Capping of Contaminated Sediments in Kearny Marsh

Final Report

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I. EXECUTIVE SUMMARY

As a result of agricultural, commercial and industrial activities conducted in the absence of environmental regulations and enforcement in the past, sediments contaminated by organic compounds, heavy metals, and other potentially toxic chemicals have accumulated in many of the world's deepwater and wetland environments. These sediment-borne contaminants can eventually become incorporated into aquatic food webs and adversely affect ecological receptors like benthic organisms and fish, and ultimately pose a risk to human health. This project is investigating a new in situ capping technology that could be used to remediate and/or manage contaminated sediments. AquaBlok™ (AB) is a patented, composite-aggregate technology comprised of a solid core, an outer layer of clay material, and polymers. When placed over sediment, AB hydrates forming a layer between contaminants in sediment and the overlying water. Other materials such as organic matter and seeds can be incorporated into the AB as needed. Wetland plant seeds were incorporated into AB creating SubmerSeeds™. This new technology will aid on the precise delivery of wetland seeds into inundated areas. This project involves both laboratory and field studies to assess the ability of AB to reduce exposure of biota to sediment contaminants as well as provide a suitable substrate for their growth.

Prior to placing the AB cap, laboratory studies were performed in order to compare AB with sand, a common capping material. Scientific questions included: 1) which substrate best supports benthic macroinvertebrate growth, 2) does AB alter water chemistry, 3) does adding organic matter to AB improve its utility as a substrate, and 4) can AB ameliorate heavy metal toxicity. Chironomids (*Chironomus riparius*), an aquatic insect larvae, were used as the test organism. Treatments consisted of sand, AB and AB amended with varying percentages of ground organic matter– 0, 0.1, 0.5, and 2.0%. Organic matter was either corncob or peat moss. Effects of cadmium (Cd) and chromium III (Cr) were evaluated in sand and amended and unamended AB. Five replicates were run in each experiment for 10 d using growth (dry weight) and survival as endpoints. Chironomids were fed and approximately 80% of their water changed daily by static renewal. Temperature and dissolved oxygen were recorded each day, while pH, alkalinity and water hardness were tested days 1 and 9. Results showed that while chironomids buried into both sand and AB, they grew best in sand. Chironomids grew to acceptable levels in 2 % organic matter (> 4.5 mg/larvae) when temperature was ≥ 21 °C but not in AB alone. AB did affect water quality. It apparently bound cations including Mg^{+2}, Ca^{+2}, NH_4^+ and H^+. This caused lower hardness and total ammonia and higher pH. Peat moss had less affect on water quality than corncob, so it was chosen to be used in field studies. Heavy metal testing showed higher LOAELs for cadmium (Cd) and chromium III (Cr) in the presence of AB (LOAEL = 10 µM Cd and > 1000 µM Cr) than with sand (LOAEL = 0.5 µM Cd, 500 µM Cr). However, this was only when metal treatments were compared to their respective controls, i.e. AB or sand without metal. The high cation exchange capacity of clay likely reduced the heavy metal toxicity associated with AB. Poor larval growth found with AB could have been due to daily resuspension of fine clay particles during the static renewal process.

Kearny Marsh in the NJ Meadowlands was chosen as the site for the field study. This marsh has been chronically contaminated by landfills, leachate and run-off. Scientific questions included: 1) do fauna and flora colonize AB, 2) does AB improve the diversity of the benthic macroinvertebrate (BMI) community, 3) what species of aquatic plants can grow in AB, 4) does AB alter the bioaccumulation of contaminants by both BMI and aquatic plants, 5) does AB affect water quality in the marsh and 6) does amending AB with peat moss improve its utility as a benthic substrate. The study design involved five treatments done in duplicate. They included 1) AB alone, 2) AB with SubmerSeed, 3) AB amended with 2% peat moss and SubmerSeed, 4) uncapped control and 5) uncapped control with SubmerSeed. SubmerSeed was used to evaluate the ability of establishing a favorable vegetative community in permanently inundated conditions. Each of the 10 plots was approximately 60 by 60 feet. AB was placed in the marsh by a "stone-flinger" between July 25th and August 3rd of 2005. All necessary permits and QAPP approval were obtained prior to placing the cap. The study site proved too deep for optimal germination of aquatic plants. Biologs platforms measuring approximately 8' X 20' were created and sunken to provide a more suitable depth for plant germination.

Sediments were characterized pre-capping. They were approximately 51 % sand, 34 % silt and 15 % clay. The organic content was high ranging from 80 to 95.3 % total organic carbon. Annual die back of wetland grasses and suboxic sediments have been known to produce sediments largely composed of decaying plant matter.

Water quality was determined prior to laying the cap, 7-13-05, and post capping, during the 2005 third quarter, 2006 2nd, 3rd, and 4th quarters, 2007 2nd, 3rd, and 4th quarters. Water quality parameters included pH, salinity, dissolved oxygen (DO), redox potential (ORP), temperature, depth and total suspended solids (TSS). Results showed seasonal differences for temperature but no significant differences between treatments. TSS also showed no statistical differences between treatments: although, it spiked twice, Aug 2005 and Oct 2007. The spike in Aug 2005 might have been related to deposition of the cap. It was unknown as to why it spiked in Oct 2007: however, Keegan landfill had been reopened and this did result in observable dust in the air. Salinity showed no significant difference between treatments except in September 2006. During this period, salinity spiked to 3.6 ppt in AB sites and 2.7 in CN sites. It was unknown as to why the CN should be lower. However, reported tide and weather conditions indicated the salinity overall might have been high due to low tide during sampling and below average rainfall during the month of September. Comparison of pre- and post capping showed that pH was significantly increased in AB plots during the first 3 months of research. For example in the 8-9-05 sampling, it ranged from 8.04 to 8.56 in AB plots and 7.35 to 8.08 in controls. The increase in pH could have been related to the cation binding ability of AB as seen in laboratory studies. Later samples analysis of DO, ORP and pH all showed significant differences between treatments during summer months. DO increased, while ORP and pH declined in CN compared to unamended and amended AB treatments. This indicated that AB was making a difference in water quality and was increasing levels of DO in general. This was likely due to lower levels of microorganism activity in the AB substrate compared to sediment. Post-capping water column depth was about 0.8 in. higher in CN than in AB plots in 2005 and 2006. This difference was less in 2007 suggesting that the cap was eroding. In May 2007 and November 2007, the difference was about 0.5 in.; in July 2007, there was no difference in water column depth between treatments. It was unknown as to why depth was similar in capped and uncapped sites in summer 2007. It may be that water column depth overall was reduced, and the CN plot locations were in areas with more elevated bottoms. The loss of water column depth in 2007 was not supported by changes in cap depth. There were no statistically significant differences in cap depth between October 2005 and November 2007, indicating that the cap had not eroded away despite the changes in water column depth.

Several techniques were used to collect information on BMI communities in Kearny Marsh pre- and post capping. The diversity of these communities has frequently been used to evaluate ecological health, and a major objective of the study was to assess the extent to which AB could serve as an alternative substrate for benthic organisms. Sediments were collected by Ekman dredge prior to capping, 7-13-06. Very few whole organisms were found, 0-3 per replicate, and consisted mostly of oligochaetes and chironomids. Chironomid head capsules, exuviae of Odonata nymph and vestiges of other BMI provided evidence that these organisms were living in the marsh but not within the sediments themselves. Post capping, samples could not be collected by Ekman dredge as the gravel in AB jammed the device, so two other techniques were used- Hester-Dendy set for one month and sediment corers. There were two-three replicates per plot for each technique. Results for core samples again found very few organisms, 0-3 individuals, including chironomid and snail. Six different taxons were found on Hester-Dendy. Chironmids were in the vast majority numbering in the thousands on some samplers. Scud (*Gammarus*) and damselfly (Hesperagrion/Nehalennia) were also numerous. The Shannon-Weiner Index, a measure of community diversity, was very low in all plots ranging from 0 – 0.95.

An analysis of biodiversity on organisms that were collected on Hester-Dendy showed large variances between plots as well as within plot replicates. This apparent inverse relationship was likely due to high abundance of only one or two taxa. Organisms that were collected on Hester-Dendy only represented some of the BMI in the marsh. The abundance of the benthic macroinvertebrates collected on the Hester-Dendys showed seasonal patterns between two dominant species, chironomids and *Gammarus,* which over lapped slightly on occasion. Although the abundance of these species was high at the start of the study, by the end of the study their abundance started to decline but not nearly as low as the abundance found in the sediment cores. For the chironomids it was clear that abundance was lower in the controls. Statistical analyses found organism abundance statistically higher in AB amended with 2% peat moss than in control.

Between September 2005 and May 2006 biodiversity decreased greatly in ABP and CN and slightly in ABP. Between May 2006 and August 2006 biodiversity decreased in ABP, AB and CN. Between August 2006 and November 2006 biodiversity increased in AB and CN and decreased slightly in ABP. Between November 2006 and May 2007 biodiversity increased in ABP and decreased slightly in CN and almost leveled in AB. Between May 2007 and July 2007 biodiversity decreased greatly in ABP, then in CN, and slightly in AB. Between July 2007 and November 2007 biodiversity increased greatly in CN and decreased in AB and decreased slightly in ABP

Total abundance of macroinvertebrates was highest in September 2005, August 2006 and July 2007 in A and in A with PM. It was significantly lower in August 2006 ($p < 0.05$), July 2007 ($p < 0.05$) and November 2007 ($p < 0.05$) in the controls. BMI abundance varied during the year. Abundance of chironomids, *Gammarus* and other species was always lowest in November and similar in 2006 and 2007. Abundance of chironomids, *Gammarus* and other species was average in May 2006 and August 2006, although in May 2007 abundance of chironomids, *Gammarus* and other species was low and only slightly higher than in was in November. Abundance of chironomids, *Gammarus* and other species was highest in September 2005 and July 2007.

Chironomid abundance was always highest in July, August and September for AB and ABP. It was only high for CN in September 2005. After this time chironomid abundance in CN declined and remained low, only approached by chironomid abundance in AB and ABP in May and November. *Gammarus* abundance was highest in May 2006 for CN, AB, and then ABP. The next highest abundance of *Gammarus* was in July 2007 for ABP, AB and then CN. *Gammarus* abundance was lowest in November for CN, ABP and then AB, although the low *Gammarus* abundance for CN first occurred in August

There was a significant negative correlation between abundance of benthic macroinvertebrates and dissolved oxygen in plot AB3 only ($r = -0.8469$, $p = 0.0082$). There was a significant positive correlation between benthic macroinvertebrate abundance and redox (eH) in plot CN2 only ($r = 0.7762$, $p = 0.0235$). There was no significant correlation between abundance of benthic macroinvretebrates and total heavy metals in the sediment. However there was a significant positive correlation between benthic macroinvertebrate abundance and PCBs in the sediment for AB plots in 2007 only ($r = 0.8482$, $p< 0.0328$).

In conclusion, the abundance of the benthic macroinvertebrates collected on the Hester-Dendys showed seasonal patterns between two dominant species, chironomids and *Gammarus*, which over lapped slightly on occasion. Although the abundance of these species was high at the start of the study, by the end of the study their abundance started to decline but not nearly as low as the abundance found in the sediment cores. For the chironomids it was clear that abundance was lower in the controls. Heavy metals in the sediment did not seem to have a large effect on benthic macroinvertebrates, which is expected since the Hester-Dendys were placed on or slightly above the sediment. Because they were not in the sediment it is surprising that abundance would increase as PCBs increased in AB. The sample sizes in the sediment cores were too small to determine an effect of heavy metals and PCBs in the sediment on benthic macroinvertebrates. Although redox seemed to have a slight effect on the abundance of benthic macroinvertebrates in one control plot, decreasing levels of dissolved oxygen seemed to have a little more of an effect although the results are inconclusive since both replicates of each treatment or control did not agree.

Marsh vegetation seeds were incorporated into SubmerSeed, a composite seeding technology where aquatic plant seeds are incorporated into small AB conglomerations allowing the seeds to be easily delivered into permanently inundated conditions. The weight of the AquaBlok pellet allows the associated seeds to sink below the surface and become integrate into the hydrated AquaBlok cap below. Do to the high depth of the experimental site; germinated seedlings were not able to establish themselves. Alternative flora colonization experiments took place on small scale 100 gallons containers both submerged on the field and on green house settings. On April 2007, nine100 gallons tubs were sunk in the marsh adjacent to the research area. Tubes were line up from the shoreline to achieve water depth of approximately 2 to 12’’inchs. For this portion of the experiment we used a set of three treatments in triplicate: treatment A (Marsh Soil /AB), treatment B (Sand/AB) and treatment C (Marsh Soil). Each tub received approximately 3lb of SubmerSeed (containing 30 common marsh plants) as in the original field experiment. For the Green House portion of the experiment, six 100 gallons tubs were use to mimic the field conditions and treatments containing SubmerSeeds in duplicate. Green House tubs were monitored weekly for a two years period.

The number of plant species capable of colonizing AquaBlok was very small. Only six, *Zizania aquatica , Alisma Subcordatum* , *Typha angustifolia, Peltandra virginica Scirpus validus* and *Scirpus sp.* of the original 128 species prepared as SubmerSeeds were able to establish themselves in AquaBlok. Natural occurring Phragmatis from the sediments seed/rhizome banks were also able to colonize AquaBlok on the green house settings. In the field, as on the green house, only a few species of plants *Scirpus validus, Scirpus sp*. and *Peltandra virginica* were able to germinate and grow. Despite our efforts to net the research tubs, most of the growing vegetation was heavily grazed.

In the green house settings, during the first growing season plants were able to germinate and grow better on 2% amended AquaBlook when compared to unamended AquaBlok. During the second growing season whatsoever, there was no difference on plant germination and growth rates between the two AquaBlok treatments. In general, plants growing on AquaBlok as an alternative sediment source were less robust than plants growing on uncapped sediments (control). When further examining the plants' growth both at the green house and the field settings, we observed a dramatic decrease in roots and leaves sizes of plants growing on tubs containing AquaBlook. Plants growing on marsh sediment have a more robust root system than plants growing in AquaBlok. While growing within the AquaBlok, roots appeared attached to the aggregate core of the SubmerSeed and continued to be heavily covered by the clay; this was more noticeable on the unamended AquaBlok than on the 2% peat moss amended AquaBlok. The presence of organic matter on the amended AquaBlok is more conducive to seedling germination and initial root development and growth than unamended AquaBlok, therefore making it a better initial substrate.

Total plant dry weight was also reduced in most species when compared to the control group. The average plant dry weight growing in marsh sediments (control) were 3.8g/plant for *Zizania aquatica,* 5.4g/plant for *Alisma subcordatum,* 12.9g/plant for *Typha angustifolia* and 158.5gr/plant for *Phragmatis sp.* Plants growing in AquaBlok (unamendded and amended with 2% peat moss) have produced smaller plants with lower dry weight 1.2g/plant and 1.33g/plant for *Zizania aquatica* and 2.1g/plant 1.7g/plant for *Alisma subcordatum,* and 10.1 gm/plant for *Typha angustifolia* when compared to those growing in soil. AquaBlok can serve as an alternative plant substrate when restoring heavy contaminated sites. AquaBlok does reduce the amount of contaminates that becomes available to the plant but does not provide the plant with adecuated amounts of nutrients necessary for a healthy marsh growth.

Chemicals of concern (COC) were monitored in the surface water and sediments pre- and post capping. Contaminants measured included heavy metals and organic contaminants (PCBs, PAHs and organochlorine pesticides). Heavy metals were analyzed by EPA SW 846 Method 7000A. PCBs, PAHs and organochlorine pesticides were analyzed by EPA SW 846 Method 8082, EPA SW 846 Method 8270C-SIM and EPA SW 846 Method 8081A, respectively.

Statistical analyses were run in order to compare treatment and collection date effects on water concentrations of heavy metals, PCBs and OCPs. For heavy metals in water, there were no significant difference in treatment for samples collected on the same date. However, there was a significant increase in total heavy metals between pre-capping and post capping in 2005. This occurred across all plots. These concentrations appeared to further decrease in 2006 and 2005. The results for 2007 were dramatically lower, but this was an artifact of sample processing. A number of the heavy metals were measured by graphite furnace instead of flame in 2007. The lower detection limits made it appear as though the metal levels were declining over time. The heavy metal measurements could not be repeated. So data were compared by summing together selected metals. Selected metals consisted of those with similar detection levels (graphite and flame) or those that were measured the same way in previous studies. These results showed more similar metal concentrations between pre-capping 2005 and post capping 2005. Heavy metal concentrations were stastically higher in 2006 versus 2005 (pre and post-capping); however, 2006 levels declined to 2005 post capping levels by 2007. Overall, eavy metal concentrations in water were similar across the site, and there were no treatment related effects for a particular collection date. However, metal concentrations did appear to change across the site after capping. Metal concentrations were statistically higher in September after capping compared to July pre-capping concentrations. Heavy metals concentrations declined between post capping 2005 and 2006; however, concentrations were still significantly higher than pre-capping. These dates could be compared as metal analyses were conducted the same way for these dates. Results in 2007 were difficult to compare to earlier dates as the detect method was changed. If analyses were modified to include only select metals (those with similar detection limits for all dates), then water concentrations in 2007 were similar to those in 2005 and 2006 post capping. The increase in water heavy metals post capping might have occurred due to increased dissolved oxygen and redox levels associated with AquaBlok capped sites.

Results for heavy metal concentrations in water also showed that Cu and Pb were of serious concern as they exceeded the freshwater CCC on all dates. Cd appeared to be of concern as its concentrations were above its CCC in 2005 and 2006. However, when the detection limit was lower in 2007 analyses, Cd was below its CCC and therefore possibly not a serious concern. Data for Hg showed concentrations above its CCC in 2007 only. It was not know why water concentrations of Hg apparently increased in 2007: there was a considerable disturbance of the nearby Keegan landfill in 2007 that might have put Hg into the water during that collection date.

Heavy metal concentrations in sediment did show treatment related effects. Metal concentrations in AquaBlok treated plots declined significantly after capping. The concentrations of metals in the cap itself were much lower than in the sediments they covered. Comparison of collection dates showed no significant increase in heavy metals in the cap between 2005 and 2007. This indicated that the heavy metals below the cap were not breaking through it. Amending the AquaBlok with peat moss did not affect metal concentrations. In uncapped plots concentrations of Cu, Hg, and Pb were consistently above their CCCs. Ni was above its CCC in 2005 and 2007. These results indicated that these four metals were of serious concern in sediments. These results corresponded with high water concentrations of Cu, Pb and Hg and indicated an overall environmental concern for these metals in the marsh.

Heavy metal analyses in BMI (chironomids) showed no significant treatment or collection date effects. Only one of the uncapped treatments, Control, had statistically higher levels of metals than other treatments, including Control S, and that difference only occurred on one collection date, September 28, 2005. Overall, it appeared that chironomids were able to control their accumulation of heavy metals such that they were not affected by substrate concentrations. While highly variable, data did show a trend for higher tissue concentrations of metals in September 2005 in all treatments. This was consistent with the spike in heavy metal water concentrations found at the same time. This suggested that the BMI were accumulating metals from water as oppose to the benthic substrate. The lack of treatment related effect in water concentrations of heavy metals most likely explains the lack of treatment effect on BMI concentrations.

Total heavy metals in chironomids collected in control plots on September 28, 2005 were significantly higher than total heavy metals in chironomids collected on any other date ($p < 0.05$) or any other plot other than AB pm S on September 28, 2005. AB pm S on September 28, 2005 was not significantly different from control S AB un and AB un S on September 28, 2005. Total heavy metals in chironomids collected from each plot were always significantly different within a sampling date ($p < 0.05$). The only plots that had chironomids with significantly higher total heavy metals than chironomids from any other plot or sampling date were chironomids collected from the controls on September 28, 2005 ($p < 0.05$).

Heavy metals in chironomids were highly variable. This variation is not a surprise given the fact that both the lowest value and the highest value for a metal were at times obtained within replicate plots. Although this was the case, the fact that the control values of September 28, 2005 were able to stand out in all of this variation deserves mention. Besides the control, other plots on September 28, 2005 were also higher than other sampling dates although not significantly higher. However after nearly a year later all of the values came down, including those of the control. The reason why the values declined over time is unknown. One possibility could be the construction of a permanent cap at the nearby Keegan Landfill during the course of the study. However once the values came down after 2005 there have been no significant differences between plots, largely due to the variation within and between plots. It is for these reasons that there is difficulty drawing conclusions about heavy metals in chironomids.

Heavy metals in plants were analyzed at the end of the experimental growing season (September 2007), all plants were harvested and analyzed for heavy metal contents. *Peltandra virginica* plant material was not sufficient for accurate metal analysis.

In the field, *Scirpus sp*. plants growing on 2% peat amended AquaBlok underlined by marsh soil, accumulated most its heavy metals in its roots with exception of Fe. The total amount of heavy metals present on the root tissues was 2.5 Times (349.94 mg/kg vs 136.94 mg/kg) more than the amount present in the leaves and stalks. On the other hand, plants growing on 2% peat amended AquaBlok underlined by sand accumulated most of their heavy metals on their leaves and stalk with exception of Cd and Cu which were found to be double on its quantities in their root system. Despite of this finding, the total amount of heavy metals without Fe accumulated on the roots 252.75 mg/kg is not significantly different from 275.25 mg/kg found in leave and stalk tissue. When compared to our control (uncapped sediment) were plants had accumulated almost twice as much (293.35 mg/kg vs 165.72 mg/kg) heavy metals (without Fe) in their root as they did in their leaves and stalks.

Plants growing under the green house settings in the Marsh soil (control) tended to concentrate higher amounts of heavy metals into their roots and/or underground portion of their stems, between 2.5 and 5 times more than the amounts concentrated in their stems and leave portions. *Zizania aquatica* has a total of 653.7 mg/kg of heavy metals excluding Fe, were 84% was found on their root tissues. *Alisma Subcordatum* has a total of 1230.31 mg/kg of heavy metals excluding Fe, were 73% was found on their root tissues. *Typha angustifolia* has accumulated 840.08 mg/kg of heavy metals excluding Fe, were 78.2% was found on their roots. Phragmatis sp. like the other plants, accumulates higher quantities (5 times more) of heavy metals on their underground portions (rhizomes and roots). From its 510.6 mg/kg of total heavy metals excluding Fe, 84% was found on tissues bellow the substrate surface. Plants growing in AquaBlok and 2% peat moss amended AquaBlok substrates tend to concentrate less amounts of heavy metals on their tissues. Total amount of heavy metals varied from 357.9 mg/kg in *Phragmatis sp.* to 542.726 mg/kg in *Zizania aquatica* growing on AquaBlok and from 409.97 mg/kg in mg/kg in *Alisma Subcordatum* to 633.12 mg/kg in *Typha angustifolia* growing on AquaBlok amended with 2% peat moss. It also worth mentioning that each of the heavy metals of concern was concentrated differently by each plant depending on the substrate they were growing. Most of the plants growing in AquaBlok concentrated higher amounts of heavy metals on their root tissue as they did on the control marsh sediment. In all, the reduction of heavy metals in capping the substrate, AquaBlok, did increase the growth of vegetation on contaminated sites.

Organic contamination of the marsh was evaluated by measuring PCB and OCP concentrations in water and benthic substrate pre- and post capping. Concentrations of total average PCBs in water exceeded the CCC (14 ng/L) across the site before capping. Concentrations were 2-17x the CCC indicating that water concentrations of PCBs were an environmental problem in the marsh. Concentrations of DDT were also high, exceeding its

CCC (130 ng/L) by 1-6x, and thereby indicating that DDT in water was of serious concern. None of the other OCPs exceeded their CCC in water pre-capping. Capping with AquaBlok significantly reduced water concentrations of PCBs and OCPs. Total PCBs declined 2-35x and OCPs declined 12-35x. This indicated that the cap had an effect on these contaminants in water. However, the decline was not treatment related as there were no statistically significant differences between plot treatments for samples collected on the same day. This was probably due to the circulation of water throughout the site. The decline in organics found for post capping samples in 2005 continued through 2006 and 2007. This suggested that if the cap had removed the organics from water, that it was not releasing them back into it over time. However, the concentrations of PCBs and DDT left in the water post capping were still too high. Multiple samples of PCB and several samples of DDT continued to exceed their respective CCC.

Sediment concentrations of organic contaminants pre-capping showed levels of PCBs spread throughout the site, but the average total PCBS were well below its SEL (53,000 µg/Kg). OCPs were also spread throughout the site. For OCPs, only the metabolites of DDT, DDD and DDE, exceeded their SELs (600 and 130 µg/Kg, respectively). This result indicated that DDT was of serious concern in the marsh. After capping, the concentrations of PCBs and OCPs in AquaBlok substrate was significantly lower than in sediments left uncapped. Total PCB and OCP concentrations were 10x and 8x lower, respectively. Substrate concentrations of both organics in AquaBlok were similar in 2005, 2006 and 2007 post capping. In addition, organic contamination of sediments from uncapped plots remained post capping. There were no significant differences in PCB or OCP concentrations between the July 2005 collection date and all post capping collection dates. In uncapped sediments, multiple replicates had concentrations of DDD and DDE that exceeded their SELs. Taken together, these results indicated that the AquaBlok did not allow PCBs and OCPs to break through the cap over a two year period, and it did not become significantly contaminated by organics in the surface water during the same time period.

Overall, capping provided a less contaminated substrate in the marsh. Results indicated that it might have removed PCBs and OCPs from the water column, and it did not allow contaminants in the sediment below the cap to break through. However, water concentrations of Cu, Pb, Hg and DDT continue to be of concern in the marsh post capping.

II. INTRODUCTION

Kearny Marsh, an approximately 320-acre freshwater wetland located within the New Jersey Meadowlands, is an ideal location for evaluating the long-term effects of capping materials such as AquaBlok^{TM} on wetland vegetation and benthic organisms. First, a variety of organic and especially metallic contaminants (including As, Cd, Cr, Cu, Pb, Hg, and Zn) have been detected in marsh sediments (Langan Engineering and Environmental Services, Inc., 1999); probable sources for these contaminants appear to include stormwater runoff into the marsh as well as potential leakage from an adjacent landfills. Second, open-water (i.e. non-vegetated) areas of the marsh have reportedly increased over the last several decades, resulting in decreased wetland habitat available for wildlife. This shift to open-water habitat may be attributable to a gradual increase in water levels within the marsh over several decades (as suggested by local observers), although no historical water-level data are available to confirm this apparent trend. AquaBlok^{TM} may increase wetland habitat for wildlife by isolating underlying sediment-borne toxicity and providing a relatively uncontaminated substrate for new plant growth and macroinvertebrate colonization. Third, Kearny Marsh is a freshwater marsh, and is thus an unusual wetland environment within the universe of predominantly saline, tidal wetlands that collectively comprise the Meadowlands. In the Meadowlands, freshwater wetlands represent 15.7% (494 acres) of all wetland habitat in the region (3,154 acres, total). This pilot study would involve approximately 0.83 acres, which is small enough not to affect the wetlands as a whole. Finally, local wetland managers estimate that remediation of contaminated sediments from Kearny Marsh through dredging and near-site disposal could cost in excess of $30 million dollars, promoting an interest in exploring alternative remedies that may provide effective sediment management at lower cost and with less ecological disturbance

The proposed work at Kearny Marsh builds on existing studies but is designed from the outset to quantifiably assess the physical as well as ecological function of AquaBlok as a long-term cap in wetlands such as those in Kearny Marsh. Specifically, the project will:

1. Characterize the development of wetland vegetation and benthic macroinvertebrate communities as a function of cap presence and type of cap amendment;
2. Determine experimentally the type and concentration of organic matter that will best support benthic macroinvertebrate growth when incorporated into AquaBlok™;
3. Assess the relative uptake of contaminants by the cap itself, wetland plants and benthic macroinvertebrates as a function of cap presence and type of cap amendment;
4. Characterize water quality (pH, DO, ORP, TSS, salinity, turbidity, temperature, depth) at capped and uncapped sites before and after capping.

III. DELIVERABLE MATRIX

This matrix lists grant activities and the time period in which it is anticipated that they will be completed.

YEAR		2004		2005				2006				2007				2008				2009	
QUARTER		3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2
Project preparation	**Res.Party**																				
Laboratory study	CB**	d/e	d/e	d/e				d/e													
Site Selection	EK*	d/m	d/m																		
Permitting	EK*	D	d	d	D																
QAPP	EK*	D	d	d																	
Pre-Capping																					
Water quality[1]	CB**							d/e													
Sediment characteristics[2]	AB***								d/e												
Plant Community Characterization[5]	AB***					d/e															
BMI Community characterization[3]	MM***								d/e												
COC in Plants	AB***								d/e												
COC BMI	MM***								d/e												
COC in water	CB**							d/e													
COCs benthic substrate	CB**								d/e												
Placement of cap	AquaBlok					d/e															
Post-Capping																					
Water quality[1]	CB**					d/e	d/e		d/e	d/e	d/e		d/e	d/e	d/e		d/e				
Plant Community Characterization[5]	AB***									d/e				d/e			d/e				
BMI Community Characterization[3]	MM***					d/e			d/e	d/e	d/e		d/e	d/e	d/e						
Accumulation of COCs[4]																					
Plants	AB***														d/e						
Water	CB**						d/e				d/e				d/e						
Benthic substrate	CB**						d/e				d/e		d/e	d/e	d/e						
BMI[3]	MM***					d/e	d/e		d/e	d/e	d/e				d/e						
Deliverables																					
Annual report, 1st	CB**												d/e								
Annual report, 2nd	MM***																d/e				
Final report	AB***																				d/e

[1] Water quality = pH, DO, Eh, salinity, temperature depth performed in field under supervision of C. Bentivegna. TSS is performed at MERI.

[2] Sediment characteristics = grain size, % TOC, % moisture performed by FDU students at MERI.

[3] BMI = Benthic macroinvertebrate

[4] COC = Contaminant of concern: include heavy metals (Cd, Cr, Cu, Fe, Hg, Pb, and Zn) plus the organics (PCBs, PAHs, organochlorine pesticides). Organics will be analyzed in sediment, capping material and surface water performed by MERI.

IV. PROJECT PREPARATION

IV. A. Laboratory Studies with AquaBlok

IV. A.1. Methods

Experimental Protocol

The test organism was 5-6 day old (2nd instar) *Chironomus riparius*. Egg masses were collected from a laboratory culture, and hatched larvae were raised separately. Larvae were raised in test water and fed the same food as provided during experiments. Test water was 1:1 carbon-filtered tapwater and deionized water. The local tapwater was unusually hard (> 300 mg/L), so it was diluted with deionized water. Final hardness was between 150-200 mg/L. The water was kept in a carboy and aerated throughout culturing and experiments. Larvae were fed a suspension of ground Tetrafin® (0.04 mg/ml).

Experimental conditions were as follows. Test vessels were 1 L polypropylene containers. Vessels contained 60 g of sand or 60 g of dry AquaBlok with or without organic amendments. Test water was placed in vessels 3 d prior to addition of larvae. This was enough time for AquaBlok to fully hydrate. Sand treatments had 250 ml of water added, where as AquaBlok treatments had 350 ml. The additional 100 ml for AquaBlok treatments accounted for the portion absorbed. For positive control and heavy metal testing, aliquots of the metal stock solution were added to test water in carboys such that there was a separate carboy for each concentration. Carboys were acid-washed between experiments. Water from the carboys was used for daily static renewal, days 0-9, with approximately 80 % exchanged each time. There were five replicates per treatment and ten larvae per vessel. Larvae in each vessel were fed 1.5 ml of the fishfood suspension daily. The light cycle was 16 h light/ 8 h dark. Temperature was controlled to some extend by supplemental heating and air conditioning, but it did vary between experiments due to temperature fluctuations in the building. Over the course of four experiments it ranged from 19-24 °C. Most data points were between 19 and 21 °C.

Data Analyses

Larvae were placed in containers on day 0 and collected on day 10. The endpoints were survival and dry weight. Survival was based on the number of live larvae collect on day 10 and presented as percent survival. Growth was based on the combined weight of larvae collected from a test vessel after drying them overnight at 80 °C. It was presented as mg/larvae. Data were analyzed by one-way analysis of variance and Tukey's post hoc test. Treatments were considered statistically significant if $p \leq 0.05$.

Water Quality Assessment

Water from containers was tested for quality parameters: dissolved oxygen (DO) and temperature were measured daily (day 1-9), while pH, alkalinity, hardness and ammonia were measured on days 0 and 9. Parameters other than temperature (Fisherbrand thermometer) and pH (Corning pH meter 240) were analyzed using LaMotte kits from Carolina Science and Math (Burlington, NC). Treatment effects on water quality were determined by one-way analysis of variance using values from each replicate as the dependent variable and treatment as the independent variable. This was followed by Tukey's post hoc test to determine significant differences between controls and other treatments, $p \leq 0.05$. For DO and temperature, 2 replicates from day 1-9 were used in data analyses (n = 18), where as for pH, alkalinity, hardness and ammonia, 5 replicates from day 9 were used (n = 5).

Organic Amendment Testing

Four experiments were performed in order to evaluate the effects of organic amendment of AquaBlok. Two experiments were done with ground corncob as the amendment and two with ground peat moss as the amendment. The organic matter was incorporated into AquaBlok during the manufacture process. Substrates for treatments were sand (negative control), sand plus 1.0 µM Cd (positive control), unamended AquaBlok and AquaBlok amended with 0.1, 0.5, or 2.0 % organic matter.

Heavy Metal Testing

Cadmium ($CdCl_2$) and chromium III (Cl_3Cr-$6H_2O$) were used to evaluate the ability of AquaBlok to modulate heavy metal toxicity. Metals were added to the aerated test water (as described above) not substrates. Experiments were initially performed with sand only. This established the concentrations for AquaBlok testing. One experiment was carried out in each substrate (sand, AquaBlok-2 % peat moss, or AquaBlok-2 % corncob) for each metal (Cd or Cr). Cd concentrations for sand were 0 (negative control: NC), 0.01, 0.1, 0.5, 1.0 and 50 µM. Cr concentrations for sand were 0, 12.5, 25, 50, 100, and 500 µM. For experiments with AquaBlok, Cd concentrations were 0 (AquaBlok control), 0.1, 1.0, 10, 50, and 100 µM, and Cr concentrations were 0, 50, 100, 200, 500 and 1000 µM. A sand negative control (0 µM heavy metal: NC) and sand positive control (1.0 µM Cd or 500 µM Cr: PC) were run for each AquaBlok test.

IV. A.2 Results

IV.A.2.a Data for Organic Amendment Testing

Results for survival and growth were based on four experiments. Figures show the combined averages and standard deviations (SD) for the two corncob or the two peat moss experiments, n = 10 per group.

Data on survival showed no statistical differences between groups even for positive control (Figure IV.A1). This was not unusual for chironomids, which are known to be a hardy species. Across replicates, survival was consistently highest in 0.5 and 2.0 % amended AquaBlok for both corncob and peat moss. The negative control met the EPA standard of ≥ 70 % survival as did all other treatments except the peat moss positive control. Survival in the first experiment for peat moss positive control was 68 ± 30 %, that in the second was 20 ± 21%.

Data on growth (mg/larvae) showed statistically significant differences between treatments (Figure IV.A2). Growth was significantly better in the negative control, sand, than in any of the AquaBlok treatments. Adding 2 % organic matter to AquaBlok significantly improved growth compared to no amendment regardless of whether the organic matter was corncob or peat moss. In keeping with the literature and the QAPP standard submitted for this project, normal growth should have been ≥ 0.45 mg/larvae. The average for negative control exceeded this standard in all experiments (> 0.86 mg/larvae), but none of those for unamended AquaBlok experiments did (< 0.41 mg/larvae). The average of combined experiments showed growth in treatments with 0.5 % peat moss (0.46 ± 0.05 mg/larvae), 2 % peat moss (0.47 ± 0.1) and 2 % corncob (0.62 ± 0.07) did meet this standard. Addition of 1 μM cadmium (1 μM) to test water (PC) significantly suppressed growth compared to all treatments showing that larval growth could be modulated.

Changes in water quality parameters for day 9 are shown in Figures IV.A3-IV.A8. Temperatures varied somewhat across treatments and experiments. They were similar for the two peat moss and 2nd corncob experiments (20 ± 1.5 °C) but higher in the 1st corncob experiment (22 ± 1 °C) (Figure IV.A3). These temperatures influenced DO such that levels in the 2nd corncob and both peat moss experiments (> 4.7 mg/L) were higher than in the 1st corncob experiment (< 4.0 mg/L), which had the higher temperature (Figure IV.A4). The addition of 2 % corncob apparently exacerbated the temperature effect seen in the 1st experiment as the DO for 2 % amendment was 2.3 mg/L compared to 3.7 mg/L for unamended. The EPA requires aeration of test water that falls below 2.5 mg/L. AquaBlok increased pH by approximately 0.5 units compared to sand (Figure IV.A5). The pH was fairly stable across treatments except in the 1st corncob experiment where low DO corresponded with a fall of 1 unit pH.

Other water quality parameters were affected by AquaBlok. Ammonia was measured as both the unionized (NH_3) and ionized form (NH_4^+). In general, ammonia increased from day 0 to day 9, ranging from 0.02-0.04 to 0.4-1.0 mg/L, respectively (data not shown), but most treatments did not increase much above 1 mg/L (Figure IV.A6). The exception was 2 % corncob treatments, in which ammonia levels were reduced in both experiments. The decline suggested that the nonionized form was converted to the ionized form, which then adsorbed to the clay in AquaBlok. Ammonia data was variable between experiments even for the same type of organic matter. In keeping with the effect on ammonia ions, hardness was lower in AquaBlok treatments compared to sand by about 40 mg/L at day 9 (Figure IV.A7). Effects were more dramatic on day 0 when test water was from vessels in which AquaBlok was allowed to absorb water for 3 days prior to starting experiments (Data not shown). On day 0, hardness ranged from 44-80 mg/L in 0 % AquaBlok to 155-196 mg/L in negative control. The increase in hardness from day 0 to day 9 d indicated that AquaBlok adsorbs less Mg^{+2} and Ca^{+2} over time and, therefore, hardness should eventually become stable. Alkalinity in AquaBlok treatments was higher than in sand (Figure IV.A8). The highest levels at day 9 occurred in both corncob experiments with 2 % amendment. Apparently hydrogen ions (H^+) were also adsorbing to the AquaBlok thereby increasing levels of bicarbonate and carbonate. The change in H^+ was more evident with alkalinity than with pH as pH is given in log units.

IV.A A.2.b. Conclusions for Organic Amendment Testing

Taken together, the bioassay data indicated that growth in sand was superior to that in AquaBlok. Addition of 2 % corncob or peat moss to AquaBlok improved growth. Since all larvae were fed and the sand provided little if any organic matter of its own, the reduced growth in AquaBlok can be attributed to less suitability as a substrate. Larvae buried into both sand and AquaBlok; however, it was observed that AquaBlok produced a fine suspension of clay that might have interfered with larval activities. However, it was also observed that larvae constructed more secure tubes in AquaBlok. Larvae in sand treatment often became exposed when test containers were jostled. Organic matter (2 %) may have ameliorated some of the stress due to AquaBlok by making more food available. It appeared as though peat moss was superior to corncob to this extent. By comparison, growth with 0.1 and 0.5 % peat moss was better than in corncob at the same percentages.

Water quality in this small system was affected by treatment. AquaBlok adsorbed the cations of Mg^{+2}, Ca^{+2}, NH_4^+ and H^+. It follows that large amounts of AquaBlok could reduce hardness and increase alkalinity temporarily in Kearny Marsh. On the other hand, AquaBlok would probably adsorb heavy metals as well and thereby have beneficial effects. Water chemistry was also affected by 2 % corncob, more so than lower percentages of corncob or any percentage of peat moss tested. This was shown by reduced DO at warmer temperatures, increased production of ionized ammonia and increased alkalinity. The results suggested that corncob was more highly digestible by bacteria than peat moss. However, chironomids appeared able to make equal use of both types of organic matter as there was no difference in grow between 2 % corncob and peat moss. Taken together, results for the bioassay and water quality indicated that 2 % peat moss would have the least effect on water quality yet support larval growth. Although chironomids grew best in sand, the ability to bind cations may make AquaBlok an appropriate substrate for heavy metal contaminated sediments.

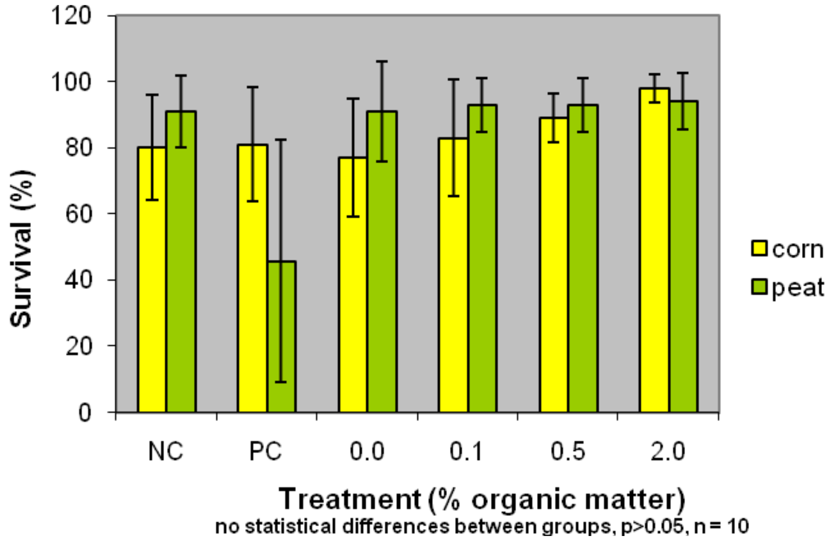


Figure IV.A1. Average survival in AquaBlok amended with different percentages of corn or peatmoss. Each data point represented the average of two experiments, n = 10. Error bars represented one SD.

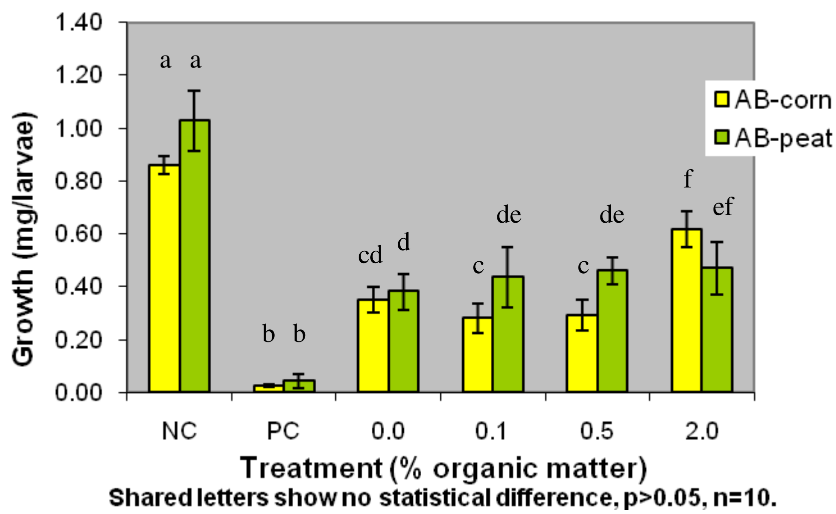


Figure IV.A2. Average growth in AquaBlok amended with different percentages of corn or peatmoss. Each data point represented the average of two experiments, n = 10. Error bars represented on SD.

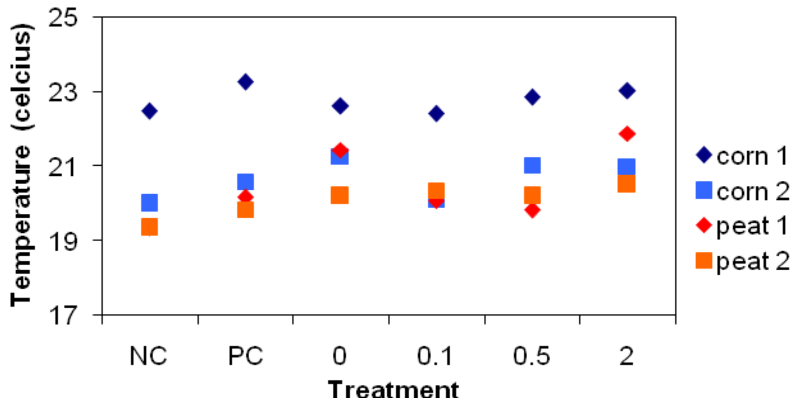


Figure IV.A3. Average temperature at day 9. Values on x-axis represented % amendment in AB. Each symbol represented treatment averages for separate experiments conducted with AB amended with peat or corn. NC and PC were sand control: NC = no Cd, PC = 1 µM Cd.

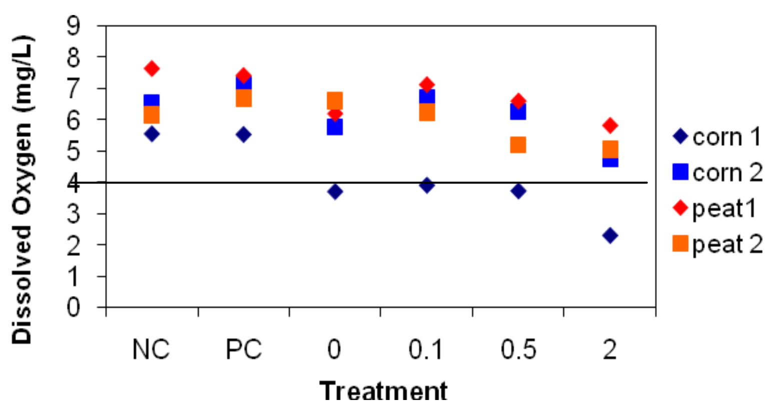


Figure IV.A4. Average dissolved oxygen at day 9. The line indicates a concentration of DO considered unsafe for aquatic organisms. Values on x-axis represented % amendment in AB. Each symbol represented treatment averages for separate experiments conducted with AB amended with peat or corn. NC and PC were sand control: NC = no Cd, PC = 1 µM Cd.

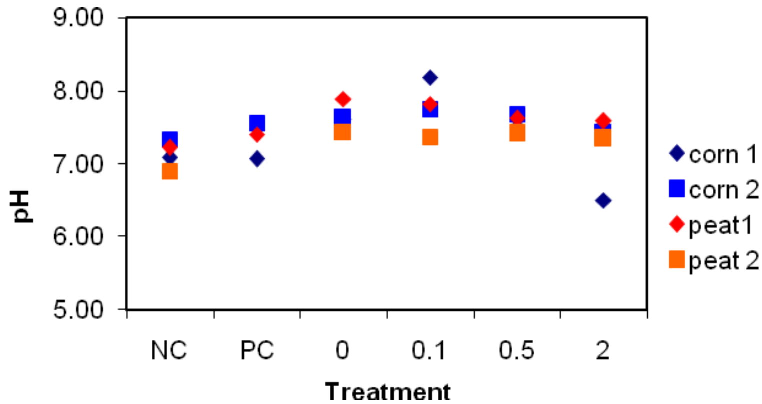


Figure IV.A5. Average pH at day 9. Values on x-axis represented % amendment in AB. Each symbol represented treatment averages for separate experiments conducted with AB amended with peat or corn. NC and PC were sand control: NC = no Cd, PC = 1 μM Cd.

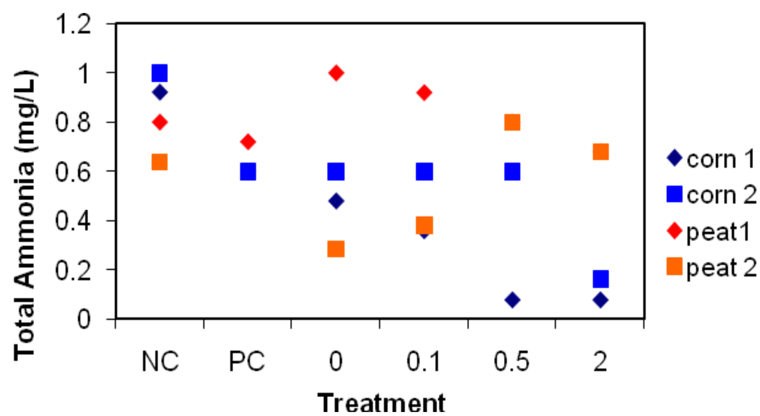


Figure IV.A6. Average total ammonia at day 8. Values on x-axis represented % amendment in AB. Each symbol represented treatment averages for separate experiments conducted with AB amended with peat or corn. NC and PC were sand control: NC = no Cd, PC = 1 μM Cd.

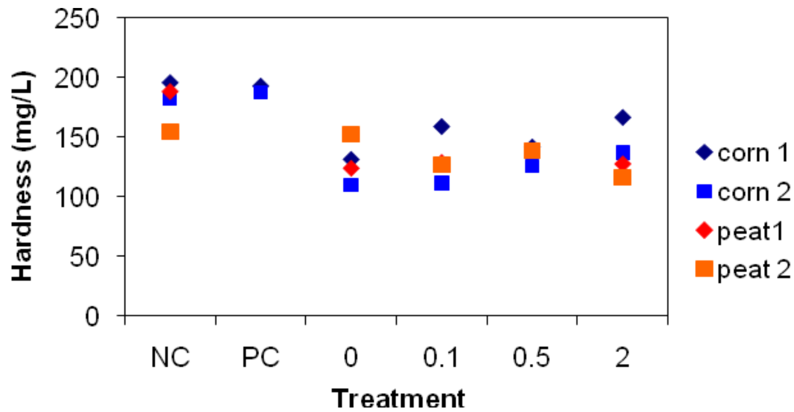


Figure IV.A7. Average hardness at day 9. Values on x-axis represented % amendment in AB. Each symbol represented treatment averages for separate experiments conducted with AB amended with peat or corn. NC and PC were sand control: NC = no Cd, PC = 1 μM Cd.

