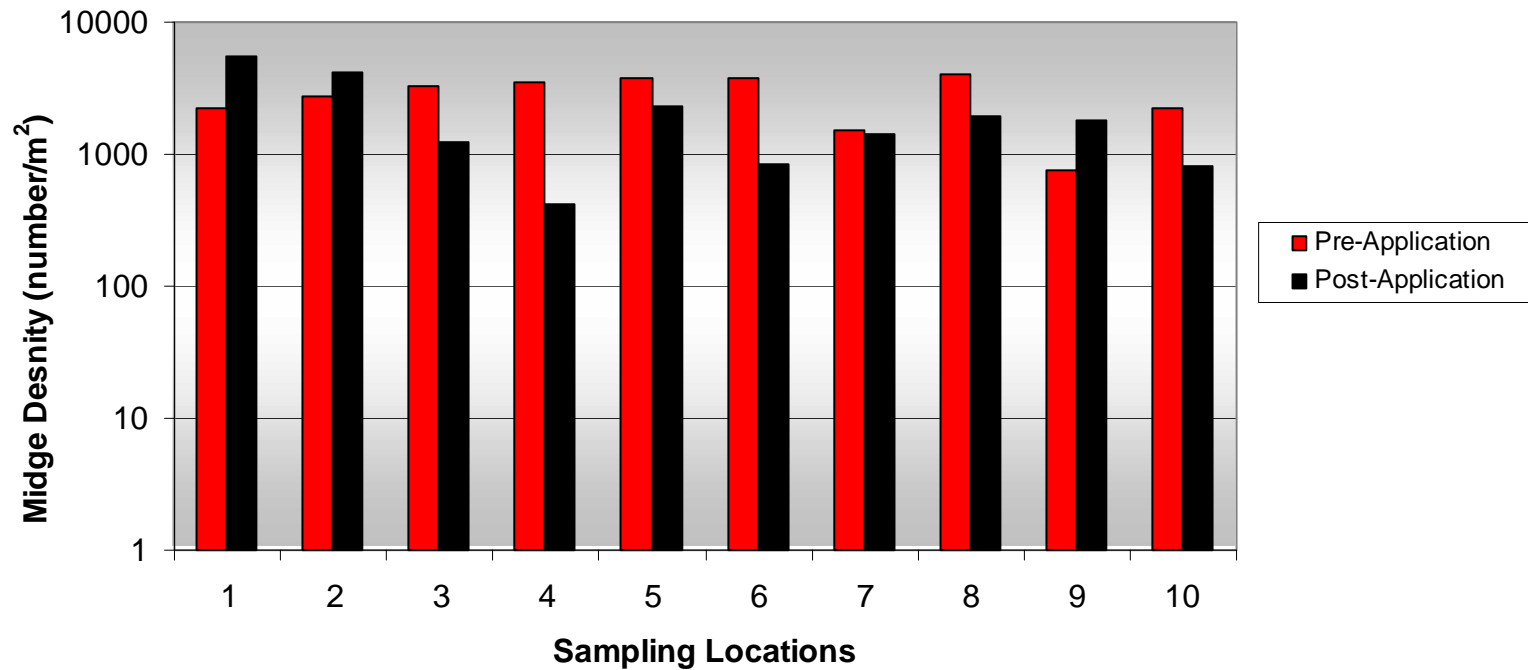
2001 Nearshore Pre- and Post-Abate

Figure 6. Straits Pond Nearshore Midge Pre- and Post-Application Means