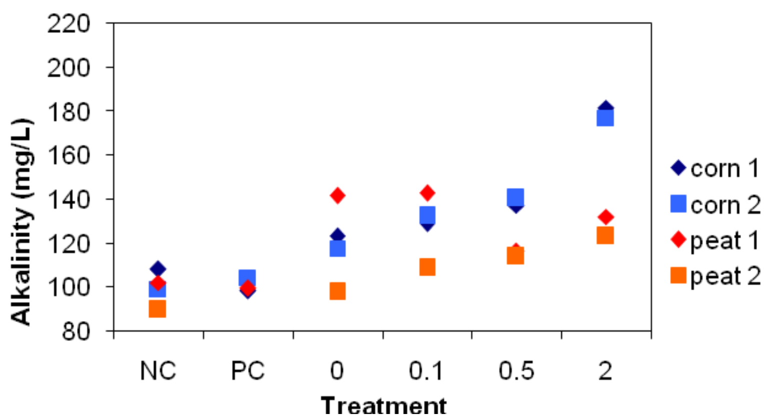


Figure IV.A8. Average alkalinity at day 9. Values on x-axis represented % amendment in AB. Each symbol represented treatment averages for separate experiments conducted with AB amended with peat or corn. NC and PC were sand control: NC = no Cd, PC = 1 μM Cd.

IV.A.2.c Data for Heavy Metal Testing

The results for Cd testing in sand showed no effects on survival at concentrations up to 10 µM (Figure IV.A9). Growth was affected with the lowest observable apparent effect level (LOAEL) equal to 0.5 µM (Figure IV.A10). In experiments with AquaBlok, survival was affected in both 2 % corncob and 2 % peat moss (Figure IV.A11). The LOAELs were 10 µM Cd. Growth was significantly reduced compared to AquaBlok control (0µM Cd) by the same concentration, 10 µM Cd, for both substrates (Figure IV.A12). Growth in the sand controls (>0.86 mg/larvae, NC) exceeded the QAPP standard (≥4.5 mg/larvae) in AquaBlok experiments. In keeping with the organic amendment experiments, growth in AquaBlok control (0 µM Cd) was less than the standard (0.35 and 0.38 mg/larvae for corncob and peat moss, respectively). Overall, Cd reduced growth at 10 µM in both types of amended AB but only relative to the AB control, 0 µM Cd.

Water quality parameters for Cd experiments are shown in Table IV.A1. Temperatures for sand (average range 19.6-20.4) and AquaBlok-2 % peat moss (average range 19.4-19.9) experiments were similar in all test groups. Those for the corncob experiment were higher (average range 21.2 to 21.8 °C). Temperature appeared to be a factor in DO concentrations. DO was corresponding higher in sand (average range 5.9 to 6.5 mg/L) and AquaBlok-2 % peat moss (average range 6.5-7.8 mg/L) experiments than in AquaBlok-2 % corncob (average range 3.5 – 6.6 mg/L) experiments. Addition of 2 % corncob significantly reduced DO compared to sand. In the AquaBlok experiment, DO in negative control sand (6.6 ± 0.7 mg/L) was higher than in negative control AquaBlok (3.5 ± 1.1 mg/L). All averages were greater than 2.5 mg/L, the critical concentration below which test vessels require aeration.

For other water quality parameters only pH was consistently higher in all treatments than in negative control sand. This occurred in sand experiments where adding Cd increased pH, for example 6.87 ± 0.14 in 0 µM Cd and 7.23 ± 0.02 in 1 µM Cd. It also occurred in AquaBlok experiments where all AquaBlok treatments had higher pH than negative control sand, for example 7.54 ± 0.10 in sand and 7.99 ± 0.12 in 0 µM Cd AquaBlok-2 % peat moss. Addition of Cd to AquaBlok did not reduce pH compared to AquaBlok alone. Alkalinity was generally increased and hardness generally reduced in AquaBlok treatments compared to sand. For example in the corncob experiment, alkalinity ranged from 153-212 mg/L in AquaBlok treatments versus 101 mg/L in sand. Hardness ranged from 122-138 mg/L in AquaBlok treatments versus 188 mg/L in sand. Significant differences were more consistent among treatments in the corncob experiment than in the peat moss one. Ammonia was consistently reduced in all AquaBlok treatments, both peat moss (average range 0.20-0.32) and corncob (average range 0.02-0.10), compared to sand control (average range 0.60-0.68).

Results for Cr showed no effects on survival in sand experiments at the concentrations tested, LOAEL > 500 µM (Figure IV.A13). Survival in all treatments exceeded the 70 % EPA standard for negative control. Growth was significantly reduced by Cr at day 10, LOAEL = 500 µM (Figure IV.A14). Growth in negative control and other treatments (average range 0.63-0.78 mg/larvae) exceeded the 4.5 mg/larvae standard set by the QAPP. That for 500 µM (0.289 ± 0.06 mg/larvae) was below the standard. In AquaBlok-2 % peat moss experiments, there were no effects on survival at the concentrations tested, LOAEL > 1000µM (Figure IV.A15). However, growth was actually increased in 500 and 1000 µM Cr (0.205 ± 0.0029 and 0.192 ± 0.038 mg/larvae, respectively) compared to AquaBlok control (0.121 ± 0.019 mg/larvae) (Figure IV.A16). This was apparently due to flocculation of oxidized Cr, which reduced the bioavailability of the Cr in solution. Flocculent was observed in test vessels at concentration ≥ 500 µM as well as in carboys containing those test solutions. The lack of Cr toxicity except in sand at high concentrations (500 µM) was probably due to test solution aeration, which is required by EPA protocols, and not necessarily indicative of effects in the field where sediments can become anaerobic. In the AquaBlok experiment, growth of negative sand control (0.848 ± 0.166 mg/larvae) exceeded the QAPP standard while no treatments with AquaBlok did (average range 0.121 – 0.205 mg/larvae). This again showed that sand supported better growth than AquaBlok. AquaBlok-2 % corncob was not tested as no toxicity was apparent in peat moss experiments.

Water quality parameters in Cr experiments were as follows (Table IV.A2). Temperatures ranged from 19.1-19.5 °C, and DOs ranged from 6.84- 7.55 mg/L. Only the 500 µM Cr concentration showed statistical differences from negative control such that pH (7.18 ± 0.14 and 7.79 ± 0.12, respectively), alkalinity (14 ± 2 and 98 ± 7 mg/L, respectively), hardness (144 ± 4 and 156 ± 8 mg/L, respectively) and ammonia (0.24 ± 0.11 and 0.65 ± 0.10 mg/L, respectively) were all reduced. Changes in alkalinity, hardness and ammonia differed from those in Cd-sand experiments and were mostly likely due to flocculent. For AquaBlok-2 % peat moss experiments, average temperature ranged from 20.2 – 20.9 °C. DO tended to be lower in AquaBlok treatments (average ranged 4.3-5.6 mg/L) than in sand negative control (6.2 ± 0.7) but was above the standard, 2.5 mg/L. Water quality parameters for pH, alkalinity, and hardness were reduced compared to negative sand control in general. Data was inconsistent probably due to an n = 2 instead of 5, occurring from technical error. Ammonia levels were significantly reduced in positive control sand (0.6 ± 0.0 mg/L) and all AquaBlok treatments (average range 0.02-0.11 mg/L) compared to negative sand control (1.00 ± 0.00

mg/L). Water quality changes in AquaBlok treatments with Cr differed from those with Cd in that pH and ammonia declined at high concentrations of Cr.

IV.A.2.d. Nominal Water Concentrations versus Measured Concentrations of Heavy Metals in Water and Substrate.

For the four Cd experiments and two Cr experiments, water was collected at 10 d for heavy metal analyses by Atomic Absorption Spectroscopy (AA). Substrate was collected at the same time for two of the AB with Cd experiments and the one AB with Cr experiment. It was anticipated that the metals would distribute between the water and substrate altering nominal versus measured concentrations. Nominal versus measured for Cd experiments are shown in Table IV.A3. In the presence of sand, the ratio between nominal versus measured water concentrations declined with increasing nominal concentrations: the ratio for 0.1 µM and 10 µM Cd were 10 and 2.8, respectively. This means that the addition of more Cd resulted in higher concentrations in water than sand. In the presence of AB, the ratio between nominal versus measured water concentrations increase or stayed the same: the ratio for 1.0 µM and 50 µM Cd were 5.7 and 55.9, respectively. This means that the addition of more Cd resulted in lower relative concentrations in water and indicated more absorption by AB. Substrate was only collected in two of the Cd experiments, one with AB amended with 2 % corn and one amended with 2 % peatmoss. The concentration of Cd in AB did increase with nominal water concentrations of Cd; however, the ratio of measured water to measured AB concentrations was relatively constant between 0.1 and 50 µM Cd. This indicated that the AB was adsorbing additional Cd when more was added. Figure IV.A17 illustrated the relationship between nominal and measured Cd in each of the experiments. In the presence of sand, the increase in

Cd was linear between 0.01 and 10 µM Cd. In the presence of AB, the concentrations of Cd level off after about 1.0 µM. Comparison of 1.0 µM Cd in sand to 1.0 µM Cd in AB for the same experiment showed that the concentration of Cd in water were higher in the presence of sand. Overall, the data indicated that AB was absorbing the Cd from the water.

Comparisons of nominal versus measured concentrations of Cr are shown in Table IV.A4. Increasing concentrations of nominal Cr did not correspond with proportional higher measured Cr in water for either the sand or AB experiment. It was observed that the Cr flocculated out of solution probably due to oxidation. The ratio of nominal to measured water concentrations was very high, it ranged from 4.1 to 5555 in the presence of sand and 514 to 3676 in the presence of AB. This indicated that very little of the Cr was dissolved in the water. The ratios of measured water to substrate concentration were lower in the sand compared to the AB experiments. This indicated that more Cr was binding to sand than AB. However, in the AB experiment, the sand control had a higher ratio than most AB treatments. This inconsistency was most likely due to the difficulty of collecting samples that were free of flocculant. Overall, most of the Cr flocculated out of solution and it could not be determined the degree to which AB might be sequestering Cr.

IV.A.2.e. Conclusions for Heavy Metal Testing

Data for heavy metal testing were consistent with those for organic amendments in that larvae showed the best growth in negative control sand. If growth for Cd treatments were compared to their respective controls (sand without Cd, AquaBlok without Cd), then the LOAEL for sand was 0.5 µM Cd (Figure IV.A10) and that for AquaBlok was 10 µM Cd based on nominal water concentrations (Figure IV.A12). Measured Cd concentrations were less than nominal.

Effects on growth using measured concentrations showed a reduction in growth for sand and AB at about 0.1 µM Cd; however, the reduction in growth, relative to control, was less in the presence of AB (Figure IV.A18). Cr toxicity testing was complicated by the aeration of the test system. This apparently oxidized the Cr forming a flocculent. The LOAEL in sand was 500 µM Cr (Figure IV.A14) and that in AquaBlok was > 1000 µM Cr (Figure IV.A16) based on nominal water concentrations. Concentrations of Cr measured in water were much less than nominal. Effects on growth using measured water concentrations showed reduced growth, relative to control, only in the presence of sand (Figure IV.A19). Overall, growth was reduced by AB irrespective of the presence of heavy metals. If this effect was mitigated by calculating growth as a percent of the substrate control, then AB reduced toxicity due to heavy metals. In the case of Cd, this was most likely due to the binding of Cd to AB.

Water quality parameters for organic amendment and Cd testing were similar in that pH and alkalinity increased while hardness decreased (Table IV.A1). Ammonia differed in that it increased with 2 % peat moss in amendment studies and declined with Cd testing. A possible explanation could be the warmer temperature in the two amendment studies (21.9 and 20.5 °C in the 1st and 2nd peat moss experiments, respectively) than in the Cd peat moss study (19.4-19.9 °C). Water quality in Cr studies differed from those with Cd in that pH and alkalinity were reduced at high concentrations. This was likely due to the presence of flocculent. Overall, water quality parameters supported the binding of cations and best explains the reduced toxicity of heavy metals due to adsorption to the clay in AB. However, this must be viewed in the context of reduced growth in AB compared to sand in the absence of heavy metals.

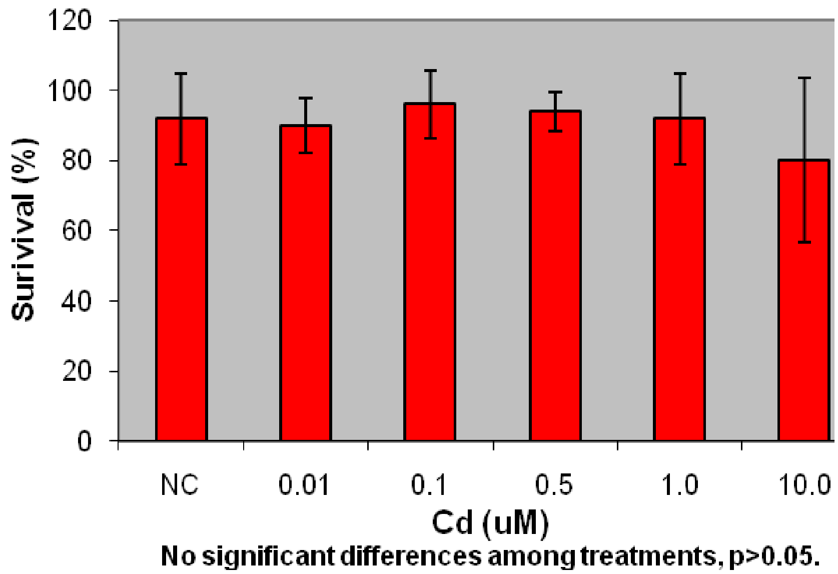


Figure IV.A9. Survival (%) of larvae exposed to Cd in sand.

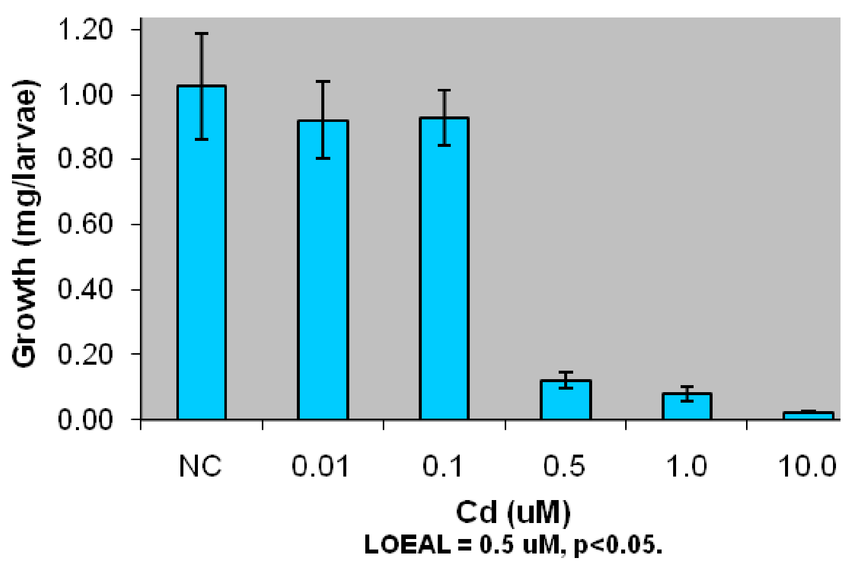


Figure IV.A10. Growth (mg/larvae) of larvae exposed to Cd in sand.

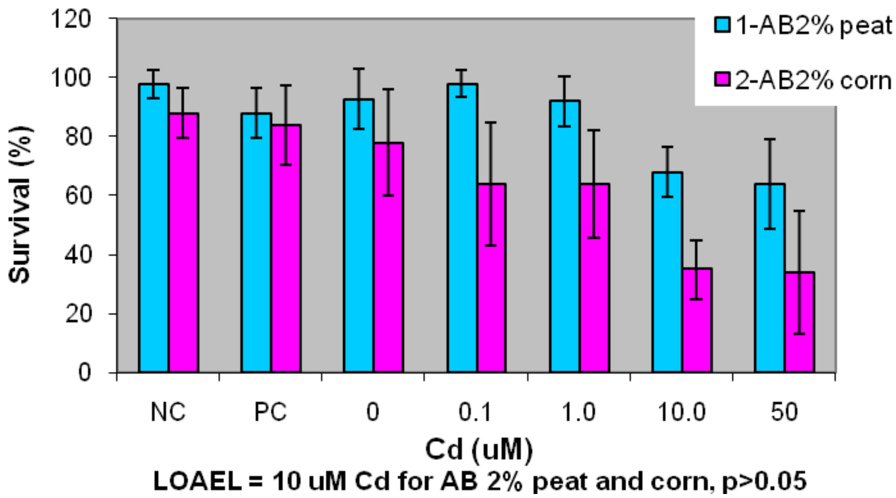


Figure IV.A11. Effect of Cd on survival (%) of larvae exposed to AquaBlok amended with 2 % peatmoss or corn.

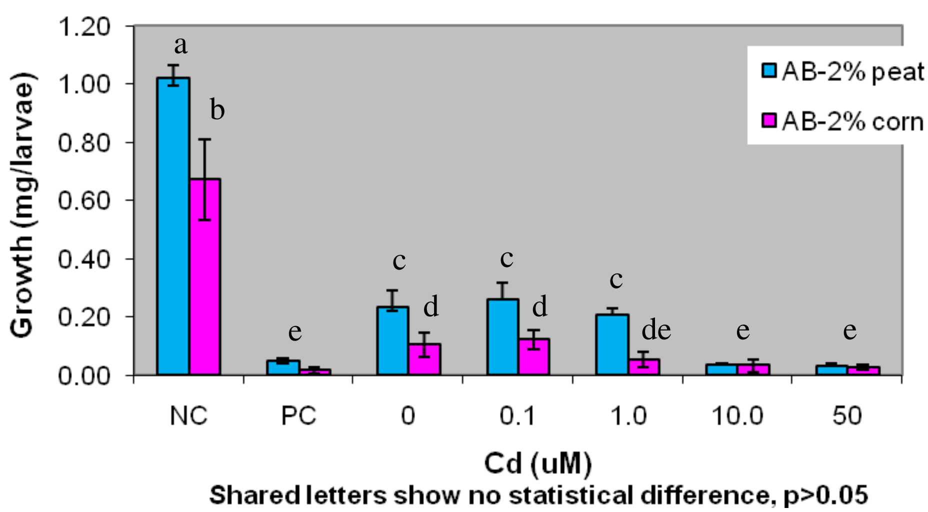


Figure IV.A12. Effect of Cd on growth (mg/larvae) of larvae exposed to AquaBlok amended with 2 % peatmoss or corn.

Table IV.A1. Water quality parameters for cadmium (Cd) experiments with sand or AquaBlok (AB) amended with 2% corncob or peat moss. Values are the average (±SD) of 5 replicates at day 9, except for temperature (Temp) and dissolved oxygen (DO), which are the average (±SD) of 2 replicates days 1-9. Yellow blocks show significant differences from NC, green blocks show differences from AB control, and blue blocks show differences from both NC and AB control, p≥0.05.

Substrate	Cd (uM)	Temp (°C)	DO (mg/L)	pH	Alkalinity (mg/L)	Hardness (mg/L	Ammonia (mg/L)
Sand	NC	19.6 (1.1)	6.0 (0.7)	6.87 (0.14)	87 (2)	163 (6)	0.88 (0.11)
	0.01	20.0 (1.1)	6.5 (0.7)	7.10 (0.04)	97 (7)	171 (6)	0.80 (0.20)
	0.1	20.0 (1.2)	6.1 (0.9)	7.21 (0.04)	99 (6)	171 (6)	0.96 (0.09)
	0.5	20.2 (1.2)	5.9 (1.0)	7.25 (0.02)	96 (7)	173 (4)	0.64 (0.09)
	1.0	20.2 (1.1)	6.3 (0.8)	7.23 (0.02)	92 (4)	169 (2)	0.76 (0.17)
	10.0	20.4 (1.0)	6.5 (0.6)	7.25 (0.03)	92 (4)	163 (4)	0.46 (0.13)
AB-2% peat	NC	19.4 (1.0)	7.5 (0.5)	7.54 (0.10)	92 (6)	163 (2)	0.68 (0.18)
	PC	19.8 (1.0)	7.5 (0.4)	8.19 (0.08)	96 (4)	192 (11)	0.54 (0.09)
	0	19.4 (1.0)	6.9 (1.2)	7.99 (0.12)	110 (18)	155 (17)	0.32 (0.11)
	0.1	19.6 (1.2)	7.0 (0.7)	8.13 (0.07)	106 (17)	140 (26)	0.22 (0.12)
	1	19.6 (1.0)	6.8 (0.6)	8.12 (0.04)	131 (10)	147 (27)	0.28 (0.11)
	10	19.7 (1.1)	7.0 (1.1)	8.10 (0.06)	122 (5)	106 (3)	0.20 (0.00)
	50	19.9 (1.1)	7.3 (0.7)	8.12 (0.09)	106 (6)	100 (9)	0.21 (0.06)
AB-2% corn	NC	21.2 (1.1)	6.6 (0.7)	7.61 (0.03)	101 (7)	188 (40)	0.60 (0.00)
	PC	21.5 (1.0)	6.6 (0.7)	7.92 (0.05)	122 (10)	185 (8)	0.04 (0.03)
	0	21.6 (1.2)	3.5 (1.1)	7.91 (0.03)	212 (26)	130 (9)	0.02 (0.01)
	0.1	21.3 (1.3)	4.5 (0.8)	7.84 (0.06)	176 (13)	122 (16)	0.06 (0.05)
	1	21.8 (1.4)	4.9 (0.8)	7.91 (0.09)	198 (15)	133 (9)	0.02 (0.00)
	10	21.6 (1.3)	5.4 (1.1)	7.96 (0.07)	153 (9)	138 (16)	0.10 (0.06)
	50	21.6 (1.3)	5.1 (0.6)	7.97 (0.07)	154 (15)	131 (25)	0.03 (0.03)

NC = negative control for AB study, which is sand plus 250 ml test water.
PC = positive control for AB study, which is sand, 1uM Cd plus 250 ml test water.
AB = AquaBlok, negative control = AB-2% peat without Cd plus 350 ml test water

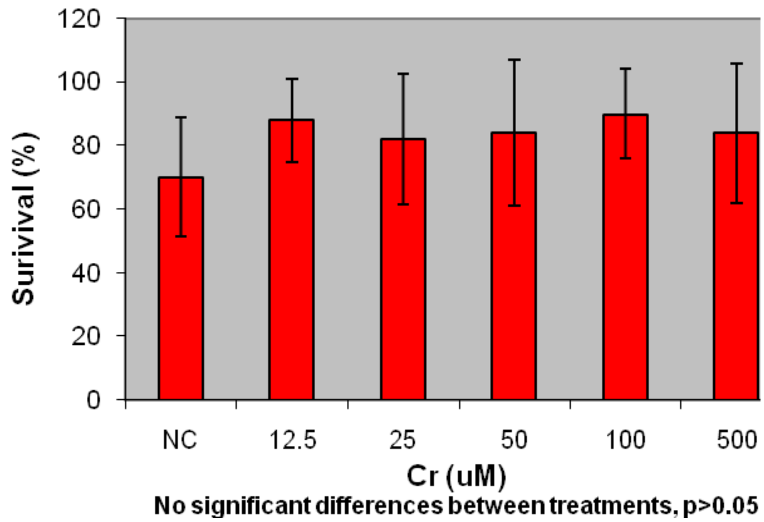


Figure IV.A13. Survival (%) of larvae exposed to Cr (III) in sand.

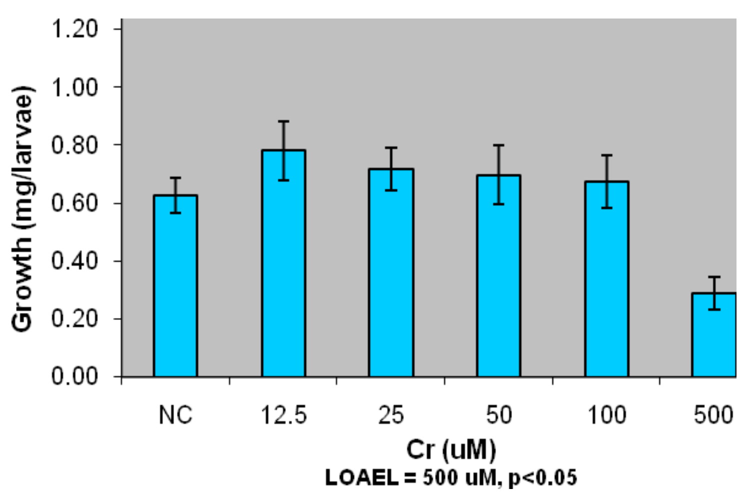


Figure IV.A14. Growth (mg/larvae) of larvae exposed to Cr (III) in sand.

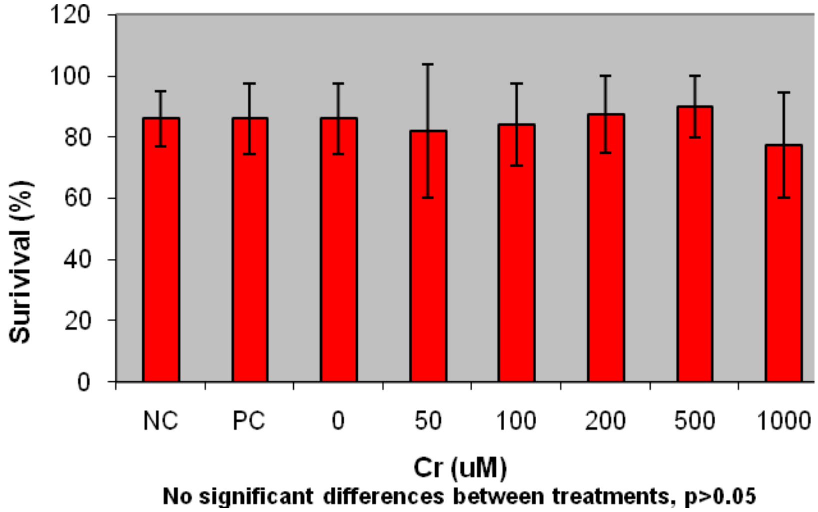


Figure IV.A15. Survival (%) of larvae exposed to Cr (III) in AquBlok amended with 2 % peatmoss.

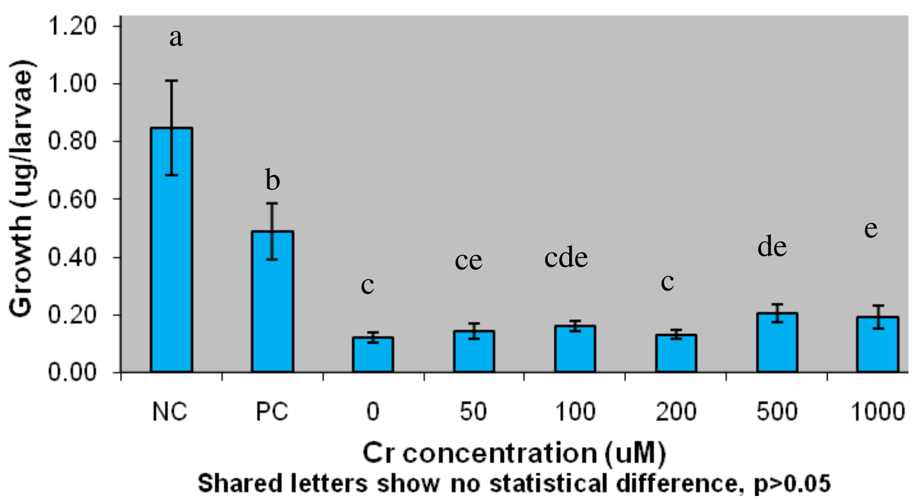


Figure IV.A16. Effect of Cr (III) on growth (mg/larvae) of larvae exposed to AquaBlok amended with 2 % peatmoss.

Table IV.A2. Water quality parameters for chromium (Cr) experiments with sand or AquaBlok (AB) amended with 2% peat moss. Values are the average (±SD) of 5 replicates at day 9, except for temperature (Temp) and dissolved oxygen (DO), which are the average (±SD) of 2 replicates days 1-9. Yellow blocks show significant differences from NC, green blocks show differences from AB control, and blue blocks show differences from both NC and AB control, p≥0.05.

Substrate	Cr (uM)	Temp (°C)	DO (mg/L)	pH	Alkalinity (mg/L)	Hardness (mg/L	Ammonia (mg/L)
Sand	NC	19.1 (0.7)	6.94 (0.58)	7.79 (0.12)	98 (7)	156 (8)	0.65 (0.10)
	12.5	19.2 (0.5)	6.84 (0.48)	7.93 (0.05)	101 (8)	165 (5)	0.64 (0.09)
	25	19.1 (0.5)	6.93 (0.64)	7.85 (0.21)	105 (3)	166 (4)	0.84 (0.17)
	50	19.3 (0.6)	6.96 (0.46)	7.90 (0.04)	90 (4)	158 (9)	0.76 (0.26)
	100	19.3 (0.8)	7.13 (0.55)	7.91 (0.08)	85 (5)	167 (4)	0.64 (0.09)
	500	19.5 (0.5)	7.55 (0.52)	7.18 (0.14)	14 (2)	144 (4)	0.24 (0.11)
AB-2% peat	NC	20.2 (0.4)	6.2 (0.7)	7.56* (0.28)	103* (18)	184* (23)	1.00* (0.00)
	PC	20.4 (0.6)	6.8 (0.9)	5.81 (0.31)	21 (1)	161 (13)	0.60 (0.00)
	0	20.3 (0.5)	5.0 (0.9)	7.79 (0.23)	103 (24)	134 (8)	0.02 (0.00)
	50	20.2 (0.5)	4.3 (1.3)	7.84 (0.01)	63 (18)	158 (3)	0.04 (0.00)
	100	20.3 (0.6)	4.3 (0.8)	7.68 (0.07)	96 (23)	146 (14)	0.11 (0.04)
	200	20.4 (0.7)	4.9 (1.0)	7.69 (0.01)	85 (1)	142 (3)	0.06 (0.03)
	500	20.7 (0.9)	5.4 (0.8)	7.46 (0.01)	64 (17)	141 (1)	0.08 (0.00)
	1000	20.9 (0.8)	5.6 (0.8)	6.70 (0.14)	14 (8)	142 (25)	0.02 (0.00)

NC = negative control for AB study, which is sand plus 250 ml test water.
PC = positive control for AB study, which is sand, 500 uM Cr plus 250 ml test water.
AB = AquaBlok, negative control = AB-2% peat without Cr plus 350 ml test water.
* only 2 replicates were measured instead of 5 on day 9

Table IV.A3. Distribution of Cd between water and substrate in toxicity tests. Data were collected from toxicity tests with Cd. Four separate experiments were done- sand only, sand or AB amended with 2% corn, and two experiments using AB amended with 2% peat. Nominal (Nm) concentrations represented the concentration of Cd added to aerated test water. Measured (Ms) values represented concentrations in water or substrate (subs) after the 10 d test as determined by AA. Ratios were calculated for Nm versus Ms water concentrations and Ms water versus subs concentrations. Values measured for control (0.0 Nm) were subtracted from other measured values before calculating the ratios. Values were the average ± SD for 4-5 replicates, accept for one concentration (*) for which only one replicate was measured. ND = no data.

Experiment	Treatment	Nm (µM)	Ms Water (µM±SD)	Ms Subs (mmol/kg±SD)	Ratio Water Nm/Ms	Ratio Water/Subs Ms
Sand	Sand	0.0	0.007±0.000	ND		ND
	Sand	0.01	0.008±0.001	ND	10	ND
	Sand	0.10	0.020±0.002	ND	7.7	ND
	Sand	0.50	0.103±0.005	ND	5.2	ND
	Sand	1.00	0.280±0.021	ND	3.7	ND
	Sand	10.00	3.546±0.149	ND	2.8	ND
AB-2% Corn	AB	0	0.043±0.022	0.024±0.007		1.8
	AB	0.1	0.077±0.0162	0.060±0.014	2.9	1.3
	AB	1.0	0.216±0.009	0.069±0.015	5.7	3.2
	AB	10.0	1.207±0.366	0.990±0.137	8.6	1.2
	AB	50.0	0.938±0.093	0.883±0.139	55.9	1.1
	Sand	0	0.014±0.014	0.004±0.001		3.4
	Sand	1.0	1.164±1.502	0.018±0.005	0.9	82.9
AB-2% Peat	AB	0	0.008±0.001	ND		ND
	AB	0.1	0.012±0.001	ND	25	ND
	AB	1.0	0.099±0.011	ND	11	ND
	AB	10.0	1.169±0.431	ND	8.6	ND
	AB	50.0	0.188±0.068	ND	277	ND
	Sand	0	0.008±0.002	ND		ND
	Sand	1.0	0.249±0.027	ND	4.1	ND
AB-2% Peat	AB	0	0.009*	0.0102±0.002		0.9
repeat	AB	0.1	0.207±0.028	0.0585±0.004	0.5	3.5
	AB	1.0	0.124±0.021	0.0302±0.005	8.7	4.1
	AB	5.0	0.850±0.399	0.1729±0.009	5.9	4.9

Table IV.A4. Distribution of Cr between water and substrate in toxicity tests. Data were collected from toxicity tests with Cr. Two separate experiments are shown- sand only and AB amended with 2% peat. Nominal (Nm) concentrations represented the concentration of Cd added to aerated test water. Measured (Ms) values represented concentrations in water or substrate (subs) after the 10 d test as determined by AA. Ratios were calculated for Nm versus Ms water concentrations and Ms water versus subs concentrations. Values were the average ± SD for 4-5 replicates. except 200 µM AB for which there were 3 replicates.

Experiment	Treatment	Nm (µM)	Ms Water (µM±SD)	Ms Subs (mmol/kg±SD)	Ratio Water Nm/Ms	Ratio Water/Subs Ms
Sand	Sand	0.0	0.038±0.059	0.050±0.038		0.764
	Sand	12.5	0.014±0.004	0.283±0.253	893	0.049
	Sand	50	0.023±0.011	0.795±0.337	2174	0.028
	Sand	100	0.018±0.002	3.063±0.992	5555	0.006
	Sand	500	0.250±0.052	30.56±15.48	2000	0.008
AB-2% Peat	AB	0	0.012±0.005	0.042±0.037		0.282
	AB	50	0.020±0.008	0.101±0.036	2500	0.202
	AB	100	0.117±0.029	0.134±0.043	855	0.874
	AB	200	0.389±0.023	0.159±0.033	514	2.445
	AB	500	0.136±0.021	1.362±0.342	3676	0.100
	AB	1000	1.407±0.616	1.454±0.147	710	0.968
	Sand	0	0.008±0.003	0.269±0.930		0.029
	Sand	500	121.20±29.06	39.27±8.73	4.1	3.087

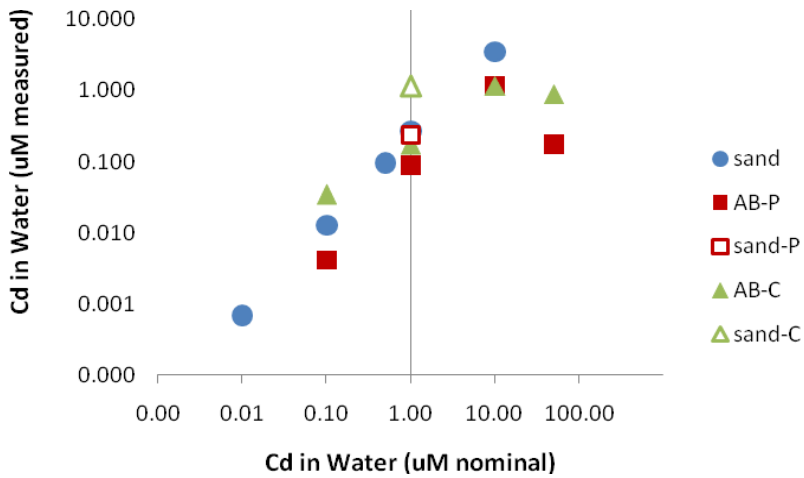


Figure IV.A17. Effect of AquaBlok on Cd water concentrations. The amount of Cd added to water (nominal) was compared to that detected (measured) in water after 10 d for different treatments. Each symbol represents a separate experiment. Treatments consisted of sand, AquaBlok (AB) amended with 2% peatmoss and AB amended with 2% corn. For each AB experiment, a treatment with sand (1 µM Cd) was run- denoted by open symbols. Each data point represented the average of 4-5 replicates.

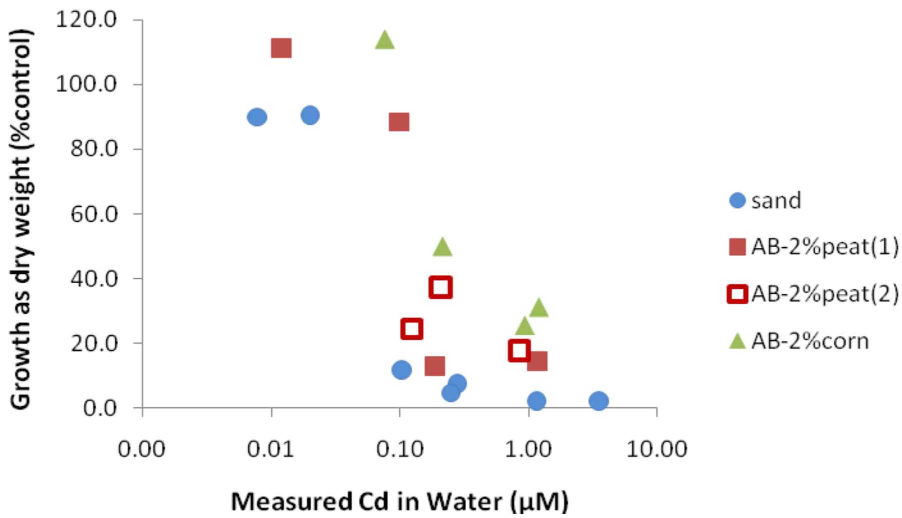


Figure IV.A18. Effect of AquaBlok on the toxicity of Cd. Data showed growth versus measured Cd concentration. Growth was represented as larval dry weight as a percent of the control for each experiment. The control for sand experiments was sand without Cd. The control for AquaBlok (AB) experiments was AB without Cd. Larval controls grew less in AB than sand. Two experiments were conducted with AB amended with 2% peatmoss (AB-2%peat)- denoted by (1) and (2). Each data value was the average of 4-5 replicates.

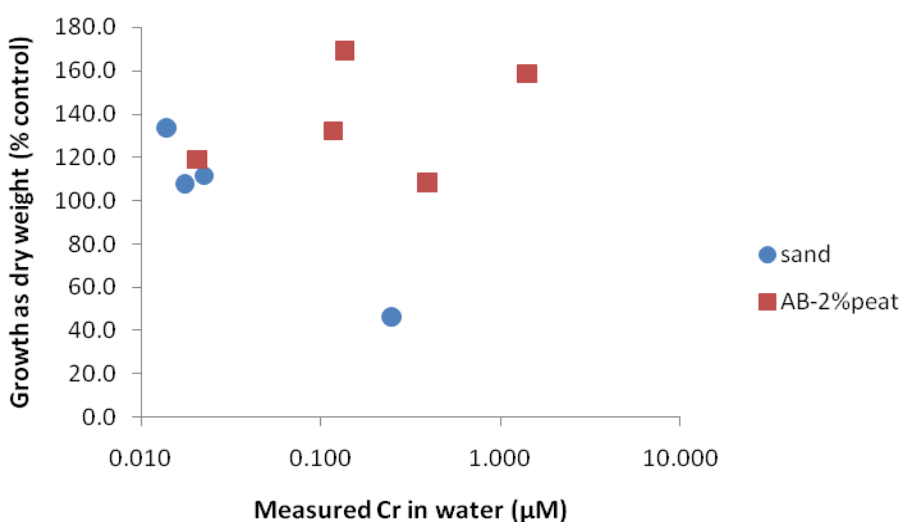


Figure IV.A19. Effect of AquaBlok on the toxicity of Cr. Data showed growth versus measured Cr concentration. Growth was represented as larval dry weight as a percent of the control for each experiment. The control for sand experiments was sand without Cr. The control for AquaBlok (AB) experiments was AB without Cr. Larval controls grew less in AB than sand. Each data value was the average of 4-5 replicates.

IV.B. Site Selection

Siting of the study area in Kearny Marsh was based on the following criteria: (1) detectable levels of most contaminants within sediments; (2) sediments that are physically representative of those typically found throughout the marsh, both in terms of composition and dominant grain size; (3) an open-water (non-vegetated) area with vegetated areas located nearby; (4) adjacent vegetation representative of that typically found throughout the marsh; (5) relatively flat sediment surfaces, characterized by pre-capping water depths preferably and typically ranging from approximately 12 to 16 inches deep, in order that targeted water depths (6 to 10 inches) are generally achieved once capping materials are placed; (6) a size of at least 0.83 acres (10/12 acres) to accommodate 10, 1/12 acre plots of which only 6 (0.5 acres) will be capped; (7) readily accessible from the standpoint of property ownership; (8) readily accessible by construction equipment, with large, open areas available nearby for material stockpiling activities; and (9) a relatively out-of-the-way location in order to minimize vandalism. The current site met these criteria with the exception of the water depth. Uncapped the water depth ranged from 24 to 42 inches. This was too deep for aquatic plants establishment. Therefore, Biologs were sunk to achieve depths of 6 to 18 inches. This process will be discussed further in section VI - Placement of the Cap.

IV.C. Experimental design

IV.C.1 Field experimental design

Figure IV.C1 shows the lay out of 10 plots each approximating 60 by 60 feet. Plots contained one of five treatments 1) AB alone, 2) AB with SubmerSeed, 3) AB amended with 2% peat moss and SubmerSeed, 4) uncapped control and 5) uncapped control with SubmerSeed, laid in duplicate. Eight of the plots were in line with the shore, which allowed easier placement of the AquaBlok materials. Plots 9 and 10 were further from shore and therefore it was decided that they would be control plots, no AquaBlok deposition. The other two control plots were intentionally placed in the more shallow parts of the marsh to increase the likelihood that the aquatic plants in SumberSeed would emerge. Sites for other treatments were chosen at random. Plots were delineated by driving stakes into the sediment, and a grid system was established by stringing lines with flags between the stakes. Flags were spaced at 10 foot intervals.

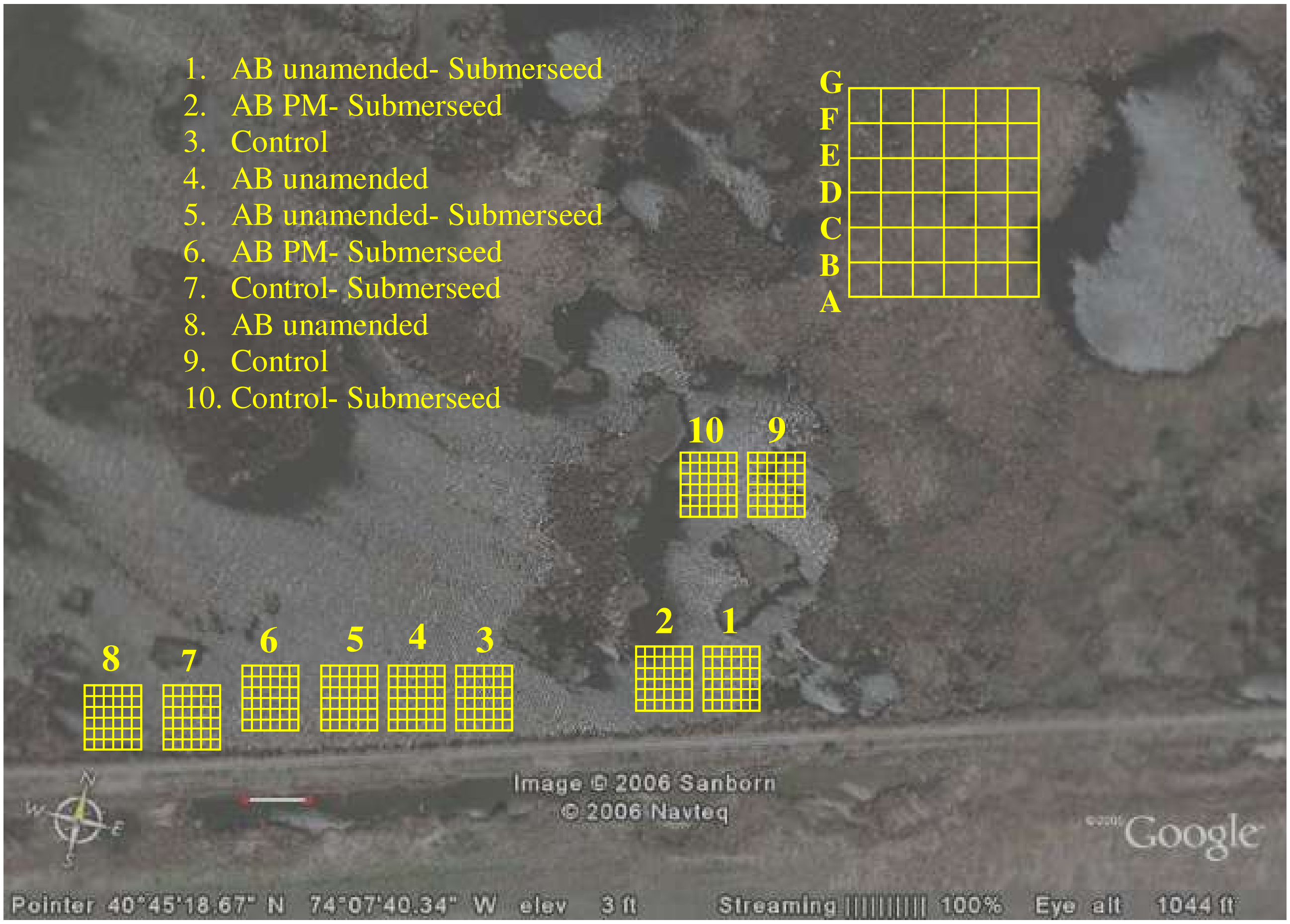


Figure IV.C1. Site map and plot grid for AquaBlok study. Plots were approximate 60 by 60 ft. Each treatment was done in duplicate for a total of 10 plots. A grid system, 0-6 by A-G, allowed sampling at defined locations. AB= AquaBlok, PM= peat moss.

IV.C.2 Alternative vegetation experiments

IV.C.2.a Field experiment:

To replicate the field design on a controlled, small scale, 100 gallons tubes we used on the field in an area adjacent to the experimental plots.

Figure IV.C2 shows the field lay out of 9- submerged tubs containing different underlying substrates: this design consist of a set of three tubs in triplicate, 9 tubs in total. Treatment A = Marsh Soil (sufficient to fill the tub to the 22" mark); treatment B Marsh Soil/ABPM contains marsh soil (sufficient to fill the tub to the 13" mark) and 150 lb of AquaBlok amended with peat moss (8" hydrated) ; and treatment C = Sand/ABPM contains sand (sufficient to fill the tub to the 13" mark) and 150 lb of AquaBlook amended with peat moss (8" hydrated). All tubs were sowed with 1¼ -1 ½ lb of SubmerSeed as on the original field design.

In order to replicate the research study in a small scale, 100 gallon tubs will be used in green house settings. Six tubs will be used to replicate the three field treatments in duplicate. All tubs will be filled with marsh sediments (1/2 way) and water. Two tubs will be capped with plain AquaBlok, two tubs will be capped with AquaBlock amended with 2% peat moss and the last two tubs will be left uncapped (control). All tubs will receive SubmerSeeds in the same amount used on the field.

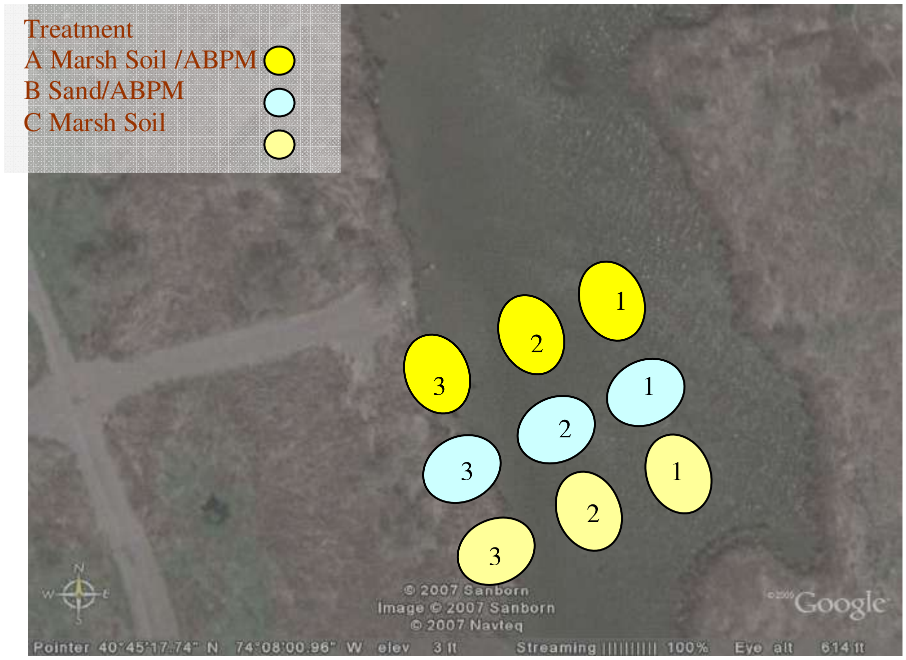


Figure IV.C2. Site map of field vegetation alternative experiment showing the position of submerged tubs duplicating the field conditions of the initial research.

IV.C2.b Alternative Green house experiment.

IV.D. Permits and Other Documentation

The following documents were provided 3/31/06: Permit #2005 00448 - J2 Nationwide Permit Compliance Certification (Permit #38) Department of the Army Corps of Engineers; Water Quality Certificate and Coastal Zone Management concurrence or waiver, NJDEP Land Use Regulation Program.

IV.E. QAPP

The QAPP was been completed and reviewed as of January 2005. Amendments were submitted August 2005 and January 2006.

V. PRE-CAPPING ACTIVITIES

V.A. Water Quality

Plots were sampled for water quality parameters before and after capping. Three replicates per plot were taken. Table V.A1 shows the GPS position of the replicates and the data collected for July 13, 2005. Capping was done approximately two weeks later. Field parameters for water quality were collected using a Hydrolab datasonde 4a. TSS was measured according to Method 2540B (Standard Methods for the Examination of Water and Wastewater, 18th edition).

In summary, salinity was very consistent across the site, ranging from 1.25 to 1.35 ppt. The pH ranged from 7.76 to 8.32 across the sites; however, it was not significantly different when comparing pH among treatment groups. Temperature ranged from 24.9 to 30.4 °C across the site. It tended to be warmer on the west side of the marsh (plot 8 averaged 29.9 ± 0.89 °C) than on the east side (plot 9 averaged 24.9 ± 0.1 °C). Given the positioning of duplicates (See Figure IV.C1), this was not associated with significant differences among treatments. DO concentrations positively correlated with temperature such that they were higher on the west side of the marsh (plot 8 averaged 10.88 ± 0.89 mg/L) and lower on the east side (plot 2 averaged 4.70 ± 0.74 mg/L). Usually DO decreases with increasing temperature: the data reported here might have resulted from increased levels of DO produced by algae in warmer plots. The ORP was similar across the study site ranging from 279 to 365 mV. Depths ranged from 1.4 to 3.5 feet across the study site but were fairly consistent within a plot. Depth was typically 2.5 feet. Plot 5 was the deepest averaging 2.93 ± 0.21 feet, while plot 10 was the shallowest averaging 2.20 ± 0.69 feet. Study site depths were a concern for aquatic plants which require 0.5 to 1.5 feet for optimal germination. Therefore, the more shallow sites were chosen for uncapped controls. TSS ranged from 17.5 to 74.0 mg/L; there did not appear to be any relationship between plot location and concentration.

Table V.A1. Water quality parameters taken prior to capping, date 7-13-05. All samples were collected between 11:00AM and 2:00PM. CNTRL = not capped, S = with SumerSeed, AB = AquaBlok, PM = amended with peat moss, UN = unamended, Sal = salinity (ppt), Temp = temperature (°C), DO = dissolved oxygen (mg/L), ORP = oxidation-reduction potential (mV), depth (feet), TSS = Total Suspended Solids (mg/L). Green blocks indicate data not included in average.

Plot #	Sample	Latitude	Longitude	Sal	pH	Temp	DO	ORP	Depth	TSS
AB UN S	1 - A	40°45. 287	074°07. 646	1.34	8.03	25.8	7.22	326	2.30	49.5
#1	1 - B	40°45. 279	074°07. 654	1.34	8.02	25.8	6.74	313	2.20	63.0
	1 - C	40°45. 279	074°07. 651	1.34	7.99	25.7	6.32	330	2.60	36.5
Average # 1				1.34	8.01	25.7	6.76	323	2.37	49.6
SD				0.00	0.02	0.1	0.45	9	0.21	13.3
AB PM S	2 - A	40°45. 278	074°07. 664	1.34	7.83	25.9	4.33	299	2.60	41.0
#2	2 - B	40°45. 279	074°07. 668	1.34	7.76	25.8	4.22	307	2.00	39.0
	2 - C	40°45. 272	074°07. 670	1.34	7.83	25.9	5.56	326	3.50	36.0
Average # 2				1.34	7.81	25.9	4.70	311	2.70	38.6
SD				0.00	0.04	0.1	0.74	14	0.75	2.5
CNTRL	3 - A	40°45. 269	074°07. 698	1.34	8.03	26.3	7.36	340	2.80	21.5
#3	3 - B	40°45. 275	074°07. 704	1.35	8.12	26.2	8.04	330	3.00	30.5
	3 - C	40°45. 271	074°07. 693	1.34	8.00	25.9	6.55	325	2.60	27.5
Average # 3				1.34	8.05	26.1	7.32	332	2.80	26.5
SD				0.01	0.06	0.2	0.75	8	0.20	4.6
AB UN	4 - A	40°45. 269	074°07. 711	1.34	8.23	29.0	10.71	315	2.70	26.5
#4	4 - B	40°45. 275	074°07. 708	1.35	8.27	29.7	11.06	315	2.70	26.0
	4 - C	40°45. 264	074°07. 706	1.35	8.32	29.7	2.02	315	3.00	25.0
Average # 4				1.35	8.27	29.5	10.89	315	2.80	25.83
SD				0.01	0.05	0.4	0.25	0	0.17	0.8
AB UN S	5 - A	40°45. 264	074°07. 708	1.34	8.24	28.9	11.29	279	2.70	17.5
#5	5 - B	40°45. 271	074°07. 722	1.33	8.23	29.2	11.28	281	3.00	35.5
	5 - C			1.34	8.23	29.1	11.38	299	3.10	24.0
Average # 5				1.34	8.23	29.1	11.32	286	2.93	25.6
SD				0.01	0.01	0.1	0.06	11	0.21	9.1

Plot #	Sample	Latitude	Longitude	Sal	pH	Temp	DO	ORP	Depth	TSS
Plot #	Sample	Latitude	Longitude	Sal	pH	Temp	DO	ORP	Depth	TSS
AB PM S	6 - A	40°45. 267	074°07. 748	1.34	8.31	29.1	11.40	288	2.70	42.5
#6	6 - B	40°45. 263	074°07. 740	1.34	8.30	29.1	11.83	298	2.60	34.5
	6 - C	40°45. 256	074°07. 745	1.34	8.27	29.2	13.25	303	2.90	56.5
Average # 6				1.34	8.29	29.1	12.16	296	2.73	44.5
SD				0.00	0.02	0.1	0.97	8	0.15	11.1
CNTRL S	7 - A	40°45. 259	074°07. 761	1.34	8.33	29.8	11.50	354	2.40	24.0
#7	7 - B	40°45. 257	074°07. 764	1.34	8.31	29.3	11.94	347	2.40	29.5
	7 - C	40°45. 256	074°07. 760	1.34	8.30	29.5	11.42	338	2.40	30.0
Average # 7				1.34	8.31	29.5	11.62	346	2.40	27.83
SD				0.00	0.02	0.3	0.28	8	0.00	3.3
AB UN	8 - A	40°45. 287	074°07. 646	1.34	8.30	30.0	9.88	364	2.00	23.0
#8	8 - B	40°45. 279	074°07. 654	1.34	8.22	29.3	11.16	344	2.20	21.5
	8 - C	40°45. 279	074°07. 651	1.34	8.30	30.4	11.60	339	2.50	24.5
Average # 8				1.34	8.27	29.9	10.88	349	2.23	23.0
SD				0.00	0.05	0.89	0.89	13	0.25	1.5
CNTRL	9 - A	40°45. 278	074°07. 664	1.34	7.95	25.1	5.93	338	3.00	36.5
#9	9 - B	40°45. 279	074°07. 668	1.34	7.98	25.5	6.55	351	2.30	36.0
	9 - C	40°45. 272	074°07. 670	1.34	8.00	25.7	7.16	365	2.30	44.5
Average # 9				1.34	7.98	25.4	7.47	312	2.53	39.0
SD				0.00	0.03	0.3	0.38	13	0.40	4.8
CNTRL S	10 - A	40°45.310	074°07.653	1.34	8.04	24.9	6.80	300	2.60	35.5
#10	10 - B	40°45.313	074°07.651	1.34	7.86	24.9	6.40	293	1.40	33.0
	10 - C	40°45.307	074°07.648	1.25	7.95	25.0	7.09	295	2.60	74.0
Average # 10				1.31	7.95	24.9	6.76	296	2.20	47.5
SD				0.05	0.09	0.1	0.35	4	0.69	23.0

V.B. Sediment Characterization

Sediments were characterized by measuring % moisture and % total organic carbon (TOC) (ASTM-D2974) as well as grain size (ASTM-D422) (Tables V.B1 – V.B2). Three replicates were taken within each plot by Ekman Dredge. At the time of sample collection for sediment, the plots had been delineated by stakes, but a grid system had not yet been set up. Therefore, the locations of samples were defined by GPS locations at first, and then by the grid system. Statistical analyses were done using a one-way ANOVA followed by Dunnett's Multiple Comparison Test.

Table V.B1 shows high moisture content in sediments ranging from 83.7 to 94.6 %. Ash content ranged from 12.5 to 20.0 %. Organic content was very high ranging from 80.0 to 95.3 %. Table V.3 shows percent grain size of pebbles ranged from an average of 0.06% in plot 7 which is a control that contains Submerseed to an average of 1.64% in plot 4 which contains AquaBlok that is not amended with peat moss. The differences were not statistically significant. Granules ranged from an average 0.44% in plot 8 which contains AquaBlok that is not amended with peat moss to an average of 5.29% in plot 2 which contains AquaBlok that is amended with peat moss and contains Submerseed. Again, the differences were not statistically significant. Coarse sand ranged from an average of 7.49% in plot 9 which is a control and it was significantly less than the average of 28.08% in plot 1 which contains AquaBlok that is not amended with peat moss and contains Submerseed ($p < 0.05$). Medium sand ranged from an average of 7.82% in plot 2 which contains AquaBlok that is amended with peat moss and contains Submerseed and was significantly less than the average of 17.56% in plot 8 which contains AquaBlok that is not amended with peat moss ($p < 0.05$).

Fine sand ranged from an average of 9.17% in plot 2 which contains AquaBlok that is amended with peat moss and has Submerseed to an average of 18.23% in plot 8 which contains AquaBlok that is not amended with peat moss. The differences were not statistically significant. Very fine sand ranged from an average of 6.88% in plot 1 which contains AquaBlok that is not amended with peat moss to an average of 10.09% in plot 7 which is a control that has Submerseed. The differences were not statistically significant. Silt ranged from an average of 24.51% in plot 1 which contains AquaBlok that is not amended with peat moss to an average of 40.21% in plot 3 which is a control. The differences were not statistically significant. Clay ranged from an average of 12.24% in plot 7 which is a control that has Submerseed to an average of 19.70% in plot 1 which contains AquaBlok that is not amended with peat moss (Table V.B2). Again, the differences were not statistically significant.

Table V.B1. Characterization of marsh sediments (July 13, 2005) including percent moisture, ash content (Ash) and total organic matter (TOC). GPS values show locations of samples.

Plot #	% moisture	% Ash	% TOC	GPS (Lat) N	GPS (long) W
1 A	92.1	10.1	89.9	40º45.287'	074º07.646'
1 B	91.7	12.6	87.4	40º45.279'	074º07.654'
1 C	94.7	13.1	86.9	40º45.279'	074º07.651'
Average	92.8	11.9	88.1		
2 A	90.5	16.9	83.1	40º45.278'	074º07.664'
2 B	94.4	12.0	88.0	40º45.279'	074º07.668'
2 C	89.1	16.4	83.6	40º45.272'	074º07.670'
Average	91.3	15.1	84.9		
3 A	87.5	16.4	83.6	40º45.269'	074º07.698'
3 B	90.4	11.9	88.1	40º45.275'	074º07.704'
3 C	94.5	12.4	87.6	40º45.271'	074º07.693'
Average	90.8	13.6	86.4		
4 A	94.6	11.0	89.0	40º45.269'	074º07.711'
4 B	86.6	16.0	84.0	40º45.275'	074º07.708'
4 C	89.2	12.3	87.7	40º45.264'	074º07.706'
Average	90.1	13.1	86.9		
5 A	95.8	11.0	89.0	40º45.264'	074º07.708'
5 B	92.1	14.7	85.3	40º45.271'	074º07.722'
5 C	83.7	14.0	86.0	ND	ND
Average	90.5	13.2	86.8		
6 A	89.9	15.9	84.1	40º45.267'	074º07.748'
6 B	93.4	11.6	88.4	40º45.263'	074º07.740'
6 C	90.2	18.2	81.8	40º45.256'	074º07.745'
Average	91.1	15.2	84.8		
7 A	91.7	15.8	84.2	40º45.259'	074º07.761'
7 B	88.8	15.5	84.5	40º45.257'	074º07.764'
7 C	87.8	15.5	84.5	40º45.256'	074º07.763'
Average	89.4	15.6	84.4		
8 A	87.9	13.2	86.8	40º45.257'	074º07.771'
8 B	91.6	16.6	83.4	40º45.253'	074º07.767'
8 C	91.7	14.6	85.4	40º45.260'	074º07.769'
Average	90.4	14.8	85.2		
9 A	91.2	20.0	80.0	40º45.312'	074º07.660'
9 B	93.1	14.5	85.5	40º45.306'	074º07.661'
9 C	94.6	12.5	87.5	40º45.303'	074º07.668'
Average	93.0	15.7	84.3		
10 A	92.9	13.6	86.4	40º45.310'	074º07.653'
10 B	96.1	14.7	95.3	40º45.313'	074º07.651'
10 C	93.1	13.9	86.1	40º45.307'	074º07.648'
Average	94.0	10.7	89.3		

Table V.B2. Grain sizes for sediment samples collected pre-capping, July 13, 2005. Samples were located within plots as shown in previous table.

Plot	Pebble	Granule	Coarse Sand	Medium Sand	Fine Sand	Very Fine Sand	Silt	Clay
1A	0.01%	0.38%	36.54%	11.94%	10.97%	6.62%	24.4%	9.1%
1B	0.99%	1.00%	16.04%	8.44%	10.03%	8.15%	27.8%	27.6%
1C	0.05%	1.86%	31.66%	8.70%	8.13%	5.87%	21.3%	22.4%
Average	0.35%	1.08%	28.08%	9.69%	9.71%	6.88%	24.51%	19.70%
2A	0.63%	5.43%	21.49%	7.51%	7.99%	7.39%	33.8%	15.8%
2B	0.63%	5.43%	21.49%	7.51%	7.99%	7.39%	33.8%	15.8%
2C	2.61%	5.00%	15.12%	8.44%	11.54%	9.74%	35.4%	12.1%
Average	1.29%	5.29%	19.36%	7.82%	9.17%	8.17%	34.34%	14.55%
3A	0.28%	3.10%	11.71%	8.46%	11.16%	9.74%	42.4%	13.2%
3B	0.15%	1.81%	3.03%	5.98%	11.77%	11.68%	50.8%	14.8%
3C	0.27%	4.96%	20.84%	10.88%	11.02%	8.59%	27.4%	16.0%
Average	0.23%	3.29%	11.86%	8.44%	11.32%	10.00%	40.21%	14.66%
4A	3.26%	1.76%	11.09%	10.68%	12.65%	10.79%	32.2%	20.8%
4B	0.00%	0.68%	11.94%	10.15%	11.95%	10.86%	42.3%	12.2%
4C	1.66%	4.15%	26.17%	14.26%	14.33%	7.25%	24.5%	7.6%
Average	1.64%	2.20%	16.40%	11.69%	12.98%	9.63%	33.00%	13.54%
5A	0.58%	4.06%	12.09%	16.40%	15.83%	11.23%	24.8%	15.1%
5B	0.01%	0.74%	19.97%	13.25%	11.96%	7.71%	32.4%	14.0%
5C	0.07%	2.34%	9.46%	11.48%	15.42%	5.36%	47.2%	8.6%
Average	0.22%	2.38%	13.84%	13.71%	14.40%	8.10%	34.79%	12.55%
6A	0.62%	0.83%	15.51%	18.07%	19.69%	6.01%	29.8%	9.4%
6B	0.24%	3.32%	9.32%	12.98%	11.55%	9.38%	24.7%	28.5%
6C	0.00%	0.07%	8.50%	14.65%	16.66%	13.06%	37.4%	9.6%
Average	0.29%	1.41%	11.11%	15.23%	15.97%	9.48%	30.65%	15.87%
7A	0.06%	1.81%	21.70%	13.46%	11.12%	7.34%	32.4%	12.1%
7B	0.03%	0.42%	10.74%	16.43%	14.75%	10.12%	36.3%	11.2%
7C	0.08%	0.40%	2.03%	14.74%	16.28%	12.83%	40.2%	13.4%
Average	0.06%	0.88%	11.49%	14.87%	14.05%	10.09%	36.31%	12.24%
8A	0.30%	0.90%	9.46%	15.30%	14.33%	10.02%	36.9%	12.8%
8B	0.00%	0.27%	21.48%	14.52%	11.51%	7.29%	33.0%	12.0%
8C	0.00%	0.14%	4.25%	22.87%	28.86%	16.81%	7.9%	19.1%
Average	0.10%	0.44%	11.73%	17.56%	18.23%	11.37%	25.92%	14.64%
9A	0.30%	1.94%	13.18%	14.61%	11.85%	7.92%	35.1%	15.1%
9B	1.55%	7.57%	2.84%	12.32%	13.09%	10.53%	40.5%	11.6%
9C	0.00%	0.86%	6.45%	16.46%	13.10%	8.17%	31.5%	23.4%
Average	0.61%	3.46%	7.49%	14.46%	12.68%	8.88%	35.70%	16.73%
10A	0.77%	9.47%	13.54%	16.29%	11.25%	5.63%	28.2%	14.9%
10B	1.13%	7.51%	4.93%	6.53%	22.41%	12.22%	18.4%	26.9%
10C	0.39%	0.24%	5.66%	10.05%	17.89%	10.92%	34.0%	20.8%
Average	0.76%	5.74%	8.04%	10.96%	17.18%	9.59%	26.87%	20.87%

V.C. Plant Community Characterization

Based on observations done during a three month period, June – September 2005 of the research area and it surrounding we conclude that: (1) the vegetation present in the research area itself (0.83 acres) is limited to small floating islands formed by the extensive mats of *Phragmites australis*' rhizomes. Associated with the *Phragmites* mats we find mostly *Eleocharis sp*., and *Althaea officinalis.* No submerged plants were found in the research area. (2) At the margins of the plots the vegetation is dominated by *Phragmites australis* (70%), *Eleocharis sp*.(12%), *Althaea officinalis* (8%), *Pluchea sp*.(5%) *Hydrocotyle americana* (3%), *Lemna minor* and *Cyperus sp* (1%) and other, no identifiable at this time, herbaceous vegetation (1%). (3) Adjacent to the research area, we collected samples of *Typha latifolia*, and *Potamogeton curli* and *Rupia maritime* which were submerged in 1.3 feet of water.

Pre-capping dominant vegetation samples were collected and identified during the months of Jun and July, 2005. *Althaea officinalis, Cyperus sp., Eleocharis palustris, Hydrocotyle Americana, Lemna minor, Phragmites australis, Pluchea sp., Potamogeton curli, Rpupia maritime,* and *Typha latifolia.* All plant samples were collected as part of large, intact sediment cores using shovels. Five plant-sediment cores containing several plant species were excavated to a soil depth of 3.5 to 4.5 feet. Plant-sediment cores were collected outside of the study area and adjacent to plot 10 (Figure V.1). A total of eight to fifteen plant specimens per species were collected. Each plant specimens was manually removed from the large block sample. Their positions were carefully recorded and photographed. From each species identified, three complete specimens were selected for herbarium preparation.

Figure V.C1. Plant-sediment core containing several plant species collected outside of the study area.

V.D. BMI Community Characterization

Pre-capping, the benthic macroinvertebrate community was sampled on July 13, 2005 using an Ekman dredge. Sediments were collected from three sites per plot (A, B and C) for a total of 30 samples. Each sample filled a one liter, plastic container that was placed on ice in the field. Upon returning to the lab, samples were either sieved immediately or stored at 4 °C for ≤48 hours before sieving. BMI were separated from sediment by sieving through a 500 micron screen. Screen contents were fixed and stored in 70% ethanol. Samples were later sorted into taxonomic groups and counted. All specimens were stored in 70% ethanol. BMI were identified using several taxonomic guides: Needham and coworkers, 1995, Walker, 1953, Gloyd and Wright, 1956, Edmunds and coworkers, 1976, Usinger, 1956, Menke, 1979, and Leech and Saderson, 1959.

Statistical analyses were done using a one-way ANOVA followed by Dunnett's Multiple Comparison Test. Results (Table V.D1) showed very few organisms in sediment. Those that were found were from the Diptera Order (includes the Family Chironomidae) or oligochaetes. They numbered from 1-3 individuals in only 6 of 30 samples. Chironomid head capsules, exuviae of Odonata nymph and vestiges of other BMI were also found providing evidence that these organisms were living in the marsh but not within the sediments themselves.

The number of dipteran larva ranged from an average of 0 in plots 1, 2, 4, 5, 6, 8, and 9 to an average of 0.3 in plots 3, 7, and 10. Plots 1, 2, 4, 5, 6, 8, and 9 contain AquaBlok that is not amended with peat moss but has Submerseed, AquaBlok that is amended with peat moss and has Submerseed, AquaBlok that is not amended with peat moss, AquaBlok that is not amended with peat moss but has Submerseed, AquaBlok that is amended with peat moss and has Submerseed, AquaBlok that is not amended with peat moss, and a control respectively. Plots 3, 7, and 10 contain a control, a control that has Submerseed, and another control that has Submerseed respectively. The differences were not statistically significant. The number of oligochaetes ranged from an average of 0 in plots 1, 4, 5, 6, 8, 9, and 10 to an average of 1 in plot 7 which contains a control with Submerseed. Plots 1, 4, 5, 6, 8, 9, and 10 contain AquaBlok that is not amended with peat moss but has Submerseed, AquaBlok that is not amended with peat moss, AquaBlok that is not amended with peat moss but has Submserseed, AquaBlok that is amended with peat moss and has Submserseed, AquaBlok that is not amended with peat moss, a control, and another control with peat moss respectively. Again, the differences were not statistically significant. The average Shannon-Weiner Index was 0 in all plots (Table V.D1) which is not statistically significant.

Table V.D1. Pre-capping Benthic macroinvertebrates community characterization. July 13, 2005

Plot #	Specimens	Shannon-Weiner Index
1A	None	0
1B	None	0
1C	None	0
Average	0	0
2A	None	0
2B	Oligochaete (2)	0
2C	None	0
Average	0.7	0
3A	None	0
3B	Oligochaete (1)	0
3C	dipteran larva (1)	0
Average	0.7	0
4A	None	0
4B	None	0
4C	None	0
Average	0	0
5A	None	0
5B	None	0
5C	None	0
Average	0	0
6A	None	0
6B	None	0
6C	None	0
Average	0	0
7A	Oligochaete (3)	0
7B	None	0
7C	dipteran larva (1)	0
Average	1.3	0
8A	None	0
8B	None	0
8C	None	0
Average	0	0
9A	None	0
9B	None	0
9C	None	0
Average	0	0
10A	None	0
10B	None	0
10C	dipteran larva (1)	0
Average	0.3	0

V.E. COC in Water

Contaminants measured in water included heavy metals and organic contaminants (PCBs, PAHs and organochlorine pesticides). Heavy metals were analyzed by EPA SW 846 Method 7000A. PCBs, PAHs and organochlorine pesticides were analyzed by EPA SW 846 Method 8082, EPA SW 846 Method 8270C-SIM and EPA SW 846 Method 8081A, respectively.

Data on heavy metals in water showed toxic levels of Cd and Pb (Table V.E1). Concentrations were above the Criteria Continuous Concentration (CCC) for chronic exposure in freshwater for Cd and fresh and salt water for Pb. The salinity of Kearny Marsh was closer to fresh than salt water (Table V.A1), so criteria for freshwater are the most appropriate to apply. Water concentrations were about 25 times higher than the criteria for Cd and about 22 times for Pb. These results indicated that these two metals are of serious concern.

Data on PCBs and organochlorine pesticides in water showed toxic levels of DDT and PCBs (Table V.E2). The contaminants were spread through out the study site and not localized within any one plot. PCB levels were 2 to 17 times the CCC for freshwater. DDT levels were 1 to 6 times the CCC for freshwater. These results indicated that these two organics are of serious concern

Table V.E1. Heavy metals in water (µg/L) collected pre-capping, date 7-12-05. CNTRL = not capped, S = with SubmerSeed, AB = AquaBlok, PM = amended with peat moss, UN = unamended, Total = sum of metals without Fe. BDL = below detection limit (Hg = 0.2 µg/L). Red shading-average value > CCC[a] freshwater.

Treatment	Sample	Site	Cd	Cr	Cu	Fe	Hg	Ni	Pb	Zn	Total
	1 A	2E	4.06	10.29	4.57	98.0	BDL	19.82	44.55	12.48	95.76
AB un S	1 B	3D	7.06	7.38	4.68	107.9	BDL	20.32	83.36	19.13	141.92
	1 C	0B	5.23	7.34	7.28	196.0	BDL	27.04	64.41	14.75	126.06
	Ave-1		5.45	8.34	5.51	133.9		22.39	64.10	15.46	121.25
	SD-1		1.51	1.69	1.54	53.9		4.03	19.41	3.38	23.45
	2 A	1D	7.22	8.59	4.65	77.1	BDL	23.37	88.50	19.17	151.50
AB pm S	2 B	5G	8.37	10.37	3.86	78.1	BDL	16.59	87.37	16.80	143.36
	2 C	6B	3.96	8.85	3.09	133.4	BDL	21.37	35.33	15.27	87.88
	Ave-2		6.52	9.27	3.87	96.2		20.44	70.40	17.08	127.58
	SD-2		2.28	0.96	0.78	32.2		3.48	30.38	1.96	34.62
CNTRL	3 A	2C	5.91	8.19	4.71	72.2	BDL	22.61	57.77	16.81	115.99
	3 B	5C	6.78	7.12	3.57	51.4	BDL	23.68	47.22	11.66	100.03
	3 C	3G	6.58	7.05	5.44	70.1	BDL	20.39	57.70	12.28	109.44
	Ave-3		6.42	7.46	4.57	64.6		22.23	54.23	13.58	108.49
	SD-3		0.46	0.64	0.95	11.4		1.68	6.07	2.81	8.03
AB un	4 A	3F	5.44	8.26	4.63	43.3	BDL	17.05	42.57	13.44	91.39
	4 B	4C	6.14	5.46	5.77	51.5	BDL	23.53	33.89	10.86	85.65
	4 C	2B	5.85	7.80	3.83	54.1	BDL	24.13	48.78	12.22	102.59
	Ave-4		5.81	7.17	4.74	49.6		21.57	41.74	12.17	93.21
	SD-4		0.35	1.50	0.97	5.6		3.93	7.48	1.29	8.62
AB un S	5 A	3E	6.58	8.58	4.71	44.8	BDL	29.18	47.79	13.43	110.27
	5 B	5B	5.85	8.03	6.88	47.4	BDL	28.98	51.99	15.59	117.31
	5 C	6D	5.85	5.37	5.42	54.9	BDL	20.54	44.91	12.76	94.85
	Ave-5		6.10	7.33	5.67	49.1		26.23	48.23	13.92	107.48
	SD-5		0.42	1.72	1.10	5.2		4.93	3.56	1.48	11.49
	6 A	2F	6.44	5.72	5.27	50.0	BDL	25.48	49.48	13.82	106.21
AB pm S	6 B	4F	6.30	7.90	4.64	48.2	BDL	27.83	52.35	15.02	114.04
	6 C	6B	5.46	8.31	4.29	45.1	BDL	17.57	62.35	14.77	112.73
	Ave-6		6.07	7.31	4.73	47.8		23.62	54.73	14.54	111.00
	SD-6		0.53	1.39	0.50	2.4		5.38	6.75	0.63	4.19
	7 A	5D	6.52	7.11	6.29	58.0	BDL	24.09	77.25	15.10	136.36
CNTRL S	7 B	2C	5.53	4.36	6.22	56.8	BDL	22.96	64.45	11.58	115.10
	7 C	6B	7.25	5.06	4.91	68.7	BDL	19.06	74.84	13.08	124.19
	Ave-7		6.43	5.51	5.80	61.2		22.04	72.18	13.25	125.22
	SD-7		0.86	1.43	0.78	6.5		2.64	6.81	1.76	10.67
AB un	8 A	3D	7.19	6.06	5.66	61.4	BDL	16.38	75.86	14.12	125.27
	8 B	2B	5.07	7.72	5.01	60.0	BDL	18.68	79.62	15.19	131.27
	8 C	6B	5.62	7.91	5.15	53.1	BDL	13.19	51.28	16.39	99.55
	Ave-8		5.96	7.23	5.27	58.2		16.08	68.92	15.24	118.70
	SD-8		1.10	1.02	0.34	4.5		2.75	15.39	1.14	16.85
CNTRL	9 A	2C	6.63	5.08	5.98	84.9	BDL	24.82	67.90	15.72	126.12
	9 B	4D	6.96	6.42	4.47	96.9	BDL	20.96	69.62	14.83	123.25
	9 C	6B	6.08	4.86	5.31	111.2	BDL	20.83	66.28	12.92	116.27
	Ave-9		6.56	5.45	5.25	97.7		22.20	67.93	14.49	121.88
	SD-9		0.45	0.85	0.75	13.2		2.27	1.67	1.43	5.06
	10 A	3D	5.11	7.80	5.65	104.8	0.34	25.81	83.72	17.38	145.47
CNTRL S	10 B	3F	6.28	6.04	8.32	147.0	BDL	21.31	64.85	16.67	123.46
	10 C	3C	7.13	7.03	4.53	101.2	BDL	28.17	79.05	14.59	140.49
	Ave-10		6.17	6.95	6.16	117.7	0.34	25.10	75.87	16.21	136.47
	SD-10		1.01	0.88	1.95	25.5		3.48	9.83	1.45	11.55
CCC[a] freshwater			0.25	74	9.0	ND	0.77	52	2.5	120	
CCC salt water			8.8	ND	3.1	ND	0.94	8.2	8.1	81	

[a]CCC is criteria continuous concentration and represents the highest concentration to which aquatic organisms should be chronically exposed to priority pollutants, µg/L. (EPA-820-B-96-001, September 1996)

Table V.E2. Concentration of organic contaminants (ng/L) in water collected pre-capping, 7-13-05. Samples were combined from replicates collected within each plot. Values shaded in yellow exceeded the EPA's CCC[a]. These criteria are not available for all contaminants. Missing values represented non-detectable levels.

PLOT REPLICATE	1A,B&C	2A,B&C	3A,B&C	4B&C	5A,B&C	6A,B&C	7 A,B&C	A,B&C 8	9C	10A,B&C	Fresh water CCC
TOTAL CONCENTRATION *(ng/L)*											
PCB	18.38	65.44	79.20	81.40	17.11	35.49	15.80	70.10	6.72	7.04	14
OCP	59.29	108.64	75.69	198.41	97.04	96.44	16.79	137.10	9.06	24.66	
SURROGATE RECOVERY (%)											
PCB 14	27.84	37.63	39.66	10.26	23.78	40.54	42.71	123.03	139.82	35.47	
PCB 65	10.90	2.86	9.22	11.58	28.69	9.99	30.75	21.29	35.90	19.48	
PCB 166	1.84	6.18	4.60	4.89	12.46	5.87	19.96	4.91	5.88	4.18	
Dibutylchlorendate	31.85	4.13	1.80	0.00	0.00	4.98	8.06	32.75	42.37	22.63	
COMPOUND NAME	**CONC *(ng/L)***	**CONC *(ng/L)***	**CONC *(ng/L)***	**CONC *(ng/L)***	**CONC *(ng/L)***	**CONC *(ng/L)***	**CONC *(ng/L)***	**CONC *(ng/L)***	**CONC *(ng/L)***	**CONC *(ng/L)***	
a-BHC	0.00	0.00	0.00	0.00	0.26	0.00	0.00	0.00	0.00	0.00	
b-BHC	0.00	0.00	0.54	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
g-BHC	30.79	41.49	19.65	24.36	9.89	15.80	6.07	31.47	4.98	7.09	160
d-BHC	10.78	10.56	2.84	5.71	1.01	0.00	2.74	0.00	0.00	3.34	
Heptachlor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	53
Aldrin	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3000
Heptachlor Epoxide	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	53
Endosulfan I	2.09	0.00	0.00	0.00	0.00	0.95	0.00	11.11	1.85	0.52	34
Dieldrin	0.00	0.00	0.00	0.00	0.00	2.15	0.00	0.00	0.00	0.00	710
DDD	4.22	0.00	0.97	3.89	17.97	2.06	0.98	5.69	2.22	0.00	
DDE	0.61	13.37	0.95	4.88	0.41	1.40	7.01	0.00	0.00	0.00	
Endrin	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	37
Endosulfan II	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	34

[a] CCC is criteria continuous concentration and represents the highest concentration to which aquatic organisms should be chronically exposed to priority pollutants, ug/L. (EPA-820-B-96-001, September 1996)

PLOT REPLICATE	1A,B&C	2A,B&C	3A,B&C	4B&C	5A,B&C	6A,B&C	7 A,B&C	A,B&C 8	9C	10A,B&C	Fresh water CCC
Endrin Aldehyde	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Endosulfan Sulfate	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
DDT	15.35	43.23	50.74	159.57	67.51	76.22	0.00	88.83	0.00	12.61	130
Endrin Ketone	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Metoxychlor	0.56	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.10	30
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
4+10	0.15	11.37	17.40	31.55	3.24	1.49	1.18	26.31	0.00	1.22	
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
8+5	0.00	0.00	0.00	0.00	0.46	0.00	0.54	0.40	0.00	0.00	
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
12+13	0.00	0.00	8.28	0.00	1.30	2.41	9.94	1.43	0.00	0.00	
18	0.00	0.00	0.00	1.71	0.00	0.00	0.00	0.07	0.00	0.00	
17	0.00	0.00	0.00	1.07	0.00	0.00	0.00	0.05	0.00	0.00	
24+27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	
16+32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.17	0.00	0.00	
29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
31+28	0.00	17.23	1.80	10.46	2.94	0.83	0.14	0.04	0.00	0.70	
21+33+53	0.00	0.00	1.30	0.00	0.00	0.00	0.00	0.47	0.00	0.00	
22	0.00	0.00	0.00	1.05	0.00	0.00	0.00	3.15	0.00	0.00	
45	0.00	0.00	0.00	8.93	0.00	0.00	0.00	0.00	0.00	0.00	
46	0.73	0.00	0.66	0.00	0.45	0.00	0.00	0.00	0.00	0.00	
52+43	1.78	10.54	1.11	3.63	1.07	2.58	0.27	0.28	1.65	0.47	
49	0.00	0.00	0.38	0.00	0.21	0.00	0.00	0.20	0.00	0.00	
47+48	0.23	5.71	0.03	0.24	0.28	0.00	0.14	1.72	0.00	0.05	
44	0.00	0.00	0.30	0.75	0.00	0.00	0.00	0.08	3.70	0.00	

PLOT REPLICATE	1A,B&C	2A,B&C	3A,B&C	4B&C	5A,B&C	6A,B&C	7 A,B&C	A,B&C 8	9C	10A,B&C	Fresh water CCC
37+42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
41+71	0.92	0.00	0.00	2.71	0.00	0.00	0.00	0.43	0.00	0.00	
64	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
100	4.67	0.00	0.00	0.00	0.00	0.00	1.63	0.00	0.00	0.00	
63	9.89	2.34	0.38	0.39	0.00	6.96	1.96	7.36	1.37	1.48	
74	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
70+76	0.00	3.85	9.95	0.00	6.18	21.13	0.00	0.00	0.00	0.00	
66+95	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
91	0.00	0.00	0.00	0.00	0.23	0.00	0.00	0.00	0.00	0.00	
56+60+85	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
101	0.00	3.08	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	
99	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
83	0.00	1.92	0.00	0.29	0.08	0.00	0.00	0.00	0.00	0.00	
97	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.00	
81+87	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
85	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
136	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
77+110	0.00	0.00	0.35	0.71	0.26	0.00	0.00	0.00	0.00	0.00	
82	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
151	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
135+144+147+127	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
107+123	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
149	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	
118	0.00	0.00	3.10	0.00	0.41	0.08	0.00	0.03	0.00	0.00	
134	0.00	4.74	2.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
131	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
146	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
105+132+153	0.00	0.00	0.00	0.00	0.00	0.00	0.00	13.08	0.00	0.00	

PLOT REPLICATE	1A,B&C	2A,B&C	3A,B&C	4B&C	5A,B&C	6A,B&C	7 A,B&C	A,B&C 8	9C	10A,B&C	Fresh water CCC
141+179	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
137+176+130	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
163+138	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
158	0.00	4.67	31.47	17.91	0.00	0.00	0.00	14.73	0.00	0.00	
178+129	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
187+182	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
183	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
128	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
185	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
174	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
177	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
202+171+176	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
157+200	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
172+197	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
180	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.14	
193	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
191	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
199	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
170+190	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
198	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
201	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
203+196	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
189	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
208+195	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
207	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
194	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
205	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
206	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
209	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	

V.F. COC in Sediment

Sediment samples were collected in triplicate from each plot and analyzed. Metals were analyzed by digesting 1-2 g dry weight in HNO_3 and microwaving in Teflon bombs. Cd, Cr, Cu, Fe, Pb and Zn were analyzed by flame or by graphite furnace atomic absorption spectrophotometry. The Hg analysis was done using cold-vapor AA in a Bacharach MAS-50D mercury analyzer. Semivolatile organic compounds (PCBs and organochlorine pesticides- OCPs) were analyzed by gas chromatography (GC-ECD and GC-MSD) based on EPA method 608, 8081 and 8082. The sediment samples (15 to 30 g wet weight) were extracted within 14 days of collection by ultrasonic extraction method (EPA Method 3550). Quality assurance for organics was accomplished using surrogates and determining % recovery as well taking field blanks. Surrogates included PCB14, PCB65, PCB166 and dibutyl chorendate and their average recovery was 83-100 %, 91-108 % and 2-31 %, respectively. Concentrations of heavy metals in samples were compared to the low effect level (LEL) and severe effect level (SEL) criterons based on the Ontario Freshwater Sediment Criterion (Persaud et al, 1993). PCBs and OCPs were compared to SEL based on U.S.E.P.A guidelines (U.S.E.P.A, 1988). For organic contaminants, SEL values depended on the percent of total organic carbon (TOC) in sediments. TOC in marsh sediments were approximately 85 %. The limit for SEL calculation was 10 % TOC, so the SEL values in Tables VII.E.2, 4 and 6 were calculated base on 10 % TOC. Sediment concentrations near or exceeding SEL would be expected to have detrimental effects on the benthic macroinvertebrate community. Statistical analyses were done using a one-way ANOVA followed by Tukey Multiple Comparison Test. Heavy metal analyses for substrate collected in July 2005 are shown in

Table V.F1, Cd ranged from an average of 3.19 mg/kg in plot 1 which contains AquaBlok that is not amended with peat moss but has Submerseed to an average of 5.43 mg/kg in plot 10 which is a control that has Submerseed. The differences were statistically significant. Cr ranged from an average of 44.0 mg/kg in plot 9 which is a control to an average of 116 mg/kg in plot 3 which is another control. The differences were not statistically significant. Cu ranged from an average of 175 mg/kg in plot 9 which is a control to an average of 342 mg/kg in plot 4 which contains AquaBlok that is not amended with peat moss. The differences were not statistically significant. Fe ranged from an average of 27920 mg/kg in plot 1 which contains AquaBlok that is not amended with Submerseed to an average of 77832 mg/kg in plot 4 which contains AquaBlok that is not amended with peat moss. The differences were not statistically significant. Hg ranged from an average of 1.03 mg/kg in plot 3 which is a control to an average of 10.7 mg/kg in plot 1 which contains AquaBlok that is not amended with Submerseed. The differences were not statistically significant. Ni ranged from an average of 53.1 mg/kg in plot 9 which is a control to an average of 97.1 mg/kg in plot 7 which is a control that is amended with Submerseed. The differences were not statistically significant. Pb ranged from an average of 78.6 mg/kg in plot 6 which contains AquaBlok that is amended with peat moss and has Submerseed and was significantly less than the average of 786 mg/kg in plot 10 which is a control that has Submerseed ($p < 0.001$), and significantly less than the average of 777 in plot 9 which is a control ($p < 0.001$). Zn ranged from an average of 520 mg/kg in plot 10 which is a control that has Submerseed to an average of 989 mg/kg in plot 7 which is a control that has Submerseed (Table V.F1). The differences were not statistically significant.

Sediment samples collected July 12, 2005 had average total PCB concentrations ranging from 643.12 μg/Kg in plot 1 to 2001.63 μg/Kg in plot 8 (Table V.F2). None of the PCB concentrations in sediment exceeded the SEL for total PCB (53,000 μg/Kg). Average total OCP concentrations ranged from 571.94 μg/Kg in plot 3 to 5281.9 in plot 7 (Table V.F2). Total average OCPs were also very high in plot 8, 4536.2 μg/Kg, which is next to plot 7. The proximity indicated a "hot spot" in the marsh. Multiple plots, 9 of 10, had replicates that exceeded the SEL for DDD (600 μg/Kg) and DDE (190 μg/Kg). This indicated that DDT metabolites could be having detrimental effects in the marsh. None of the other OCP concentrations exceeded SEL.

Table V.F1. Heavy metals in sediments (mg/Kg) collected pre-capping, 7-13-05. CNTRL = not capped, S = with SubmerSeed, AB = AquaBlok, PM = amended with peat moss, UN = unamended, Total = sum of metals without Fe. BDL = below detection limit (Hg = 0.2 μg/L). Red shading- average value > CCC[a] freshwater.

Site	Cd,	Cr,	Cu,	Fe,	Hg,	Ni,	Pb,	Zn,	GPS (Lat) N	GPS (long) W
1 A	2.35	41.1	137	19105	26.9	41.6	319	530	40°45.287'	074°07.646'
1 B	3.79	82.6	255	53609	2.19	54.6	537	346	40°45.279'	074°07.654'
1 C	3.44	118	319	11047	2.90	78.2	520	725	40°45.279'	074°07.651'
Mean	3.19	80.6	237	27920	10.7	58.1	459	534		
2 A	6.23	134	362	56075	4.14	87.8	590	1036	40°45.278'	074°07.664'
2 B	2.67	29.2	98.9	18192	1.21	28.0	212	343	40°45.279'	074°07.668'
2 C	5.16	60.9	321	65448	2.07	53.2	445	389	40°45.272'	074°07.670'
Mean	4.69	74.7	261	46572	2.47	56.3	416	589		
3 A	3.18	121	383	38483	0.56	78.3	417	658	40°45.269'	074°07.698'
3 B	3.86	169	371	51286	2.42	88.7	764	468	40°45.275'	074°07.704'
3 C	4.21	57.3	232	27833	0.10	61.1	238	693	40°45.271'	074°07.693'
Mean	3.75	116	329	39201	1.03	76.0	473	606		
4 A	6.46	117	411	103230	2.16	89.2	589	1133	40°45.269'	074°07.711'
4 B	5.87	99.2	391	105555	3.09	77.0	503	1024	40°45.275'	074°07.708'
4 C	2.20	48.9	223	24710	0.68	42.1	342	273	40°45.264'	074°07.706'
Mean	4.84	88.4	342	77832	1.98	69.4	478	810		
5 A	5.25	98.8	312	86953	2.40	78.0	455	893	40°45.264'	074°07.708'
5 B	4.58	73.1	244	61702	2.51	64.4	370	689	40°45.271'	074°07.722'
5 C	4.74	90.2	431	9733	1.47	69.5	521	553	-------	-------
Mean	4.86	87.4	329	52796	2.13	70.6	449	712		
6 A	3.15	30.7	141	16947	2.04	48.0	68.5	330	40°45.267'	074°07.748'
6 B	5.93	71.7	283	67362	2.75	82.5	85.3	873	40°45.263'	074°07.740'
6 C	3.58	29.0	153	18067	0.06	57.2	81.9	1067	40°45.256'	074°07.745'
Mean	4.22	43.8	192	34125	1.62	62.6	78.6	757		
7 A	5.12	65.7	246	27972	2.26	71.4	490	869	40°45.259'	074°07.761'
7 B	4.65	89.2	343	44845	3.37	99.8	952	897	40°45.257'	074°07.764'
7 C	6.16	78.5	432	78078	2.58	120	157	1200	40°45.256'	074°07.763'
Mean	5.31	77.8	340	50298	2.74	97.1	533	989		
8 A	4.11	29.0	295	2122	0.56	93.6	343	685	40°45.257'	074°07.771'
8 B	5.42	118	386	24013	1.84	112	50.1	804	40°45.253'	074°07.767'
8 C	5.97	68.9	334	81541	5.94	82.4	49.7	1270	40°45.260'	074°07.769'
Mean	5.17	72.0	338	35892	2.78	96.0	148	920		

9 A	7.68	82.2	349	107760	3.04	98.3	1012	1320	40°45.312'	074°07.660'
9 B	1.79	16.6	56.1	5327	0.95	18.4	485	185	40°45.306'	074°07.661'
9 C	2.95	33.3	121	4871	0.10	42.6	777	416	40°45.303'	074°07.668'
Mean	4.14	44.0	175	39319	1.36	53.1	758	640		
10 A	4.63	75.8	202	24889	3.67	74.4	809	484	40°45.310'	074°07.653'
10 B	5.44	72.5	214	36712	4.85	69.7	797	594	40°45.313'	074°07.651'
10 C	6.21	80.9	229	22358	6.95	74.7	753	481.37	40°45.307'	074°07.648'
Mean	5.43	76.4	215	27986	5.16	72.9	786	519.8		
LEL	0.6	26	16		0.20	16	31	120		
SEL	10.0	110	110		2.00	75	250	820		

LEL = Lowest Effects Limit based on Ontario Aquatic Sediment Criterion.
SEL = Severe Effects Limit based on Ontario Aquatic Sediment Criterion.

Table V.F2. Concentrations of organic contaminants (µg/Kg) in sediments collected pre-capping, 7-13-05. Samples were combined from replicates collected within each plot.. Treatments were: plots 3&9 = control, 7&10 = control with SubmerSeed, 4&8 = AquaBlok unamended, 1&5 = AquaBlok unamended with Submer Seed and 2&6 = AquaBlok amended with peat moss with SubmerSeed. Values shaded in yellow exceeded the EPA's SELs for PCB and OCP. These criteria are not available for all contaminants. Zero values represented non-detectable levels.