2001 Offshore Pre- and Post-Abate

Figure 7. Straits Pond Midshore Midge Pre- and Post-Application Means



2001 Deepwater Pre- and Post-Abate

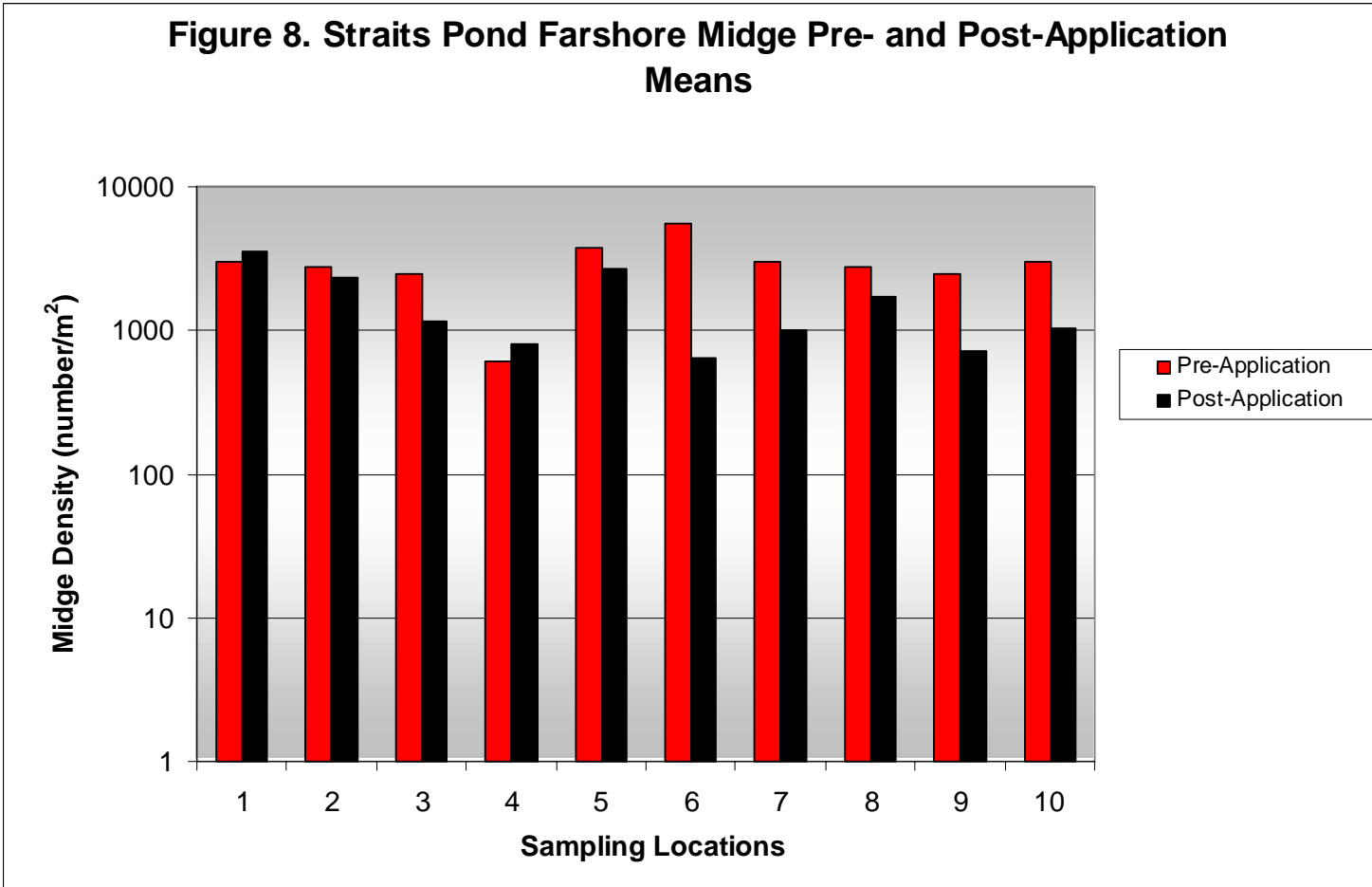
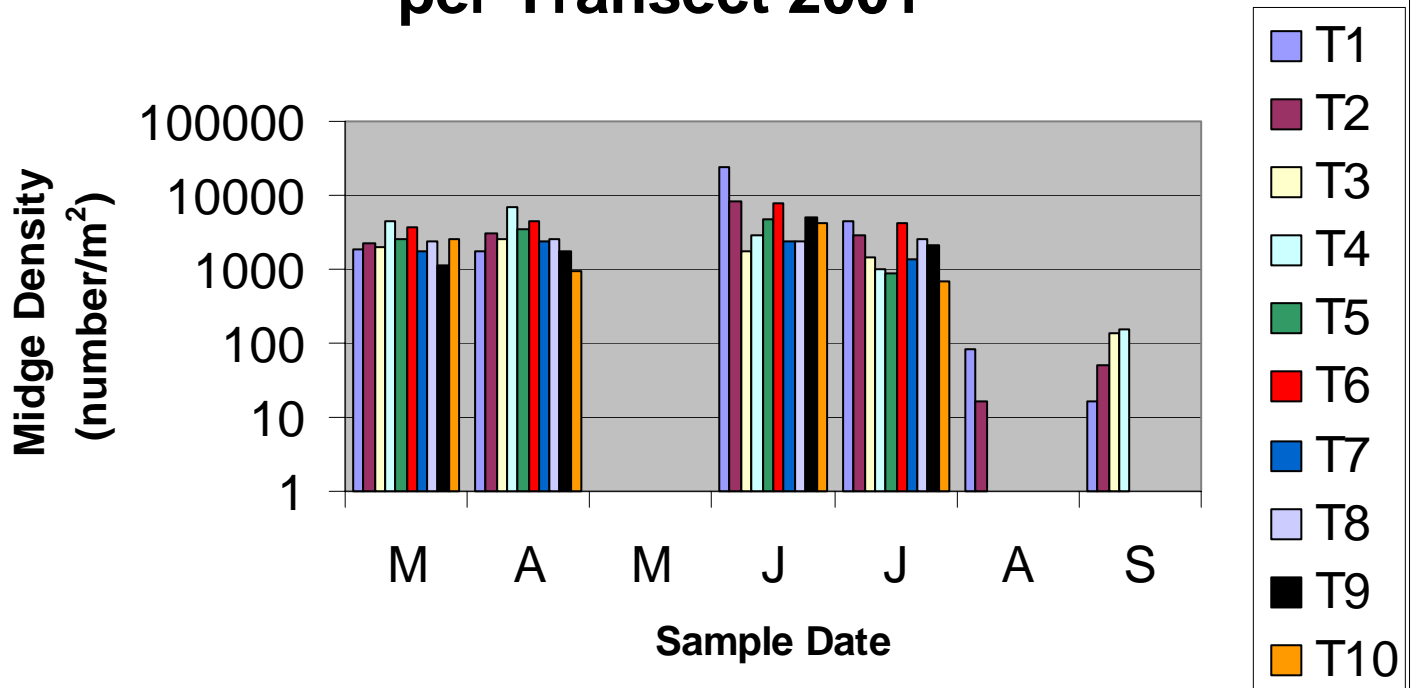
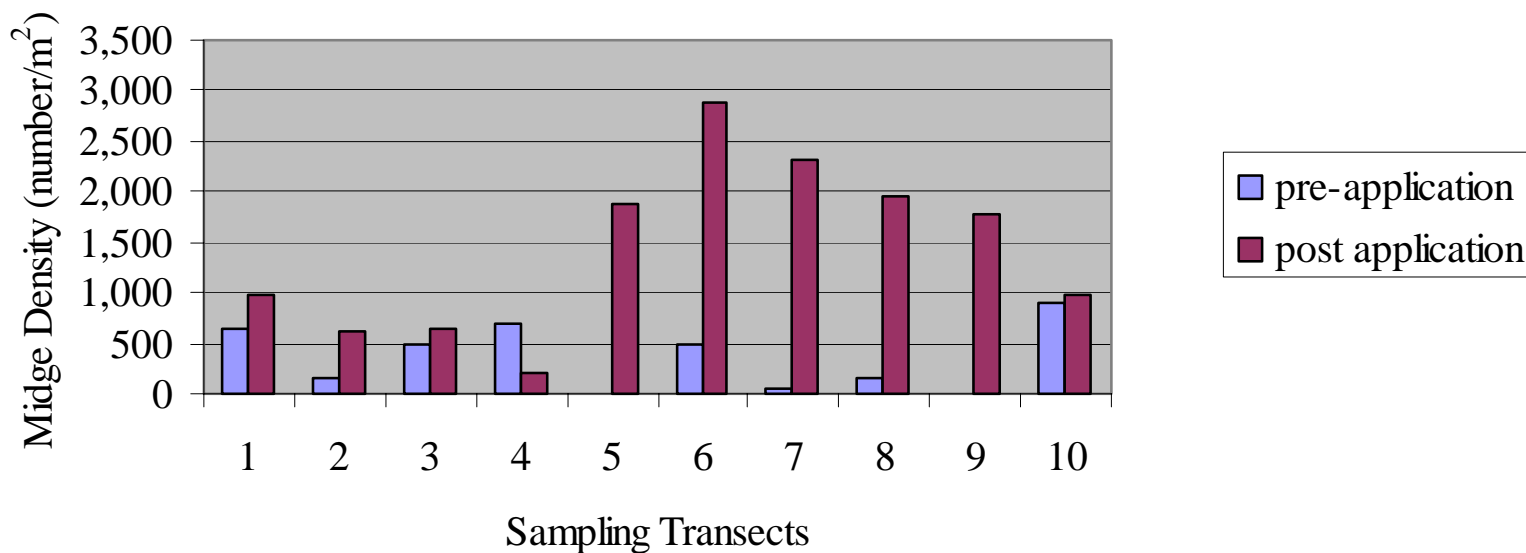


Figure 5. Mean Number of Midges per Transect 2001



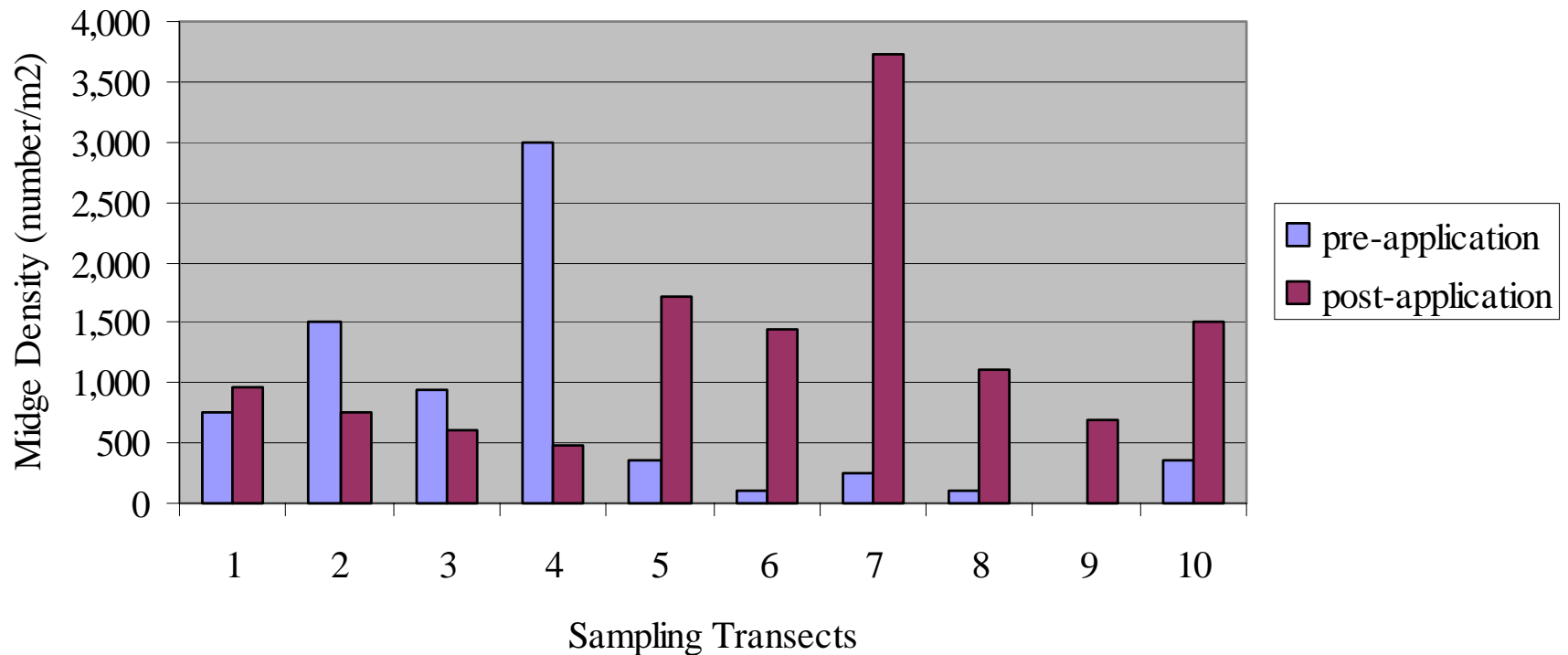
2002 Nearshore Pre- and Post-Abate

Figure 3. Straits Pond Nearshore Pre-Application Midge Abundance vs Mean Post Application Midge Abundance (2002)