LOCATION	1A B C	2A B C	3A B C	4A B C	5A B C	6A B C	7A B C	8A B C	9A B C	10A B C	SEL (µg/Kg)
PCB (µg/Kg)	227.61	1575.82	959.19	1488.74	847.05	600.53	699.62	944.02	1762.89	1701.98	53,000
	831.16	404.59	728.64	2146.58	1093.90	1350.29	847.32	1743.12	888.75	771.46	
	843.58	809.39	2144.65	484.95	2467.13	1922.13	1378.52	3318.76	676.53	458.45	
Mean	634.12	929.93	1277.49	1379.42	1469.36	1290.98	975.15	2001.63	1109.39	977.30	
OCP (µg/Kg)	1082.68	6052.65	361.58	637.31	2721.79	319.50	11443.06	797.71	2183.44	3915.37	
	259.45	1207.45	791.06	1716.93	1213.67	4139.35	3307.39	11308.32	603.48	551.87	
	3724.18	808.42	563.17	1725.08	2109.45	992.78	1095.25	1502.70	774.38	360.42	
Mean	1688.77	2689.51	571.94	1359.77	2014.97	1817.21	5281.9	4536.24	1187.1	1609.22	
SURROGATE RECOVERY (%)											
PCB 14	30.34	77.94	90.31	76.28	64.15	88.58	126.57	189.20	199.48	113.06	
	69.99	78.43	88.51	86.01	86.47	104.36	118.40	181.88	79.66	83.80	
	79.23	72.27	85.29	83.12	92.35	153.09	180.63	223.77	85.09	83.39	
Mean	59.85	76.21	88.04	81.80	80.99	115.34	141.87	198.28	121.41	93.42	
PCB 65	31.14	99.57	86.50	82.58	75.86	105.00	124.31	169.71	198.28	32.96	
	76.98	115.14	106.39	108.16	96.54	106.54	134.68	183.00	98.81	93.34	
	99.77	66.20	93.04	85.15	84.22	138.78	178.02	211.61	120.79	105.19	
Mean	69.30	93.64	95.31	91.96	85.54	116.77	145.67	188.11	139.29	77.16	
PCB 166	31.36	78.15	89.59	71.20	60.82	96.03	121.35	165.85	197.76	113.65	
	71.56	77.49	89.25	83.73	91.62	92.60	138.39	185.98	85.94	84.01	
	78.70	71.00	84.55	75.33	78.97	140.48	177.22	213.56	89.59	85.34	
Mean	60.54	75.55	87.80	76.75	77.14	109.70	145.65	188.46	124.43	94.33	
Dibutychlorendate	151.55	157.16	119.76	41.19	34.65	122.30	98.55	99.27	98.22	99.13	
	60.43	110.74	122.82	32.29	98.30	33.25	98.46	99.41	149.48	98.45	
	99.01	129.96	40.74	67.35	35.11	98.94	98.78	98.72	181.34	144.31	

LOCATION	1A B C	2A B C	3A B C	4A B C	5A B C	6A B C	7A B C	8A B C	9A B C	10A B C	SEL (µg/Kg)
Mean	103.66	132.62	94.44	46.94	56.02	84.83	98.60	99.13	143.01	113.96	
Pesticide	CONC (µg/Kg)	CONC (µg/Kg)	CONC (µg/Kg)	CONC (µg/Kg)	CONC (µg/Kg)	CONC (µg/Kg)	CONC (µg/Kg)	CONC (µg/Kg)	CONC (µg/Kg)	CONC (µg/Kg)	
OCP a-BHC	63.62	5.59	3.17	3.62	3.51	4.82	4.03	15.60	15.69	6.89	100
	2.74	4.47	8.14	5.76	3.20	5.49	4.54	5.86	10.70	3.47	
	2.30	4.69	3.02	3.47	9.39	0.00	8.74	0.00	7.08	6.63	
Mean	23.22	4.92	4.78	4.28	5.37	3.44	5.77	7.15	11.16	5.66	
OCP b-BHC	68.05	4.83	3.10	4.34	2.67	5.90	2.59	10.81	14.29	8.77	210
	1.90	3.41	5.69	3.97	2.44	5.26	4.86	5.62	7.94	4.86	
	18.69	2.49	4.94	0.00	4.73	0.00	2.02	2.96	4.41	8.45	
Mean	29.55	3.58	4.58	2.77	3.28	3.72	3.16	6.46	8.88	7.36	
OCP g-BHC	63.97	21.17	11.77	21.91	12.77	7.30	6.12	24.12	25.18	8.67	600
	9.94	20.81	8.83	48.91	13.15	31.18	6.22	14.83	19.72	10.66	
	9.08	10.06	22.49	24.19	55.82	0.00	9.07	24.48	14.08	10.15	
Mean	27.66	17.35	14.36	31.67	27.25	12.83	7.14	21.14	19.66	9.83	
OCP d-BHC	45.32	0.00	0.00	1.98	0.00	0.00	2.58	63.09	53.33	24.00	
	0.00	0.00	0.00	0.00	0.00	8.20	0.00	15.86	0.00	6.03	
	0.00	0.00	1.51	0.00	5.84	0.00	0.00	0.00	0.00	4.16	
Mean	15.11	0.00	0.50	0.66	1.95	2.73	0.86	26.32	17.78	11.40	
OCP Heptachlor	68.55	41.81	16.32	7.92	4.39	19.29	0.65	10.85	8.57	15.24	2400
	19.65	27.15	15.07	26.08	12.40	15.29	5.03	7.82	36.99	4.69	
	17.88	16.74	10.36	10.23	18.69	4.81	9.05	12.91	24.52	15.25	
Mean	35.36	28.57	13.92	14.74	11.83	13.13	4.91	10.53	23.36	11.73	
OCP Aldrin	60.84	0.00	8.05	0.00	0.00	0.24	0.00	0.00	1.10	8.26	800
	1.34	6.92	0.00	0.00	0.00	0.00	0.41	0.00	0.00	0.00	
	0.00	4.63	0.00	0.00	0.00	0.29	0.00	1.08	0.00	0.62	
Mean	20.73	3.85	2.68	0.00	0.00	0.18	0.14	0.36	0.37	2.96	
OCP Heptachlor Epoxide	66.87	5.80	4.70	4.88	2.85	3.69	5.06	0.00	4.19	4.05	2400
	0.00	0.00	3.92	0.00	0.00	6.47	0.00	0.00	0.00	2.98	
	0.00	4.63	6.98	0.00	7.04	0.00	0.00	5.55	0.00	3.74	
Mean	22.29	3.48	5.20	1.63	3.30	3.39	1.69	1.85	1.40	3.59	
OCP Endosulfan I	63.36	12.05	3.77	0.00	0.00	6.07	0.00	0.00	0.00	0.00	
	2.83	9.01	3.73	19.14	7.31	12.03	0.00	0.00	0.00	4.64	
	4.23	5.40	11.12	0.00	16.66	0.00	0.00	27.43	5.39	4.01	
	23.47	8.82	6.21	6.38	7.99	6.03	0.00	9.14	1.80	2.88	

LOCATION	1A B C	2A B C	3A B C	4A B C	5A B C	6A B C	7A B C	8A B C	9A B C	10A B C	SEL (µg/Kg)
Mean											
OCP Dieldrin	67.11	0.00	4.45	5.74	1.30	3.75	0.00	0.00	0.00	0.00	9100
	2.13	14.61	4.84	10.30	3.09	9.03	0.00	0.00	0.00	3.66	
	0.00	10.39	7.30	9.26	7.79	0.00	0.00	0.00	8.10	4.45	
Mean	23.08	8.33	5.53	8.43	4.06	4.26	0.00	0.00	2.70	2.70	
OCP DDE	75.19	555.73	49.96	124.40	266.25	122.71	732.72	68.22	695.33	310.10	190
	54.28	60.50	57.15	206.99	87.65	421.97	378.18	572.13	48.98	55.14	
	147.03	58.32	82.93	49.03	277.42	173.75	206.57	272.60	58.49	35.60	
Mean	92.17	224.85	63.35	126.81	210.44	239.48	439.16	304.32	255.60	133.61	
OCP Endrin	74.08	0.00	2.72	5.41	0.00	0.00	0.00	0.00	0.00	0.00	13,000
	2.80	0.00	2.83	0.00	0.00	4.92	0.00	0.00	0.00	0.00	
	0.00	2.99	6.71	0.00	0.00	0.00	0.00	0.00	0.00	7.57	
Mean	25.63	1.00	4.09	1.80	0.00	1.64	0.00	0.00	0.00	2.52	
OCP Endosulfan II	66.64	0.00	3.91	1.49	0.00	0.00	0.00	0.00	0.00	0.00	
	3.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	2.99	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.50	
Mean	23.22	1.00	1.30	0.50	0.00	0.00	0.00	0.00	0.00	0.83	
OCP DDD	67.74	4551.21	138.49	241.64	2327.29	0.00	10543.97	436.76	1184.92	3006.77	600
	130.45	903.19	541.09	449.21	330.91	2563.42	2846.17	1057.28	320.92	382.96	
	1022.90	432.47	257.62	408.91	1151.12	713.68	717.35	809.49	567.34	204.93	
Mean	407.03	1962.29	312.4	366.59	1269.77	1092.37	4702.50	767.84	691.06	1198.22	
OCP Endrin Aldehyde	67.63	6.59	3.37	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10
	4.13	0.00	4.02	0.00	0.00	1.19	0.00	0.00	0.00	1.43	
	0.00	2.42	0.00	0.00	0.00	0.00	0.00	0.00	4.53	4.65	
Mean	23.92	3.00	2.46	0.00	0.00	0.40	0.00	0.00	1.51	2.03	
OCP Endosulfan	59.79	145.00	5.59	0.00	0.00	8.36	0.00	0.00	0.00	0.00	
Sulfate	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	6.64	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.18	
Mean	19.93	50.55	1.86	0.00	0.00	2.79	0.00	0.00	0.00	2.06	
OCP DDT	78.65	694.82	53.68	95.81	100.79	57.96	100.30	168.26	98.74	481.02	1200
	24.25	128.93	57.24	755.44	753.51	918.89	61.98	113.92	74.11	23.19	
	2410.10	140.65	54.53	1140.04	554.95	93.94	71.75	135.89	80.44	28.25	
Mean	837.67	321.47	55.15	663.76	469.75	356.93	78.01	139.36	84.43	177.49	
OCP Endrin	25.28	0.00	48.54	115.04	0.00	79.42	43.14	0.00	78.32	41.60	

LOCATION	1A B C	2A B C	3A B C	4A B C	5A B C	6A B C	7A B C	8A B C	9A B C	10A B C	SEL (µg/Kg)
Ketone											
	0.00	0.00	74.97	191.13	0.00	136.00	0.00	0.00	84.12	46.37	
	91.97	101.27	89.36	56.23	0.00	0.00	70.70	201.82	0.00	11.72	
Mean	39.08	33.76	70.96	120.80	0.00	479.81	37.95	67.27	54.15	33.23	
OCP Metoxychlor	0.00	8.03	0.00	3.12	0.00	0.00	1.89	0.00	3.79	0.00	
	0.00	28.44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.80	
	0.00	0.00	4.28	23.72	0.00	6.31	0.00	8.49	0.00	1.57	
Mean	0.00	12.16	1.43	8.95	0.00	2.10	0.63	2.83	1.26	1.12	
PCB 1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
PCB 3	0.00	119.94	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	904.14	0.00	0.00	22.08	0.00	73.68	0.00	0.00	
Mean	0.00	39.98	301.38	0.00	0.00	7.36	0.00	24.56	0.00	0.00	
PCB 4+10	0.00	0.00	4.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	3.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	19.45	3.22	0.00	0.00	13.07	0.00	0.00	0.00	1.18	
Mean	0.00	6.48	3.54	0.00	0.00	4.36	0.00	0.00	0.00	0.39	
PCB 7	0.00	0.70	5.51	0.00	0.00	0.88	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.53	1.52	0.33	0.00	0.00	0.00	0.00	2.04	0.00	0.62	
Mean	0.18	0.74	1.95	0.00	0.00	0.29	0.00	0.68	0.00	0.21	
PCB 6	0.00	0.71	6.65	1.67	1.40	1.08	0.00	0.00	2.77	0.00	
	0.00	1.69	1.21	1.94	0.00	1.87	0.00	0.00	0.00	1.26	
	0.00	6.67	0.74	1.49	0.00	2.73	2.33	4.88	0.00	0.47	
Mean	0.00	3.02	2.87	1.70	0.47	1.89	0.78	1.63	0.92	0.58	
PCB 8+5	3.07	5.85	6.20	5.39	0.00	3.25	0.00	0.00	0.00	0.00	
	7.05	0.00	0.00	5.98	4.00	8.91	0.00	0.00	3.02	2.83	
	3.74	0.00	5.20	0.00	5.46	0.00	0.00	14.48	0.00	1.69	
Mean	4.62	1.95	3.80	3.79	3.15	4.05	0.00	4.83	1.01	1.51	
PCB 19	0.00	0.00	0.00	6.23	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	6.31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	

LOCATION	1A B C	2A B C	3A B C	4A B C	5A B C	6A B C	7A B C	8A B C	9A B C	10A B C	SEL (µg/Kg)
Mean	0.00	0.00	2.10	2.08	0.00	0.00	0.00	0.00	0.00	0.00	
PCB 12+13	0.00	3.87	22.48	8.08	0.00	0.00	0.00	3.87	0.00	0.00	
	0.00	0.00	18.25	17.42	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	19.26	2.35	0.00	0.00	0.00	7.96	0.00	0.00	0.00	
Mean	0.00	7.71	14.36	8.50	0.00	0.00	2.65	1.29	0.00	0.00	
PCB 18	3.91	11.53	10.61	0.00	7.26	9.35	8.47	9.52	24.58	26.06	
	6.73	6.95	7.93	22.55	9.15	16.19	11.55	11.38	7.79	8.03	
	7.78	6.41	13.42	8.38	30.31	19.96	18.30	36.66	6.52	3.87	
Mean	6.14	8.30	10.65	10.31	15.57	15.17	12.77	19.19	12.96	12.65	
PCB 17	1.76	6.34	5.99	4.14	6.13	10.81	4.73	6.06	20.20	13.22	
	3.49	4.12	5.59	10.15	8.03	10.25	5.15	5.20	4.77	4.83	
	3.72	3.14	7.79	4.77	10.02	13.79	9.21	26.38	3.88	1.62	
Mean	2.99	4.53	6.46	6.35	8.06	11.62	6.36	12.55	9.62	6.56	
PCB 24+27	0.00	1.21	0.87	0.95	2.14	2.33	0.00	0.00	1.95	0.00	
	0.00	2.40	0.82	1.11	2.77	2.35	0.00	0.00	0.00	1.07	
	1.21	0.54	0.99	0.00	0.00	2.48	0.00	5.48	1.55	0.00	
Mean	0.40	1.38	0.89	0.69	1.64	2.39	0.00	1.83	1.17	0.36	
PCB 16+32	2.72	13.60	7.08	7.67	5.11	4.69	7.89	17.20	21.64	29.02	
	5.51	10.42	5.89	0.00	8.25	10.83	10.58	0.00	0.00	5.67	
	7.24	4.72	7.27	9.63	8.70	20.07	16.69	33.19	4.97	40.81	
Mean	5.16	9.58	6.75	5.77	7.35	11.86	11.72	16.80	8.87	25.17	
PCB 29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	3.90	0.26	0.00	0.00	0.00	0.00	1.54	0.00	0.00	
Mean	0.00	1.3	0.09	0.00	0.00	0.00	0.00	0.51	0.00	0.00	
PCB 26	0.00	5.55	3.55	3.80	4.14	4.78	0.00	5.85	8.40	4.94	
	1.85	4.10	0.00	6.90	5.04	7.15	4.20	0.00	3.23	3.95	
	2.92	24.08	3.77	3.81	5.40	10.23	6.15	16.54	3.30	1.43	
Mean	1.59	11.24	2.44	4.84	4.86	7.39	3.45	7.46	4.98	3.44	
PCB 25	0.36	2.79	1.38	1.90	2.53	2.59	0.00	1.86	3.64	2.08	
	0.84	1.66	1.16	3.18	2.95	4.13	1.41	0.00	1.45	1.94	
	1.33	0.64	1.93	1.81	2.59	5.04	2.78	8.86	1.59	0.45	
Mean	0.84	1.70	1.49	2.30	2.69	3.92	1.40	3.57	2.23	1.49	
PCB 31+28	9.27	55.20	33.62	43.29	33.23	35.63	29.14	40.17	72.29	66.73	
	18.22	48.14	24.18	74.41	60.92	72.59	29.50	38.17	33.14	31.69	

LOCATION	1A B C	2A B C	3A B C	4A B C	5A B C	6A B C	7A B C	8A B C	9A B C	10A B C	SEL (µg/Kg)
	27.52	20.21	41.10	35.28	84.48	72.98	30.68	134.57	28.06	13.85	
Mean	18.34	41.18	32.97	50.99	59.54	60.4	29.77	70.97	44.50	37.42	
PCB 21+33+53	4.54	20.07	12.65	17.97	10.91	11.09	10.76	10.19	22.40	27.22	
	6.55	8.58	9.12	24.69	14.24	22.83	8.80	9.43	11.11	10.46	
	8.64	6.87	14.84	9.91	21.27	22.41	16.32	44.34	9.21	6.51	
Mean	6.58	11.84	12.20	17.52	15.47	18.78	11.96	21.32	14.24	14.73	
PCB 22	1.80	12.72	7.05	11.31	7.63	3.75	6.65	7.78	17.08	14.57	
	3.87	5.10	4.44	16.32	7.74	11.55	7.10	8.25	3.78	9.52	
	5.66	3.29	12.69	6.07	15.40	14.85	12.19	29.41	5.43	5.92	
Mean	3.78	7.04	8.06	11.23	10.26	10.05	8.65	15.15	8.76	10.00	
PCB 45	0.00	0.00	11.40	0.00	39.34	0.00	0.00	30.59	0.00	35.58	
	1.24	0.00	7.30	0.00	4.23	0.00	39.17	0.00	0.00	0.00	
	0.00	21.93	0.00	0.00	0.00	42.60	27.87	6.99	3.25	0.00	
Mean	0.41	7.31	6.23	0.00	14.52	14.2	22.35	12.53	1.08	11.86	
PCB 46	0.59	1.46	1.80	1.84	0.00	0.77	0.00	0.00	4.76	0.00	
	0.00	0.00	1.26	0.00	0.00	2.44	1.76	0.00	0.00	2.52	
	0.00	0.73	1.86	0.00	0.00	3.77	2.52	7.70	0.00	0.00	
Mean	0.20	0.73	1.64	0.61	0.00	2.33	1.43	2.57	1.59	0.85	
PCB 52+43	4.05	47.77	22.64	23.09	18.55	22.58	15.13	19.61	39.33	43.19	
	12.99	30.80	21.56	36.63	27.01	37.95	17.87	19.04	21.77	18.80	
	18.79	15.18	26.66	12.83	37.55	37.04	29.07	74.54	20.06	12.49	
Mean	11.94	31.25	23.62	24.18	27.70	32.52	20.69	37.73	27.05	24.83	
PCB 49	2.70	27.97	13.53	17.71	17.99	16.67	17.37	25.09	29.18	0.00	
	6.34	10.49	11.55	27.69	23.81	0.00	22.51	23.77	19.20	14.85	
	11.42	7.91	19.19	13.54	28.59	37.30	27.45	65.84	13.40	6.19	
Mean	6.82	15.46	14.76	19.65	23.46	17.99	22.44	38.23	20.59	7.00	
PCB 47+48	3.60	12.33	0.00	7.92	8.47	11.51	4.47	7.09	0.00	42.51	
	6.58	11.33	0.00	23.99	11.96	15.61	7.20	0.00	7.60	10.79	
	0.00	7.55	9.62	6.72	11.34	16.53	9.04	16.36	11.21	5.66	
Mean	3.39	10.40	3.21	12.88	10.59	14.55	6.90	7.82	6.27	19.65	
PCB 44	3.86	28.36	16.24	34.06	14.95	12.64	16.39	19.44	39.23	28.27	
	10.00	18.29	14.56	38.18	20.37	36.73	19.31	22.30	13.91	13.15	
	0.00	8.15	23.64	13.22	41.57	32.84	29.33	66.55	9.77	5.75	
Mean	4.62	18.27	18.15	28.49	25.63	27.40	21.68	36.10	20.97	15.72	

LOCATION	1A B C	2A B C	3A B C	4A B C	5A B C	6A B C	7A B C	8A B C	9A B C	10A B C	SEL (µg/Kg)
PCB 37+42	1.75	17.11	44.07	31.03	7.75	6.24	0.00	10.51	28.17	9.07	
	5.20	11.86	7.77	17.73	11.21	19.05	14.84	14.09	4.04	5.79	
	7.82	37.35	8.97	7.75	19.89	23.01	21.61	35.95	3.43	2.11	
Mean	4.92	22.11	20.27	18.84	12.95	16.1	12.15	20.18	11.88	5.66	
PCB 41+71	4.53	37.99	21.02	57.60	28.47	26.47	19.41	22.08	49.58	49.35	
	11.70	13.64	16.58	54.33	27.40	42.32	15.73	23.59	33.87	22.84	
	19.62	11.62	40.13	14.03	76.31	49.02	38.31	99.77	25.18	14.82	
Mean	11.95	21.08	25.91	41.99	44.06	39.27	24.48	48.48	36.21	29.00	
PCB 64	0.00	0.00	0.00	61.66	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.09	
	0.00	0.00	20.73	0.00	0.00	27.13	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	6.91	20.55	0.00	9.04	0.00	0.00	0.00	2.70	
PCB 40	0.00	14.26	12.58	250.88	43.08	5.78	5.72	8.94	12.22	83.47	
	1.85	0.00	5.47	622.15	17.69	20.04	7.50	6.83	6.21	22.51	
	32.52	4.73	13.11	53.75	1119.43	20.40	11.12	36.88	16.53	4.91	
Mean	11.46	6.33	10.39	308.93	393.4	15.41	8.11	17.55	11.65	36.96	
PCB 100	0.00	0.00	1.45	1.20	1.66	1.67	0.61	1.05	1.11	2.32	
	0.00	0.00	1.38	0.00	1.94	2.52	0.55	0.00	1.62	1.53	
	0.00	1.04	1.63	0.00	0.00	3.93	2.64	6.65	1.45	0.67	
Mean	0.00	0.35	1.49	0.4	1.20	2.70	1.27	2.57	1.39	1.51	
PCB 63	0.00	0.00	0.00	0.00	0.00	1.67	0.00	0.00	3.52	0.00	
	0.00	0.00	0.00	0.00	0.00	1.24	0.00	0.00	0.00	0.72	
	0.00	0.84	0.00	0.00	0.00	2.47	0.00	4.97	0.00	0.00	
Mean	0.00	0.28	0.00	0.00	0.00	1.79	0.00	1.66	1.17	0.24	
PCB 74	5.47	26.61	12.37	13.39	7.89	9.20	12.96	17.92	22.73	36.69	
	10.32	3.43	6.97	36.71	19.15	12.01	5.12	17.89	22.87	7.32	
	20.35	4.60	9.97	19.81	16.81	15.46	26.87	31.46	12.84	3.90	
Mean	12.05	11.55	9.77	23.30	14.62	12.22	14.98	22.42	19.48	15.97	
PCB 70+76	6.92	57.68	32.83	34.20	26.47	33.13	32.73	41.18	78.40	86.99	
	14.13	19.61	27.08	58.98	40.27	45.60	0.00	38.36	43.72	29.74	
	29.67	18.59	41.07	27.96	0.00	58.37	48.69	104.78	28.54	17.36	
Mean	16.91	31.96	33.66	40.38	22.25	45.7	27.14	61.44	50.22	44.70	
PCB 66+95	8.76	87.96	54.20	62.33	29.18	44.69	40.18	62.42	128.50	126.15	
	24.44	20.78	38.66	111.71	67.78	80.46	50.65	33.55	58.40	45.66	

LOCATION	1A B C	2A B C	3A B C	4A B C	5A B C	6A B C	7A B C	8A B C	9A B C	10A B C	SEL (µg/Kg)
	42.69	21.79	63.86	29.51	80.53	95.64	86.53	186.61	34.72	24.66	
Mean	25.30	43.51	52.24	67.85	61.83	73.60	59.12	94.19	73.87	65.49	
PCB 91	0.68	7.83	5.67	4.16	5.96	3.56	54.09	10.39	14.68	19.88	
	3.58	0.00	5.06	0.00	7.27	11.75	12.90	10.24	0.00	4.23	
	0.00	2.84	5.84	3.54	8.62	11.13	10.36	24.84	2.80	2.29	
Mean	1.42	3.56	5.52	2.57	7.28	8.81	25.78	15.16	5.83	8.80	
PCB 50+60+85	0.00	0.00	25.72	28.47	0.00	0.00	0.00	0.00	0.00	0.00	
	10.40	0.00	0.00	47.58	0.00	0.00	0.00	0.00	0.00	9.34	
	0.00	61.29	16.20	0.00	0.00	0.00	0.00	54.00	0.00	5.12	
Mean	3.47	20.43	13.97	25.35	0.00	0.00	0.00	18.00	0.00	4.82	
PCB 101	4.08	42.08	20.59	24.79	22.31	14.30	35.77	25.67	43.89	58.69	
	12.08	10.63	18.21	0.00	29.72	33.05	32.47	27.19	24.45	19.70	
	22.47	11.43	26.65	11.57	31.90	45.21	39.16	86.68	16.38	9.63	
Mean	12.88	21.38	21.82	12.12	27.98	30.85	35.80	46.51	28.24	29.34	
PCB 99	2.91	19.81	11.39	14.65	10.04	8.43	4.25	26.42	14.53	44.88	
	5.88	9.00	12.49	21.50	13.70	17.90	23.91	30.43	12.44	10.07	
	12.34	15.69	14.10	6.41	15.89	30.65	29.65	63.42	8.64	5.47	
Mean	7.04	14.83	12.66	14.19	13.21	18.99	19.27	40.09	11.87	20.14	
PCB 83	6.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	2.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
PCB 97	1.10	11.72	5.31	6.70	5.23	4.47	4.86	6.14	15.65	15.80	
	3.41	2.61	4.98	10.99	7.07	8.90	6.62	5.32	5.88	5.36	
	6.21	2.75	7.31	2.94	8.90	11.38	9.67	21.94	4.22	2.66	
Mean	3.57	5.69	5.87	6.88	7.07	8.25	7.05	11.13	8.58	7.94	
PCB 81+87	2.03	18.95	8.94	11.71	9.29	7.76	9.09	10.72	25.06	29.77	
	5.91	6.19	8.30	19.98	13.24	14.61	10.93	13.10	14.65	10.21	
	10.75	5.64	11.90	5.26	13.76	18.12	15.16	35.81	7.37	5.67	
Mean	6.07	10.26	9.71	12.32	12.10	13.50	11.73	19.88	15.69	15.22	
PCB 85	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.40	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.84	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	0.00	0.00	0.28	0.00	0.00	0.47	0.00	
PCB 136	0.44	6.82	3.47	4.19	2.96	0.00	3.52	3.49	7.57	9.38	
	2.29	0.00	3.19	6.65	3.93	5.74	4.91	3.18	3.46	2.76	

LOCATION	1A B C	2A B C	3A B C	4A B C	5A B C	6A B C	7A B C	8A B C	9A B C	10A B C	SEL (µg/Kg)
	3.55	1.56	5.17	2.33	5.56	7.90	6.86	16.75	2.27	1.49	
Mean	2.09	2.79	3.94	4.39	4.15	4.55	5.10	7.81	4.43	4.54	
PCB 77+110	4.81	54.34	25.45	34.07	24.24	16.26	0.00	31.65	66.43	34.21	
	16.34	12.86	25.36	66.83	34.98	42.59	28.19	971.74	38.87	31.39	
	27.15	13.30	41.35	15.17	48.01	53.48	49.67	107.50	28.71	19.09	
Mean	16.1	26.83	30.72	38.69	35.74	37.44	25.95	370.30	44.67	28.23	
PCB 82	0.42	3.87	2.78	2.45	5.04	0.00	2.75	4.60	6.94	6.90	
	2.37	0.00	5.02	0.00	1.47	2.59	3.26	2.70	7.44	4.90	
	4.29	1.46	5.21	2.58	0.00	5.85	4.87	9.77	8.09	0.17	
Mean	2.36	1.78	4.34	1.68	2.17	2.81	3.63	5.69	7.49	3.99	
PCB 151	1.46	16.56	9.74	11.78	7.87	5.50	8.52	9.09	16.93	18.08	
	5.33	2.85	6.74	19.49	11.22	15.07	11.01	8.17	8.96	7.31	
	8.58	4.19	13.84	4.31	14.14	21.69	15.14	39.24	6.02	4.10	
Mean	5.12	7.87	10.11	11.86	11.08	14.09	11.56	18.83	10.64	9.83	
PCB 135+144+147+127	0.77	11.61	6.19	8.57	4.96	0.00	2.81	3.72	6.49	13.05	
	0.00	0.00	5.01	12.81	7.68	9.52	4.58	53.39	6.30	4.28	
	5.79	2.96	9.40	0.00	9.97	12.42	10.89	23.31	4.44	2.79	
Mean	2.19	4.86	6.87	7.13	7.54	7.31	6.09	26.81	5.74	6.71	
PCB 107+123	0.24	0.00	0.00	2.45	0.00	0.00	0.00	0.00	4.67	0.00	
	0.00	0.00	0.00	0.00	0.00	3.19	0.00	0.00	0.00	1.74	
	0.00	1.98	2.80	0.00	3.02	4.05	0.00	7.47	5.14	0.95	
Mean	0.08	0.66	0.93	0.82	1.01	2.41	0.00	2.49	3.27	0.90	
PCB 149	4.43	58.03	29.84	38.43	31.20	16.48	39.99	31.42	66.81	68.27	
	17.36	10.07	25.06	59.53	36.97	50.30	37.95	35.79	30.74	26.18	
	27.99	15.13	45.40	11.27	46.80	66.44	53.06	124.99	20.62	14.51	
Mean	16.59	27.74	33.43	36.41	38.32	44.41	43.67	64.07	39.39	36.32	
PCB 118	3.06	33.51	17.31	23.56	17.59	10.84	14.27	24.75	44.67	44.00	
	9.49	10.20	15.04	39.11	22.11	30.45	19.09	14.95	19.41	17.28	
	16.22	8.56	24.59	0.00	28.39	32.01	28.32	62.23	14.16	8.99	
Mean	9.59	17.42	18.98	20.89	22.70	24.43	20.56	33.98	26.08	23.42	
PCB 134	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	2.34	0.00	0.00	0.66	0.60	
	0.00	0.00	1.84	0.00	0.00	0.00	0.00	0.00	0.00	0.45	
Mean	0.00	0.00	0.61	0.00	0.00	0.78	0.00	0.00	0.22	0.35	

LOCATION	1A B C	2A B C	3A B C	4A B C	5A B C	6A B C	7A B C	8A B C	9A B C	10A B C	SEL (µg/Kg)
PCB 131	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
PCB 146	0.53	26.61	13.63	12.86	9.07	5.63	7.44	8.81	15.20	0.00	
	6.42	0.00	12.38	0.00	12.61	16.35	9.12	5.62	0.00	7.73	
	10.32	4.91	14.44	3.76	16.07	17.44	13.49	34.67	6.32	5.14	
Mean	5.76	10.51	13.48	5.54	12.58	13.14	10.02	16.37	7.17	4.29	
PCB 105+132+153	18.95	144.85	73.44	99.69	71.86	40.99	33.08	41.31	171.53	114.71	
	40.55	29.52	63.37	155.21	101.00	110.00	39.95	69.24	71.96	62.22	
	67.59	37.94	97.86	31.85	95.34	160.24	130.90	287.08	41.93	30.44	
Mean	42.36	70.77	78.22	95.58	89.40	103.74	67.98	132.54	95.14	69.12	
PCB 141+179	0.00	16.98	0.00	12.99	9.26	11.95	8.50	9.00	28.03	20.19	
	4.85	5.56	0.00	20.72	15.20	0.00	11.04	5.20	9.31	0.00	
	7.11	5.16	0.00	4.35	14.74	21.57	15.03	39.66	7.85	0.00	
Mean	3.99	9.23	0.00	12.69	13.07	11.17	11.52	17.95	15.06	6.73	
PCB 137+176+130	0.00	0.00	1.80	1.15	0.00	1.76	2.05	1.73	2.88	0.00	
	0.00	0.00	1.10	0.00	5.20	0.00	1.35	0.00	0.00	0.92	
	0.00	1.66	0.00	0.00	0.00	3.80	2.03	5.79	0.00	0.61	
Mean	0.00	0.55	0.97	0.38	1.73	1.85	1.81	2.51	0.96	0.51	
PCB 163+138	6.61	0.00	47.54	67.27	49.50	30.95	37.92	50.51	110.41	115.80	
	28.50	19.49	40.28	5.40	67.65	76.50	52.71	40.52	52.39	46.15	
	47.42	23.61	70.25	30.50	76.39	100.30	3.07	188.99	36.18	23.42	
Mean	27.51	14.37	52.69	34.39	64.51	69.25	31.23	93.34	66.33	61.79	
PCB 158	0.96	14.18	6.28	1.16	7.48	4.57	9.24	0.86	19.88	21.05	
	3.99	3.19	6.68	20.25	10.32	0.00	9.65	10.44	9.91	7.87	
	7.50	3.40	11.84	3.87	11.36	13.65	87.36	28.64	5.51	5.75	
Mean	4.15	6.92	8.27	8.43	9.72	6.07	35.42	13.31	11.77	11.56	
PCB 178+129	0.00	8.48	5.41	0.00	6.33	2.19	3.86	4.69	7.76	10.12	
	2.63	0.00	4.38	13.51	5.39	7.10	4.99	3.00	4.79	3.75	
	7.84	2.92	7.01	0.00	11.40	9.96	23.61	17.71	3.24	2.16	
Mean	3.49	3.80	5.60	4.50	7.71	6.42	10.82	8.47	5.26	5.34	
PCB 187+182	3.22	43.90	22.74	30.96	20.54	13.48	18.64	21.27	37.34	43.63	
	13.96	10.27	18.51	49.61	28.72	33.49	25.19	16.78	22.85	18.27	
	21.19	11.44	32.84	8.94	36.73	49.42	31.93	81.51	14.42	11.23	

LOCATION	1A B C	2A B C	3A B C	4A B C	5A B C	6A B C	7A B C	8A B C	9A B C	10A B C	SEL (µg/Kg)
Mean	12.79	21.87	24.70	29.84	28.66	32.13	25.25	39.85	24.87	24.38	
PCB 183	1.24	26.64	12.90	19.39	13.97	7.21	12.00	13.58	23.21	22.44	
	8.99	0.00	11.61	0.00	18.34	21.22	15.77	9.06	14.35	11.35	
	13.18	7.91	21.53	3.17	22.22	28.03	19.46	52.77	7.00	6.20	
Mean	7.80	11.52	15.35	7.52	18.18	18.82	15.74	25.14	14.85	13.33	
PCB 128	0.59	13.13	6.34	10.09	9.35	4.15	4.89	0.00	16.07	3.25	
	3.28	2.23	5.77	7.96	7.57	8.11	6.38	4.37	7.96	7.77	
	6.72	5.52	9.48	2.53	3.51	13.40	11.58	25.11	1.01	3.88	
Mean	3.53	6.96	7.20	6.86	6.81	8.55	7.62	9.83	8.35	4.97	
PCB 185	0.58	4.45	2.55	3.26	2.21	0.97	1.96	2.17	3.72	4.62	
	5.15	1.80	3.52	5.46	2.98	3.22	2.28	1.49	0.00	1.84	
	2.32	1.80	3.59	0.00	3.73	17.88	3.22	8.34	0.00	1.07	
Mean	2.68	2.68	3.22	2.91	2.97	7.36	2.49	4.00	1.24	2.51	
PCB 174	2.55	36.13	20.64	29.82	19.02	17.09	15.21	20.21	39.02	37.74	
	4.14	7.61	15.43	48.87	26.08	31.83	20.83	14.22	20.23	17.00	
	17.72	9.51	31.95	11.00	31.36	45.37	28.76	73.82	13.84	10.19	
Mean	8.14	17.75	22.67	29.90	25.49	31.43	21.60	36.08	24.36	21.64	
PCB 177	0.89	17.28	10.74	10.21	6.63	4.34	8.01	6.12	16.36	21.33	
	9.34	4.19	6.80	16.16	8.59	12.41	11.49	0.00	12.42	4.94	
	8.56	56.52	13.08	4.03	14.38	21.11	16.71	37.06	8.36	5.17	
Mean	6.26	26.00	10.21	10.13	9.87	12.62	12.07	14.39	12.38	10.48	
PCB 202+171+176	5.16	21.59	14.43	18.16	10.75	5.07	12.33	15.94	37.63	21.15	
	3.74	11.70	11.98	31.36	14.86	17.97	17.68	16.58	20.01	8.84	
	10.75	49.30	12.28	6.68	23.49	22.70	22.60	28.18	16.24	5.17	
Mean	6.55	27.53	12.90	18.73	16.37	15.25	17.54	20.23	24.63	11.72	
PCB 157+200	76.45	0.00	15.80	19.12	0.00	11.28	0.00	0.00	0.00	0.00	
	374.52	0.00	15.48	40.00	0.00	27.84	0.00	0.00	0.00	6.03	
	76.15	78.12	26.01	0.00	0.00	0.00	0.00	0.00	0.00	8.75	
Mean	175.71	26.04	19.10	19.71	0.00	13.04	0.00	0.00	0.00	4.93	
PCB 172+197	0.00	8.31	4.29	4.92	2.63	1.95	3.30	2.83	5.73	11.20	
	2.83	0.00	3.23	8.39	3.60	5.59	4.03	2.31	0.00	2.61	
	3.44	2.34	6.27	0.00	8.40	9.73	5.80	15.26	0.00	1.83	
Mean	2.09	3.55	4.60	4.44	4.88	5.76	4.38	6.80	1.91	5.21	
PCB 180	0.00	84.86	48.93	75.24	39.87	22.99	31.50	37.13	67.58	116.98	
	30.25	0.00	37.10	181.41	54.24	87.53	37.19	26.47	43.88	35.53	

LOCATION	1A B C	2A B C	3A B C	4A B C	5A B C	6A B C	7A B C	8A B C	9A B C	10A B C	SEL (µg/Kg)
	43.06	24.40	86.02	0.00	85.24	93.96	54.13	149.01	34.02	21.37	
Mean	24.44	36.42	57.35	85.55	59.78	68.16	40.94	70.87	48.49	57.96	
PCB 193	0.00	4.20	4.78	3.94	0.00	1.18	1.53	0.00	3.73	13.74	
	0.00	0.00	2.33	0.00	0.00	6.54	1.34	1.44	0.00	2.08	
	2.15	1.13	5.19	0.00	4.17	8.52	0.00	14.53	0.00	1.37	
Mean	0.72	1.78	4.10	1.31	1.39	5.41	0.96	5.32	1.24	5.73	
PCB 191	0.00	2.26	2.31	1.81	0.00	0.00	1.01	0.00	2.49	7.51	
	0.00	0.00	0.84	0.00	0.00	0.00	0.00	0.00	1.21	0.57	
	0.00	0.64	0.00	0.00	0.00	7.19	0.00	4.19	1.13	0.61	
Mean	0.00	1.08	1.05	0.60	0.00	2.40	0.34	1.40	1.61	2.90	
PCB 199	0.00	1.50	0.00	1.18	0.77	0.36	0.71	0.00	1.57	4.15	
	0.00	0.00	0.68	4.51	0.00	2.21	0.00	0.00	0.93	0.59	
	0.00	0.32	1.30	0.00	0.00	5.38	1.38	3.46	0.76	0.39	
Mean	0.00	0.61	0.66	1.90	0.26	2.65	0.70	1.15	1.09	1.71	
PCB 170+190	2.95	53.96	28.59	40.57	28.74	13.62	20.45	1.82	67.54	5.72	
	16.20	6.24	23.13	0.00	37.93	45.18	30.27	22.06	29.50	24.16	
	27.70	13.33	48.05	0.00	45.68	72.30	48.42	122.14	39.33	12.77	
Mean	15.62	24.51	33.26	13.52	37.45	43.70	33.05	48.67	45.46	14.22	
PCB 198	0.00	0.00	0.79	0.95	0.77	0.23	0.60	0.62	1.02	0.00	
	0.00	0.00	0.78	0.00	0.00	0.98	0.72	0.00	0.79	0.50	
	0.00	0.45	1.03	0.00	0.00	0.00	0.00	2.19	0.00	0.37	
Mean	0.00	0.15	0.87	0.32	0.26	0.40	0.44	0.94	0.60	0.29	
PCB 201	1.43	29.99	16.58	19.96	13.23	7.66	13.44	14.29	25.47	0.00	
	11.61	4.99	14.68	0.00	16.74	22.25	17.11	10.11	17.10	11.59	
	15.00	7.87	22.94	28.67	27.14	63.14	22.97	56.30	8.94	8.44	
Mean	9.35	14.28	18.07	16.21	19.04	31.02	17.84	26.90	17.17	6.68	
PCB 203+196	1.67	43.33	21.20	30.47	21.54	10.07	17.80	22.00	38.40	0.00	
	14.54	0.00	19.74	0.00	27.72	31.39	22.97	12.75	33.18	18.75	
	21.14	11.17	32.61	0.00	34.04	59.38	30.69	78.46	20.39	12.37	
Mean	12.45	18.17	24.52	10.16	27.77	33.61	23.82	37.74	30.66	10.37	
PCB 189	0.00	6.61	2.54	3.78	2.83	1.04	1.72	1.17	2.95	0.00	
	0.00	0.00	0.00	0.00	4.08	3.39	0.00	0.00	0.00	1.43	
	0.00	1.94	4.05	0.00	0.00	4.39	1.62	8.01	0.00	1.06	
	0.00	2.85	2.20	1.26	2.30	2.94	1.11	3.06	0.98	0.83	

LOCATION	1A B C	2A B C	3A B C	4A B C	5A B C	6A B C	7A B C	8A B C	9A B C	10A B C	SEL (µg/Kg)
Mean											
PCB 208+195	0.00	25.06	10.92	15.99	12.61	0.00	3.62	89.67	12.81	0.00	
	7.22	0.00	11.03	0.00	15.50	17.26	7.74	4.34	13.87	9.68	
	11.31	5.03	17.56	0.00	19.03	19.14	17.59	25.84	20.93	6.13	
Mean	6.18	10.03	13.17	5.33	15.71	12.13	9.65	39.95	15.87	5.27	
PCB 207	0.00	0.00	0.71	1.13	1.01	0.38	0.79	1.01	1.50	0.00	
	0.00	0.00	0.85	0.00	1.11	1.12	0.96	0.00	1.07	0.54	
	0.00	0.30	1.24	0.00	1.37	0.00	1.32	2.77	0.00	0.60	
Mean	0.00	0.10	0.93	0.38	1.16	0.50	1.02	1.26	0.86	0.38	
PCB 194	0.60	17.71	9.00	12.81	8.55	3.73	6.87	8.45	15.85	16.29	
	5.76	0.00	7.61	20.55	11.23	13.37	8.78	5.23	9.60	7.37	
	8.64	4.39	13.99	0.00	13.97	24.19	13.61	34.87	15.37	4.14	
Mean	5.00	7.37	10.20	11.12	11.25	13.76	9.75	16.18	13.61	9.27	
PCB 205	0.00	0.00	0.73	1.39	0.00	0.00	0.54	0.41	0.70	0.00	
	0.00	0.00	0.64	0.00	0.00	1.28	0.38	0.00	0.97	0.59	
	0.00	0.46	1.48	0.00	0.00	3.56	0.70	3.38	0.00	0.00	
Mean	0.00	0.15	0.95	0.46	0.00	1.61	0.54	1.26	0.56	0.20	
PCB 206	0.80	15.57	6.66	9.37	7.61	4.85	5.94	8.08	13.67	0.00	
	4.49	0.00	8.42	0.00	9.20	10.09	7.75	4.18	10.87	6.88	
	6.78	3.16	9.54	0.00	12.49	16.69	10.21	23.47	0.00	4.68	
Mean	4.02	6.24	8.21	3.12	9.77	10.54	7.97	11.91	8.18	3.85	
PCB 209	0.21	3.52	2.44	3.79	0.00	0.00	2.15	3.82	5.41	0.00	
	1.84	0.00	3.97	0.00	2.77	3.48	3.33	9.67	4.89	3.01	
	1.50	1.27	2.85	0.00	4.28	3.34	3.86	10.52	0.00	2.85	
Mean	1.18	1.60	3.09	1.26	2.35	2.27	3.11	8.00	3.43	1.95	

V.G. COC in Plants

Samples of dominant vegetation of the Kearny Marsh area were collected on March of 2005 and examined for COC of concern (Table V.G1).

Based on the contaminants of concern analysis results of representative plants collected from Kearny Marsh, *Althaea officinalis* plant tissue has a total 1199.80 mg/kg of heavy metals with out Fe. Most of those metals with exception of the Fe are found on the above ground plant tissue varying from 79.9% of the total Zn to 53.8% of the total Cu. Fe total for this plant is 6,317.04 mg/kg most of which about 80% of the total weight was found on the root tissue. *Puchea sp*. plant tissue has a total of heavy metals with out Fe of 912.59 mg/kg. Most of the Cd (approximately 75% of the total amount), Ni (approximately 73% of the total amount), Hg and Zn (approximately 62% and 64%of the total amount). Most of the Fe (approximately 91% of the total amount) and Cr (approximately 71% of the total amount) are found on the roots of the plants. *Eleocharis palustris* plant tissue has a total of heavy metals with out Fe of 1,005.39 mg/kg. Cr, Cu, Ni, Pb and Hg are found mostly in the bellow ground (roots) portion of the plant. Cd and Zn (approximately 57% and 74%of the total amount) are more prevalent on the leaves of the plants. The total amount of Fe is 8037.74 mg/kg most of which (approximately 86% of the total amount) is also found below ground on the root tissue.

Among the plants examined, *Phragmites australis* and *Typha latifolia* have lower amounts of heavy metals in their tissue. *Phragmites australis* total amount of metals without Fe is 526.56 mg/kg and the total amount of metals without Fe for *Typha latifolia* is 518.13 mg/kg. While *Phragmites* maintain most of its heavy metal bellow ground with exception of

Hg which is evenly distributed among the plant tissue; *Typha latifolia* on the other hand, have an even distribution of most of its heavy metals with exception of the Cr and Fe (approximately 74% and 90%of the total amount) which are found mostly on the root system.

V.H. COC in Benthic Macroinvertebrates (BMI)

Based on pre-capping benthic macroinvertebrates collection in July 2005, there were not enough macroinvertebrates for COC analysis (Table V.D1).

Table V.G1. COC in dominant vegetation of Kearny Marsh (March 2005). mg/kg

		Cd	Cr	Cu	Fe	Hg	Ni	Pb	Zn	Total w/o Fe
Althaea officinalis	Leaf	45.326	24.68	130.54	4840	1.23	245.99	631.79	5212.27	6291.83
	Stem	38.85	26.02	251.18	6027	1.04	160.52	834.39	1368.61	2680.61
	Roots	33.675	28.74	327.82	53016	0.83	176.2	1025.73	1628.38	3221.37
	Total	117.851	79.44	709.54	63882	3.1	582.71	2491.91	8209.26	12193.81
	Substrate	33.675	28.74	327.82	53016	0.83	176.2	1025.73	1628.38	3221.37
	Above Substrate	84.176	50.7	381.72	10867	2.27	406.51	1466.18	6580.88	8972.44
Pluchea sp	Leaf	38.963	29.81	411.51	4899	1.42	128.53	562.17	2070.89	3243.3
	Stem	46.274	39.96	182.62	3036	1.28	320.92	483.14	1090.62	2164.82
	Roots	28.272	170.81	562.04	80011	1.63	155.5	1208.01	1702.27	3828.53
	Total	113.509	240.58	1156.17	87946	4.33	604.96	2253.32	4863.78	9236.65
	Substrate	28.272	170.81	562.04	80011	1.63	155.5	1208.01	1702.27	3828.53
	Above Substrate	85.237	69.77	594.13	7935	2.7	449.45	1045.31	3161.51	5408.12
Phragmatis sp	Leaf	20.213	12.54	67.64	1735	0.96	52.02	288.09	550.59	992.36
	Rhizomes(stem)	22.944	29.36	61.09	3878	1.26	24.89	301.56	419.69	860.5
	Roots	15.889	118.04	272.21	22708	1.22	334.13	1011.89	862.19	2615.56
	Total	59.046	159.94	400.94	28321	3.44	411.04	1601.54	1832.47	4468.41
	Substrate	38.833	147.4	333.3	26586	2.48	359.02	1313.45	1281.88	3476.06
	Above Substrate	20.213	12.54	67.64	1735	0.96	52.02	288.09	550.59	992.36
Eleocharis palustris	Leaf	27.084	57.71	187.6	9478	0.18	98.54	722.85	3802.05	4896.64
	Stem	18.136	14.07	65.34	1424	0.8	27.46	217.36	597.16	939.71
	Roots	32.672	387.33	694.36	70094	1.32	248.41	1577.51	1481.42	4423.02
	Total	77.892	459.11	947.3	80996	2.3	374.41	2517.72	5880.63	10259.37
	Substrate	32.672	387.33	694.36	70094	1.32	248.41	1577.51	1481.42	4423.02
	Above Substrate	45.22	71.78	252.94	10902	0.98	126	940.21	4399.21	5836.35
Typha angustifolia	Leaf	22.371	27.83	73.44	1846	1.33	59.69	415.3	592.34	1129.23
	Stem	17.333	98.5	187.68	5009	1.17	94.77	353.62	376.16	1192.3
	Roots	22.764	370.1	294.25	62249	0.24	225.39	990.41	985.42	2888.58
	Total	62.468	496.43	555.37	69104	2.74	379.85	1759.33	1953.92	5210.11
	Substrate	22.764	370.1	294.25	62249	0.24	225.39	990.41	985.42	2888.58
	Above Substrate	39.704	126.33	261.12	6855	2.5	154.46	768.92	968.5	2321.53

VI. CAP INSTALATION

VI.A Placement of AquaBlok

The AquaBlok was trucked into the Meadowlands and stored dry until application. Prior to AquaBlok application, plot perimeters were defined by driving stakes into the sediment (See Section IV.B.) and treatment groups were assigned to each plot. AquaBlok was spread using a "stoneflinger" operated by CS Materials Inc. The stoneflinger is a motorized vehicle with an extended arm that propelled the AquaBlok into the marsh from the shore (Figure VI.A1). Dates of application were July 25th through August 3rd. Water quality sampling was done before application, July 13, 2005, and after, August 9th and September 28th, 2005. On August 23rd, cores were taken from each capped plot in order to determine the depth of the hydrated cap.

Figure VI.A1. Stoneflinger placing AquaBlok into the marsh

In order to evaluate cap thickness, 6 cores per taken across each plot. The data showed a relatively uniform application (Table VI.A1). Thickness ranged from 0.3 to 1.3 feet among all plots and averaged 0.8 to 1.2 feet for each plot. Figure VI.A2 illustrates and example of cap thickness using plot 1. While most of the cap was fairly uniform, there were occasional spots where the cap was thicker (or thinner) than in the rest of the plot.

Table VI.A1. Cap thickness (feet) measured approximately one month after application, 8-23-05. Site was based on grid in Picture 2 (0/A = west-south). S = with SumerSeed, AB = AquaBlok, PM = amended with peat moss, UN = unamended, AVE = average thickness, SD = standard deviation. Cap thickness was fairly consistent.

Plot 1		Plot 2		Plot 4		Plot 5		Plot 6		Plot 8	
AB-UN-S		AB-PM-S		AB-UN		AB-UN-S		AB-PM-S		AB-UN	
site	depth	site	depth	site	depth	site	depth	site	depth	site	depth
1-B	0.9	1-B	0.9	3-B	0.9	5-D	0.7	1-B	0.3	5-D	0.9
5-C	1.7	3-D	1.0	3-F	0.6	6-F	1.0	4-B	0.7	5-F	0.9
4-D	1.0	5-B	1.3	0-E	0.6	3-E	0.6	5-D	1.3	3-E	0.9
0-E	1.2	6-E	0.5	2-C	1.0	1-F	0.2	4-E	0.5	1-E	1.1
1-F	1.3	4-E	0.7	5-C	1.1	2-B	1.2	3-C	1.2	2-B	0.9
3-E	1.2	1-D	0.7	6-A	0.5	1-D	1.1	1-D	1.2	4-C	0.7
AVE	1.2	AVE	0.9	AVE	0.8	AVE	0.8	AVE	0.9	AVE	0.9
SD	0.3	SD	0.3	SD	0.2	SD	0.4	SD	0.4	SD	0.1

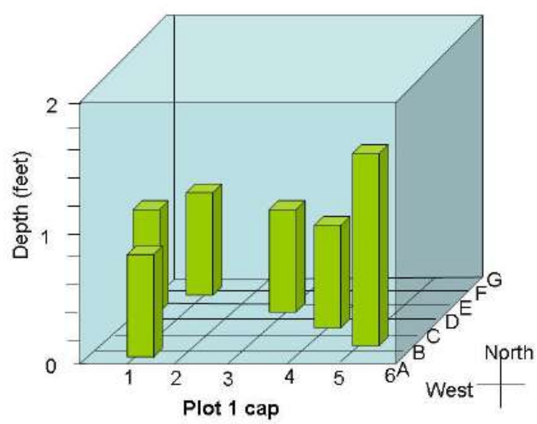


Figure VI.A2. Example of cap placement in grid system. Data were for plot 1 that contained unamended AquaBlok with SubmerSeed. Cap placement was fairly uniform ranging from 0.9 to 1.7 feet deep.