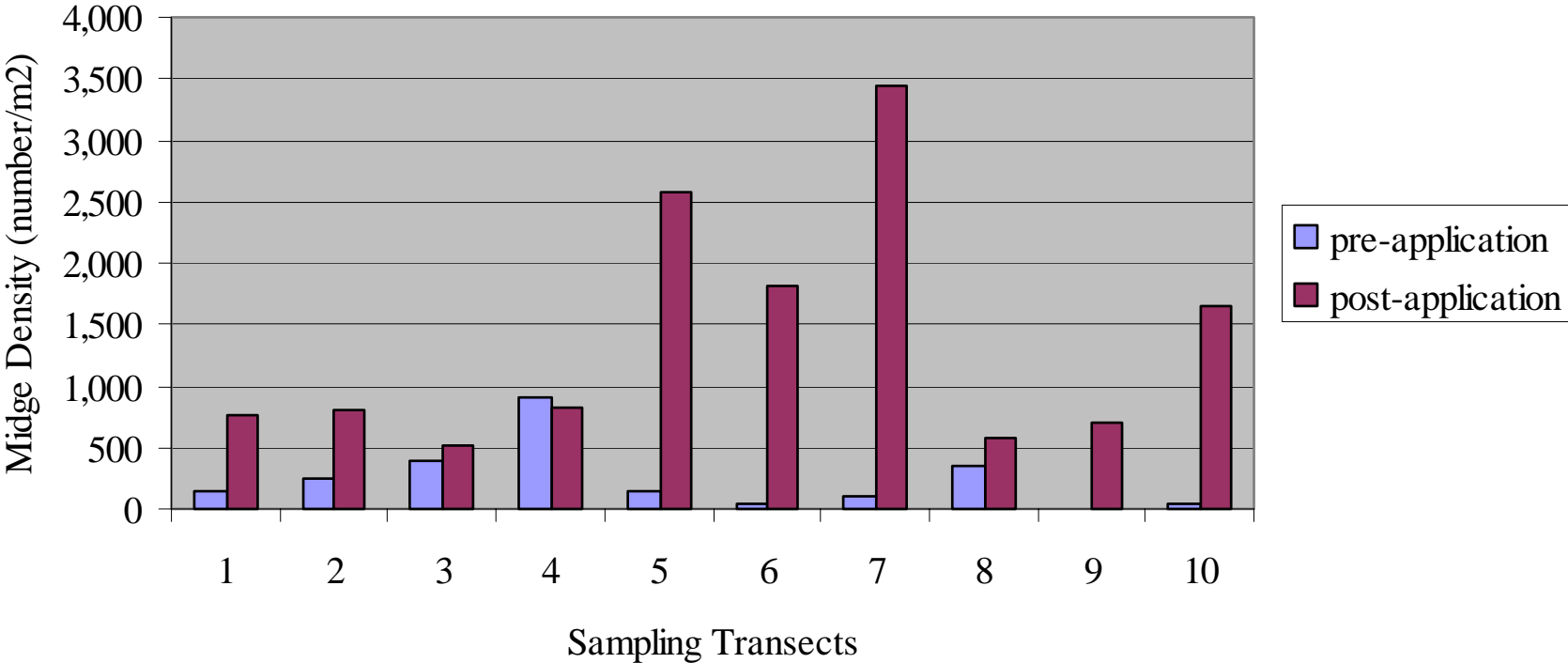
2002 Offshore Pre- and Post-Abate

Figure 4. Straits Pond Offshore Pre-Application Midge Abundance vs Mean Post Application Midge Abundance (2002)