VI.B. Biological Platform (BioLogs[2])

After the installation of the Cap, water levels continue to rise on the research area. Due to the excessive water depth of the research plots designated to receive plant seeds (SubmerSeed), biological platforms 6-8 inches in depth occupying 4% of the total area of each plot were created. Biological platforms (Figure VI.B1) were created using six BioLogs (measuring 16" in thickness and 20 feet in length) tide-up together forming a 20 feet long by 8 feet wide by 16" deep platform. Biological platforms were placed and anchored at the deepest area on each plot. Once the platform sunk (Figure VI.B2) it received the same AquaBlok treatment as the research plot. AquaBlok was applied by hand to each biological platform at a rate of 15 lb/square foot.

Figure VI.B1: Biological platform 20 feet long by 8 feet wide by 16" deep.

[2] BioLogs are made from 100% coir (coconut fiber) bound by coir fiber netting and over time will degrade once stabilized by the vigorous network of roots and grasses. The result is a 100% natural solution designed to promote healthy waterways and enhance wildlife habitat.

Figure VI.B2. Biological platforms anchored at the deepest area of each experimental plot.

VI.C. SubmerSeed

SubmerSeed, is a composite seeding technology where aquatic plant seeds are incorporated into small AB conglomerations (Figure VI.C1) allowing the seeds to be easily delivered into permanently inundated conditions. The weight of the AquaBlok pellet allows the associated seeds to sink below the surface and become integrate into the hydrated AquaBlok cap below.

Based on the local area and adjacent wetland natural vegetation, a final list of plant seed have been agreed upon to be incorporated into the SubmerSeed thechnology (Table VI.C1). SubmerSeeds were sown by hand at the rate of ~4.6lbs/100 SF across the entire plots (1, 2, 5, 6, 7, and 10) designated to receive plant seeds (including the biological platforms).

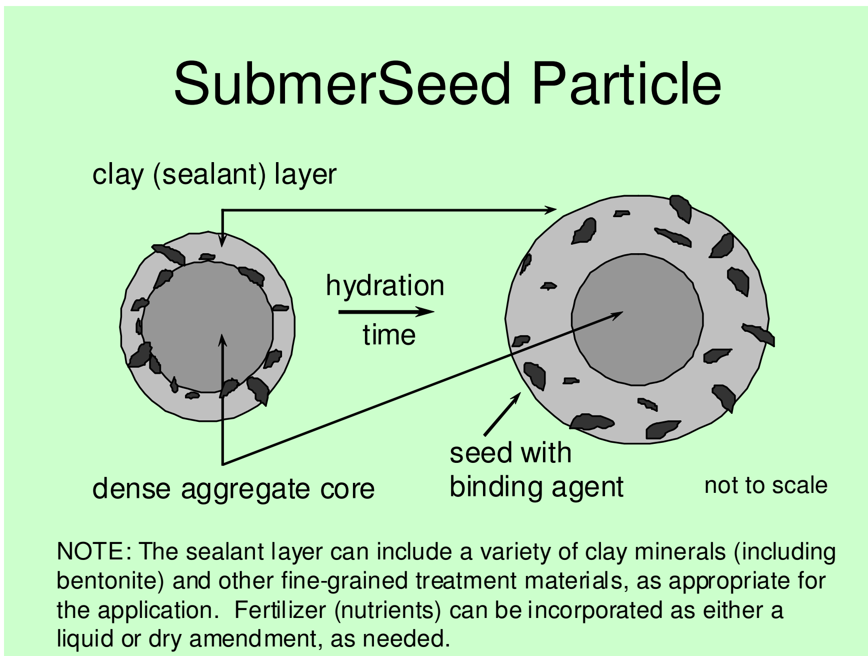


Figure VI.C1. SubmerSeed particle technology

Table VI.C1. SubmerSeed composition

Botanical Name	Common Name	Oz.
Permanent Grasses / Sedges / Rushes		
Carex comosa	Bristly Sedge	2.50
Carex lacustris	Common Lake Sedge	0.25
Carex lurida	Bottlebrush Sedge	4.00
Carex vulpinoidea	Brown Fox Sedge	6.00
Eleocharis ovata	Blunt Spike Rush	1.00
Juncus effuses	Common Rush	1.00
Leersia orzyoides	Rice Cut Grass	3.00
Scirpus acutus	Hard-Stemmed Bulrush	2.50
Scirpus pungens	Chairmaker's Rush	4.00
Scirpus validus	Great Bulrush	6.00
		30.25
Temporary Cover		
Avena sativa	Common Oat	360.00
Lolium multiflorum	Annual Rye	104.00
		464.00
Forbs		
Acorus calamus	Sweet Flag	1.00
Asclepias incarnata	Swamp Milkweed	1.50
Alisma spp.	Water Plantain	2.00
Cephalanthus occidentalis	Buttonbush	1.00
Decodon verticillatus	Swamp Loosestrife	1.25
Eupatorium maculatum	Spotted Joe-Pye Weed	0.50
Hibiscus spp.	Rosemallow	3.00
Iris virginica	Blue Flag Iris	6.00
Lobelia cardinalis	Cardinal Flower	0.25
Lobelia siphilitica	Great Blue Lobelia	1.50
Ludwigia alternifolia	Seedbox	0.25
Mimulus ringens	Monkey Flower	1.00
Peltandra virginica	Arrow Arum	16.00
Pontederia cordata	Pickerel Weed	10.00
Sagittaria latifolia	Broad-Leaved Arrowhead	2.00
Sparganium americanum	American Bur Reed	2.00
Sparganium eurycarpum	Common Bur Reed	4.00
Verbena hastata	Blue Vervain	1.00
Zizania aquatica	Wild Rice	8.00
		62.25

VII. POST-CAPPING ACTIVITIES

VII.A. Water Quality

Water quality parameters were sampled post capping during 2005 (Tables VII.A1-VII.A2), 2006 (Tables VII.A3 – VII.A6), 2007 (TablesVII.A7- VII.A13) Parameters included salinity, pH, temperature, DO, eH (redox) and depth. Data were collected with a Hydrolab datasonde 4a. TSS was measured using Standard Methods 2540B.

2005

During 2005, Salinity changed over the sampling period increasing from July (pre-capping) to August and from August to September (Figure VII.A1). There were no differences between plots pre-capping, 7-13-05, with values ranging from 1.25 to 1.35 ppt. In 8-9-05 post capping, there were no significant differences between treatments, but salinity increased compared to pre-capping and ranged from 1.41 to 1.72 ppt. Salinity doubled on 9-28-05 in all treatments ranging from 2.21 to 3.77 ppt. It was significantly lower in control plots (with or without SS) than in AB plots. The increased salinity was associated with an increased in depth of about 0.5 ft. It is uncertain at this time as to why the increase in water volume was associated with higher salinity. The difference between controls and AB plots might have been related to AB suspended in the water column.

Data on pH showed that it was increased in AB plots. In the 8-9-05 sampling, it ranged from 8.04 to 8.56 in AB plots and 7.35 to 8.08 in controls: on 9-28-05, it ranged from 7.56 to 8.23 in AB plots and from 7.30 to 7.75 in control samples. The pH was significantly higher in two of three AB treatments than in both controls (with or without SS) on 8-9-05 and on 9-28-05 (Figure VII.A2). The consistent effect in both post capping sampling periods indicated that AB does affected pH under field conditions.

Water temperature did not vary by plot pre or post capping (Figure VII.A3). The range in July, 7-13-05, was from 24.9 to 30.4 °C. In August, 8-9-05, the temperature was similar ranging from 26.8 to 28.2 °C. Temperature declined in September, 9-28-05, ranging from 19.0 to 20.3 °C.

Pre-capping data showed no significant differences in DO between plots; however, in both post capping samples DO was statistically lower in controls (without SubmerSeed (SS) than in any of the AquaBlok (AB) treatments (Figure VII.A4). For example on 9-28-05, control ranged from 1.89 to 3.57 mg/L, while unamended AB ranged from 4.74 to 7.30 mg/L. The consistent results indicated that AB improved DO concentrations. This could have been due to the separation of surface water from anaerobic bacterial activity in sediment. As in pre-capping data, temperature and DO were positively correlated such that declining DOs were associated with lower water temperatures. This probably reflected less algal mass in September.

ORP values declined post capping. The valves appeared to correspond with DO levels such that they were higher in AB treatments than controls (Figure VII.A5). However, the only statistical differences were on the 8-9-05 sampling date where redox for unamended AB (with or without SS) was greater than for controls (with or without AB). Values for unamended AB without SS ranged from 164 to 272 mV while those for control without SS ranged from 31 to 135 mV. High variability within plots accounted for the lack of consistent differences between treatments.

Data on depth showed that capping reduced water depth by approximately 1 foot (Figure VII.A6). Depth ranged from 1.5 to 3.5 ft pre-capping (7-13-05) and from 0.9 to 2.6 ft in the first post capping measurements (8-9-05). The depth rose about 0.5 feet in the next sampling period, 9-28-05, ranging from 1.3 to 3.0 ft.

TSS concentrations appeared to spike in 8-9-05 post capping (Figure VII.A7). Values within replicates were highly variable and no statistical differences were found between capped and uncapped plots. The decline a month later, 9-28-05, suggested that the spike could have been due to placement of the cap and that any suspended solids had settled.

Overall field results showed that AB could affect water quality. As in the laboratory, AB caused pH to increase. This might be associated with the binding of cations. It also improved DO and the corresponding ORP potential. This might be associated with separation of the water column from anaerobic activity in sediments. Data also showed that algal make an important contribution to the DO levels in the marsh, greatly increasing them during the day at least.

Table VII.A1. Water quality parameters taken post capping, August 9, 2005. All samples were collected between 11:00AM and 2:00PM. CNTRL = not capped, S = with SubmerSeed, AB = AquaBlok, PM = amended with peat moss, UN = unamended, Sal = salinity (ppt), Temp = temperature (°C), DO = dissolved oxygen (mg/L), ORP = oxidation-reduction potential (mV),TSS = total suspended solids (mg/L).Green blocks indicate data not included in average.

Plot #	Sample	Location	Salinity	pH	Temp.	DO	ORP	depth	TSS
AB UN S	1 - 1	2 – E	1.72	8.23	28.0	8.64	145	1.40	41
1	1 - 2	1 – E	1.71	8.21	28.1	8.90	130	1.50	112
	1 - 3	4 – C	1.71	8.26	28.2	5.91	151	1.50	32
Average # 1			1.71	8.23	28.1	7.82	142	1.47	61.7
SD			0.01	0.03	0.1	1.66	11	0.06	43.8
AB PM S	2 - 1	2 – C	1.72	8.29	27.9	9.94	171	1.20	25
2	2 - 2	5 – C	1.71	8.14	27.8	3.34	71	1.20	168
	2 - 3	5 – D	1.71	8.27	28.2	9.50	189	1.50	32.5
Average # 2			1.71	8.23	28.0	7.59	144	1.30	75.2
SD			0.01	0.08	0.2	3.69	64	0.17	80.5
CNTRL	3 - 1	0 – D	1.72	8.37	27.9	8.42	271	2.60	79
3	3 - 2	5 – D	1.46	8.08	27.1	1.34	31	2.40	123
	3 - 3	1 – F	1.69	8.04	27.7	2.50	41	2.30	26
Average # 3			1.62	8.06	27.6	1.92	36	2.43	76.0
SD			0.14	0.03	0.4	0.82	7	0.15	48.6
AB UN	4 - 1	5 – G	1.72	8.43	27.8	7.49	251	1.50	30
4	4 - 2	4 – D	1.71	8.42	28.1	8.05	252	1.30	30
	4 - 3	ND	1.72	8.39	27.7	8.10	258	1.50	27
Average # 4			1.72	8.41	27.9	7.88	254	1.43	29.0
SD			0.01	0.02	0.2	0.34	4	0.12	1.7
AB UN S	5 - 1	1 – D	1.71	8.29	27.4	7.55	222	1.40	28
5	5 - 2	5 – E	1.71	8.30	27.4	7.82	244	1.50	43
	5 - 3	5 – B	1.71	8.39	27.5	6.87	242	1.30	172
Average # 5			1.71	8.33	27.5	7.41	236	1.40	81.0

SD			0.00	0.06	0.1	0.49	13	0.10	79.2
Plot #	Sample	Location	Salinity	pH	Temp.	DO	ORP	depth	TSS
AB PM S	6 - 1	2 – C	1.71	7.80	27.5	1.82	147	1.90	34
6	6 - 2	4 – D	1.71	7.89	27.4	6.48	181	1.50	31
	6 -3	1 – D	1.71	8.03	27.5	7.90	219	0.80	117
Average # 6			1.71	7.91	27.4	7.19	182	1.40	60.7
SD			0.00	0.12	3.18	1.00	36	0.56	48.8
CNTRL S	7 - 1	3 – C	1.59	7.95	27.1	2.33	40	2.10	72
7	7 - 2	4.5 – D	1.55	7.68	26.8	0.43	53	2.30	37
	7 - 3	2 – B	1.54	7.83	27.1	0.95	34	2.10	87
Average # 7			1.56	7.82	27.0	1.24	42	2.17	65.3
SD			0.03	0.14	0.2	0.98	10	0.12	25.7
AB UN	8 - 1	2 – D	1.71	8.56	27.0	8.08	272	0.90	28
8	8 - 2	5 – F	1.71	8.45	27.1	8.89	280	1.50	43
	8 - 3	1 – F	1.71	8.13	26.9	6.47	164	1.70	71
Average # 8			1.71	8.38	27.0	7.81	239	1.37	47.3
SD			0.00	0.22	0.1	1.23	65	0.42	21.8
CNTRL	9 - 1	5 – D	1.54	7.69	27.6	0.30	93	1.70	300
9	9 - 2	6 – F	1.34	7.35	27.7	0.88	113	1.40	134
	9 - 3	3 – B	1.71	7.58	27.6	3.22	135	2.30	26
Average # 9			1.53	7.54	27.6	1.47	114	1.80	153.3
SD			0.19	0.17	0.1	1.55	21	0.46	138.0
CNTRL S	10 - 1	0 – B	1.43	7.82	27.5	1.02	83	2.20	23
10	10 - 2	2 – D	1.41	7.78	27.6	0.71	94	2.30	465
	10 - 3	5 – F	1.54	7.69	27.0	1.55	81	2.00	24
Average # 10			1.46	7.76	27.4	1.09	86	2.17	170.7
SD			0.07	0.07	0.3	0.42	7	0.15	127.5

Table VII.A2. Water quality parameters taken post capping, date 9-28-05. All samples were collected between 11:00AM and 2:00PM. CNTRL = not capped, S = with SubmerSeed, AB = AquaBlok, PM = amended with peat moss, UN = unamended, Sal = salinity (ppt), Temp = temperature (°C), DO = dissolved oxygen (mg/L), ORP = oxidation-reduction potential (mV), TSS = total suspended solids (mg/L).

Plot #	Sample	Location	Salinity	pH	Temp.	DO	ORP	Depth	TSS
AB UN S	1 - 1	2-E	3.19	7.67	19.8	5.38	83	2.30	27.5
1	1 -2	3-D	3.66	7.91	19.3	7.74	137	1.50	27.0
	1 - 3	0-B	3.49	7.56	19.1	3.30	83	ND	13.0
Average # 1			3.45	7.71	19.4	5.47	101		22.5
SD			0.24	0.18	0.3	2.22	31		8.2
AB PM S	2 - 1	1-D	3.61	7.64	19.0	6.50	75	2.10	23.5
2	2 - 2	5-G	3.69	7.87	19.2	6.15	131	2.00	30.5
	2 - 3	6-B	3.64	7.87	19.2	3.69	64	1.70	29.4
Average # 2			3.65	7.79	19.1	5.45	90		27.8
SD			0.04	0.13	0.1	1.53	36		3.8
CNTRL	3 - 1	2-C	2.80	7.52	20.0	3.40	70	3.00	35.0
3	3 - 2	5-C	2.32	7.41	19.6	1.89	87	2.60	20.0
	3 - 3	3-G	2.64	7.30	19.3	3.57	78	ND	16.5
Average # 3			2.59	7.41	19.6	2.95	78		23.8
SD			0.24	0.11	0.4	0.92	9		9.8
AB UN	4 - 1	3-F	3.65	7.75	19.5	5.06	71	1.50	23.0
4	4 - 2	4-C	3.66	7.96	19.2	5.82	82	1.70	22.5
	4 - 3	2-B	3.60	7.85	19.3	3.78	96	2.20	14.5
Average # 4			3.64	7.85	19.3	4.89	83		20.0
SD			0.03	0.11	0.1	1.03	13		4.8
AB UN S	5 - 1	3-E	3.71	7.85	19.5	4.18	105	1.70	36.5
5	5 - 2	5-B	3.69	7.87	19.5	6.10	91	1.80	23.5
	5 - 3	6-D	2.69	7.56	19.5	3.76	80	2.20	22.5
Average # 5			3.36	7.76	19.5	4.68	92		27.5
SD			0.58	0.17	0.1	1.25	13		7.8

Plot #	Sample	Location	Salinity	H	Temp.	DO	ORP	Depth	TSS
AB PM S	6 - 1	2-F	3.72	7.93	19.3	7.00	107	2.30	23.5
6	6 - 2	4-F	3.74	7.91	19.2	5.10	122	1.70	34.0
	6 -3	6-B	3.52	7.95	19.5	5.17	93	1.50	18.5
Average # 6			3.66	7.93	19.3	5.76	107		25.3
SD			0.12	0.02	0.2	1.08	15		7.9
CNTRL S	7 - 1	5-D	2.21	7.56	20.3	3.86	45	2.80	26.0
7	7 - 2	2-C	3.34	7.75	19.2	3.28	53	2.70	55.5
	7 - 3	6-B	3.62	7.63	18.9	4.47	47	2.30	18.0
Average # 7			3.06	7.65	19.5	3.87	48		33.2
SD			0.75	0.10	0.7	0.60	4		19.8
AB UN	8 - 1	3-D	3.76	8.23	19.0	7.30	382	1.30	25.0
8	8 - 2	2-B	3.77	8.05	19.2	4.83	79	1.90	37.5
	8 - 3	6-B	3.75	8.12	19.0	4.74	58	1.80	25.0
Average # 8			3.76	8.13	19.1	5.62	173		29.2
SD			0.01	0.09	0.1	1.45	181		7.2
CNTRL	9 - 1	2-C	2.77	7.39	19.8	2.96	36	ND	23.0
9	9 - 2	4-D	2.45	7.34	20.2	2.84	67	ND	18.0
	9 - 3	6-B	2.81	7.37	19.8	3.08	14	ND	10.0
Average # 9			2.68	7.37	20.0	2.96	39		17.0
SD			0.20	0.03	0.2	0.12	27		6.6
CNTRL S	10 - 1	3-D	2.41	7.35	20.0	5.30	80	2.70	6.0
10	10 - 2	3-F	2.07	7.39	20.0	4.59	19	2.80	19.0
	10 - 3	3-C	2.76	7.45	20.1	3.21	35	ND	15.5
Average # 10			2.41	7.40	20.0	4.37	45		13.5
SD			0.35	0.05	0.1	1.06	32		6.7

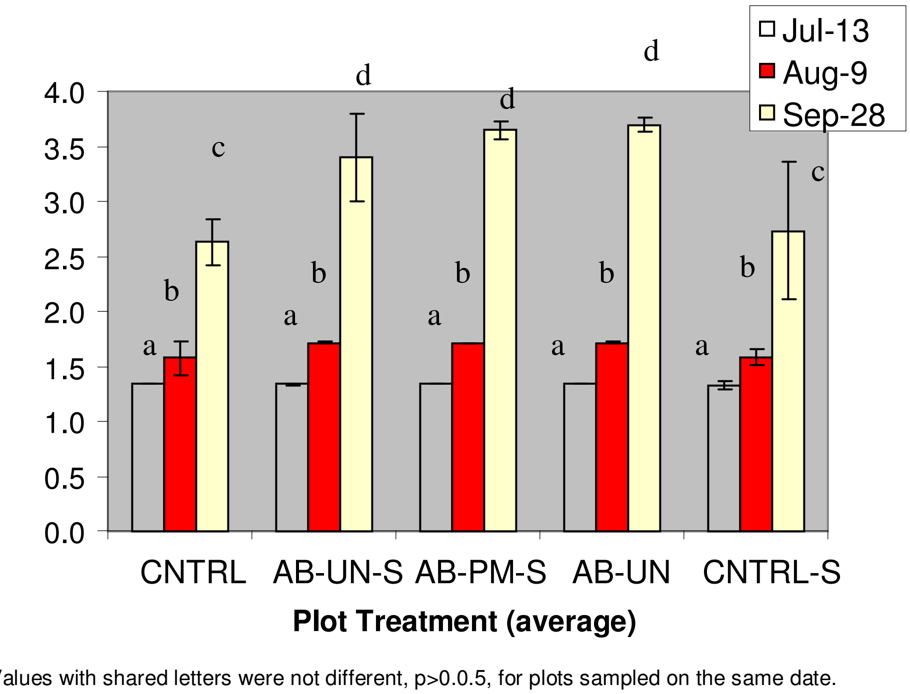


Figure VII.A1. Pre- and post capping water salinity during 2005

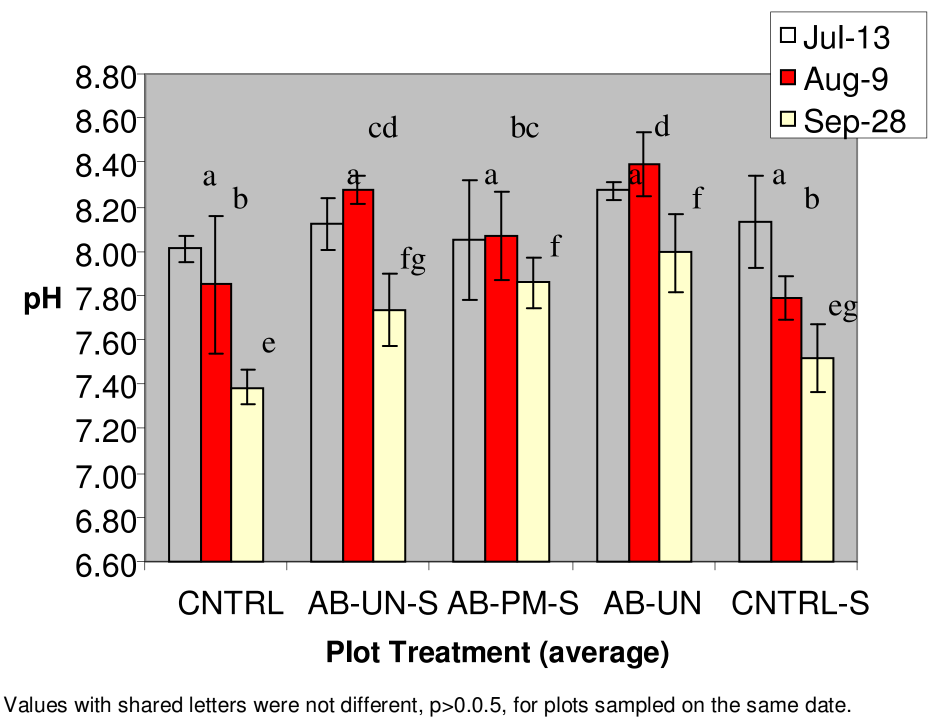


Figure VII.A2 Pre- and post capping water pH during 2005

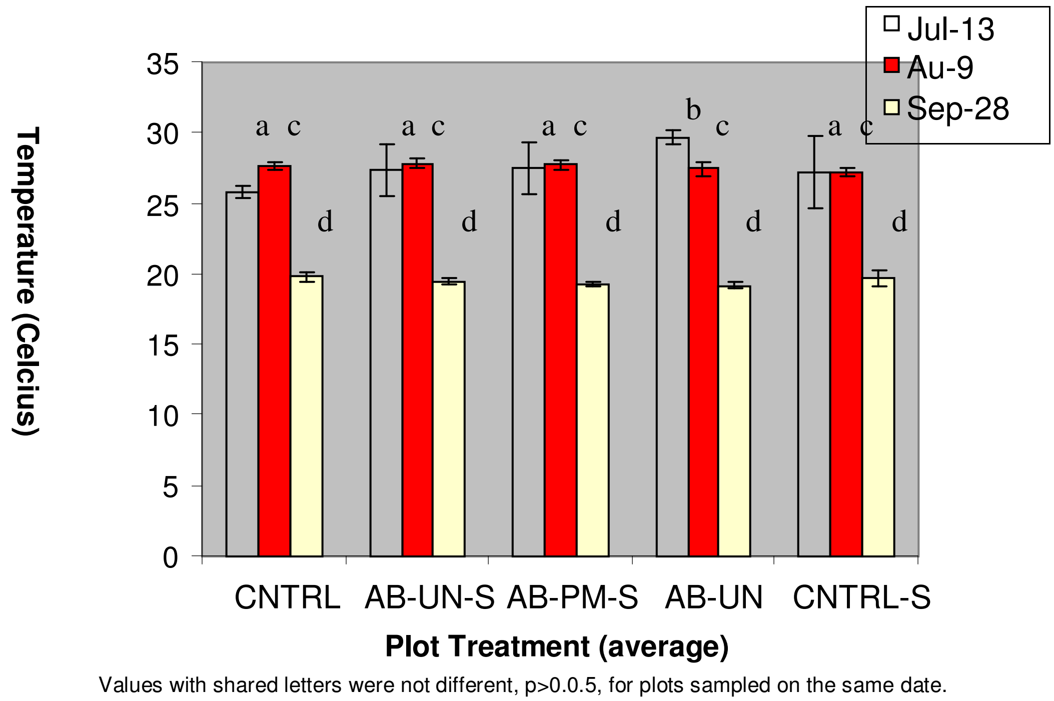


Figure VII.A3. Pre- and post capping water Temperature during 2005

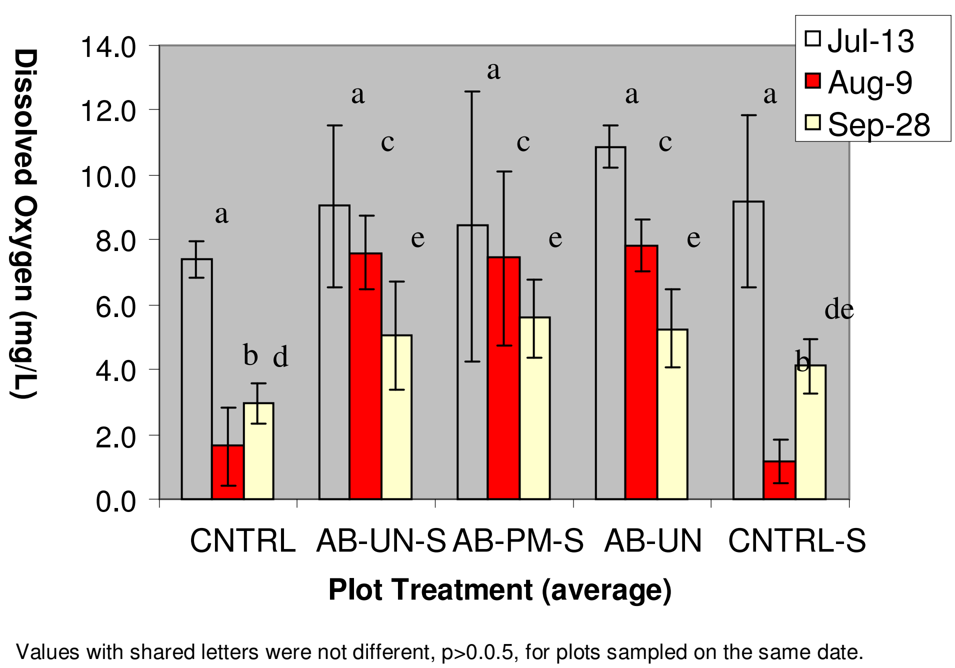


Figure VII.A4. Pre- and post capping Water Dissolved Oxygen (mg/L) during 2005

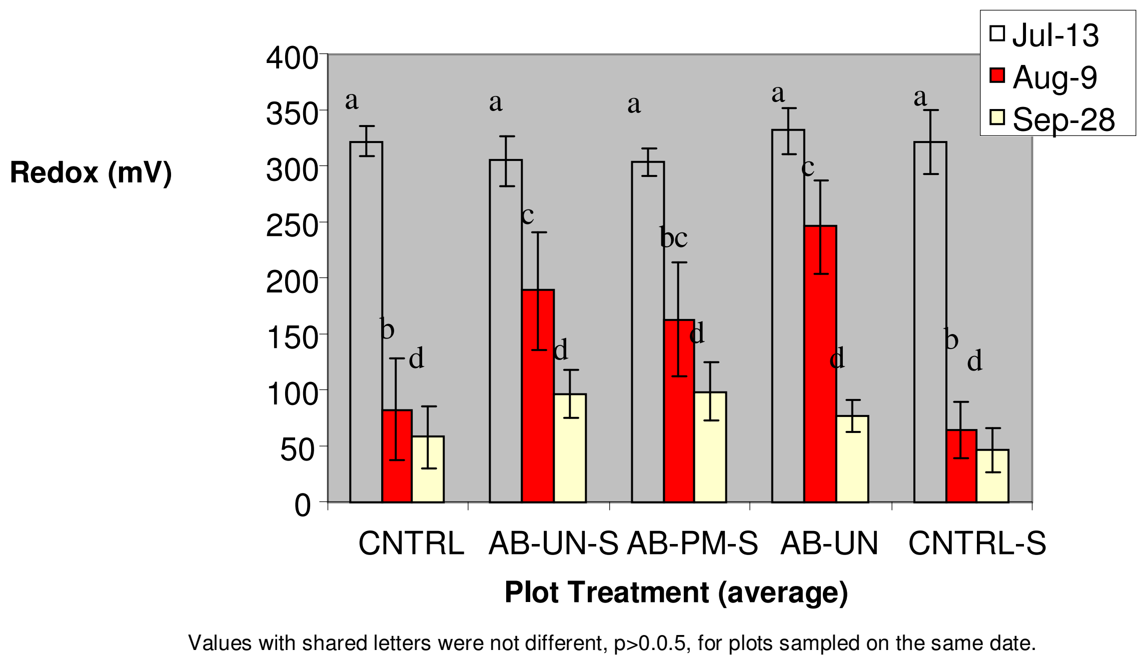


Figure VII.A5. Pre- and post capping water Oxidation-reduction potential (mV) during 2005

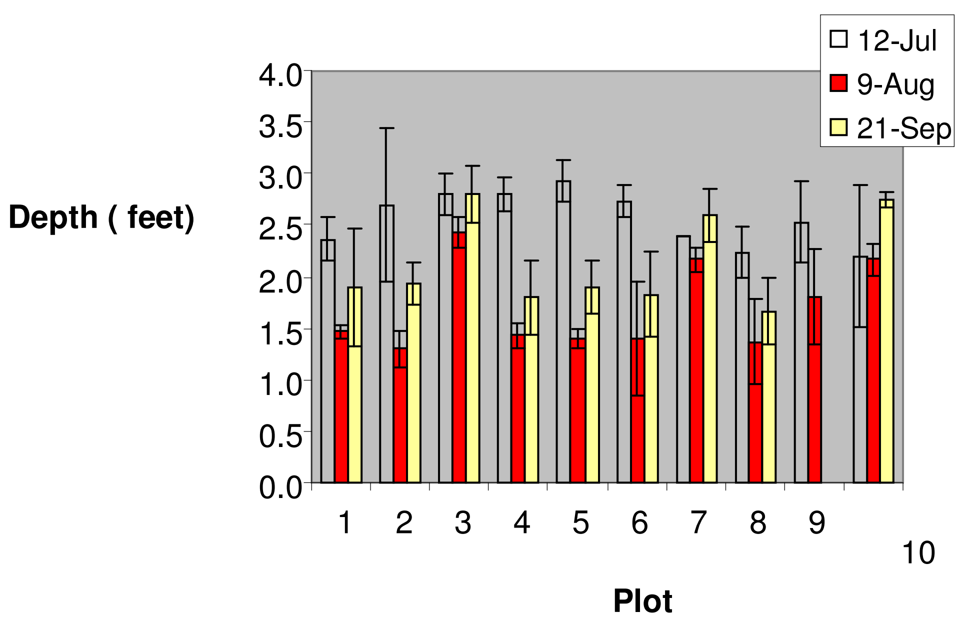


Figure VII.A6. Water depth pre- and post capping – 2005. Plots 3, 7, 9 and 10 were uncapped. The cap reduced depth by approximately 1 foot

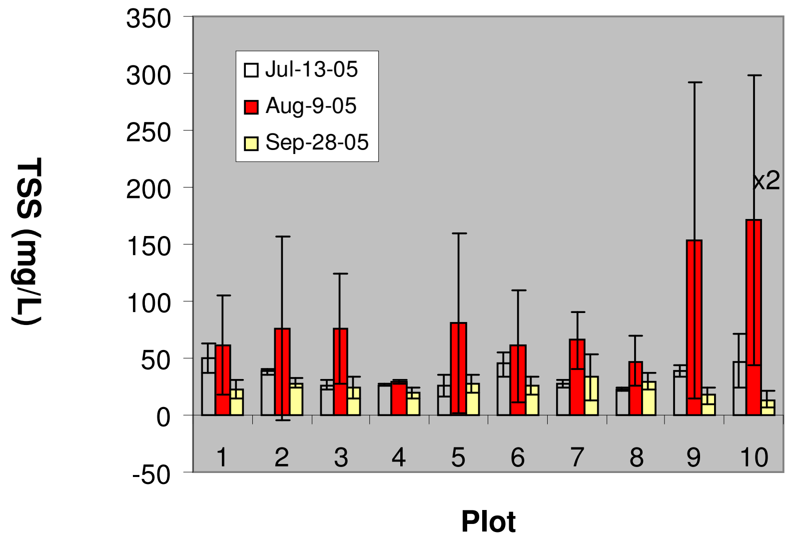


Figure VII.A7. Pre- and post capping water Total Suspended Solid concentrations during 2005. Plots 3, 7, 9, and 10 were uncapped. Error bars represent 1 SD, the one for plot 10 is twice that presented. There were no significant differences between plots for the same sample date

2006

In May 10, 2006 (Table VII.3), temperature ranged from 16.80 to 17.90 °C. The averages in plots 9 (17.13 ± 0.21) and 10 (17.10 ± 0.26), which are a control and a control with Submerseed, respectively, were significantly lower than the average in plot 8 (17.90 ± 0.00), which contains AquaBlok unamended with peat moss ($p < 0.001$) and significantly lower than all other plots ($p < 0.05$). DO ranged from 1.80 to 5.80 mg/L. DO in plot 9 (3.8 ± 1.74) which is a control was significantly lower than in plot 6 (5.67 ± 0.15) which contained AquaBlok amended with peat moss and Submerseed ($p < 0.001$). Conductivity ranged from 4.3 to 4.5 mg/L and was not significantly different between plots. Salinity ranged from an average of 2.3 ± 0.0 ppt in plots 4-8 to an average of 2.4 ± 0.0 ppt in plots 1-3 and 9 and 10. The differences were not statistically significant or related to treatment. pH ranged from 7.8

to 8.0. The average in plot 10 (7.8 ± 0.0), which is a control with Submerseed, was significantly lower than the average of 8.0 ± 0.0 in both plots 6 and 7which contains AquaBlok amended with peat moss and SubmerSeed and a control with Submerseed, respectively ($p < 0.001$). ORP ranged from 92.00 to 317.00 mV. ORP in plot 10 (186.67 ± 84.16 mV), which is a control with Submerseed, was significantly less than in plot 6 (311.00 ± 5.29), which contains AquaBlok amended with peat moss and Submerseed ($p < 0.001$), and significantly less than plots 3 (a control), 4 (containing AquaBlok), 5 (also containing AquaBlok), 7 (a control), and 8 (also containing AquaBlok) ($p < 0.001$). Depth ranged from 1.50 to 3.20 ft. Depth in plot 8 (1.67 ± 0.15 ft), which contains AquaBlok unamended with peat moss, was significantly less than in plot 10 (3.00 ± 0.17 ft) which is a control with Submerseed ($p < 0.001$) and significantly less than plots 9 and 3 (controls) ($p < 0.05$). TSS ranged from an average 30.5 mg/L in plot 1 which contains AquaBlok that is unamended with peat moss but has Submerseed to an average of 61.8 mg/L in plot 4 which contains AquaBlok that is unamended with peat moss. The differences were not statistically significant..

In August of 2006 (TableVII.A4), temperature ranged from 24.80 to 27.10 °C. Temperatures in plots 7 (24.57 ± 1.04) and 8 (24.90 ± 0.10), which are a control with Submerseed and AquaBlok unamended with peat moss, respectively, were significantly lower than in plot 10 (26.77 ± 0.45) which is a control with Submerseed ($p < 0.001$), plot 9 (a control) ($p < 0.001$), and plot 1 (AquaBlok that is unamended with peat moss with Submerseed) ($p < 0.05$). Temperature data indicated that the plots on the west side of the site were cooler than those on the east. DO ranged from 1.00 to 7.40 mg/L. DO in plot 7 (3.30 ± 1.84 mg/L) and 9 (2.35 ± 0.87 mg/L), which is a control with Submerseed and control, respectively, were significantly lower than in plot 3 (7.27 ± 0.23 mg/L) which is a control (p <

0.05). Plots with AquaBlok generally had higher levels of DO than those without except plot 3. Conductivity ranged from 2.90 to 8.80 mg/L. The lowest average was in plot 7 (3.63 ± 0.67 mg/L), which is a control with Submerseed , and the highest average was in plot 9 (5.73 ± 2.66 mg/L) which is a control. The differences between all plots were not statistically significant. Salinity ranged from 2.10 to 2.30 mg/L. The lowest average was in plot 7 (2.13 ± 0.15 mg/L), which is a control with Submerseed, and the highest averages were in plots 1-4 and 8 (2.30 ± 0.0 mg/L). The differences between all plots were not statistically significant. pH ranged from 7.80 to 8.00. The averagein plot 7 (7.30 ± 0.20), which is a control with Submerseed,was significantly lower than in plot 3 (8.07 ± 0.06), which is a control ($p < 0.001$), and in plots 1 (AquaBlok unamended with peat moss with Submerseed), 2 (AquaBlok amended with peat moss and Submerseed), 4-6 (AquaBlok unamended with peat moss, AquaBlok unamended with peat moss with Submerseed, and AquaBlok amended with peat moss and Submerseed, respectively), and 8-9 (AquaBlok unamended with peat moss and a control, respectively). ORP ranged from 98.00 to 324.00 mV. ORP in plot 7 (100.33 ± 56.72 mV), which is a control with Submerseed, was significantly lower than in plot 8 (323.67 ± 0.58 mV), which contains AquaBlok unamended with peat moss ($p < 0.001$), and in plots 2-5 (AquaBlok amended with peat moss and Submerseed, a control, AquaBlok unamended with peat moss, and AquaBlok unamended with peat moss with Submerseed, respectively) and 9 (a control) ($p < 0.05$). Depth ranged from 1.20 to 3.30 ft. Depth was lowest in plots 4 (1.73 ± 0.06 ft) and 6 (1.73 ± 0.25 ft), which have AquaBlok unamended with peat moss and AquaBlok amended with peat moss and Submerseed, respectively, and highest in plot 3 (2.77 ± 0.23 ft) which is a control. The differences among all plots were not statistically significant.

In October of 2006 (Table VII.A5), temperature ranged from 15.70 to 16.60 °C. Temperatures in plot 8 (15.77 ± 0.06), which contains AquaBlok unamended with peat moss, was significantly lower than plot 10 (16.37 ± 0.12) which is a control with Submerseed ($p < 0.001$) and plots 1 (AquaBlok unamended with peat moss with Submerseed) and 7 (a control with Submerseed) ($p < 0.05$). DO ranged from 0.62 to 9.40 mg/L. DO in plot 7 (3.60 ± 2.79 mg/L),which is a control with Submerseed, was significantly lower than in plot 8 (9.17 ± 0.32 mg/L), which contains AquaBlok unamended with peat moss ($p < 0.05$) and plots 2 (AquaBlok amended with peat moss and Submerseed), 4 (AquaBlok unamended with peat moss), and 6 (AquaBlok amended with peat moss and Submerseed) ($p < 0.05$). Conductivity ranged from 4.10 to 4.50 mg/L. Conductivityin plot 7 (4.20 ± 0.20 mg/L)), which is a control with Submerseed, was significantly lower than in plots 5 (4.47 ± 0.06 mg/L) and 6, which contain AquaBlok unamended with peat moss and AquaBlok amended with peat moss and Submerseed ($p < 0.001$), respectively, and plot 4 (AquaBlok unamended with peat moss) ($p < 0.05$). Salinity ranged from 2.3 to 2.4 ppt. Salinity in plot 7 (2.23 ± 0.15 ppt), which is a control with Submerseed, was significantly lower than plots 3-6 (all 2.40 ± 0.0 ppt), which are a control, AquaBlok unamended with peat moss, AquaBlok unamended with peat moss with Submerseed, AquaBlok amended with peat moss with Submerseed, and AquaBlok unamended with peat moss, respectively ($p < 0.001$) and plot 8, which is AquaBlok unamended with peat moss ($p < 0.001$). pH ranged from 7.40 to 8.20. pH in plot 7 (7.10 $\pm$0.10), which is a control with Submerseed was significantly lower than in plot 8 (8.17 ± 0.06), which contains AquaBlok unamended with peat moss ($p < 0.001$) and all other plots ($p < 0.001$). ORP ranged from 3.90 to 73.90 mV. ORPin plot 8 (13.80 ± 8.84 mV), which contains AquaBlok unamended with peat moss was significantly lower than in plot 7 (68.00 ± 7.21), which is a control with Submerseed ($p < 0.05$).

In November of 2006 (Table VII.A6), temperature ranged from 8.27 to 8.59 °C. Temperature in plot 7 (8.34 ± 0.04 °C),which is a control with Submerseed , was significantly lower than in plot 1 (8.58 ± 0.01 °C), which contains AquaBlok unamended with peat moss with Submerseed ($p < 0.001$), plot 2 (AquaBlok amended with peat moss and Submerseed) ($p < 0.05$), plot 9 (a control) ($p < 0.05$) and plot 10 (a control with Submerseed) ($p < 0.001$). Percent DO ranged from 7.10 to 10.60 mg/L. DO in plot 9 (7.20 ±0.10 mg/L), which is a control, was significantly lower than in plot 6 (10.47 ± 0.15 mg/L), which contains AquaBlok amended with peat moss and Submerseed ($p < 0.001$) and all other plots ($p < 0.001$). The DO values were unusually high and may have been due to probe inaccuracy. Conductivity ranged from 3.40 to 4.10 mg/L. Conductivity in plot 3 (3.80 ± 0.35 mg/L),which is a control, was significantly lower than in plot 2 (4.30 ± 0.06 mg/L), which is AquaBlok amended with peat moss and Submerseed ($p < 0.05$). There were no other significant differences between plots. Salinity ranged from an average of 2.1 ± 0.00 ppt in plots 3-8 and 10 to an average of 2.2 ± 0.0 ppt in plots 1-2 and 9. Plots 3-8 are a control, AquaBlok unamended with peat moss, AquaBlok unamended with peat moss and with Submerseed, AquaBlok amended with peat moss, a control with Submerseed, AquaBlok unamended with peat moss, and a control with Submerseed, respectively. Plots 1-2 and 9 are AquaBlok unamended with peat moss and with Submerseed, AquaBlok amended with peat moss, and a control, respectively. The differences were not statistically significant. pH ranged from 7.20 to 8.00. pH in plot 10 (7.60 ± 0.35), which is a control with Submerseed, was significantly lower than in plots 5 (7.97 ± 0.06) and 7 (8.00 ± 0.00), which contains AquaBlok unamended with peat moss and with Submerseed and a control with Submerseed, respectively ($p < 0.05$). ORP ranged from an average of 55.90 ± 18.59 in plot 7, which is a control with Submerseed, to an average of 88.73 ± 0.27 in plot 10, which is a control with Sumberseed. There were no significant differences between plots. Depth ranged from 2.30 to 3.40 ft. Depth in plots 6 (2.80 ± 0.17 ft) and 8 (2.60 ± 0.17 ft), which contains AquaBlok amended with peat moss and Submerseed and AquaBlok unamended with peat moss, respectively, were significantly lower than in plots 3 (3.30 ± 0.10 ft) and 7 (3.30 ± 0.10 ft), which is a control and a control with Submerseed ($p < 0.05$ for plot 6 and $p < 0.001$ for plot 8). TSS ranged from an average of 10.3 ± 2.75 mg/L in plot 3, which is a control, to an average of 20.90 ± 7.46 mg/L in plot 7, which is a control with Submerseed. The differences were not statistically significant.

TableVII.A3. Water quality parameters taken post capping, May 10, 2006. All samples were collected between 11:00AM and 2:00PM.CNTRL = not capped, S = with SubmerSeed, AB = AquaBlok, PM = amended with peat moss, UN = unamended, Sal = salinity (ppt), Temp = temperature (□C), DO = dissolved oxygen (mg/L), ORP = oxidation-reduction potential (mV), depth (ft), cond = conductivity (mg/L). TSS = total suspended solids (mg/L).

Plot #	Sample	Site	Salinity	pH	Temp.	DO	ORP	Depth	Cond	TSS
AB UN S	1 - 1	1C	2.40	7.90	17.70	4.90	257.00	1.60	4.50	31.0
1	1 -2	5D	2.40	7.90	17.70	4.90	261.00	1.90	4.30	30.0
	1 - 3	4B	2.40	7.90	17.60	4.80	267.00	2.20	4.30	30.5
Averages for plot # 1			2.40	7.90	17.67	4.87	261.67	1.90	4.37	30.5
SD			0.00	0.00	0.06	0.06	5.03	0.30	0.12	
AB PM S	2 - 1	2A	2.40	7.90	17.60	4.80	157.00	1.90	4.30	28.5
2	2 - 2	4B	2.40	7.90	17.50	4.90	255.00	1.60	4.30	30.0
	2 - 3	6D	2.40	7.90	17.50	4.70	275.00	2.20	4.30	46.8
Averages for plot # 2			2.40	7.90	17.53	4.80	229.00	1.90	4.30	35.1
SD			0.00	0.00	0.06	0.10	63.15	0.30	0.00	
CNTRL	3 - 1	3A	2.40	7.90	17.60	5.00	307.00	2.30	4.30	36.0
3	3 - 2	2E	2.40	7.90	17.50	4.70	294.00	2.20	4.30	29.5
	3 - 3	5D	2.40	7.90	17.40	4.50	312.00	3.00	4.30	30.0
Averages for plot # 3			2.40	7.90	17.50	4.73	304.33	2.50	4.30	31.8
SD			0.00	0.00	0.10	0.25	9.29	0.44	0.00	
AB UN	4 - 1	4E	2.30	7.90	17.50	5.10	304.00	1.80	4.30	118
4	4 - 2	2D	2.30	7.90	17.60	4.80	308.00	1.50	4.30	34.5
	4 - 3	3A	2.30	7.90	17.50	5.10	297.00	2.00	4.30	33.0
Averages for plot # 4			2.30	7.90	17.53	5.00	303.00	1.77	4.30	61.8
SD			0.00	0.00	0.06	0.17	5.57	0.25	0.00	
AB UN S	5 - 1	9A	2.30	7.90	17.60	4.60	309.00	2.00	4.30	35.8
5	5 - 2	7C	2.30	7.90	17.60	4.60	299.00	2.00	4.30	35.5
	5 - 3	4D	2.30	7.90	17.60	4.80	303.00	1.40	4.30	35.0
Averages for plot # 5			2.30	7.90	17.60	4.67	303.67	1.80	4.30	35.4
SD			0.00	0.00	0.00	0.12	5.03	0.35	0.00	

Plot #	Sample	Site	Salinity	pH	Temp.	DO	ORP	Depth	Cond	TSS
AB PM S	6 - 1	5E	2.30	8.00	17.40	5.80	317.00	2.00	4.30	33.5
6	6 - 2	2B	2.30	8.00	17.50	5.50	309.00	2.00	4.30	29.5
	6 -3	2D	2.30	8.00	17.50	5.70	307.00	2.10	4.30	33.0
Averages for plot # 6			2.30	8.00	17.47	5.67	311.00	2.03	4.30	32.0
SD			0.00	0.00	0.06	0.15	5.29	0.06	0.00	
CNTRL S	7 - 1	5D	2.30	8.00	17.50	5.20	313.00	2.20	4.30	41.0
7	7 - 2	5B	2.30	8.00	17.50	4.90	296.00	2.10	4.30	34.5
	7 - 3	1D	2.30	8.00	17.80	5.20	286.00	2.30	4.30	33.5
Averages for plot # 7			2.30	8.00	17.60	5.10	298.33	2.20	4.30	36.3
SD			0.00	0.00	0.17	0.17	13.65	0.10	0.00	
AB UN	8 - 1	2B	2.30	7.90	17.90	5.00	282.00	1.50	4.30	33.5
8	8 - 2	4E	2.30	8.00	17.90	5.20	310.00	1.80	4.30	34.5
	8 - 3	1D	2.30	8.00	17.90	5.40	317.00	1.70	4.30	31.5
Averages for plot # 8			2.30	7.97	17.90	5.20	303.00	1.67	4.30	33.2
SD			0.00	0.06	0.00	0.20	18.52	0.15	0.00	
CNTRL	9 - 1	4C	2.40	7.90	16.90	1.80	190.00	2.80	4.30	35.5
9	9 - 2	2B	2.40	7.90	17.30	4.60	159.00	2.60	4.30	30.5
	9 - 3	3C	2.40	7.90	17.20	5.00	247.00	3.00	4.30	32.0
Averages for plot # 9			2.40	7.90	17.13	3.80	198.67		4.30	32.7
SD			0.00	0.00	0.21	1.74	44.64		0.00	
CNTRL S	10 - 1	3B	2.40	7.80	17.30	4.50	253.00	2.90	4.30	31.0
	10 - 2	5D	2.40	7.80	16.80	3.20	215.00	3.20	4.30	32.5
	10 - 3	5C	2.40	7.80	17.20	4.60	92.00	2.90	4.30	33.5
Averages for plot # 10			2.40	7.80	17.10	4.10	186.67	3.00	4.30	32.3
SD			0.00	0.00	0.26	0.78	84.16	0.17	0.00	

Table VII.A4. Water quality parameters taken post capping, August 10, 2006. All samples were collected between 11:00AM and 2:00PM. CNTRL = not capped, S = with SubmerSeed, AB = AquaBlok, PM = amended with peat moss, UN = unamended, Sal = salinity (ppt), Temp = temperature (°C), DO = dissolved oxygen (mg/L), ORP = oxidation-reduction potential (mV), depth (ft), cond = conductivity (mg/L).