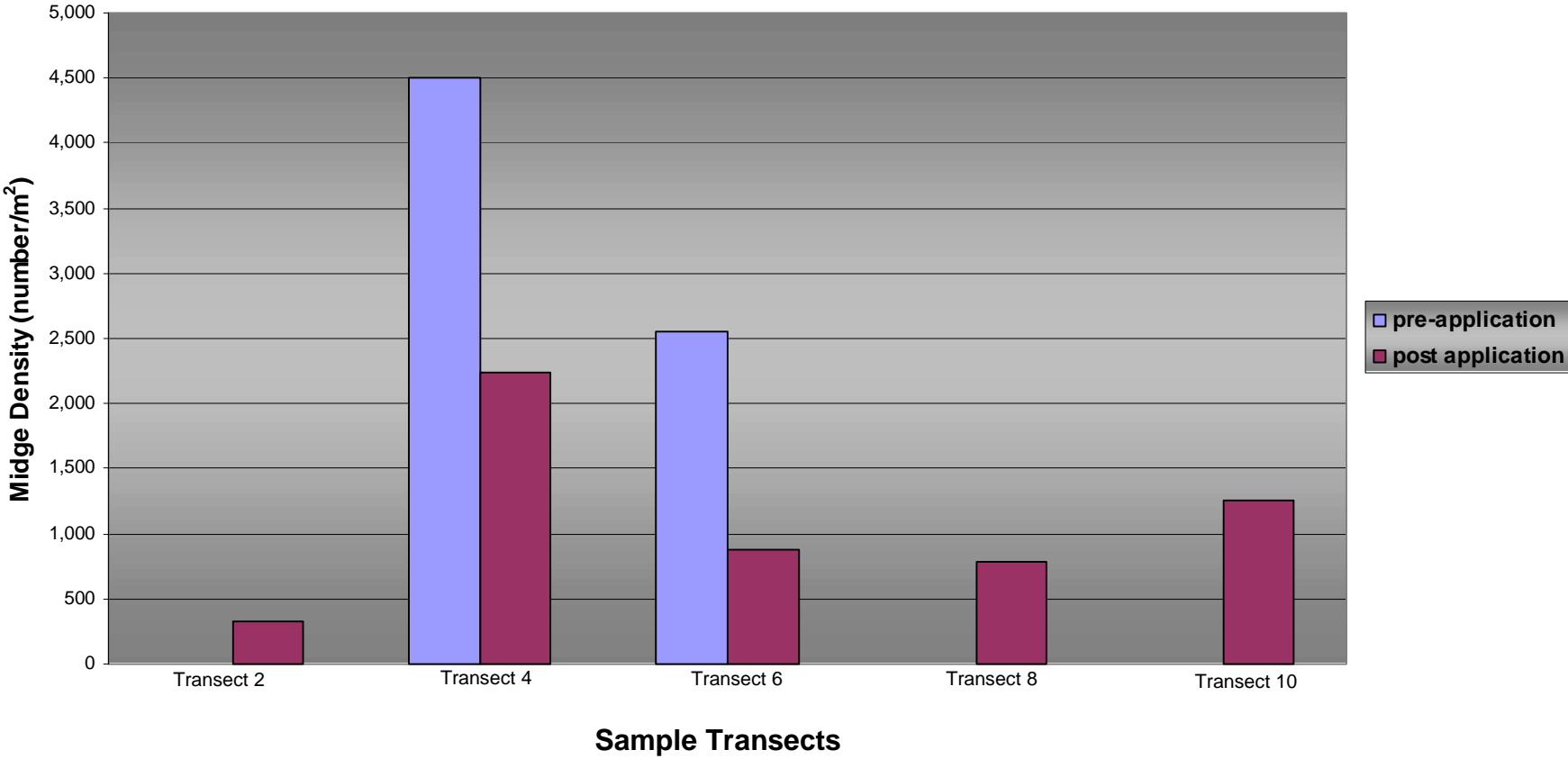
2002 Deepwater Pre- and Post-Abate

Figure 5. Straits Pond Deepwater Pre-Application Midge Abundance vs Mean Post Application Midge Abundance (2002)



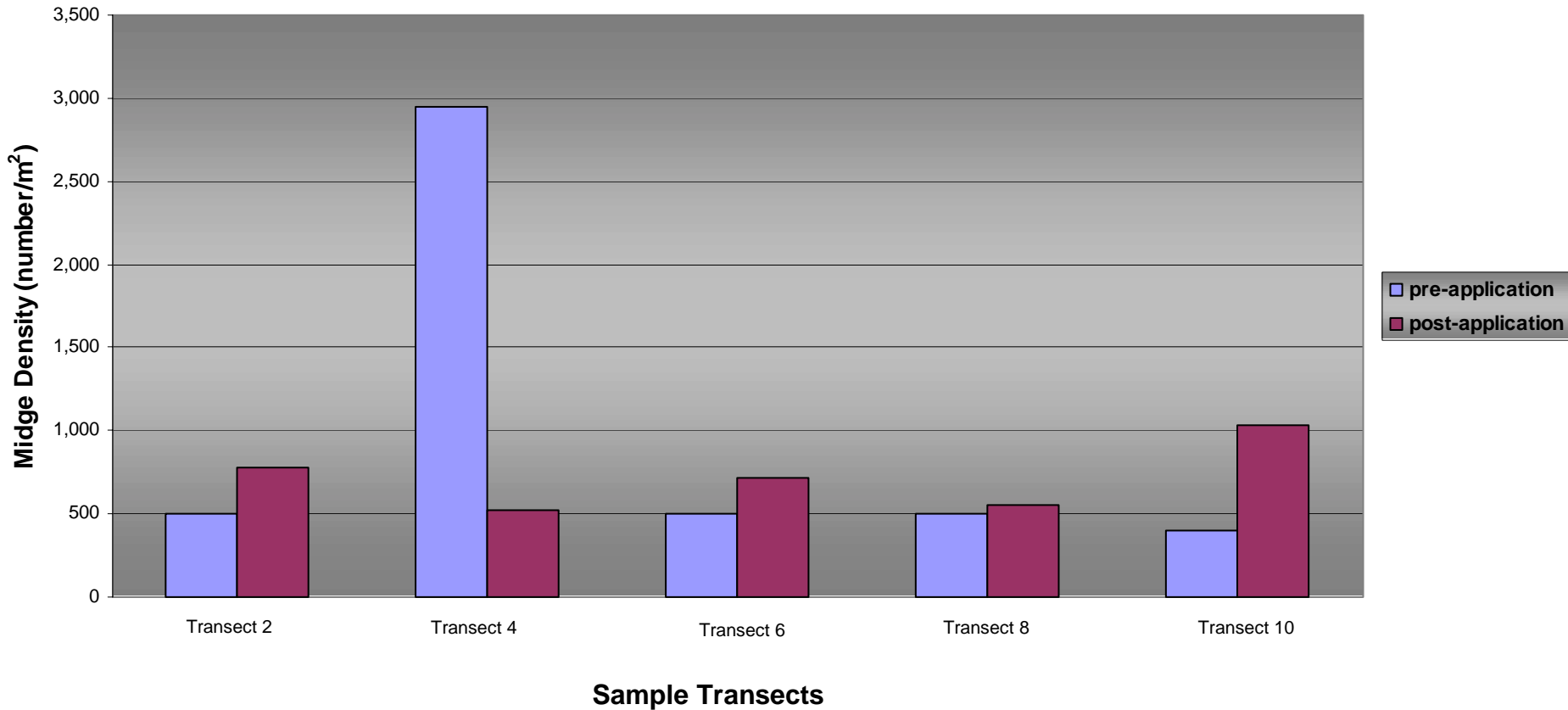
2003 Nearshore Pre- and Post-Abate

Figure 3. Straits Pond Nearshore Pre-Application Midge Abundance vs Mean Post Application Midge Abundance (2003)



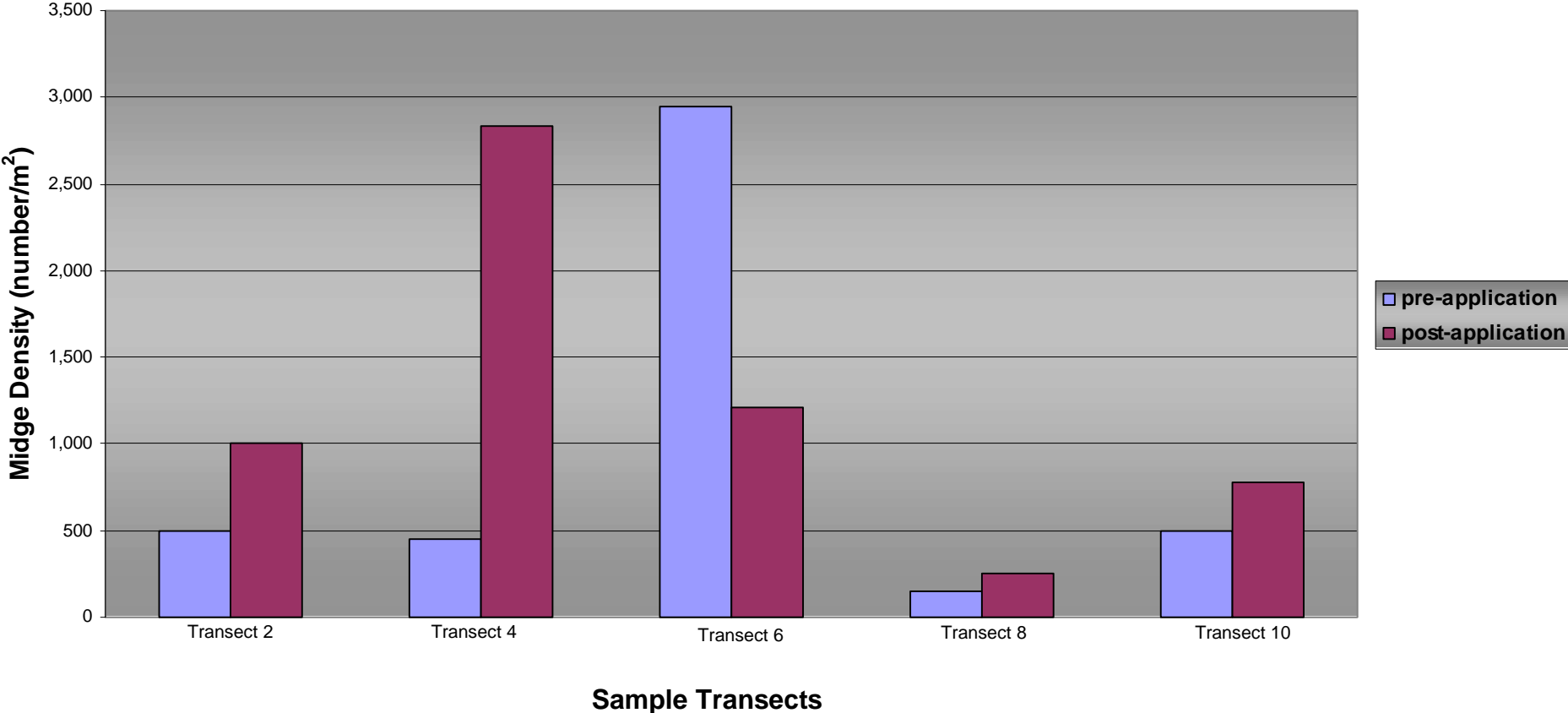
2003 Offshore Pre- and Post-Abate

Figure 4. Straits Pond Offshore Pre-Application Midge Abundance vs Mean Post Application Midge Abundance (2003)