Plot #	Sample #	Site	Salinity	pH	Temp.	DO	ORP	Depth	Cond
AB UN S	1 - 1	1C	2.30	7.90	25.90	6.40	208.00	1.70	4.20
1	1 -2	5D	2.30	7.70	26.20	4.50	125.00	1.20	4.20
	1 - 3	4B	2.30	7.80	26.20	6.10	152.00	2.60	4.20
Averages for plot # 1			2.30	7.80	26.10	5.67	161.67	1.83	4.20
SD			0.00	0.10	0.17	1.02	42.34	0.71	0.00
AB PM S	2 - 1	2A	2.30	8.00	26.00	6.80	253.00	2.10	4.20
2	2 - 2	4B	2.30	8.00	25.70	6.60	261.00	1.40	4.20
	2 - 3	6D	2.30	7.80	25.30	2.20	100.00	1.80	4.20
Averages for plot # 2			2.30	7.93	25.67	5.20	204.67	1.77	4.20
SD			0.00	0.12	0.35	2.60	90.73	0.35	0.00
CNTRL	3 - 1	3A	2.30	8.00	25.50	7.00	250.00	2.50	4.20
	3 - 2	2E	2.30	8.10	25.90	7.40	291.00	2.90	4.20
	3 - 3	5D	2.30	8.10	25.80	7.40	227.00	2.90	4.20
Averages for plot # 3			2.30	8.07	25.73	7.27	256.00	2.77	4.20
SD			0.00	0.06	0.21	0.23	32.42	0.23	0.00
AB UN	4 - 1	4E	2.30	8.00	25.50	7.00	242.00	1.70	4.20
4	4 - 2	2D	2.30	7.90	25.70	6.90	247.00	1.70	4.20
	4 - 3	3A	2.30	7.90	25.40	7.00	254.00	1.80	4.20
Averages for plot # 4			2.30	7.93	25.53	6.97	247.67	1.73	4.20
SD			0.00	0.06	0.15	0.06	6.03	0.06	0.00
AB UN S	5 - 1	9A	2.30	7.90	25.30	6.70	240.00	2.20	4.20
5	5 - 2	5B	2.30	7.90	25.20	6.60	248.00	1.70	4.20
	5 - 3	3A	2.20	7.90	25.30	6.90	238.00	1.80	4.20
Averages for plot # 5			2.27	7.90	25.27	6.73	242.00	1.90	4.20

Plot #	Sample #	Site	Salinity	pH	Temp.	DO	ORP	Depth	Cond
SD			0.06	0.00	0.06	0.15	5.29	0.26	0.00
AB PM S	6 - 1	5E	2.30	7.70	25.20	6.50	163.00	1.70	4.20
6	6 - 2	2B	2.30	7.70	25.20	6.00	210.00	2.00	4.20
	6 -3	5A	2.20	7.80	24.90	6.40	203.00	1.50	4.20
Averages for plot # 6			2.27	7.73	25.10	6.30	192.00	1.73	4.20
SD			0.06	0.06	0.17	0.26	25.36	0.25	0.00
CNTRL S	7 - 1	5D	2.00	7.10	25.40	2.50	77.00	2.20	3.80
7	7 - 2	5B	2.30	7.50	23.40	5.40	165.00	3.00	4.20
	7 - 3	1D	2.10	7.30	24.90	2.00	59.00	2.90	2.90
Averages for plot # 7			2.13	7.30	24.57	3.30	100.33	2.70	3.63
SD			0.15	0.20	1.04	1.84	56.72	0.44	0.67
AB UN	8 - 1	2B	2.30	7.70	24.80	6.00	324.00	1.30	4.20
8	8 - 2	4E	2.30	7.60	24.90	5.80	324.00	3.10	4.10
	8 - 3	5B	2.30	7.80	25.00	6.10	323.00	2.00	4.20
Averages for plot # 8			2.30	7.70	24.90	5.97	323.67	2.13	4.17
SD			0.00	0.10	0.10	0.15	0.58	0.91	0.06
CNTRL	9 - 1	4C	2.30	7.80	27.10	2.14	203.00	3.30	4.20
	9 - 2	2B	2.10	7.40	26.00	1.60	191.00	3.10	8.80
	9 - 3	3F	2.30	8.00	27.00	3.30	242.00	1.20	4.20
Averages for plot # 9			2.23	7.73	26.70	2.35	212.00	2.53	5.73
SD			0.12	0.31	0.61	0.87	26.66	1.16	2.66
CNTRL S	10 - 1	3A	2.30	7.40	26.80	4.10	98.00	2.70	4.20
10	10 - 2	4D	2.10	7.30	26.30	1.00	104.00	2.60	3.90
	10 - 3	1A	2.30	7.60	27.20	6.20	165.00	2.80	4.20
Averages for plot # 10			2.23	7.43	26.77	3.77	122.33	2.70	4.10
SD			0.12	0.15	0.45	2.62	37.07	0.10	0.17

Table VII.A5. Water quality parameters taken post capping, October 26 2006. All samples were collected between 11:00AM and 2:00PM. CNTRL = not capped, S = with SubmerSeed, AB = AquaBlok, PM = amended with peat moss, UN = unamended, Sal = salinity (ppt), Temp = temperature (°C), DO = dissolved oxygen (mg/L), ORP = oxidation-reduction potential (mV), depth (ft), cond = conductivity mg/L). Depth measurements were not taken.

Plot #	Sample #	Site	Salinity	pH	Temp.	DO	ORP	Depth	Cond
AB UN S	1 - 1	B2	2.30	8.00	16.60	8.35	35.80		4.40
1	1 -2	D5	2.30	7.90	16.10	6.30	16.60		4.40
	1 - 3	1C	2.30	8.00	16.00	8.50	54.50		4.40
Averages for plot # 1			2.30	7.97	16.23	7.72	35.63		4.40
SD			0.00	0.06	0.32	1.23	18.95		0.00
AB PM S	2 - 1	2A	2.30	8.10	16.00	8.70	73.90		4.40
2	2 - 2	B4	2.30	8.10	16.10	8.60	54.90		4.40
	2 - 3	6D	2.30	8.00	16.10	8.50	33.40		4.40
Averages for plot # 2			2.30	8.07	16.07	8.60	54.07		4.40
SD			0.00	0.06	0.06	0.10	20.26		0.00
CNTRL	3 - 1	3A	2.40	7.70	16.00	7.60	69.40		4.40
3	3 - 2	2D	2.40	8.10	16.00	6.60	55.00		4.40
	3 - 3	5D	2.40	7.80	16.00	0.62	0.40		4.10
Averages for plot # 3			2.40	7.87	16.00	4.94	41.60		4.30
SD			0.00	0.21	0.00	3.77	36.40		0.17
AB UN	4 - 1	4E	2.40	8.10	16.00	8.40	4.70		4.40
4	4 - 2	2D	2.40	8.10	16.00	8.70	45.60		4.50
	4 - 3	3A	2.40	8.10	16.10	8.70	19.20		4.40
Averages for plot # 4			2.40	8.10	16.03	8.60	23.17		4.43
SD			0.00	0.00	0.06	0.17	20.74		0.06
AB UN S	5 - 1	9A	2.40	8.10	16.00	8.60	21.00		4.40
5	5 - 2	7C	2.40	8.10	16.00	8.60	39.70		4.50
	5 - 3	C2	2.40	8.10	16.00	3.20	32.40		4.50
Averages for plot # 5			2.40	8.10	16.00	6.80	31.03		4.47
SD			0.00	0.00	0.00	3.12	9.42		0.06

Plot #	Sample #	Site	Salinity	pH	Temp.	DO	ORP	Depth	Cond
AB PM S	6 - 1	5E	2.40	8.10	16.00	8.50	32.60		4.50
6	6 - 2	B2	2.40	8.10	16.00	8.70	6.90		4.50
	6 -3	B4	2.40	8.10	16.00	8.70	29.60		4.50
Averages for plot # 6			2.40	8.10	16.00	8.63	23.03		4.50
SD			0.00	0.00	0.00	0.12	14.05		0.00
CNTRL	7 - 1	5D	2.40	7.20	16.00	6.80	62.00		4.40
7	7 - 2	5B	2.10	7.10	16.00	2.30	76.00		4.00
	7 - 3	1D	2.20	7.00	16.80	1.70	66.00		4.20
Averages for plot # 7			2.23	7.10	16.27	3.60	68.00		4.20
SD			0.15	0.10	0.46	2.79	7.21		0.20
AB UN	8 - 1	2B	2.40	8.10	15.70	8.80	12.00		4.40
8	8 - 2	4C	2.40	8.20	15.80	9.40	6.00		4.40
	8 - 3	3D	2.40	8.20	15.80	9.30	23.40		4.40
Averages for plot # 8			2.40	8.17	15.77	9.17	13.80		4.40
SD			0.00	0.06	0.06	0.32	8.84		0.00
CNTRL	9 - 1	4C	2.30	7.60	16.10	4.60	18.30		4.40
	9 - 2	2B	2.30	7.70	16.10	6.40	66.50		4.40
	9 - 3	F4	2.30	7.70	16.10	6.10	3.90		4.40
Averages for plot # 9			2.30	7.67	16.10	5.70	29.57		4.40
SD			0.00	0.06	0.00	0.96	32.79		0.00
CNTRL S	10 - 1	F4	2.30	7.60	16.30	5.20	22.00		4.40
	10 - 2	B2	2.30	7.50	16.30	4.10	42.00		4.40
	10 - 3	A1	2.30	7.40	16.50	3.60	61.00		4.40
Averages for plot # 10			2.30	7.50	16.37	4.30	41.67		4.40
SD			0.00	0.10	0.12	0.82	19.50		0.00

Table VII.A6. Water quality parameters taken post capping, November 13, 2006. All samples were collected between 11:00AM and 2:00PM. CNTRL = not capped, S = with SubmerSeed, AB = AquaBlok, PM = amended with peat moss, UN = unamended, Sal = salinity (ppt), Temp = temperature (°C), DO = dissolved oxygen (mg/L), ORP = oxidation-reduction potential (mV), depth (ft), cond = conductivity (mg/L), TSS = total suspended solids (mg/L). DO data may be inaccurate due to failed probe. Green cell = data point likely to be inaccurate.

Plot #	Sample #	Site	Salinity	pH	Temp.	DO	ORP	Depth	Cond	TSS
AB UN S	1 - 1	B2	2.20	7.90	8.57	8.73	101.00	2.70	4.10	6.50
1	1 -2	D5	2.20	7.80	8.59	8.75	104.00	2.80	4.10	13.5
	1 - 3	1C	2.20	7.80	8.59	8.80	106.00	2.50	4.10	14.5
Averages for plot # 1			2.20	7.83	8.58	8.76	103.67	2.67	4.10	11.5
SD			0.00	0.06	0.01	0.04	2.52	0.15	0.00	4.36
AB PM S	2 - 1	2A	2.20	7.90	8.44	8.90	107.00	2.70	4.00	9.00
2	2 - 2	B4	2.20	7.80	8.42	8.70	110.00	2.30	4.00	11.5
	2 - 3	6D	2.20	7.80	8.59	8.50	81.00	2.80	4.10	12.5
Averages for plot # 2			2.20	7.83	8.48	8.70	99.33	2.60	4.03	11.0
SD			0.00	0.06	0.09	0.20	15.95	0.26	0.06	1.80
CNTRL	3 - 1	3A	2.10	7.90	8.37	9.90	82.00	3.20	3.40	8.5
	3 - 2	2D	2.10	7.90	8.41	10.00	65.00	3.30	4.00	13.5
	3 - 3	5D	2.10	7.90	8.42	9.93	420.00	3.40	4.00	9.0
Averages for plot # 3			2.10	7.90	8.40	9.94	73.50	3.30	3.80	10.3
SD			0.00	0.00	0.03	0.05	12.02	0.10	0.35	2.75
AB UN	4 - 1	4E	2.10	7.90	8.41	10.10	62.10	3.30	4.00	9.00
4	4 - 2	2D	2.10	7.90	8.40	10.20	71.70	2.90	4.00	11.5
	4 - 3	3A	2.10	7.90	8.39	10.10	79.40	3.00	4.00	12.0
Averages for plot # 4			2.10	7.90	8.40	10.13	71.07	3.07	4.00	10.8
SD			0.00	0.00	0.01	0.06	8.67	0.21	0.00	1.61
AB UN S	5 - 1	9A	2.10	7.90	8.35	10.20	66.90	3.20	4.00	12.0
5	5 - 2	7C	2.10	8.00	8.42	10.30	69.20	2.80	4.00	10.0
	5 - 3	C2	2.10	8.00	8.37	10.20	72.20	2.90	4.00	20.5
Averages for plot # 5			2.10	7.97	8.38	10.23	69.43	2.97	4.00	14.2

SD			0.00	0.06	0.04	0.06	2.66	0.21	0.00	5.58
Plot #	Sample #	Site	Salinity	pH	Temp.	DO	ORP	Depth	Cond	TSS
AB PM S	6 - 1	5E	2.10	8.00	8.43	10.60	48.20	2.70	4.00	12.5
6	6 - 2	B2	2.10	7.50	8.39	10.30	68.30	3.00	4.00	22.5
	6 -3	B4	2.10	8.00	8.43	10.50	70.50	2.70	4.00	21.3
Averages for plot # 6			2.10	7.83	8.42	10.47	62.33	2.80	4.00	18.8
SD			0.00	0.29	0.02	0.15	12.29	0.17	0.00	5.46
CNTRL S	7 - 1	5D	2.10	8.00	8.37	10.40	77.30	3.20	4.00	29.5
7	7 - 2	5B	2.10	8.00	8.29	10.40	43.80	3.40	4.00	16.2
	7 - 3	1D	2.10	8.00	8.36	10.40	46.60	3.30	4.00	17.0
Averages for plot # 7			2.10	8.00	8.34	10.40	55.90	3.30	4.00	20.09
SD			0.00	0.00	0.04	0.00	18.59	0.10	0.00	7.46
AB UN	8 - 1	2B	2.10	7.90	8.27	10.10	63.30	2.50	3.90	10.0
8	8 - 2	4C	2.10	7.90	8.41	10.10	72.60	2.80	3.90	11.5
	8 - 3	3D	2.10	7.90	8.37	10.10	80.60	2.50	3.90	11.5
Averages for plot # 8			2.10	7.90	8.35	10.10	72.17	2.60	3.90	11.0
SD			0.00	0.00	0.07	0.00	8.66	0.17	0.00	0.87
CNTRL	9 - 1	4C	2.20	7.60	8.42	7.10	18.30	3.00	4.10	9.0
9	9 - 2	2B	2.20	7.80	8.47	7.30	66.50	3.00	4.00	7.0
	9 - 3	F4	2.20	7.70	8.57	7.20	3.90	3.20	4.00	23.0
Averages for plot # 9			2.20	7.70	8.49	7.20	29.57	3.07	4.03	13.0
SD			0.00	0.10	0.08	0.10	32.79	0.12	0.06	8.72
CNTRL S	10 - 1	F4	2.10	7.80	8.42	7.70	79.10	2.90	4.00	8.00
10	10 - 2	B2	2.10	7.80	8.53	8.70	89.50	3.40	4.00	14.5
	10 - 3	A1	2.10	7.20	8.57	8.90	97.60	3.10	4.00	12.5
Averages for plot # 10			2.10	7.60	8.51	8.43	88.73	3.13	4.00	11.7
SD			0.00	0.35	0.08	0.64	9.27	0.25	0.00	3.33

Overall treatment effects in 2006 for water quality parameters are depicted in figures VII.A8 to VII.A14. Statistical analyses showed some differences in water quality parameters between treatments in 8-10-06 and 10-26-06 but none for 5-10-06 or 11-13-06. For the 8-10-06 monitoring, pH was statistically lower in control-SubmerSeed (SS), p= 0.001, than all other treatments including control without SS. ORP was lower (approximately 90 mV) in control-SS than all other treatments, p=0.022; however, control without SS was not different than AB treatments. No significant differences were found between treatments for DO when data from plot 3 (control) were included: the DO was unusually high in this plot and possibly inaccurate. Without plot 3, DO for control (plot 7) was statistically lower than all AB treatments, p=0.018. DO for control-SS was lower than AB-U and AB-SS-U but not AB-SS-PM or control. There were no treatment differences for salinity, temperature or conductivity. For the 10-26-06 monitoring, salinity and temperature was lower in control-SS than AB-unamended (p=0.009), but the differences in values were too small to be relevant. pH was lower in control and control-SS than all AB sites by approximately 0.5 units (p=0.022). DO was also lower in control and control-SS than all AB sites (p=0.020). DO in AB sites ranged from 9.17 to 6.80 mg/L and control sites ranged from 4.94 to 3.60 mg/L. Generally for the 5-10-06 and 8-10-06 sampling periods, AB increased pH and DO in August and October 2006. There were no significant differences for ORP and conductivity for these same dates. Data showed that depth was about 0.8 ft deeper in uncapped plots compared to capped ones in 5-10-06 and 8-10-06. Water levels were higher in 11-13-06 resulting in some AB plots not being significantly lower than controls. Depth was not measured 10-26-06. TSS was only measured in November of 2006: there were not significant differences between control and AB treatments.

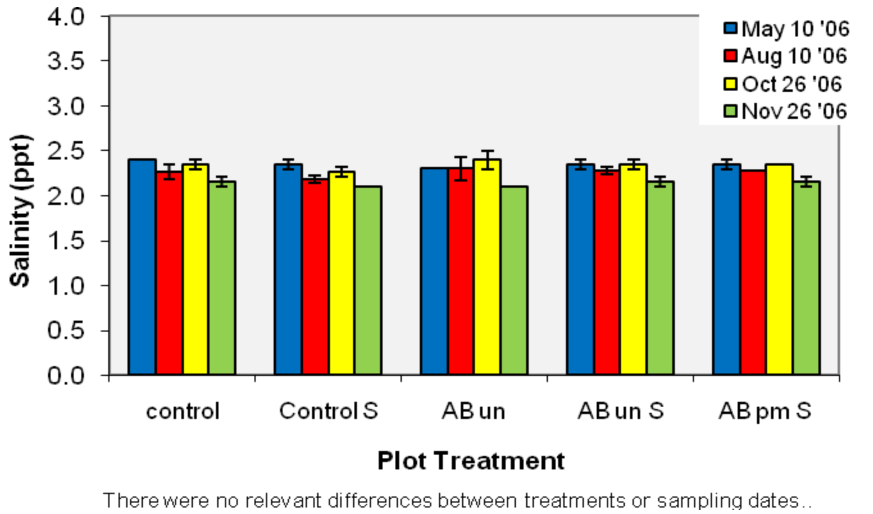


Figure VII.A8 Effect of plot treatment on salinity during 2006. Each value is the average ± SD of six replicates combined from two plots of the same treatment. Control = no AquaBlok (AB) and no SumberSeed (S), control S = no AB with SumberSeed, AB un = unamended AquaBlok, AB un S = unamended AquaBlok with SumberSeed, AB pm S = AquaBlok amended with peatmoss with SumberSeed.

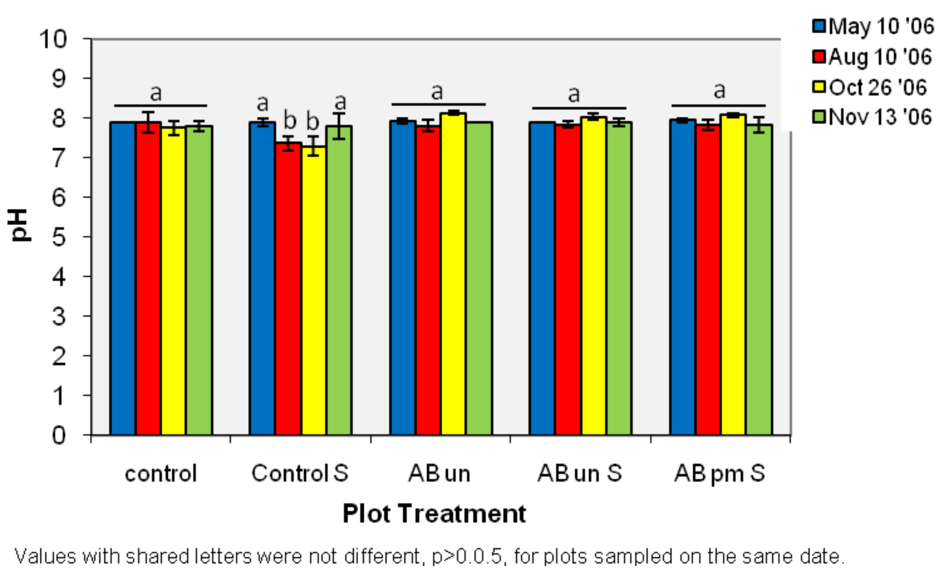
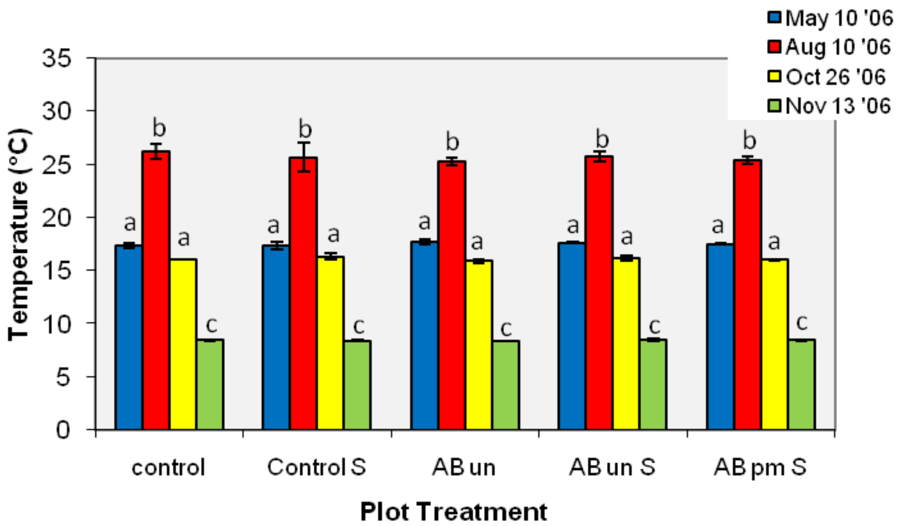
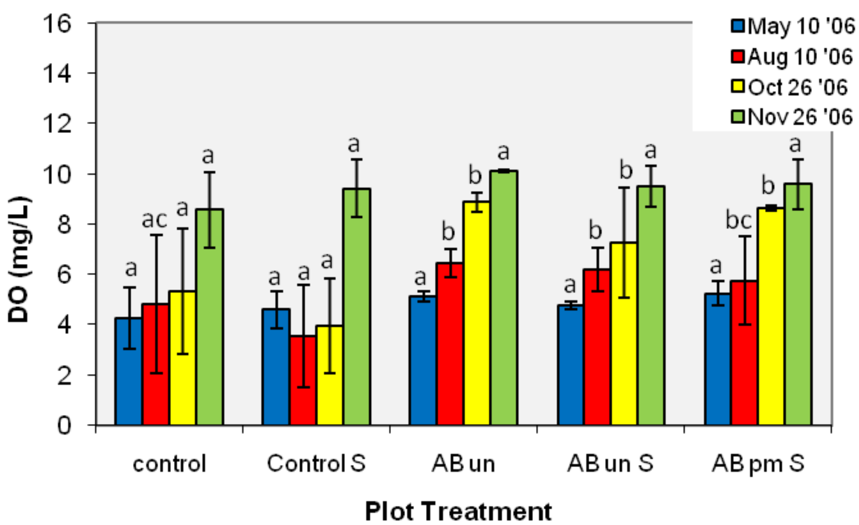


Figure VII.A9 Effect of plot treatment on pH during 2006. Each value is the average ± SD of six replicates combined from two plots of the same treatment. Control = no AquaBlok (AB) and no SumberSeed (S), control S = no AB with SumberSeed, AB un = unamended AquaBlok, AB un S = unamended AquaBlok with SumberSeed, AB pm S = AquaBlok amended with peatmoss with SumberSeed.



Values with shared letters were not different, p>0.0.5, for plots sampled on the same date.

Figure VII.A10 Effect of plot treatment on temperature during 2006. Each value is the average ± SD of six replicates combined from two plots of the same treatment. Control = no AquaBlok (AB) and no SumberSeed (S), control S = no AB with SumberSeed, AB un = unamended AquaBlok, AB un S = unamended AquaBlok with SumberSeed, AB pm S = AquaBlok amended with peatmoss with SumberSeed.



Values with shared letters were not different, p>0.0.5, for plots sampled on the same date.

Figure VII.A11. Effect of plot treatment on dissolved oxygen (DO) during 2006. Each value is the average ± SD of six replicates combined from two plots of the same treatment. The exception is control in August: data for plot 3 were not included (see text). Control = no AquaBlok (AB) and no SumberSeed (S), control S = no AB with SumberSeed, AB un = unamended AquaBlok, AB un S = unamended AquaBlok with SumberSeed, AB pm S = AquaBlok amended with peatmoss with SumberSeed.

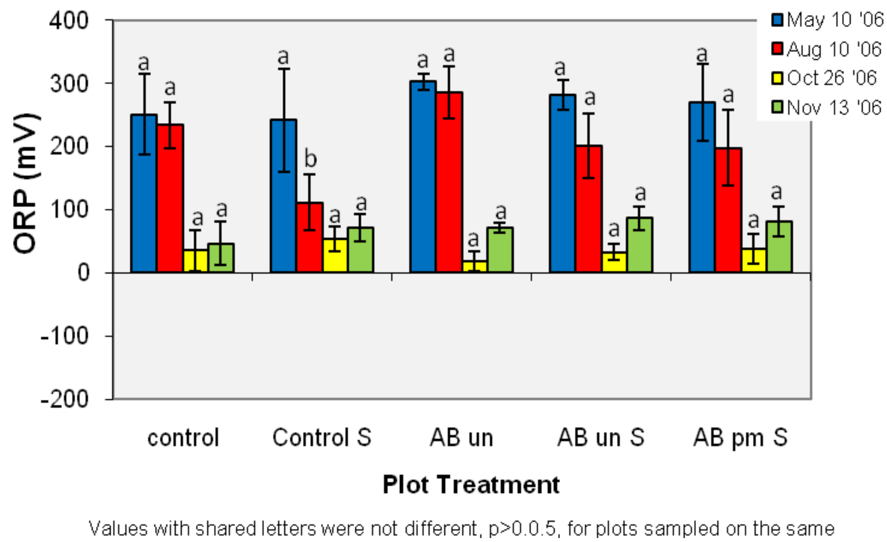


Figure VII.A12. Effect of plot treatment on oxidation-reduction potential (ORP) during 2006. Each value is the average ± SD of six replicates combined from two plots of the same treatment. The exception is for control for which one abnormally high value for plot 3 was not included. Control = no AquaBlok (AB) and no SumberSeed (S), control S = no AB with SumberSeed, AB un = unamended AquaBlok, AB un S = unamended AquaBlok with SumberSeed, AB pm S = AquaBlok amended with peatmoss with SumberSeed.

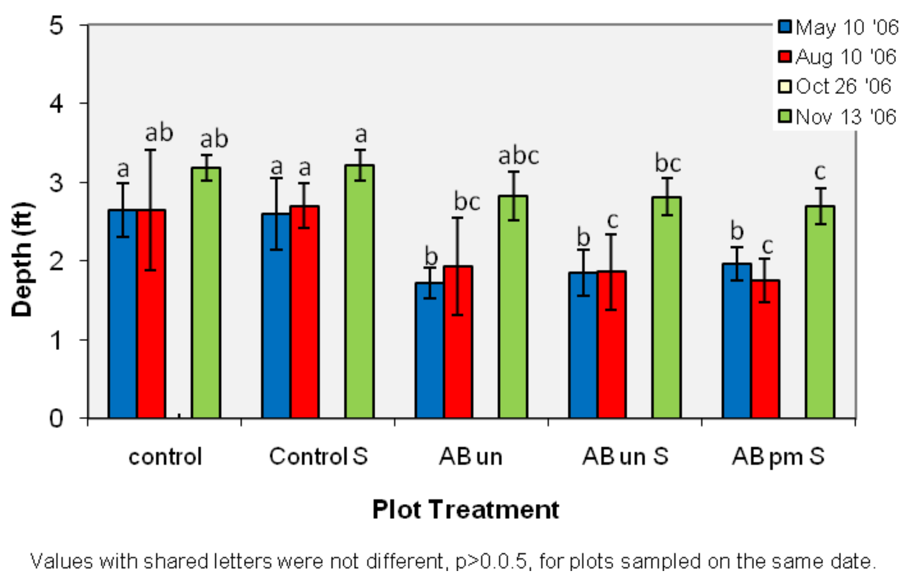


Figure VII.A13 Effect of plot treatment on depth (ft) during 2006. Each value is the average ± SD of six replicates combined from two plots of the same treatment. Control = no AquaBlok (AB) and no SumberSeed (S), control S = no AB with SumberSeed, AB un = unamended AquaBlok, AB un S = unamended AquaBlok with SumberSeed, AB pm S = AquaBlok amended with peatmoss with SumberSeed.

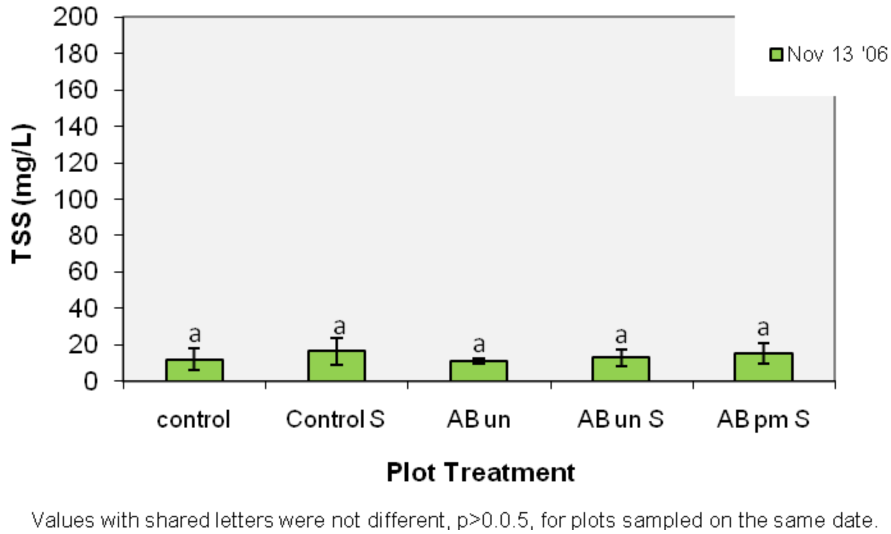


Figure VII.A14. Effect of plot treatment on total suspended solids (TSS) in November 2006. Each value is the average ± SD of six replicates combined from two plots of the same treatment. Control = no AquaBlok (AB) and no SumberSeed (S), control S = no AB with SumberSeed, AB un = unamended AquaBlok, AB un S = unamended AquaBlok with SumberSeed, AB pm S = AquaBlok amended with peatmoss with SumberSeed.

2007

On April 19, 2007 (Table VII.A7) salinity ranged from an average of 1.0 ppt in plot 8 which contains AquaBlok that is not amended with peat moss to an average of 1.20 in plot 7 which is a control with Submerseed. The pH ranged from an average of 7.38 in plot 7 which is a control that has Submerseed to 8.26 in plot 5 which contains AquaBlok that lacks peat moss but has Submerseed. Temperature ranged from an average of 8.85 ^{o}C in plot 10 which is a control that has Submerseed to an average of 9.49 ^{o}C in plot 4 which contains AquaBlok that is not amended with peat moss. Dissolved oxygen ranged from an average of 6.50 mg/l in plot 7 which is a control with Submerseed to an average of 10.07 mg/l in plot 6 which contains AquaBlok that has peat moss and Submerseed. Conductivity ranged from an average of 2.03 in plot 8 which contains AquaBlok that is not amended with peat moss to 2.36 in plot 7 which is a control that has Submerseed. ORP ranged from an average of -2.03 in plot 7 which is a control that has Submerseed to -69.1 in plot 2 which has AquaBlok, peat moss and Submerseed. Depth ranged from an average of 4.07 ft in plots 6 and 8 which contain AquaBlok to 4.80 ft in plot 10 which is a control with Submerseed.

On May 22, 2007 (Table VII.A8) salinity ranged form an average of 1.27 ppt in plot 7 which is a control with Submerseed to an average of 1.40 ppt in plot 9 which is a control. The pH ranged from an average of 7.83 in plot 10 which is a control with Submerseed to an average of 8.40 in plot 5 which contains AquaBlok that lacks peat moss but has Submerseed. Temperature ranged from an average of 19.38 ^{o}C in plot 9 which is a control to an average of 20.55 ^{o}C in plot 5 which has AquaBlok without peat moss but has Submerseed. Dissolved oxygen ranged from an average of 4.84 mg/l in plot 10 which is a control with Submerseed to 6.96 mg/l in plot 9 which is a control. Conductivity ranged from an average of 2.57 in plots 7 and 8 which lack and have AquaBlok respectively to an average of 2.68 in plot 9 which is a control. ORP ranged from an average of 6.43 in plot 1 which contains to an average of 70,.47 in plot 10 which is a control. Depth ranged from an average of 1.87 ft in plot 9 which is a control to 2.70 in plot 9 which is a control.

On July 2, 2007 (Table VII.A9) salinity ranged from an average of 1.69 in plot 10 which is a control with Submerseed to an average of 1.84 in plots 4 and 5 which have AquaBlok. The pH ranged from an average of 7.85 in plot 10 which is a control with

Submerseed to an average of 8.66 in plot 6 which has AquaBlok, peat moss and Submerseed. Temperature ranged from an average of 22.08 ^{o}C in plot 9 which is a control to an average of 24.72 in plot 6 which ha AquaBlok. Dissolved oxygen ranged from an average of 40% and 3 mg/l in plots 7 and 10 which are controls with Submerseed to an average of 119.9% and 9.906 mg/l in plot 5 which has AquaBlok that lacks peat moss but has Submerseed. Conductivity ranged from an average of 3.232 in plot 10 which is a control with Submerseed to an average of 3.396 in plot 6 which has AquaBlok, peat moss and Submerseed. ORP ranged from an average of -117 in plot 7 which is a control with Submerseed to an average of 53.6 in plot 1 which has AquaBlok that lacks peat moss and has Submerseed. Depth ranged from an average of 1.95 ft in plot 8 which has AquaBlok to an average of 2.73 in plot 3 which is a control plot.

On July 31, 2007 (Table VII.A10) salinity ranged from an average of 1.69 ppt in plot 9 which is a control to an average of 1.73 in plots 1, 2, 4, and 5 which all contain AquaBlok. The pH ranged from an average of 7.64 in plot 9 which is a control to an average of 8.70 in plot 8 which has AquaBlok that lacks peat moss. Temperature ranged from an average of 27.1 ^{o}C in plot 9 which is a control to an average of 30.3 ^{o}C 8 in plot 8 which contains AquaBlok. Dissolved oxygen ranged from an average of 36.1% and 2.80 mg/l in plot 9 which is a control to an average of 172.6% and 12.83 mg/l in plot 8 which contains AquaBlok that lacks peat moss. Conductivity was an average of 1.69 in plot 9 which was a control and was the lowest of all plots. ORP ranged from an average of -285 in plot 7 which is a control with Submerseed to an average of 40.5 in plot 6 which has AquaBlok, peat moss and ubmerseed. Depth ranged from an average of 1.98 ft in plot 7 which is a control to an average of 2.5 ft in plot 4 which has AquaBlok. TSS ranged from an average of 16.0 mg/l in plot 9 which is a control to an average of 28.5 mg/l in plot 5 which has AquaBlok that lacks peat moss but has Submerseed.

On October 10, 2007 (Table VII.A11) salinity ranged from an average of 1.8 ppt in plots 1, 2 and 3 (AquaBlok, AquaBlok and a control respectively) to an average of 1.9 in plots 5, 6, and 9 (AquaBlok, AquaBlok and a control respectively). The pH ranged from an average of 7.3 in plot 3 which is a control to an average of 8.0 in plot 8 which has AquaBlok that lacks peat moss. Temperature ranged from an average of 20.3 ^{o}C in plots 6, 7, and 8 (AquaBlok, a control and AquaBlok respectively) to 20.9 in plot 3 which is a control. Dissolved oxygen, measured from grab samples brought back to the laboratory due to probe failure in the field, ranged from an average of 71.7% and 6.39 mg/l in plot 10 which is a control with Submerseed to an average of 89.3% and 7.98 mg/l in plot 1 which has AquaBlok that lacks peat moss but has Submerseed. Conductivity ranged from an average of 3.1 in plot 6 which has AquaBlok, peat moss and Submerseed to an average of 3.830 in plot 3.61 in plot 8 which has AquaBlok that lacks peat moss. ORP ranged from an average of -115 in plot 3 which is a control to an average of 49.7 in plot 6 which has AquaBlok with peat moss and Submerseed. Depth ranged from an average of 1.6 ft in plot 9 which is a control to an average of 2.1 in plot 3 which is a control. TSS ranged from an average of 48.5 in plot 1 which has AquaBlok that lacks peat moss but has Submerseed to an average of 118 in plot 3 which is a control plot.

On October 17, 2007 (Table VII.A12) salinity ranged from an average of 1.84 in plots 5 and 9 (AquaBlok and a control respectively) to an average of 1.89 in plot 10 which is a control with Submerseed. The pH ranged from an average of 8.08 in plot 9 which is a control to an average of 8.49 in plot 4 which has AquaBlok that lacks peat moss. Temperature ranged from an average of 16.58 ^{o}C in plot 9 which is a control to an average of 17.29 in plot 8 which has AquaBlok that lacks peat moss. Dissolved oxygen, measured from grab samples brought back to the laboratory due to probe failure in the field, ranged from an average of 128.7% and 11.81 mg/l in plot 10 which is a control that has Submerseed to an average of 194.2% and 17.86 mg/l in plot 8 which has AquaBlok that lacks peat moss. Conductivity ranged from an average of 3.47 in plot 5 which has AquaBlok that lacks peat moss but has Submerseed to an average of 3.67 in plot 8 which has AquaBlok that lack Submerseed. ORP ranged form an average of -204 in plot 7 which is a control with Submerseed to an average of 96.0 in plot 8 which has AquaBlok that lacks peat moss. Depth ranged from an average of 1.73 ft in plot 8 which has AquaBlok lacks peat moss to an average of 2.7 in plot 7 which is a control. TSS ranged from an average of 43.3 mg/l in plot 10 which is a control with Submerseed to an average of 59.2 mg/l in plot 8 which has AquaBlok that lacks peat moss.

On November 16, 2007 (Table VII.A13) salinity ranged from an average of 1.65 ppt in plots 2 and 5 which have AquaBlok with and without peat moss respectively to an average of 1.74 ppt in plot 1 which has AquaBlok with out peat moss. The pH ranged from an average of 7.78 in plots 9 and 10 which are controls to an average of 8.56 which has AquaBlok. Temperature ranged from an average of 7.55 ^{o}C in plot 7 which is a control to an average of 8.45 ^{o}C in plot 1 which has AquaBlok. Dissolved oxygen ranged from an average of 64.2% and 7.68 mg/l in plot 1 which has AquaBlok that lacks peat moss but has Submerseed to an average of 95.4% and 10.91 mg/l in plot 4 which has AquaBlok that lacks peat moss. Conductivity ranged from an average of 3.144 in plot 2 which has AquaBlok, peat moss, and Submerseed to an average of 3.28 in plots 1, 9, and 10 (AquaBlok, a control, and a control respectively). ORP ranged from an average of 17.8 in plot 3 which is a control to an average of 86.7 in plot 6 which has AquaBlok, peat moss, and Submerseed. Depth ranged from an average of 2.1 ft in plot 8 which has AquaBlok without peat moss to an average of 2.8 ft in plots 3, 7, and 9 which are controls. Cap thickness ranged from an average of 0.72 ft in plot 8 which has AquaBlok without peat moss to an average of 1.1 ft in plot 5 which contains AquaBlok without peat moss but with Submerseed. TSS ranged from an average of 12.3 mg/l in plot 10 which is a control with Submerseed to an average of 51.7 mg/l in plot 3 which is a control plot.

Table VII.A7. Water quality parameters taken post capping, April 19, 2007 . All samples were collected between 11:00AM and 2:00PM. CNTRL = not capped, S = with SubmerSeed, AB = AquaBlok, PM = amended with peat moss, UN = unamended, Sal = salinity (ppt), Temp = temperature (°C), DO = dissolved oxygen (mg/L), ORP = oxidation-reduction potential (mV), depth (ft), cond = conductivity (mg/L). DO data may be inaccurate due to failed probe.

Plot #	Sample #	Site	Salinity	pH	Temp.	DO	ORP	Depth	Cond
AB UN S	1 - 1	1C	1.08	8.02	9.60	10.30	-63.10	4.00	2.16
1	1 -2	4D	1.07	8.15	9.38	10.10	-66.40	4.30	2.14
	1 - 3	2E	1.10	7.48	9.30	6.00	-26.50	4.40	2.19
Averages for plot # 1			1.08	7.88	9.43	8.80	-52.00	4.23	2.16
SD			0.02	0.36	0.16	2.43	22.15	0.21	0.03
AB PM S	2 - 1	2A	1.09	8.25	9.66	9.80	-69.60	4.30	2.15
2	2 - 2	3B	1.06	8.27	9.37	10.00	-70.50	3.90	2.13
	2 - 3	4C	1.26	7.91	8.77	5.40	-67.10	4.50	2.52
Averages for plot # 2			1.14	8.14	9.27	8.40	-69.07	4.23	2.27
SD			0.11	0.20	0.45	2.60	1.76	0.31	0.22
CNTRL	3 - 1	1B	1.06	7.88	9.55	9.80	-49.70	4.60	2.12
3	3 - 2	4D	1.07	8.18	9.33	9.90	-66.30	4.20	2.14
	3 - 3	5A	1.08	8.21	9.39	10.00	-67.50	4.70	2.17
Averages for plot # 3			1.07	8.09	9.42	9.90	-61.17	4.50	2.14
SD			0.01	0.18	0.11	0.10	9.95	0.26	0.03
AB UN	4 - 1	2C	1.00	8.25	9.43	10.00	-69.70	4.00	2.12
4	4 - 2	3A	1.05	8.24	9.63	10.10	-69.20	4.40	2.10
	4 - 3	4E	1.06	8.22	9.40	9.90	-68.00	4.20	2.13
Averages for plot # 4			1.04	8.24	9.49	10.00	-68.97	4.20	2.12
SD			0.03	0.02	0.13	0.10	0.87	0.20	0.02
AB UN S	5 - 1	5B	1.05	8.25	9.42	9.50	-70.10	4.30	2.10
5	5 - 2	4D	1.07	8.29	9.43	10.20	-71.90	3.90	2.14
	5 - 3	7B	1.05	8.24	9.55	10.00	-65.10	4.40	2.11
Averages for plot # 5			1.06	8.26	9.47	9.90	-69.03	4.20	2.12

Plot #	Sample #	Site	Salinity	pH	Temp.	DO	ORP	Depth	Cond
SD			0.01	0.03	0.07	0.36	3.52	0.26	0.02
AB PM S	6 - 1	5E	1.05	8.20	9.26	9.80	-67.00	4.00	2.10
6	6 - 2	2B	1.05	8.25	9.35	10.20	-67.10	4.20	2.11
	6 -3	2D	1.05	8.26	9.43	10.20	-70.30	4.00	2.15
Averages for plot # 6			1.05	8.24	9.35	10.07	-68.13	4.07	2.12
SD			0.00	0.03	0.09	0.23	1.88	0.12	0.03
CNTRL S	7 - 1	3A	1.20	7.40	8.90	5.50	-20.40	4.70	2.39
7	7 - 2	5D	1.20	7.60	8.84	8.80	32.60	4.40	2.30
	7 - 3	2D	1.20	7.13	8.95	5.20	-18.30	4.70	2.40
Averages for plot # 7			1.20	7.38	8.90	6.50	-2.03	4.60	2.36
SD			0.00	0.24	0.06	2.00	30.01	0.17	0.06
AB UN	8 - 1	1A	1.00	7.90	8.90	8.90	-56.00	4.60	1.90
8	8 - 2	3C	1.00	8.17	9.30	9.90	-56.00	3.70	2.10
	8 - 3	3B	1.00	8.18	9.10	9.80	-66.10	3.90	2.09
Averages for plot # 8			1.00	8.08	9.10	9.53	-59.37	4.07	2.03
SD			0.00	0.16	0.20	0.55	5.83	0.47	0.11
CNTRL	9 - 1	1C	1.10	8.07	9.97	9.50	-59.30	4.70	2.26
9	9 - 2	4A	1.10	7.70	8.87	9.90	-39.20	4.80	2.27
	9 - 3	4D	1.10	8.18	8.93	9.90	-65.60	4.10	2.21
Averages for plot # 9			1.10	7.98	9.26	9.77	-54.70		2.25
SD			0.00	0.25	0.62	0.23	13.79		0.03
CNTRL S	10 - 1	3C	1.10	7.94	8.92	8.80	-41.40	4.90	2.22
10	10 - 2	2A	1.10	8.11	8.88	8.80	-61.60	4.60	2.23
	10 - 3	5A	1.10	7.92	8.76	7.10	-42.30	4.90	2.27
Averages for plot # 10			1.10	7.99	8.85	8.23	-48.43	4.80	2.24
SD			0.00	0.10	0.08	0.98	11.41	0.17	0.03

Table VII.A8. Water quality parameters taken post capping, May 22 2007 All samples were collected between 11:00AM and 2:00PM. CNTRL = not capped, S = with SubmerSeed, AB = AquaBlok, PM = amended with peat moss, UN = unamended, Sal = salinity (ppt), Temp = temperature (°C), DO = dissolved oxygen (mg/L), ORP = oxidation-reduction potential (mV), depth (ft), cond = conductivity (mg/L).

Plot #	Sample #	Site	Salinity	pH	Temp.	DO	ORP	Depth	Cond
AB UN S	1 - 1	1C	1.38	7.95	20.39	7.62	11.70	2.20	2.66
1	1 -2	4D	1.38	8.05	19.77	1.97	-9.10	2.30	2.66
	1 - 3	2E	1.36	8.08	20.10	5.89	16.70	2.40	2.63
Averages for plot # 1			1.37	8.03	20.09	5.16	6.43	2.30	2.65
SD			0.01	0.07	0.31	2.89	13.68	0.10	0.02
AB PM S	2 - 1	2A	1.38	8.11	21.06	7.65	30.10	2.20	2.67
2	2 - 2	3B	1.38	8.07	20.56	8.21	36.20	2.20	2.67
	2 - 3	4C	1.36	8.01	19.93	3.27	32.80	2.20	2.52
Averages for plot # 2			1.37	8.06	20.52	6.38	33.03	2.20	2.62
SD			0.01	0.05	0.57	2.70	3.06	0.00	0.09
CNTRL	3 - 1	1B	1.35	8.28	20.01	9.49	36.20	2.60	2.60
3	3 - 2	4D	1.35	8.20	19.75	8.49	4.60	2.70	2.61
	3 - 3	5A	1.35	8.17	20.15	7.13	27.90	2.60	2.61
Averages for plot # 3			1.35	8.22	19.97	8.37	22.90	2.63	2.61
SD			0.00	0.06	0.20	1.18	16.38	0.06	0.01
AB UN	4 - 1	2C	1.35	8.30	20.43	9.79	30.20	2.30	2.60
4	4 - 2	3A	1.35	8.34	20.14	9.36	27.00	2.40	2.61
	4 - 3	4E	1.34	8.32	19.93	9.92	33.10	2.60	2.61
Averages for plot # 4			1.35	8.32	20.17	9.69	30.10	2.43	2.61
SD			0.01	0.02	0.25	0.29	3.05	0.15	0.01
AB UN S	5 - 1	5B	1.35	8.44	20.48	9.61	11.60	2.20	2.59
5	5 - 2	4D	1.35	8.36	20.42	9.47	18.70	2.30	2.60
	5 - 3	7B	1.35	8.39	20.76	9.31	20.70	2.60	2.60
Averages for plot # 5			1.35	8.40	20.55	9.46	17.00	2.37	2.60

SD			0.00	0.04	0.18	0.15	4.78	0.21	0.01
Plot #	Sample #	Site	Salinity	pH	Temp.	DO	ORP	Depth	Cond
AB PM S	6 - 1	5E	1.32	8.23	20.20	9.08	2.00	2.50	2.54
6	6 - 2	2B	1.33	8.20	20.06	9.13	11.80	2.30	2.60
	6 -3	2D	1.34	8.28	20.40	9.36	6.80	2.00	2.60
Averages for plot # 6			1.33	8.24	20.22	9.19	6.87	2.27	2.58
SD			0.01	0.04	0.17	0.15	4.90	0.25	0.03
CNTRL S	7 - 1	3A	1.22	8.20	19.96	1.99	24.50	2.40	2.55
7	7 - 2	5D	1.24	8.07	20.27	8.11	24.50	2.30	2.58
	7 - 3	2D	1.34	8.24	20.21	8.74	35.00	1.50	2.58
Averages for plot # 7			1.27	8.17	20.15	6.28	28.00	2.07	2.57
SD			0.06	0.09	0.16	3.73	6.06	0.49	0.02
AB UN	8 - 1	1A	1.23	8.10	20.15	8.23	16.30	2.00	2.57
8	8 - 2	3C	1.33	8.19	20.85	8.97	28.50	1.70	2.57
	8 - 3	3B	1.34	8.22	20.53	8.77	41.40	1.90	2.58
Averages for plot # 8			1.30	8.17	20.51	8.66	28.73	1.87	2.57
SD			0.06	0.06	0.35	0.38	12.55	0.15	0.01
CNTRL	9 - 1	1C	1.39	8.12	19.67	5.27	10.10	2.70	2.66
9	9 - 2	4A	1.42	7.87	18.90	7.74	26.70	2.80	2.73
	9 - 3	4D	1.38	7.94	19.56	7.87	54.70	2.60	2.66
Averages for plot # 9			1.40	7.98	19.38	6.96	30.50	2.70	2.68
SD			0.02	0.13	0.42	1.47	22.54	0.10	0.04
CNTRL S	10 - 1	3C	1.35	7.89	19.21	3.41	69.50	2.60	2.61
10	10 - 2	2A	1.33	7.83	19.28	2.62	88.50	2.70	2.58
	10 - 3	5A	1.38	7.76	20.30	8.49	53.40		2.68
Averages for plot # 10			1.35	7.83	19.60	4.84	70.47	2.65	2.62
SD			0.03	0.07	0.61	3.19	17.57	0.07	0.05

Table VII.A9. Water quality parameters taken post capping, July 02, 2007. All samples were collected between 11:00AM and 1:00PM. CNTRL = not capped, S = with SubmerSeed, AB = AquaBlok, PM = amended with peat moss, UN = unamended, Sal = salinity (ppt), Temp = temperature (°C), DO = dissolved oxygen (mg/L), ORP = oxidation-reduction potential (mV), depth (ft), cond = conductivity (mg/L), TSS = total suspended solids (mg/L).

Plot #	Sample #	Site	Salinity	pH	Temp.	DO	ORP	Depth	Cond
AB UN S	1 - 1	1C	1.77	8.19	23.40	7.89	-37.00	1.90	2.28
1	1 -2	4D	1.77	8.05	23.01	6.84	-76.00	2.00	3.37
	1 - 3	2E	1.77	8.10	23.54	3.65	-47.90	2.10	3.38
Averages for plot # 1			1.77	8.11	23.32	6.13	-53.63	2.00	3.01
SD			0.00	0.07	0.27	2.21	20.12	0.10	0.63
AB PM S	2 - 1	2A	1.77	8.38	23.53	7.68	-13.40	2.20	3.38
2	2 - 2	3B	1.78	8.22	24.27	8.34	-48.20	1.95	3.40
	2 - 3	4C	1.76	8.06	23.42	2.39	-77.10	2.20	3.35
Averages for plot # 2			1.77	8.22	23.74	6.14	-46.23	2.12	3.38
SD			0.01	0.16	0.46	3.26	31.90	0.14	0.03
CNTRL	3 - 1	1B	1.77	8.48	24.51	9.66	-37.50	2.70	3.39
3	3 - 2	4D	1.77	8.29	23.71	8.84	-70.50	2.80	3.39
	3 - 3	5A	1.77	8.46	23.28	7.04	32.10	2.70	3.39
Averages for plot # 3			1.77	8.41	23.83	8.51	-25.30	2.73	3.39
SD			0.00	0.10	0.62	1.34	52.38	0.06	0.00
AB UN	4 - 1	2C	1.98	8.60	24.61	9.35	8.10	2.40	3.39
4	4 - 2	3A	1.78	8.60	24.40	9.63	2.60	1.90	3.40
	4 - 3	4E	1.77	8.56	24.47	10.01	-9.00	2.40	3.38
Averages for plot # 4			1.84	8.59	24.49	9.66	0.57	2.23	3.39
SD			0.12	0.02	0.11	0.33	8.73	0.29	0.01
AB UN S	5 - 1	5B	1.78	8.66	20.89	9.71	17.30	2.00	3.34
5	5 - 2	4D	1.77	8.63	24.77	9.95	9.60	2.20	3.39
	5 - 3	7B	1.77	8.63	24.75	10.06	13.40	2.45	3.39
Averages for plot # 5			1.77	8.64	23.47	9.91	13.43	2.22	3.37

SD			0.01	0.02	2.23	0.18	3.85	0.23	0.03
Plot #	Sample #	Site	Salinity	pH	Temp.	DO	ORP	Depth	Cond
AB PM S	6 - 1	5E	1.78	8.63	24.31	8.98	21.30	2.60	3.40
6	6 - 2	2B	1.77	8.68	25.33	10.63	27.40	2.00	3.39
	6 -3	2D	1.78	8.67	24.49	9.18	23.30	2.10	3.40
Averages for plot # 6			1.78	8.66	24.71	9.60	24.00	2.23	3.40
SD			0.01	0.03	0.54	0.90	3.11	0.32	0.01
CNTRL S	7 - 1	3A	1.73	8.08	24.45	6.51	-91.30	2.70	3.32
7	7 - 2	5D	1.75	8.13	24.76	2.64	-127.40	2.60	3.35
	7 - 3	2D	1.77	8.12	23.69	0.36	-131.60	2.55	3.38
Averages for plot # 7			1.75	8.11	24.30	3.17	-116.77	2.62	3.35
SD			0.02	0.03	0.55	3.11	22.15	0.08	0.03
AB UN	8 - 1	1A	1.75	8.42	24.62	3.22	-150.00	2.05	3.36
8	8 - 2	3C	1.77	8.50	24.57	9.37	-23.00	2.10	3.39
	8 - 3	3B	1.77	8.35	24.78	9.74	-45.30	1.70	3.38
Averages for plot # 8			1.76	8.42	24.66	7.44	-72.77	1.95	3.38
SD			0.01	0.08	0.11	3.66	67.81	0.22	0.01
CNTRL	9 - 1	1C	1.71	8.08	22.04	4.35	-106.50	2.50	3.33
9	9 - 2	4A	1.71	8.03	22.12	4.92	-109.40	2.10	3.27
	9 - 3	4D	1.76	8.20	22.08	6.24	36.80	2.90	3.36
Averages for plot # 9			1.73	8.10	22.08	5.17	-59.70	2.50	3.32
SD			0.03	0.09	0.04	0.97	83.58	0.40	0.05
CNTRL S	10 - 1	3C	1.70	7.96	22.20	2.26	-101.40	2.50	3.25
10	10 - 2	2A	1.62	7.59	22.28	2.66	-136.40	2.30	3.10
	10 - 3	5A	1.76	8.00	22.02	5.96	-62.70	3.00	3.35
Averages for plot # 10			1.69	7.85	22.17	3.63	-100.17	2.60	3.23
SD			0.07	0.23	0.13	2.03	36.87	0.36	0.13

Table VII.A10. Water quality parameters taken post capping, July 31, 2007. All samples were collected between 11:30AM and 1:30PM. CNTRL = not capped, S = with SubmerSeed, AB = AquaBlok, PM = amended with peat moss, UN = unamended, Sal = salinity (ppt), Temp = temperature (°C), DO = dissolved oxygen (mg/L), ORP = oxidation-reduction potential (mV), depth (ft), cond = conductivity (mg/L), TSS = total suspended solids (mg/L).

Plot #	Sample #	Site	Salinity	pH	Temp.	DO	ORP	Depth	Cond	TSS
AB UN S	1 - 1	1C	1.73	8.18	28.30	8.62	-18.40	2.00	3.30	26.5
1	1 -2	4D	1.74	8.09	27.90	7.32	-65.00	2.25	3.30	20.5
	1 - 3	2E	1.73	8.15	28.10	8.11	-49.50	2.25	3.30	19.0
Averages for plot # 1			1.73	8.14	28.10	8.02	-44.30	2.17	3.30	22.0
SD			0.01	0.05	0.20	0.66	23.73	0.14	0.00	4.0
AB PM S	2 - 1	2A	1.73	8.37	28.60	8.95	-3.10	2.40	3.30	26.5
2	2 - 2	3B	1.73	8.26	28.80	9.50	-22.70	2.00	3.30	26.5
	2 - 3	4C	1.73	7.86	28.80	8.67	-65.00	2.25	3.30	27.5
Averages for plot # 2			1.72	8.16	28.83	9.04	-30.27	2.22	3.30	26.8
SD			0.00	0.17	0.12	0.42	31.64	0.20	0.00	0.6
CNTRL	3 - 1	1B	1.73	8.44	29.40	10.56	55.50	2.30	3.30	22.5
3	3 - 2	4D	1.69	8.11	28.40	2.71	-111.90	2.40	3.24	21.0
	3 - 3	5A	1.73	8.35	28.70	7.10	-10.60	2.20	3.32	23.0
Averages for plot # 3			1.72	8.30	28.83	6.79	-22.33	2.30	3.29	22.2
SD			0.02	0.17	0.51	3.93	84.31	0.10	0.04	1.0
AB UN	4 - 1	2C	1.73	8.55	29.30	10.53	1.80	2.75	3.30	26.5
4	4 - 2	3A	1.73	8.59	29.60	11.90	13.90	2.30	3.30	28.5
	4 - 3	4E	1.73	8.54	29.30	11.16	21.90	2.40	3.30	26.5
Averages for plot # 4			1.73	8.56	29.40	11.20	12.53	2.48	3.30	27.2
SD			0.00	0.03	0.17	0.69	10.12	0.24	0.00	1.2
AB UN S	5 - 1	5B	1.72	8.65	29.70	12.30	32.50	2.00	3.17	24.0
5	5 - 2	4D	1.73	8.65	29.90	12.50	37.00	2.30	3.30	32.0
	5 - 3	7B	1.73	8.60	29.50	11.17	-10.30	2.50	3.30	29.5

Plot #	Sample #	Site	Salinity	pH	Temp.	DO	ORP	Depth	Cond	TSS
Averages for plot # 5			1.73	8.63	29.70	11.99	19.73	2.27	3.26	28.5
SD			0.01	0.03	0.20	0.72	26.11	0.25	0.08	4.1
AB PM S	6 - 1	5E	1.72	8.64	29.80	11.97	35.60	2.30	3.32	22.0
6	6 - 2	2B	1.72	8.65	29.70	11.52	44.50	2.40	3.32	22.5
	6 -3	2D	1.72	8.64	29.70	12.13	41.30	2.30	3.32	25.8
Averages for plot # 6			1.72	8.64	29.73	11.87	40.47	2.33	3.32	23.4
SD			0.00	0.01	0.06	0.32	4.51	0.06	0.00	2.0
CNTRL S	7 - 1	3A	1.72	8.34	29.66	10.27	-111.00	1.75	3.31	24.0
7	7 - 2	5D	1.71	8.48	29.80	9.48	-64.80	2.10	3.28	21.5
	7 - 3	2D	1.72	8.48	29.60	2.96	-78.60	2.10	3.31	14.0
Averages for plot # 7			1.72	8.43	29.69	7.57	-71.70	1.98	3.30	19.8
SD			0.01	0.08	0.10	4.01	9.76	0.20	0.02	5.2
AB UN	8 - 1	1A	1.72	8.71	30.40	12.66	19.50	2.00	3.32	27.5
8	8 - 2	3C	1.72	8.70	30.20	13.03	20.20	2.20	3.32	24.5
	8 - 3	3B	1.72	8.64	30.20	12.80	4.40	2.00	3.31	12.5
Averages for plot # 8			1.72	8.68	30.27	12.83	14.70	2.07	3.32	21.5
SD			0.00	0.04	0.12	0.19	8.93	0.12	0.01	7.9
CNTRL	9 - 1	1C	1.73	7.86	27.60	6.49	-62.00	2.00	3.30	16.0
9	9 - 2	4A	1.64	7.57	27.00	0.65	-152.00	2.25	3.10	14.5
	9 - 3	4D	1.71	7.49	26.70	1.27	-91.80	2.25	3.30	17.5
Averages for plot # 9			1.69	7.64	27.10	2.80	-101.93	2.17	3.23	16.0
SD			0.05	0.19	0.46	3.21	45.85	0.14	0.12	1.5
CNTRL S	10 - 1	3C	1.68	7.97	28.10	0.80	-122.20	2.00	3.20	17.5
10	10 - 2	2A	1.73	8.06	27.90	7.47	-76.10	2.25	3.30	16.0
	10 - 3	5A	1.73	8.48	28.10	4.60	-153.60	2.40	3.30	17.5
Averages for plot # 10			1.71	8.17	28.03	4.29	-117.30	2.22	3.27	17.0
SD			0.03	0.27	0.12	3.35	38.98	0.20	0.06	0.9

Table VII.A11. Water quality parameters taken post capping, October 10, 2007. All samples were collected between 11:00 AM and 12:30 PM. CNTRL = not capped, S = with SubmerSeed, AB = AquaBlok, PM = amended with peat moss, UN = unamended, Sal = salinity (ppt), Temp = temperature (°C), DO = dissolved oxygen (mg/L), ORP = oxidation-reduction potential (mV), depth (ft), cond = conductivity (mg/L), TSS = total suspended solids (mg/L).

Plot #	Sample #	Site	Salinity	pH	Temp.	DO	ORP	Depth	Cond	TSS
AB UN S	1 - 1	1C	1.90	7.70	20.60	9.23	-51.00	1.70	3.50	47.5
1	1 -2	4D	1.80	7.60	20.10	7.94	-118.00	1.50	3.30	46.0
	1 - 3	2E	1.80	7.60	20.50	6.78	-97.00	1.90	3.40	52.0
Averages for plot # 1			1.83	7.63	20.40	7.98	-88.67	1.70	3.40	48.5
SD			0.06	0.06	0.26	1.23	34.27	0.20	0.10	3.1
AB PM S	2 - 1	2A	1.90	7.70	20.50	5.94	-50.00	2.10	3.50	95.0
2	2 - 2	3B	1.90	7.80	20.60	6.10	-27.00	1.70	3.50	75.0
	2 - 3	4C	1.70	7.50	20.60	7.63	-122.00	1.80	3.30	56.0
Averages for plot # 2			1.83	7.67	20.57	6.56	-66.33	1.87	3.43	75.3
SD			0.12	0.15	0.06	0.93	49.56	0.21	0.12	19.5
CNTRL	3 - 1	1B	1.80	7.30	20.50	7.80	-160.00	1.70	3.30	56.0
3	3 - 2	4D	1.80	7.10	21.90	6.80	-119.00	2.50	3.40	51.0
	3 - 3	5A	1.90	7.50	20.30	6.37	-66.00	2.00	3.50	247.0
Averages for plot # 3			1.83	7.30	20.90	6.99	-115.00	2.07	3.40	118.0
SD			0.06	0.20	0.87	0.73	47.13	0.40	0.10	111.7
AB UN	4 - 1	2C	1.80	7.90	20.50	7.19	-140.00	2.00	3.40	64.0
4	4 - 2	3A	1.40	8.10	20.50	7.75	8.20	1.70	3.50	50.0
	4 - 3	4E	1.80	7.70	20.50	7.46	-121.00	2.20	3.40	52.0
Averages for plot # 4			1.67	7.90	20.50	7.47	-84.27	1.97	3.43	55.3
SD			0.23	0.20	0.00	0.28	80.64	0.25	0.06	7.6
AB UN S	5 - 1	5B	1.90	8.00	20.40	6.73	-28.00	1.80	3.50	49.0
5	5 - 2	4D	1.90	8.10	20.30	7.20	1.00	2.00	3.50	52.0

Plot #	Sample #	Site	Salinity	pH	Temp.	DO	ORP	Depth	Cond	TSS
	5 - 3	7B	1.90	8.10	20.40	7.98	-50.00	2.00	3.50	64.0
Averages for plot # 5			1.90	8.07	20.37	7.30	-25.67	1.93	3.50	55.0
SD			0.00	0.06	0.06	0.63	25.58	0.12	0.00	7.9
AB PM S	6 - 1	5E	1.80	7.50	20.40	7.19	-85.00	2.00	3.40	81.0
6	6 - 2	2B	1.90	7.80	20.30	6.74	-42.00	1.80	2.50	53.0
	6 -3	2D	1.90	7.90	20.30	8.55	-22.00	1.80	3.50	62.0
Averages for plot # 6			1.87	7.73	20.33	7.49	-49.67	1.87	3.13	65.3
SD			0.06	0.21	0.06	0.94	32.19	0.12	0.55	14.3
CNTRL S	7 - 1	3A	1.90	7.90	20.30	7.30	-54.00	1.90	3.50	56.0
7	7 - 2	5D	1.90	7.90	20.30	7.52	-66.00	1.80	3.50	57.0
	7 - 3	2D	1.70	7.10	20.40	7.32	-140.00	2.00	3.20	209.0
Averages for plot # 7			1.83	7.63	20.33	7.38	-86.67	1.90	3.40	107.3
SD			0.12	0.46	0.06	0.12	46.58	0.10	0.17	88.0
AB UN	8 - 1	1A	1.70	8.10	20.20	6.83	-140.00	1.70	3.83	69.0
8	8 - 2	3C	1.90	8.00	20.30	7.11	-42.00	1.80	3.50	48.5
	8 - 3	3B	1.90	8.00	20.30	7.00	-14.00	1.60	3.50	67.0
Averages for plot # 8			1.83	8.03	20.27	6.98	-65.33	1.70	3.61	61.5
SD			0.12	0.06	0.06	0.14	66.16	0.10	0.19	11.3
CNTRL	9 - 1	1C	1.90	7.90	20.50	6.47	-23.00	1.80	3.50	101.0
9	9 - 2	4A	1.90	7.90	20.50	7.30	-47.00	1.30	3.50	50.0
	9 - 3	4D	1.80	7.80	20.60	7.65	-100.00	1.60	3.50	68.0
Averages for plot # 9			1.87	7.87	20.53	7.14	-56.67	1.57	3.50	73.0
SD			0.06	0.06	0.06	0.61	39.40	0.25	0.00	25.9
CNTRL S	10 - 1	3C	1.70	7.50	21.00	6.42	-137.00	1.80	3.30	47.0
10	10 - 2	2A	1.90	7.60	20.50	6.27	-48.00	1.80	3.50	67.0
	10 - 3	5A	1.90	7.80	20.50	6.49	-28.00	2.00	3.50	53.0
Averages for plot # 10			1.83	7.63	20.67	6.39	-71.00	1.87	3.43	55.7
SD			0.12	0.15	0.29	0.11	58.03	0.12	0.12	10.3

Table VII.A12. Water quality parameters taken post capping, October 17, 2007. All samples were collected between 11:00 AM and 12:00 PM. CNTRL = not capped, S = with SubmerSeed, AB = AquaBlok, PM = amended with peat moss, UN = unamended, Sal = salinity (ppt), Temp = temperature (°C), DO = dissolved oxygen (mg/L), ORP = oxidation-reduction potential (mV), depth (ft), cond = conductivity (mg/L), TSS = total suspended solids (mg/L).

Plot #	Sample #	Site	Salinity	pH	Temp.	DO	ORP	Depth	Cond	TSS
AB UN S	1 - 1	1C	1.89	8.11	17.14	13.01	-61.00	1.90	3.56	38.0
1	1 -2	4D	1.88	8.20	17.08	13.79	-41.40	1.90	3.56	63.0
	1 - 3	2E	1.88	8.25	16.94	13.84	-31.60	1.80	3.55	48.0
Averages for plot # 1			1.88	8.19	17.05	13.55	-44.67	1.87	3.56	49.7
SD			0.01	0.07	0.10	0.47	14.97	0.06	0.01	12.6
AB PM S	2 - 1	2A	1.88	8.19	16.65	17.16	-43.30	2.10	3.56	46.0
2	2 - 2	3B	1.89	8.15	16.76	17.82	-23.20	1.80	3.57	45.0
	2 - 3	4C	1.78	8.08	16.63	14.32	-98.00	2.10	3.38	43.0
Averages for plot # 2			1.85	8.14	16.68	16.43	-54.83	2.00	3.50	44.7
SD			0.06	0.06	0.07	1.86	38.71	0.17	0.11	1.5
CNTRL	3 - 1	1B	1.86	8.37	16.89	12.45	-100.40	1.90	3.53	56.0
3	3 - 2	4D	1.87	8.07	16.82	13.65	-82.90	2.30	3.54	61.0
	3 - 3	5A	1.88	8.19	16.79	14.46	-52.00	2.10	3.56	44.0
Averages for plot # 3			1.87	8.21	16.83	13.52	-78.43	2.10	3.54	53.7
SD			0.01	0.15	0.05	1.01	24.51	0.20	0.02	8.7
AB UN	4 - 1	2C	1.87	8.34	16.94	17.87	-3.70	2.40	3.54	43.0
4	4 - 2	3A	1.88	8.29	17.80	14.88	-28.00	1.80	3.54	48.0
	4 - 3	4E	1.88	8.39	16.91	13.25	15.30	2.20	3.55	60.0
Averages for plot # 4			1.88	8.34	17.22	15.33	-5.47	2.13	3.54	50.3
SD			0.01	0.05	0.51	2.34	21.70	0.31	0.01	8.7
AB UN S	5 - 1	5B	1.88	8.62	17.10	14.20	54.60	1.90	3.55	50.0
5	5 - 2	4D	1.88	8.41	17.01	17.81	57.80	2.10	3.55	45.0
	5 - 3	7B	1.75	8.24	16.80	13.78	-105.70	2.40	3.32	52.0
Averages for plot # 5			1.84	8.42	16.97	15.26	2.23	2.13	3.47	49.0

Plot #	Sample #	Site	Salinity	pH	Temp.	DO	ORP	Depth	Cond	TSS
SD			0.08	0.19	0.15	2.22	93.49	0.25	0.13	3.6
AB PM S	6 - 1	5E	1.88	8.35	16.89	12.05	12.90	2.20	3.56	51.0
6	6 - 2	2B	1.87	8.36	16.86	14.38	34.80	2.80	3.54	50.0
	6 -3	2D	1.88	8.40	17.20	12.44	47.90	2.10	3.55	56.0
Averages for plot # 6			1.88	8.37	16.98	12.96	31.87	2.37	3.55	52.3
SD			0.01	0.03	0.19	1.25	17.68	0.38	0.01	3.2
CNTRL S	7 - 1	3A	1.86	8.23	17.02	18.31	-61.00	2.90	3.53	50.0
7	7 - 2	5D	1.88	8.29	17.29	18.33	22.50	2.30	3.56	56.0
	7 - 3	2D	1.88	8.31	16.84	14.86	-24.30	2.80	3.55	54.0
Averages for plot # 7			1.87	8.28	17.05	17.17	-20.93	2.67	3.55	53.3
SD			0.01	0.04	0.23	2.00	41.85	0.32	0.02	3.1
AB UN	8 - 1	1A	1.89	7.93	17.30	16.79	100.70	1.80	3.58	54.0
8	8 - 2	3C	1.88	8.60	17.24	18.88	93.80	1.80	3.57	49.5
	8 - 3	3B	1.88	8.27	17.72	17.91	93.40	1.60	3.57	74.0
Averages for plot # 8			1.88	8.27	17.42	17.86	95.97	1.73	3.57	59.2
SD			0.01	0.34	0.26	1.05	4.10	0.12	0.01	13.0
CNTRL	9 - 1	1C	1.84	8.23	16.75	16.46	-143.80	2.00	3.53	53.0
9	9 - 2	4A	1.84	8.01	16.73	14.32	-122.40	1.60	3.51	46.0
	9 - 3	4D	1.82	8.01	16.75	13.95	-198.50	2.20	3.44	43.0
Averages for plot # 9			1.83	8.08	16.74	14.91	-154.90	1.93	3.49	47.3
SD			0.01	0.13	0.01	1.36	39.25	0.31	0.05	5.1
CNTRL S	10 - 1	3C	1.90	8.15	16.81	10.48	-27.00	2.50	3.60	45.0
10	10 - 2	2A	1.89	8.18	19.25	12.18	-58.00	2.30	3.56	46.0
	10 - 3	5A	1.89	8.08	17.00	12.78	-67.70	2.70	3.59	39.0
Averages for plot # 10			1.89	8.14	17.69	11.81	-50.90	2.50	3.58	43.3
SD			0.01	0.05	1.36	1.19	21.26	0.20	0.02	3.8

Table VII.A13. Water quality parameters taken post capping, date 11-16-07. All samples were collected between 11:00 AM and 12:00 PM. CNTRL = not capped, S = with SubmerSeed, AB = AquaBlok, PM = amended with peat moss, UN = unamended, Sal = salinity (ppt), Temp = temperature (°C), DO = dissolved oxygen (mg/L), ORP = oxidation-reduction potential (mV), depth (ft), cond = conductivity (mg/L), TSS =total suspended solids (mg/L).

Plot #	Sample	Site	Salinity	pH	Temp.	DO	ORP	Depth	Cond	TSS
AB UN S	1 - 1	1C	1.67	7.96	7.69	10.51	24.60	2.10	3.18	23.0
1	1 -2	4D	1.78	7.92	8.72	5.91	12.00	2.40	3.32	7.0
	1 - 3	2E	1.76	7.81	8.75	6.55	21.10	2.20	3.34	7.0
Averages for plot # 1			1.74	7.90	8.39	7.66	19.23	2.23	3.28	12.3
SD			0.06	0.08	0.60	2.49	6.50	0.15	0.09	9.2
AB PM S	2 - 1	2A	1.61	8.03	7.83	10.62	-11.20	2.60	3.18	30.0
2	2 - 2	3B	1.66	8.03	7.77	11.16	51.20	2.15	3.17	25.0
	2 - 3	4C	1.61	8.00	7.83	9.48	-25.30	2.50	3.69	34.0
Averages for plot # 2			1.63	8.02	7.81	10.42	4.90	2.42	3.35	29.7
SD			0.03	0.02	0.03	0.86	40.71	0.24	0.29	4.5
CNTRL	3 - 1	1B	1.66	8.01	7.57	10.40	-14.10	3.00	3.17	32.0
3	3 - 2	4D	1.66	8.01	7.66	11.05	41.50	2.70	3.18	79.0
	3 - 3	5A	1.66	8.01	7.78	11.00	31.00	2.80	3.18	44.0
Averages for plot # 3			1.66	8.01	7.67	10.82	19.47	2.83	3.18	51.7
SD			0.00	0.00	0.11	0.36	29.54	0.15	0.01	24.4
AB UN	4 - 1	2C	1.66	8.01	7.64	11.03	83.90	2.70	3.18	28.0
4	4 - 2	3A	1.66	7.88	7.74	10.76	53.00	2.30	3.18	26.0
	4 - 3	4E	1.67	8.01	7.94	10.78	83.80	2.50	3.18	26.0
Averages for plot # 4			1.66	7.97	7.77	10.86	73.57	2.50	3.18	26.7
SD			0.01	0.08	0.15	0.15	17.81	0.20	0.00	1.2
AB UN S	5 - 1	5B	1.66	7.99	7.70	10.74	8.50	2.00	3.18	23.0
5	5 - 2	4D	1.60	8.00	7.69	10.60	82.30	2.40	3.17	25.0
	5 - 3	7B	1.67	7.98	7.67	10.08	82.50	2.50	3.18	30.0
Averages for plot # 5			1.64	7.99	7.69	10.47	57.77	2.30	3.18	26.0

Plot #	Sample	Site	Salinity	pH	Temp.	DO	ORP	Depth	Cond	TSS
SD			0.04	0.01	0.02	0.35	42.67	0.26	0.01	3.6
AB PM S	6 - 1	5E	1.66	7.98	7.41	10.64	84.50	2.40	3.18	28.0
6	6 - 2	2B	1.66	7.93	7.67	10.55	98.40	2.10	3.18	29.0
	6 -3	2D	1.67	7.98	7.66	10.96	80.90	2.30	3.16	28.0
Averages for plot # 6			1.66	7.96	7.58	10.72	87.93	2.27	3.17	28.3
SD			0.01	0.03	0.15	0.22	9.24	0.15	0.01	0.6
CNTRL S	7 - 1	3A	1.67	8.03	7.55	10.60	75.10	2.70	3.20	25.0
7	7 - 2	5D	1.66	8.00	7.65	10.16	62.40	3.00	3.17	30.0
	7 - 3	2D	1.66	8.01	7.54	10.67	66.10	2.60	3.17	27.0
Averages for plot # 7			1.66	8.01	7.58	10.48	67.87	2.77	3.18	27.3
SD			0.01	0.02	0.06	0.28	6.53	0.21	0.02	2.5
AB UN	8 - 1	1A	1.65	8.58	7.46	9.85	108.40	2.10	3.15	18.0
8	8 - 2	3C	1.66	8.12	7.51	10.43	68.10	2.20	3.16	29.5
	8 - 3	3B	1.67	8.10	7.59	10.15	73.80	2.00	3.16	28.0
Averages for plot # 8			1.66	8.27	7.52	10.14	83.43	2.10	3.16	25.2
SD			0.01	0.27	0.07	0.29	21.81	0.10	0.01	6.3
CNTRL	9 - 1	1C	1.71	7.79	8.32	9.06	42.90	2.60	3.27	18.0
9	9 - 2	4A	1.74	7.75	8.54	7.70	44.30	3.00	3.30	12.0
	9 - 3	4D	1.71	7.79	8.35	9.06	42.50	2.90	3.26	41.0
Averages for plot # 9			1.72	7.78	8.40	8.61	43.23	2.83	3.28	23.7
SD			0.02	0.02	0.12	0.79	0.95	0.21	0.02	15.3
CNTRL S	10 - 1	3C	1.73	7.79	8.47	8.02	18.70	2.60	3.30	14.0
10	10 - 2	2A	1.71	7.78	8.33	8.55	36.40	2.60	3.26	12.0
	10 - 3	5A	1.72	7.78	8.40	8.53	41.70	2.80	3.27	11.0
Averages for plot # 10			1.72	7.78	8.40	8.37	32.27	2.67	3.28	12.3
SD			0.01	0.01	0.07	0.30	12.04	0.12	0.02	1.5

A summary of water quality from July 2005, pre-capping, through November 2007, post-capping is depicted in Figures VII.A15-21. The data in the figures were obtained on dates that BMI were collected and included salinity, pH, temperature, dissolved oxygen (DO), oxidation-reduction potential (ORP), water column depth and total suspended solids (TSS). Effects of plot treatment were summarized by date. Replicates from the four control plots (CN- uncapped) were averaged together making n= 12. The same was done for replicates from the four unamended AquaBlok (AB-capped) plots. This was done because the SubmerSeed did not produce any plants that might have altered the treatment. AB amended with peat moss (AB-P) and SubmerSeed was averaged as a separate treatment making n = 6 as in previous figures. Therefore, the treatments presented include CN, AB and AB-P. Results showed seasonal differences for temperature but no significant differences between treatments. TSS also showed no statistical differences between treatments: although, it spiked twice, Aug 2005 and Oct 2007. The spike in Aug 2005 might have been related to deposition of the cap. It was unknown as to why it spiked in Oct 2007: however, Keegan landfill had been reopened and this did result in observable dust in the air. Salinity showed no significant difference between treatments except in September 2006. During this period, salinity spiked to 3.6 ppt in AB sites and 2.7 in CN sites. It was unknown as to why the CN should be lower. However, reported tide and weather conditions indicated the salinity overall might have been high due to low tide during sampling and below average rainfall during the month of September. DO, ORP and pH all showed significant differences between treatments during summer months. DO increased, while ORP and pH declined in CN compared to unamended and amended AB treatments. This indicated that AB was making a difference in water quality and was increasing levels of DO in general. This was likely due to lower levels of microorganism activity in the AB substrate compared to sediment. Postcapping water column depth was about 0.8 in. higher in CN than in AB plots in 2005 and 2006. This difference was less in 2007 suggesting that the cap was eroding. In May 2007 and November 2007, the difference was about 0.5 in.; in July 2007, there was no difference in water column depth between treatments. It was unknown as to why depth was similar in capped and uncapped sites in summer 2007. It may be that water column depth overall was reduced, and the CN plot locations were in areas with more elevated bottoms. The loss of water column depth in 2007 was not supported by changes in cap depth as shown in Figure VII.A22. There were no statistically significant differences in cap depth between October 2005 and November 2007, indicating that the cap had not eroded away despite the changes in water column depth.

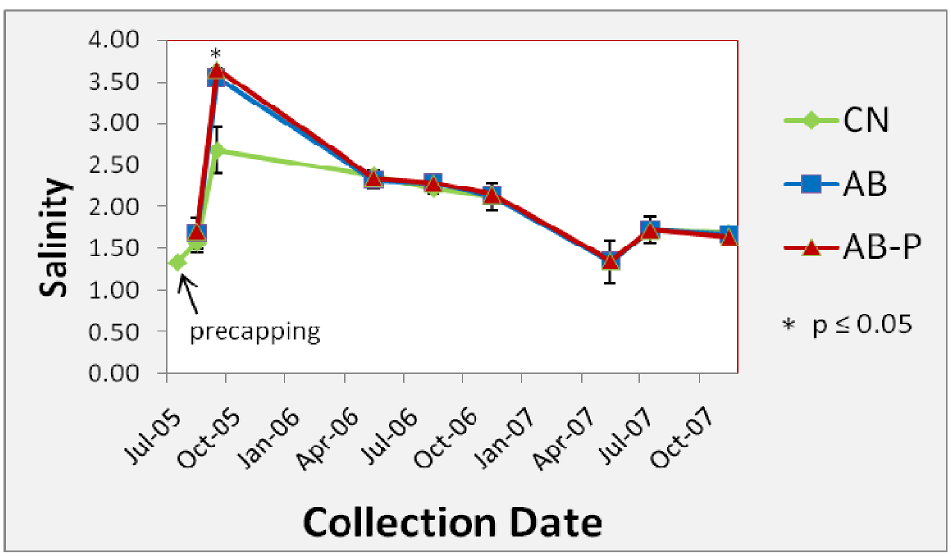


Figure VII.A15. Effect of plot treatment on salinity from July 2005 (pre-capping) to November 2007. Data are averages ± SD for control (CN: uncapped with/without SubmerSeed), AquaBlok unamended (AB: capped with/without SubmerSeed) and AquaBlok amended with peatmoss (AB-P: capped with SubmerSeed), n = 12, 12 and 6, respectively. July 2005 data represent all plots prior to capping, n = 30. The arrow indicates summer months. The asterick represents values that were statistically different from CN.

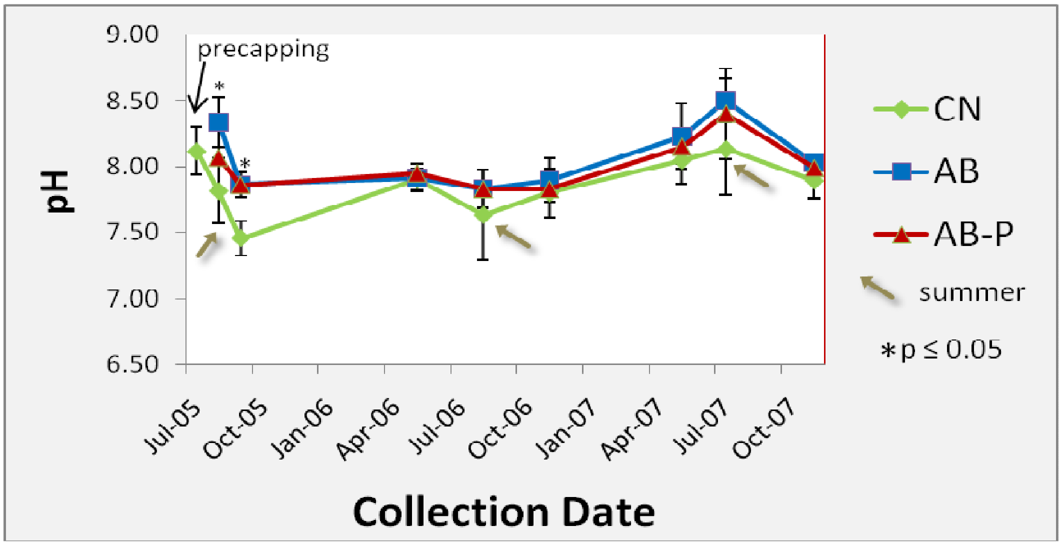


Figure VII.A16. Effect of plot treatment on pH from July 2005 (pre-capping) to November 2007. Data are averages ± SD for control (CN: uncapped with/without SubmerSeed), AquaBlok unamended (AB: capped with/without SubmerSeed) and AquaBlok amended with peatmoss (AB-P: capped with SubmerSeed). n = 12, 12 and 6, respectively. July 2005 data represent the average ± SD for all plots prior to capping, n = 30. The arrow indicates summer months. The asterick represents values that were statistically different from CN.

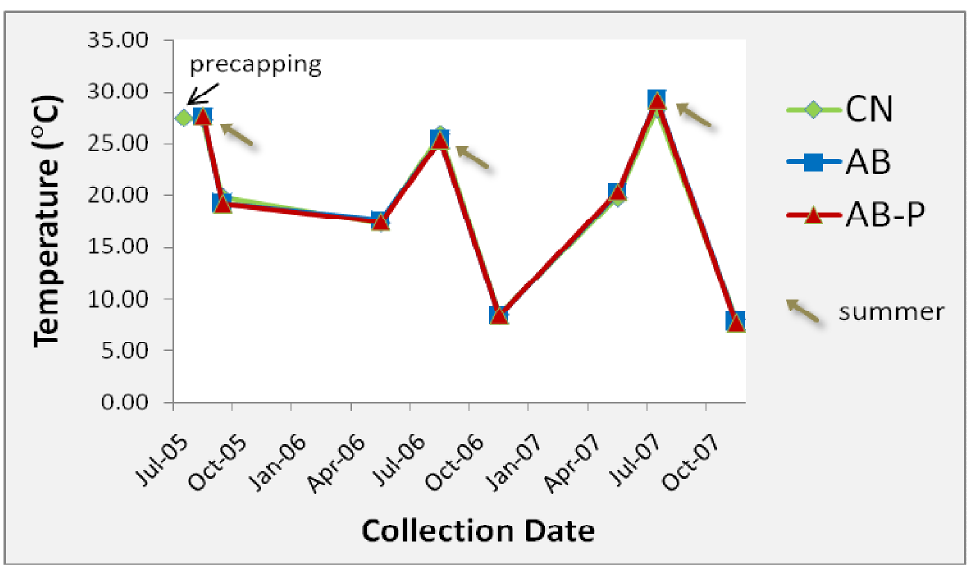


Figure VII.A17. Effect of plot treatment on temperature from July 2005 (pre-capping) to November 2007. Data are averages ± SD for control (CN: uncapped with/without SubmerSeed), AquaBlok unamended (AB: capped with/without SubmerSeed) and AquaBlok amended with peatmoss (AB-P: capped with SubmerSeed). n = 12, 12 and 6, respectively. July 2005 data represent the average ± SD for all plots prior to capping, n = 30. The arrow indicates summer months. No values were statistically different from CN.

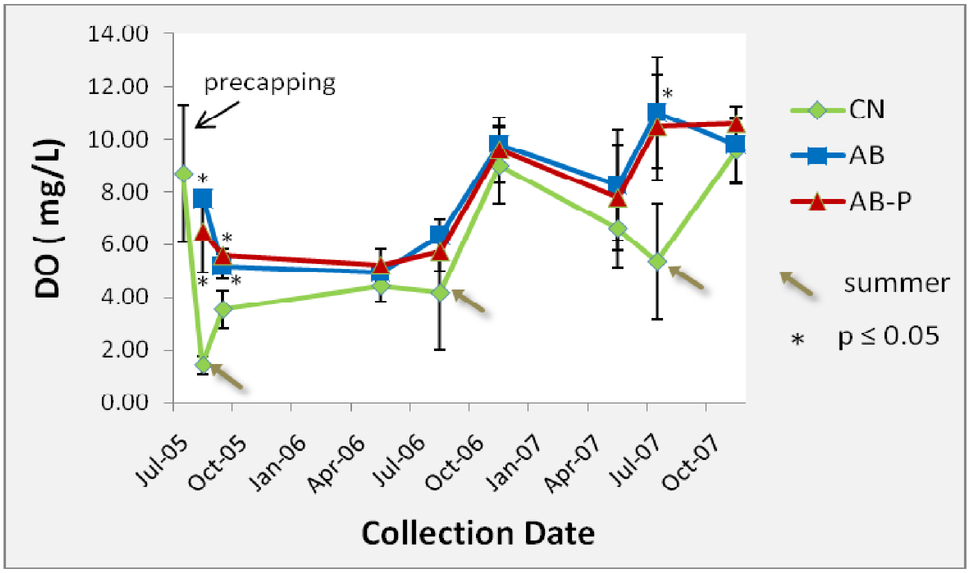


Figure VII.A18. Effect of plot treatment on dissolved oxygen (DO) from July 2005 (pre-capping) to November 2007. Data are averages ± SD for control (CN: uncapped with/without SubmerSeed), AquaBlok unamended (AB: capped with/without SubmerSeed) and AquaBlok amended with peatmoss (AB-P: capped with SubmerSeed). n = 12, 12 and 6, respectively. July 2005 data represent the average ± SD for all plots prior to capping, n = 30. The arrow indicates summer months. Astericks indicated values that were statistically different from CN.

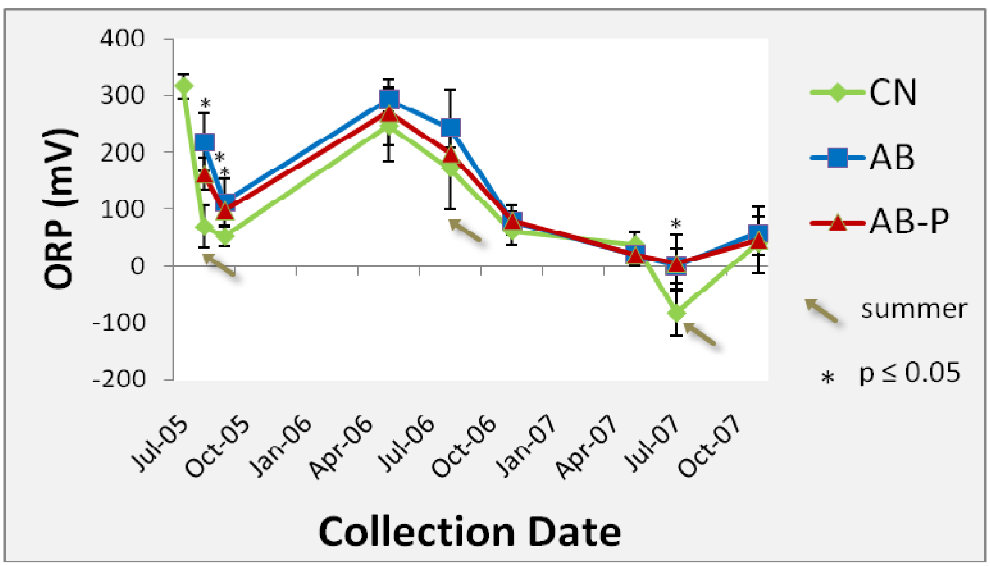


Figure VII.A19. Effect of plot treatment on oxidation-reduction potential (ORP) from July 2005 (pre-capping) to November 2007. Data are averages ± SD for control (CN: uncapped with/without SubmerSeed), AquaBlok unamended (AB: capped with/without SubmerSeed) and AquaBlok amended with peatmoss (AB-P: capped with SubmerSeed). n = 12, 12 and 6, respectively. July 2005 data represent the average ± SD for all plots prior to capping, n = 30. The arrow indicates summer months. Astericks indicated values that were statistically different from CN.

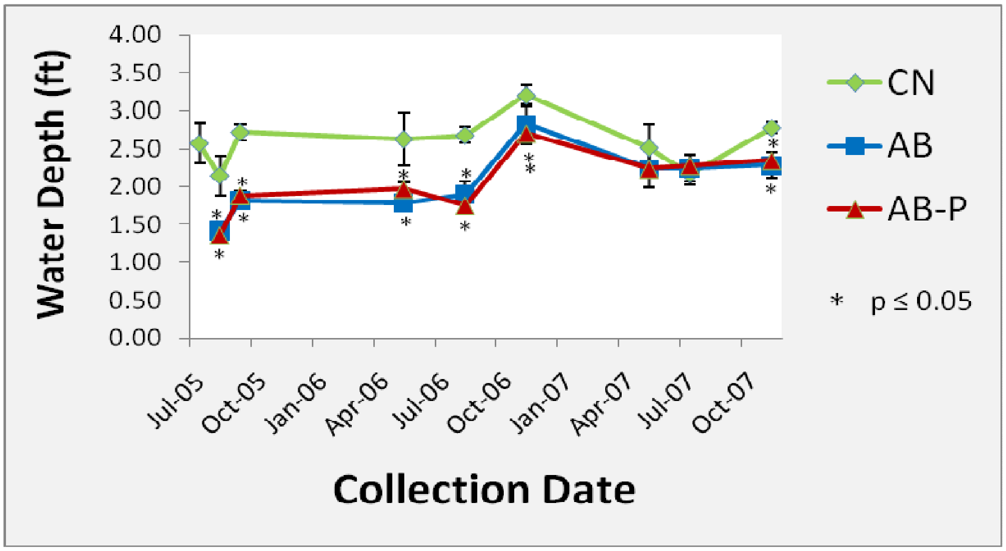


Figure VII.A20. Effect of plot treatment on water depth from July 2005 (pre-capping) to November 2007. Data are averages ± SD for control (CN: uncapped with/without SubmerSeed), AquaBlok unamended (AB: capped with/without SubmerSeed) and AquaBlok amended with peatmoss (AB-P: capped with SubmerSeed). n = 12, 12 and 6, respectively. July 2005 data represent the average ± SD for all plots prior to capping, n = 30. Astericks indicated values that were statistically different from CN.

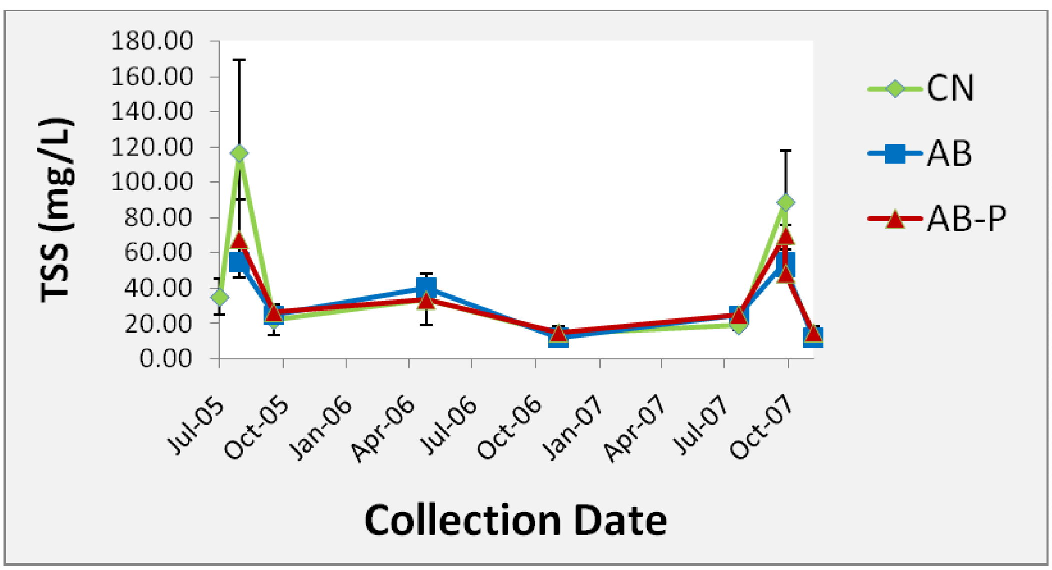


Figure VII.A21. Effect of plot treatment on total suspended solids from July 2005 (pre-capping) to November 2007. Data are averages ± SD for control (CN: uncapped with/without SubmerSeed), AquaBlok unamended (AB: capped with/without SubmerSeed) and AquaBlok amended with peatmoss (AB-P: capped with SubmerSeed). n = 12, 12 and 6, respectively. July 2005 data represent the average ± SD for all plots prior to capping, n = 30. There were no statistical differences from CN.

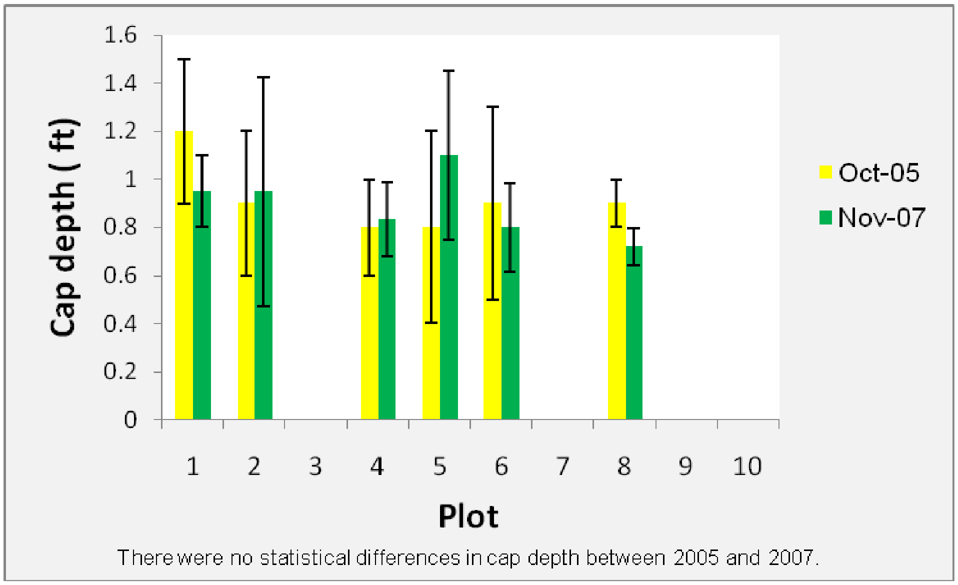


Figure VII.A22. Cap depth overtime. Data represent the average ± SD for three measures taken at the same locations where water quality parameters were measured.