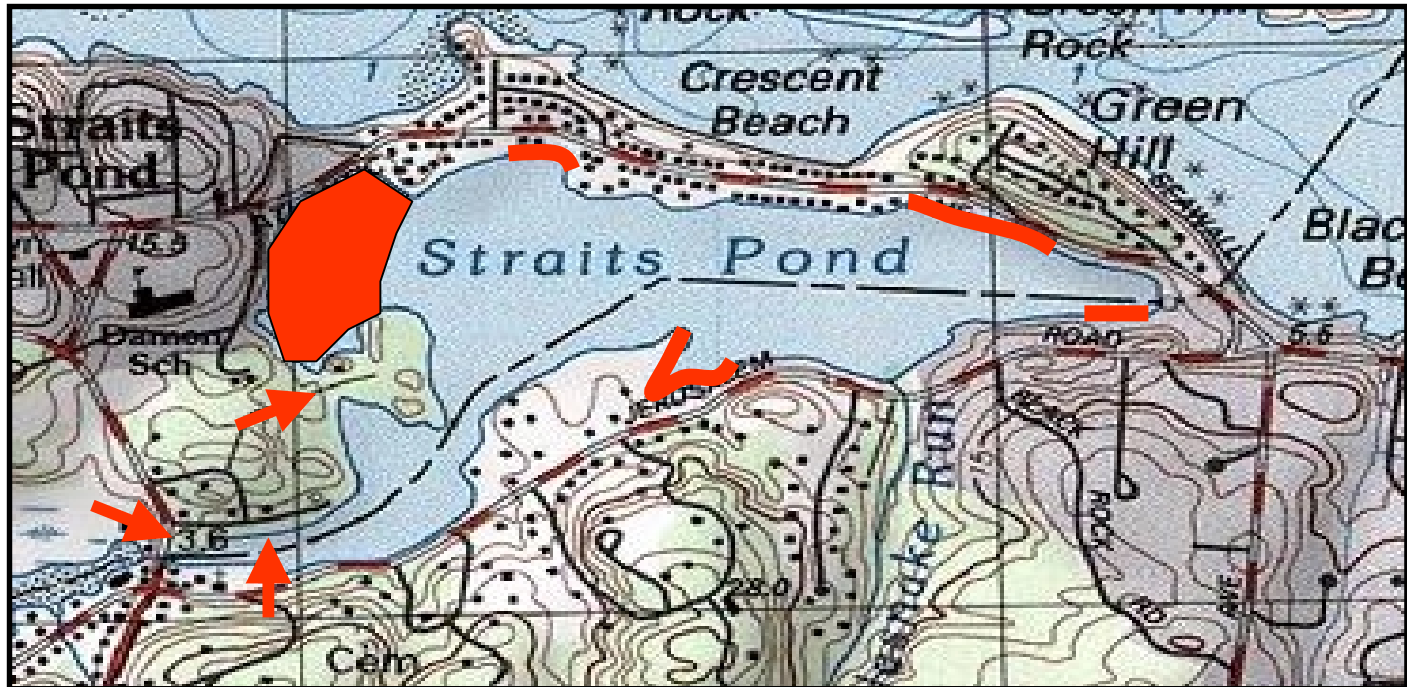
2003 Deepwater Pre- and Post-Abate

Figure 5. Straits Pond Deepwater Pre-Application Midge Abundance vs Mean Post Application Midge Abundance (2003)



- More flow-restricted coves tended to have higher midge counts and algae coverage
- Year-to-year variation may be related to coldness of preceding winter and management changes (e.g., modified tide gate operation)
- Often midge counts up post-Abate application
- Difficult to say whether counts would have been higher if Abate not used because the study did not have a control site/pond
- Several studies in the published scientific literature discuss the diminishment of Abate effectiveness on midges with repeated use
- At best, Abate is a short-term management method

Flow Restrictions and High Midge and Plant Concentrations



Primary Factors Affecting Midge Populations

- Excess nutrient loads promote aq algal growth
- Aq algae (and plants) respire, die, decay and use up DO, creating conditions favorable to midges
- Inconsistent salinity can reduce midge predator populations (they are less tolerant of this than midges)
- Many midge species are capable of more than one generation per season (multivoltine life cycle), consequently, treating with Abate once per season may not be sufficient.
- Abate is a non-specific pesticide (kills midges and midge predators)

Additional Assessment Needs

1. Hydrologic modeling should be conducted to fully understand how water flows through the system
2. A nutrient loading analysis and source assessment should be performed once the hydrology is understood. This would be beneficial toward understanding the assimilative capabilities of the system, the specific nutrient sources within the watershed, and the means for reducing those sources
3. Finally, an algal and zooplankton community analysis would be a simple way of understanding the true nature of the algal growth problem and how it may best be managed

Management Recommendations

1. Increase tidal flushing (bigger opening, more frequent exchange)
2. Increase circulation (remove island causeway, limited dredging)
3. Construct stormwater BMPs (constructed wetlands, specialized catch basins)
4. Continue sewer connection process
5. Reduce lawn fertilizer use
6. Other:
 - Promote proper pet waste management through education
 - Allow goose and swan hunting?

Program Funding Options

1. Increase tidal flushing (bigger opening, more frequent exchange)
 - Mass Highway Reconstruction of Route 228 Bridge at West Corner
2. Increase circulation (remove island causeway, limited dredging)
 - Army Corps Section 206 Ecosystem Restoration Funding
 - Use Mass Highway Bridge Replacement as Partial Matching Funds
 - NOAA Coastal Habitat Restoration Grants
3. Construct stormwater BMPs (constructed wetlands, specialized catch basins)
 - MCZM-CPR Grant to Complete Design, Permitting, Construction

NOTE: **Integrated Planning** of these projects will leverage the most state and federal funds and minimize town funding requirements.