VII.B. Plant Community Characterization

<u>VII.B.1. Experimental site.</u>

During 2005, the plant community was not evaluated post-capping.

During the spring of 2006 after the installation of biologs, Plot 1 (AquaBlok that is unamended with peat moss and has Submerseed) has poor visibility to see plants. The bio log is deeper than 8-10 inches. Plot 2 (AquaBlok that is amended with peat moss and has Submerseed) has some vegetation. The plants are germinating. The visibility is better. There is a large amount of possible seedlings. Plot 5 (AquaBlok that is unamended with peat moss and has Submerseed) has very poor visibility of 2-3 inches. Possible growth is questionable. Plot 6 (AquaBlok that is amended with peat moss and has Submerseed) has biologs that are not totally covered with AquaBlok. There seems to be germination on the biologs, more so than that which was covered by AquaBlok. Plot 7 (a control that has Submerseed) has large *Phragmites* and the visibility is very poor (2-3 inches). Plot 8 (AquaBlok that is unamended with peat moss) has small *Phragmites*. Plot 9 (a control) has natural vegetation occurring on the North side. Plot 10 (a control that has Submerseed) has no AquaBlok but seems to have vegetation. The visibility is approximately 4 inches. The North West pole is out of the water. SubmerSeeds did not germinate therefore vegetation was not established on research plots. Seedlings floated away and did not become established on research plots.

<u>VII.B.2. Alternative Field experiment:</u>

Field submerged tubs were examined every two to three weeks during the 2007 growing season (Table VI.B1). On June 8, 2007 field tubs were examined for seedling growth. The tubs closest to the shore (Figure VI.B1) were at the water surface with 3-4 inches of water above the substrate inside the tub. A large amount (too many to count) of different seedlings were observed on the soil treatment tub. The Soil/ABPM treatment tub had 12 small seedlings and the Sand/ABPM treatment tub had 18 seedlings in the substrate and a large number of floating seedlings. Tubs at deeper waters (4-12 inches deep) had a few seedlings 4-8, mostly on the Sand/ABPM treatment. Soil samples were collected from each tub.

During the month of August, the tubs were examined twice, once on August 1, 2007 and on August 24, 2007. The number of plants in each tub did not change much. Marsh Soil/ABPM treatment tub 3 had four (4) Scirpus validus (Bulrush) seedlings, five (5) Scirpus sp. seedlings and one small Peltandra virginica (Arrow arum). Marsh Soil/ABPM tubs 1 & 2 did not have any vegetation. Sand/ABPM treatment tub 3 had eight seedlings of two different species. Tub 2 of the Sand/ABPM treatment has two (2) Scirpus sp seedlings and tub 1 did not have any vegetation. Marsh Soil treatment tub 3 was the only one with vegetation tubs 1 & 2 were void of vegetation. Tub 3 had one Scirpus validus, twelve (12) Peltandra virginica (Arrow arum) and five seedlings of two different species.

On September 18, the net covering the tubs were removed and the tubs were examined for plant growth. Marsh Soil/ABPM treatment tub 3 had four (4) Scirpus validus (Bulrush) and five (5) Scirpus sp. seedlings. Marsh Soil/ABPM tubs 1 & 2 did not have any vegetation. Sand/ABPM treatment tub 3 had two (2) Scirpus validuss plants and six seedlings of two different species. Tub 2 of the Sand/ABPM treatment continues to has two (2) Scirpus sp seedlings and tub 1 did not have any vegetation. Marsh Soil treatment tubs 1 & 2 did not have any vegetation. Tub 3 had one Scirpus validus, twelve (12) Peltandra virginica (Arrow arum) and 3 seedlings.

During our October 15 visit to the field, plants were harvested and brought to the Laboratory. Small seedlings were left on the tubs. Most of the Scirpus validuss (Bulrush) were heavily grazed. The Peltandra virginica (Arrow arum) were starting to die back. Each plant was dug in its entirety (Figure VII.B2). Plants were them brought into the laboratory were they were washed measured and pressed. Pressed plants were dry on an oven at 160°C for one week. Once dry, each plant was recorded, photographed, weighted, and separated into roots, stems and leaves. All plant material was later grounded and prepared for metal analysis.

On June 26 Tubs were examined for plant growth. Tubs closest to the shore were somewhat out of the water. The Soil treatment tub had 1-2 inches of water and 19 seedlings (three different species). The Sand/ABPM treatment was dry (no water above substrate), the AquaBlok was still moist and had a large number of seedlings (too many to count) of different species. Soil/ABPM treatment tub contained very little water and just a few seedlings. Three to four inches of water was added to tubs in order to fill them to their maximum capacity. Tubs at deeper waters did not have any seedlings at all.

On July 12 Tubs were first examined for plant growth and then cover with a net to prevent grazing of the newly developed seedlings. Marsh Soil/ABPM treatment tub 3 had nine (9) Scirpus sp. Seedlings and one (1) small Peltandra virginica (Arrow arum). Soil/ABPM treatment tubes 1 & 2 were cover with large amounts of algae. The Sand/ABPM treatment the tub closest to the shore (3) had 18 seedlings of three different species. Tub 2 had two (2) seedlings and tub 1 did not have any vegetation. The Marsh Soil treatment tub closest to the shore (3) had four (4) Scirpus sp. seedlings, twelve (12) Peltandra virginica

(Arrow arum) and three (3) other seedlings. The other two tubs (1 & 2) did not have any vegetation.

Table VII.B1. Field experiment 2007 season, plant germination and growth.

	Number of plants				
Treatment/replica	Jun 2007	July 2007	August 2007	September 2007	October 2007
Soil/ABPM 1	none	none	none	None	none
Soil/ABPM 2	4 seedlings	none	none	None	1 seadling
Soil/ABPM 3	12 seedlings (tmtc* floating)	9 Scirpus sp. Seedlings and 1small Peltandra virginica	4 Scirpus validus seedlings 5 Scirpus sp. seedlings 1 Peltandra virginica	4 Scirpus validus 5 Scirpus sp. seedlings	4 Scirpus validus (leaves grazed) 2 Scirpus sp. seedlings
Sand/ABPM 1	none	none	none	none	none
Sand/ABPM 2	8 seedlings	2 seedlings	2 Scirpus sp seedlings	2 Scirpus sp seedlings	1 Scirpus validus 1 Scirpus sp seedling
Sand/ABPM 3	18 seedlings	18 seedlings	8 seedlings	2 Scirpus validuss 6 seedlings ?	2 Scirpus validuss (leaves grazed) 6 seedlings ?
Soil 1	none	none	none	None	None
Soil 2	???	none	none	none	None
Soil 3	tmtc*	4 Scirpus sp. seedlings 12 Peltandra virginica 3 seedlings ?	1 Scirpus validus 12 Peltandra virginica 2 Scircus sp. seedlings 3 seedlings ?	1 Scirpus validus 12 Peltandra virginica 3 seedlings ?	1 Scirpus validus 5 Peltandra virginica 3 seedlings ?

tmtc* = to many to count

Figure VII.B1 Experimental field tubs (September 18, 2007) showing the 2007 seed germination and seasonal growth of SubmerSeeds plants. Notice that only the tubs that are not totally submerged contain vegetation. Tubes that were submerged during the entire season, do not have any vegetation.

Figure VII.B2. Field plant harvest. Each plant was dug in its entirety, washed and transported to the Lab

VII.B.3. Alternative Green house experiment.

The numbers of plants at each tube were recorded bi-weekly from February 2006 to May 2007 (Table VII.B2, Figure VII.B4). During the firth growing season (2006) *Zizania aquatica* and *Alisma subcordatum* were the dominant vegetation (Figure VII.B3). *Typha angustifolia* and *Phragmatis* (from the seed bank) did not start to develop until the end of the growing season. *Zizania aquatica* and *Alisma subcordatum* plants were allowed to flower and seed before the plants were harvested for metal analysis. Seeds were left on the tubs for future propagation. *Typha angustifolia* and *Phragmatis* (from the seed bank) survived the frost and continue to grow during the 2007 season. During the first and second month of the 2007 growing season, *Alisma subcordatum* become the dominant vegetation in all treatments. *Zizania aquatica* was only observed in small numbers, on the tubs caped with AquaBlok. Later during the season, *Phragmatis* took over the tubs caped with AquaBlok killing most of the *Typha angustifolia* and *Alisma subcordatum* plants. *Phragmatis* did not grow well on the tubs caped by amended AquaBlok, allowing *Typha angustifolia* and *Alisma subcordatum* plants to flourish. The control tubs containing marsh soil only (uncapped) showed a more balanced growth of all three species of plants, *Phragmatis, Typha angustifolia* and *Alisma subcordatum*.

Using a full plant growing season as the endpoint, tables VII.B2 & B3 summarizes the number of plants and the average size of the plants and their dry weight. The average plant dry weight in soil (control) were 3.8g/plant for *Zizania aquatica,* 5.4g/plant for *Alisma subcordatum,* 12.9g/plant for *Typha angustifolia* and 158.5gr/plant for *Phragmatis sp.* Plants growing in unamended AquaBlok have produced smaller plants with lower dry weight 1.2g/plant (3.8 g/plant) for *Zizania aquatica* and 2.1g/plant (5.8g/plant) for *Alisma* *subcordatum* when compared to those growing in soil (Figure VII.C5). The addition of 2% peat moss to AquaBlok improved its ability to serve as an alternative to sediment for the initial colonization stage. During the first growing season, the average plant weight for this treatment were 1.33gr/plant for *Zizania aquatica and 5.8*gr/plant for *Alisma subcordatum* (Table VII.B3). During the second growing season what so ever; *Alisma subcordatum* were smaller and had a less robust root system (Figure VII.B6). Notice that *Fragmatis sp.* was not able to grow on this substrate.

Table VII.B2. Plant germination and growth of alternative green house experiment. AB = AquaBlok, PM = amended with peat moss, UN = unamended

		Zizania aquatica			***Alisma subcordatum***			***Typha angustifolia***			***Phragmatis sp.***		
		AB UN	AB PM	Soil	AB UN	AB PM	Soil	AB UN	AB PM	Soil	AB UN	AB PM	Soil
2006	Feb	0	0	0	0	0	0	0	0	0	0	0	0
2006	March	0	0	0	0	0	0	0	0	0	0	0	0
2006	April	0	0	0	0	0	0	0	0	0	0	0	0
2006	May	12	30	25	25	48	58	0	0	0	0	0	0
2006	Jun	11	35	30	30	52	58	4	8	9	1	2	0
2006	July	10	32	28	45	52	48	4	8	9	1	2	0
2006	August	0	5	8	12	26	20	2	4	12	12	1	3
2006	September	0	0	2	12	20	14	2	4	18	12	1	6
2006	October	0	0	0	7	3	14	3	4	15	15	1	7
2006	November	0	0	0	5	3	12	3	4	13	15	1	7
2006	December	0	0	0	3	3	8	0	3	10	15	1	7
2007	January	0	0	0	3	3	8	0	2	5	15	0	7
2007	Feb	0	0	0	3	3	8	0	2	5	15	0	7
2007	March	0	0	0	3	3	8	0	2	5	15	0	7
2007	April	0	0	0	25	20	28	0	3	5	25	0	8
2007	May	5	0	0	30	20	32	0	3	6	25	0	8

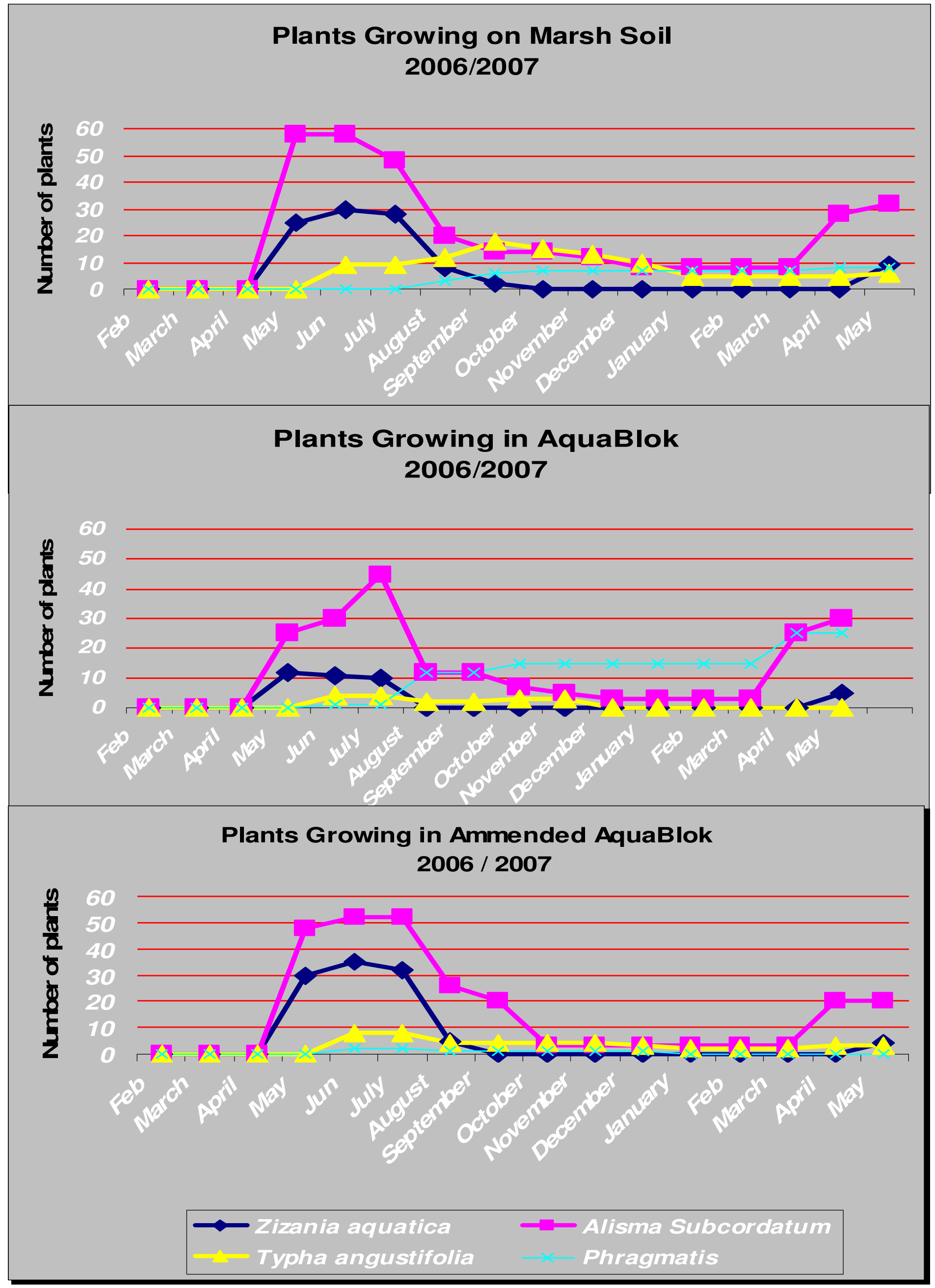


Figure Figure VII.B 3. Vegetation growing at each treatment during the 2006 and 2007 growing season on the Green house

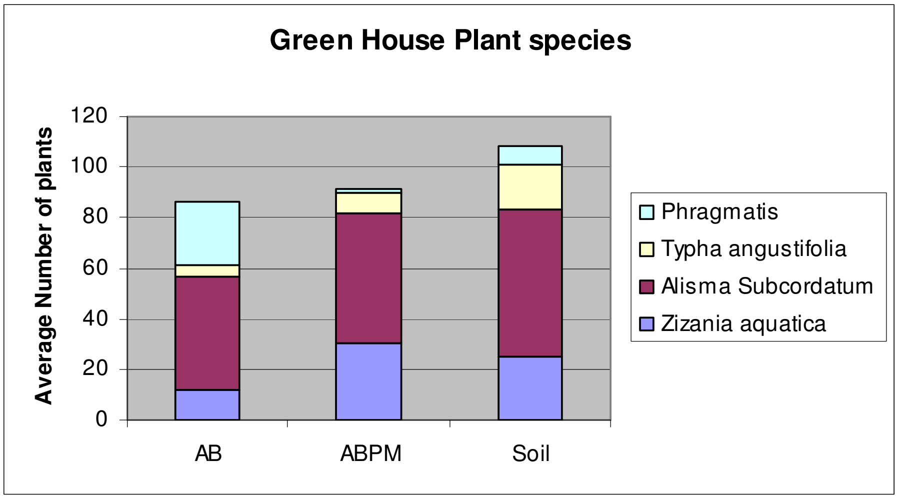


Figure VII.B4 Number of plants growing on a green house setting, at each treatment during the 2006 and 2007 growing season. AB=AquaBlok, PM= amended with 2%peat moss

Table VII.B3. Average size and dry weigh of plants growing at different treatments during 2006 and 2007. Soil, AB= AquaBlok and PM=amended with 2%peat moss NG= no growth. Y1=first Growing season, Y2+ second growing season.

Plant Species	**SOIL**		**AB**		**ABPM**	
	Average size (cm)	Average dry weight (gr)	Average size (cm)	Average dry weight (gr)	Average size (cm)	Average dry weight (gr)
Zizania aquatica	52.6	3.8	43.6	1.2	43.7	1.33
***Alisma subcordatum* Y1**	59.3	5.8	58.7	5.8	44.9	5.6
***Alisma subcordatum* Y2**	58.9	5.4	59.8	2.1	42.2	1.7
Typha angustifolia	92.2	12.9	NG	NG	74.4	10.1
Phragmatis sp	158.5	14.7	162.7	27.9	NG	NG

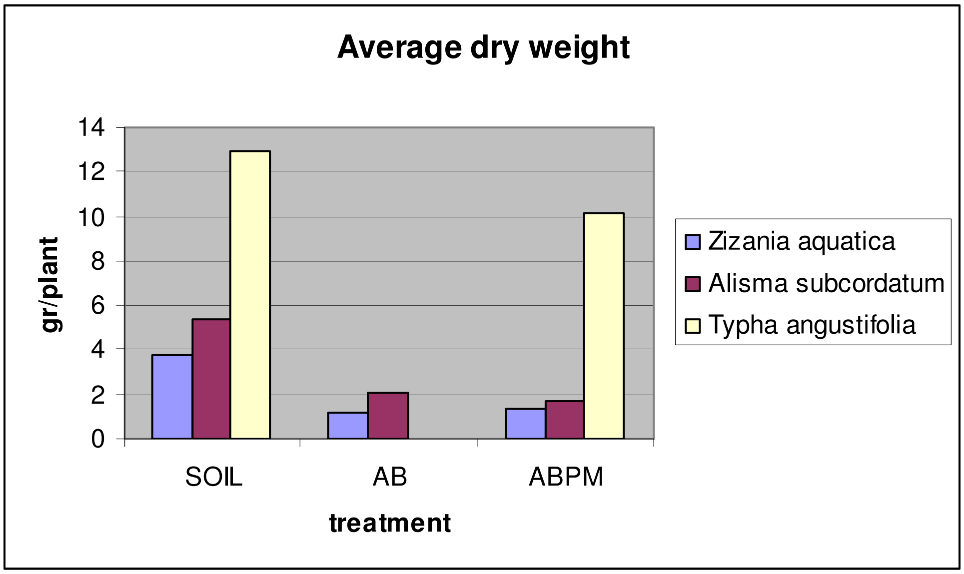


Figure VII.B5. Average plants dry weigh growing at different treatments during the second growing season. Soil, AB= AquaBlok and PM=amended with 2%peat moss.

During the examination of roots system, plants growing on marsh sediment have a more robust root system than plants growing in AquaBlok. While growing within the AquaBlok, roots appeared attached to the aggregate core of the SubmerSeed and continued to be heavily covered by the clay; this was more noticeable on the unamended AquaBlok than on the 2% peat moss amended AquaBlok (Figure VII.B5). The presence of organic matter on the amended AquaBlok is more conducive to seedling germination and initial root development and growth than unamended AquaBlok, therefore making it a better initial substrate.

Figure VII.B6. Representatives from each species growing in all three treatments were examined for their root system, their size and mass. Root system of test plants: Top left = roots of Alisma subcordatum growing in soil, amended AquaBlok and plain AquaBlok. Note the large amount of clay surrounding the roots (Submerseed composition). Top right = same roots after heavy washing to remove the clay. Note the healthy root system attached to the aggregate cores of the SubmerSeeds. Also noticeable is the longer less robust root system growing in plain AquaBlok (arrow). Middle = roots of Typha angustifolia growing in soil, amended AquaBlok and plain AquaBlok. Bottom left= roots of Zizania aquatica growing in soil and amended AquaBlok showing the same characteristics as above.

VII.C. BMI Community Characterization

Post-capping, the benthic macroinvertebrate community was sampled using Hester-Dendy and coring devices. Ekman dredge was not used because the gravel contained in the AquaBlok caused it to jam. Hester-Dendy were placed two per plot for one month. When collected, they were placed in plastic bags with site water and put on ice. Upon returning to the lab, organisms were immediately removed from Hester-Dendy, sieved through a 500 micron screen and stored in 70% ethanol. Core sampling devices consisted of plastic tubes with a 3 inch diameter. Three cores were collected per plot. The upper 4-5 inches of each core was put in a one liter, plastic container and put on ice. Upon returning to the lab, cores were stored at 4 °C before sieving as above and stored in 70% ethanol. Samples were later sorted into taxonomic groups (Table VII.C1) and counted. All specimens were stored in 70% ethanol. BMI were identified using several taxonomic guides sited in Section V.D of this report.

Table VII.C1. Identification of benthic macroinvertebrates collected from Hester-Dendy. Chironomidae were grouped at the Family level. Most organisms were identified to the Genus level. Some organisms were identified to the Species level (italicized).

Genus/Family	Common name	Table designation
Belastoma	giant water bug	Watrbug
Chironomidae (Family)	Larvae of midge fly	Chiron
Ephemerella	mayfly	Mayfly
Gammarus fasciatus	scud	Scud
Hesperagrion/Nehalennia	damsel fly (Genera combined)	Damsel
Palaemonetes pugio	grass shrimp	Shrimp
Physella	snail	Snail
Somatochlora	Green stripped dragonfly	Dragonfly

2005

Results from the September 28, 2005 sampling are shown in Tables VII.C2, C3, C4 and C5. Only six different taxa were found on Hester-Dendy. Chironmids were in the vast majority numbering in the thousands on some samplers (Table VII.C2 and Figure VII.C1). They are most likely the base of the foodweb. Scud and damselfly were also numerous.

Combining organisms from the two Hester-Dendys in each plot showed significant difference between groups. Control plots with or without SubmerSeed (S) had significantly less abundance than those with AquaBlok-Peat moss-SubmerSeed (AB-PM-S) (Figure VII.C 2). Biodiversity on Hester-Dendy were low, ranging from zero to 0.950 (Table VII.C3). There were no significant differences between plots; although, it was somewhat higher in Control than AB-PM-S (Figure VII.C3).

In September and August abundance of the macroinvertebrates on the Hester-Dendy collectors ranged from an average of 20 in combined control plots that have Submerseed which was significantly less than the average of 79 in combined AquaBlok plots that are amended with peat moss and have Submerseed ($p < 0.05$). The combined AquaBlok plots that are not amended with peat moss and are without Submerseed were not significantly different from the combined control plots or the combined AquaBlok plots that are amended with peat moss and have Submerseed (Figure VII.C4).

Core samples contained very few organisms, ranging from 0-3 individuals per core (Table VII.C5). Only chironomid or snails were found. More organisms may colonize the substrate in time. On September 28, 2005 the number of chironomid larvae from cores ranged from an average of 0 in plots 1, 3, 6, 7, 8, 9, and 10 to an average of 1.3 in plot 4.

The differences were not statistically significant. The average Shannon-Weiner Index was 0 in these plots. The number of chironomid larvae and aquatic snails averaged 0.3 in plot 2. This was not statistically significant. The average Shannon-Weiner Index was 0.231 in this plot (Table VII.C6). This was not statistically significant.

Table VII.C2. Benthic macroinvertebrates collected from Hester-Dendys on September 28, 2005, post capping. Replicate sampling devices were placed for 1 month in each plot. Values were number of individuals in each genera accept for chironomids, which is a Family. AB = AquaBlok, PM = peat moss, S = SumberSeed. Controls contained no AquaBlok.

		Family or Genera (common name)					
Treatment	Location	Gammarus (scud)	Hesperagrion/ Nehalennia (damselfly)	Somatochlora (dragonfly)	Ephemerella (mayfly)	Physella (snail)	Chironomidae (chironomid)
AB-S	plot 1 #1	1	2	1	0	0	> 500
	plot 1 #2	2	40	11	0	0	> 500
AB-PM-S	plot 2 #1	15	13	0	0	0	> 500
	plot 2 #2	4	53	0	0	0	> 500
Control	plot 3 #1	3	2	0	0	0	71
	plot 3 #2	11	6	1	1	0	> 500
AB	plot 4 #1	3	1	0	0	0	> 500
	plot 4 #2	3	4	0	0	1	> 500
AB-S	plot 5 #1	17	0	2	0	0	> 500
	plot 5 #2	7	2	0	1	1	> 500
AB-PM-S	plot 6 #1	5	0	1	0	0	> 500
	plot 6 #2	5	60	3	0	0	> 500
Control-S	plot 7 #1	0	0	0	0	0	22
	plot 7 #2	11	0	0	0	0	> 500
AB	plot 8 #1	9	10	0	0	1	> 500
	plot 8 #2	0	17	0	0	0	166
Control	plot 9 #1	1	0	2	0	0	> 500
	plot 9 #2	1	6	0	0	0	> 500
Control-S	plot 10 #1	10	1	3	0	0	> 500
	plot 10 #2	8	8	0	0	0	> 500

Table VII.C3. Abundance of benthic macroinvertebrates collected from Hester-Dendy on September 28, 2005. Treatm = treatment, Sample = replicate within plot, Loc = location based on plot grid, sum/rp = sum of organisms divided by number of replicates, Sum = total number of organisms.

Treatm	Sample	Loc	chiron	scud	watrbug	damsel	mayfly	shrimp	snail	dragonfly	unkn	Sum
AB un S	1-A	1C	500	1	0	2	0	0	0	1	0	504
1	1-B	5D	500	2	0	5	46	0	0	11	0	564
	Sum/rp		500.0	1.5	0.0	3.5	23.0	0.0	0.0	6.0	0.0	534.0
AB pm S	2-A	2A	500	15	0	2	11	0	0	0	0	528
2	2-B	4B	500	4	0	4	43	0	0	0	0	551
	Sum/rp		500.0	9.5	0.0	3.0	27.0	0.0	0.0	0.0	0.0	539.5
control	3-A	3A	71	3	0	2	0	0	0	0	0	76
3	3-B	2E	500	11	0	2	3	0	0	1	0	517
	Sum/rp		285.5	7.0		2.0	1.5	0.0	0.0	0.5	0.0	296.5
AB un	4-A	4E	500	3	0	1	0	0	0	0	0	504
4	4-B	2D	500	2	0	2	0	0	1	0	0	505
	Sum/rp		500.0	2.5	0.0	1.5	0.0	0.0	0.5	0.0	0.0	504.5
AB un S	5-A	9A	500	17	0	0	0	0	0	2	0	519
5	5-B	5B	500	7	0	2	1	0	1	0	0	511
	Sum/rp		500	12	0	0.5	0.5	0	0.5	1	0	515
AB pm S	6-A	5E	500	5	0	0	0	0	0	1	0	506
6	6-B	2B	500	7	0	5	52	0	0	4	0	568
	Sum/rp		500.0	6.0	0.0	0.0	26.0	0.0	0.0	2.5	0.0	537.0
Control S	7-A	5D	22	0	0	0	0	0	0	0	0	22
7	7-B	5B	500	11	0	0	0	0	0	0	0	511
	Sum/rp		261.0	5.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	266.5
AB un	8-A	2B	500	9	0	6	2	0	1	0	1	519
8	8-B	4E	166	0	0	0	17	0	0	0	0	183
	Sum/rp		333.0	4.5	0.0	0.0	9.5	0.0	0.5	0.0	0.5	351.0
Control	9--A	4C	500	1	0	0	0	0	0	2	0	503
9	9--B	2B	500	1	0	0	6	0	0	0	0	507
	Sum/rp		500.0	1.0	0.0	0.0	3.0	0.0	0.0	1.0	0.0	505.0

Control S	10--A	3A	500	10	0	1	2	0	0	1	0	514
10	10--B	4D	500	8	0	2	6	0	0	0	0	516
	Sum/rp		500.0	9.0	0.0	0.0	4.0	0.0	0.0	0.5	0.0	515.0

Table VII.C4. Analysis of benthic macroinvertebrates data from Hester-Dendys on September 28, 2005, postcapping. AB = AquaBlok, PM = peat moss, S = SumberSeed. Controls contained no AquaBlok. Abundance is number of organisms. Richness is number of species. H' is Shannon-Weiner Index. Chironomids were included in abundance or H'.

Group	Plot/replicate	abundance	abundance[a]	richness	richness[a]	H'	H'[a]
Control	plot 3 #1	5		3		0.673	
	plot 3 #2	19	24	5	5	0.990	0.918
	plot 9 #1	3		3		0.637	
	plot 9 #2	7	10	3	4	0.410	0.95
Control-S	plot 7 #1	0		1		0.000	
	plot 7 #2	11	11	2	2	0.000	0
	plot 10 #1	14		4		0.759	
	plot 10 #2	16	30	3	4	0.693	0.898
AB	plot 4 #1	4		3		0.562	
	plot 4 #2	8	12	4	4	0.974	0.918
	plot 8 #1	20		4		0.856	
	plot 8 #2	17	37	2	4	0.000	0.671
AB-S	plot 1 #1	4		4		1.040	
	plot 1 #2	53	57	4	4	0.662	0.708
	plot 5 #1	19		3		0.336	
	plot 5 #2	11	30	5	6	1.034	0.766
AB-PM-S	plot 2 #1	28		3		0.691	
	plot 2 #2	57	85	3	3	0.254	0.531
	plot 6 #1	6		3		0.451	
	plot 6 #2	68	74	4	4	0.440	0.598

[a]Data from plot replicates were combined

Table VII.C5. Benthic macroinvertebrates collected from substrate cores on September 28, 2005, post capping. Three replicate samples were collected in each plot. Values were number of individuals within each genera accept for chironomids and oligochaetes. AB = AquaBlok, PM = peat moss, SS = SumberSeed. Controls contained no AquaBlok.

		Family or Genus (common name)						
Treatment	Location	Gammarus (scud)	Hesperagrion/Nehalennia (damselfly)	Somatochlora (dragonfly)	Ephemerella (mayfly)	Physella (snail)	(oligochaete)	Chironomidae (chironomid)
AB-SS	plot 1 A	0	0	0	0	0	0	0
	plot 1 B	0	0	0	0	0	0	0
	plot 1 C	0	0	0	0	0	0	0
AB-PM-SS	plot 2 A	0	0	0	0	0	0	0
	plot 2 B	0	0	0	0	0	0	0
	plot 2 C	0	0	0	0	1	0	1
Control	plot 3 A	0	0	0	0	0	0	0
	plot 3 B	0	0	0	0	0	0	0
	plot 3 C	0	0	0	0	0	0	0
AB	plot 4 A	0	0	0	0	0	0	3
	plot 4 B	0	0	0	0	0	0	1
	plot 4 C	0	0	0	0	0	0	0
AB-SS	plot 5 A	0	0	0	0	0	0	3
	plot 5 B	0	0	0	0	0	0	0
	plot 5 C	0	0	0	0	0	0	0
AB-PM-SS	plot 6 A	0	0	0	0	0	0	0
	plot 6 B	0	0	0	0	0	0	0
	plot 6 C	0	0	0	0	0	0	0
Control-SS	plot 7 A	0	0	0	0	0	0	0
	plot 7 B	0	0	0	0	0	0	0
	plot 7 C	0	0	0	0	0	0	0
AB	plot 8 A	0	0	0	0	0	0	0
	plot 8 B	0	0	0	0	0	0	0
	plot 8 C	0	0	0	0	0	0	0
Control	plot 9 A	0	0	0	0	0	0	0
	plot 9 B	0	0	0	0	0	0	0
	plot 9 C	0	0	0	0	0	0	0
Control-SS	plot10 A	0	0	0	0	0	0	0
	plot10 B	0	0	0	0	0	0	0
	plot10 C	0	0	0	0	0	0	0

Table VII.C6. Shannon-Weiner index for benthic macroinvertebrates present in substrate cores after capping (collected September 28, 2005).

Plot	Specimens	Shannon-Weiner Index
1A	None	0
1B	None	0
1C	None	0
Average	0	0
2A	None	0
2B	None	0
2C	chironomid larva (1) and aquatic snail (1)	0.692
Average	0.3	0.231
3A	None	0
3B	None	0
3C	None	0
Average	0	0
4A	Chironomid larvae (3)	0
4B	Chironomid larva (1)	0
4C	None	0
Average	1.3	0
5A	Chironomid larvae (3)	0
5B	None	0
5C	None	0
Average	1	0
6A	None	0
6B	None	0
6C	None	0
Average	0	0
7A	None	0
7B	None	0
7C	None	0
Average	0	0
8A	None	0
8B	None	0
8C	None	0
Average	0	0
9A	None	0
9B	None	0
9C	None	0
Average	0	0
10A	None	0
10B	None	0
10C	None	0
Average	0	0

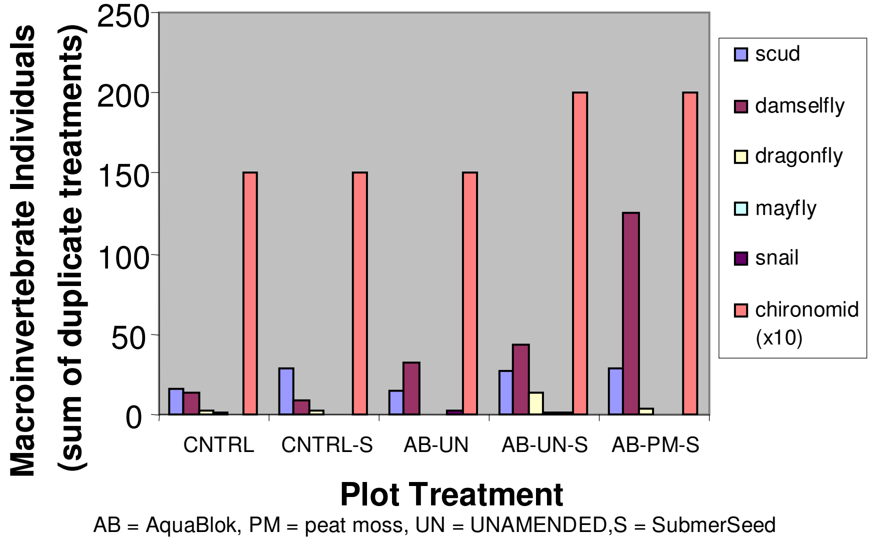


Figure VII.C1. Benthic macroinvertebrates collected on September 28, 2005 from Hester-Dendy

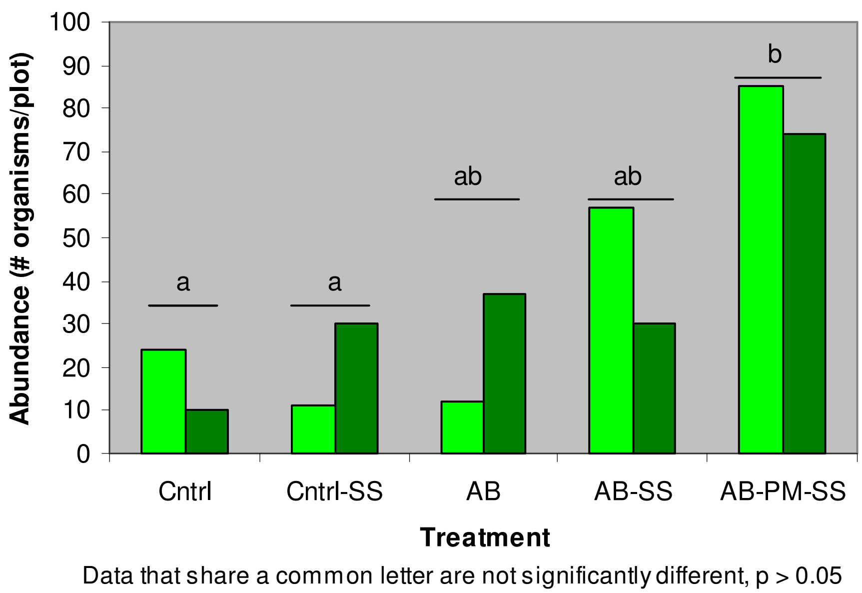


Figure VII.C2. Abundance on Hester-Dendys collected September 28, 2005

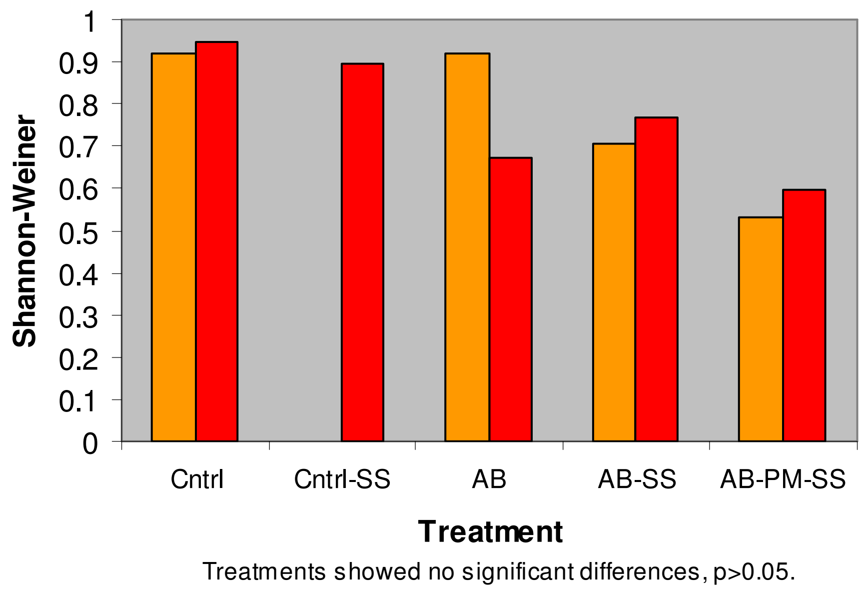


Figure VII.C3. Biodiversity on Hester-Dendy collected September 28, 2005

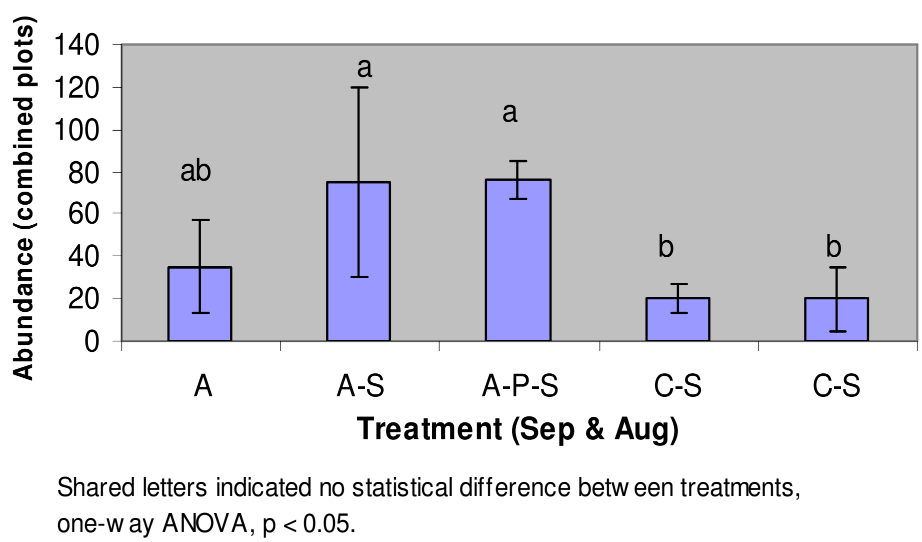


Figure VII.C4. Effects of treatments on microinvertebrate abundance

2006

The abundance of macroinvertebrates on the Hester-Dendy collectors was greatest in the controls without S and was least in A with S in May of 2006 (Table VII.C7). Abundance in combined controls was 1127 individuals and in combined A without S it was 482 individuals. The majority of individuals were always chironomids and scuds (*Gammarus*) (Table VII.C7).

In the substrate cores, the number of gammarids ranged from an average of 0 in plots 1, 3, 4, 5, 6, 7, 8, 9 and 10 to an average of 0.3 in plot 2 which contains AquaBlok that is amended with peat moss and has Submerseed. The average Shannon-Weiner Index was 0 in all plots (Table VII.C8). The number of chironomids ranged from an average of 0 in plots 1, 2, 3, 4, 7, 8, 9 and 10 to an average of 0.3 in plots 5 and 6. Plot 5 contains AquaBlok that is unamended with peat moss and has Submerseed and plot 6 contains AquaBlok that is amended with peat moss and has Submerseed (Table VII.C8).

In May of 2006 the abundance on Hester-Dendys was greatest in plot 3 which is a control and was least in plot 10 which is a control that has Submerseed (Figure VII.C5). The Shannon-Weiner Index was and average of 0.6 or above in all plots except plots 7 and 9 which are controls with and without Submerseed respectively (Figure VII.C6).

The abundance of macroinvertebrates on the Hester-Dendy collectors was greatest in A without PM or S and was least in the controls without S in August of 2006 (Table VII.C9). Abundance in combined A without PM or S was 607 individuals and in combined A without PM or S it was 85 individuals. Once again the majority of the individuals were always chironomids and scuds (*Gammarus*) (Table VII.C9). On November 21, 2006 the number of specimens in the substrate cores was average of 0 in all plots. The Shannon-Weiner Index was 0 in all plots (Table VII.C10).

Table VII.C7. Abundance of benthic macroinvertebrates collected from Hester-Dendy on May 10, 2006. Treatm = treatment, Sample = replicate within plot, Loc = location based on plot grid, sum/rp = sum of organisms divided by number of replicates, Sum = total number of organisms. See Table VII.C1 for organism identifications.

Treatm	Sample	Loc	chiron	scud	watrbug	damsel	mayfly	shrimp	snail	dragonfly	unkn	Sum
AB S	1-A	1C	148	75	0	0	14	0	0	0	0	237
1	1-B	5D	224	84	0	0	3	0	0	0	0	311
	1-C	4B	53	53	0	0	1	0	0	0	0	107
	sum/rp		141.7	70.7	0.0	0.0	6.0	0.0	0.0	0.0	0.0	218.3
AB PM S	2-A	2A	250	98	0	0	1	0	0	0	0	349
2	2-B	4B	91	47	0	0	0	0	0	1	0	139
	2-C	6D	246	95	0	0	0	0	0	0	0	341
	sum/rp		195.7	80.0	0.0	0.0	0.3	0.0	0.0	0.3	0.3	276.3
Control	3-A	3A	288	234	0	0	3	0	0	0	0	525
3	3-B	2E	358	416	0	0	1	0	0	0	0	775
	3-C	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	sum/rp		323.0	325.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	650.0
AB	4-A	4E	251	294	0	0	1	0	0	0	0	546
4	4-B	2D	111	59	0	0	0	0	0	0	0	170
	4-C	3A	313	177	0	0	0	0	0	0	0	490
	sum/rp		225.0	176.7	0.0	0.0	0.3	0.0	0.0	0.0	0.0	402.0
AB S	5-A	9A	215	118	0	1	4	0	1	0	0	339
5	5-B	5B	97	91	0	0	0	0	0	0	0	188
	5-C	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	sum/rp		156.0	104.5	0.0	0.5	2.0	0.0	0.5	0.0	0.0	263.5
AB PM S	6-A	5E	98	141	0	0	1	0	0	0	0	240
6	6-B	2B	56	138	0	0	0	0	0	0	0	194
	6-C	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	sum/rp		77.0	139.5	0.0	0.0	0.5	0.0	0.0	0.0	0.0	217.0
Control S	7-A	5D	24	166	0	0	0	0	0	0	0	190
7	7-B	5B	223	227	0	0	0	0	0	0	0	450
	7-C	1D	243	159	ND	0	0	ND	0	0	0	402

Treatm	Sample	Loc	chiron	scud	watrbug	damsel	mayfly	shrimp	snail	dragonfly	unkn	Sum
	sum/rp		163.3	184.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	347.3
AB	8-A	2B	361	146	0	0	0	0	0	0	0	507
8	8-B	4E	201	167	0	0	0	0	0	0	0	368
	8-C	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	sum/rp		281.0	156.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	437.5
Control	9--A	4C	334	52	0	0	4	0	0	0	1	391
9	9--B	2B	445	116	0	0	2	0	0	0	0	563
	9-C	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	sum/rp		389.5	84.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0	477.0
Control S	10--A	3A	57	34	0	0	1	0	0	0	0	92
10	10--B	4D	226	86	0	0	10	0	0	0	0	322
	10-C	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	sum/rp		141.5	60.0	0.0	0.0	5.5	0.0	0.0	0.0	0.0	207.0

Table VII.C8. Benthic macroinvertebrates present in substrate cores on May 10, 2006. AB=AquaBlok, PM=2% peat moss amendment, S=SubmerSeed, C=control

Site	Habitat	Specimens	Shannon-Weiner Index	Loc
1A	AB S	None	0	1C
1B	AB S	None	0	5D
1C	AB S	None	0	4A
Average		0	0	
2A	AB PM S	None	0	2A
2B	AB PM S	Gammarid (1)	0	4B
2C	AB PMS	None	0	6D
Average		0.3	0	
3A	C	None	0	3A
3B	C	None	0	3D
3C	C	None	0	2B
Average		0	0	
4A	AB	None	0	4E
4B	AB	None	0	2D
4C	AB	None	0	3A
Average		0	0	
5A	AB S	None	0	9A
5B	AB S	None	0	7C
5C	AB S	Chironomid (1)	0	4C
Average		0.3	0	
6A	AB PM S	None	0	5E
6B	AB PM S	Chironomid (1)	0	2B
6C	AB PM S	None	0	2D
Average		0.3	0	
7A	C S	None	0	5D
7B	C S	None	0	5B
7C	C S	None	0	1C
Average		0	0	
8A	AB	None	0	4D
8B	AB	None	0	2B
8C	AB	None	0	5A
Average		0	0	
9A	C	None	0	4C
9B	C	None	0	2B
9C	C	None	0	4E
Average		0	0	
10A	C S	None	0	3A
10B	C S	None	0	4C
10C	C S	None	0	2D
Average		0	0	

Table VII.C9. Abundance of benthic macroinvertebrates collected from Hester-Dendy on August 10, 2006. Treatm = treatment, Sample = replicate within plot, Loc = location based on plot grid, sum/rp = sum of organisms divided by number of replicates, Sum = total number of organisms. See Table VII.C1 for organism identifications.

Treatm	Sample	Loc	chiron	scud	watrbug	damsel	mayfly	shrimp	snail	dragonfly	unkn	Sum
AB un S	1-A	1C	500.0	41.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	180.3
1	1-B	5D	500.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	168.0
	1-C	4B	153.0	26.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	59.7
	Sum/rp		384.3	23.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	136.0
AB pm S	2-A	2A	500.0	40.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	180.3
2	2-B	4B	500.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	167.7
	2-C	6D	364.0	11.0	0.0	4.0	0.0	0.0	0.0	0.0	0.0	126.3
	Sum/rp		454.7	18.0	0.0	1.7	0.0	0.0	0.0	0.0	0.0	158.1
control	3-A	3A	70.0	11.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	82.0
3	3-B	2E	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	3-C	5D	33.0	10.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	43.0
	Sum/rp		23.3	3.7	0.0	0.0	0.3	0.0	0.0	0.0	0.0	27.3
AB un	4-A	4E	294.0	22.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	317.0
4	4-B	2D	500.0	11.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	512.0
	4-C	3A	326.0	26.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	352.0
	Sum/rp		373.3	19.7	0.0	0.3	0.0	0.3	0.0	0.0	0.0	393.7
AB un S	5-A	9A	500.0	116.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	616.0
5	5-B	5B	116.0	14.0	0.0	0.0	0.0	3.0	0.0	0.0	0.0	133.0
	5-C	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Sum/rp		308.0	65.0	0.0	0.0	0.0	1.5	0.0	0.0	0.0	374.5
AB pm S	6-A	5E	500.0	55.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	555.0
6	6-B	2B	126.0	17.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	143.0
	6-C	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Sum/rp		313.0	36.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	349.0
Control S	7-A	5D	26.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	28.0
7	7-B	5B	14.0	30.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	45.0

Treatm	Sample	Loc	chiron	scud	watrbug	damsel	mayfly	shrimp	snail	dragonfly	unkn	Sum
	7-C	1D	68.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	70.0
	Sum/rp		36.0	11.3	0.0	0.3	0.0	0.0	0.0	0.0	0.0	47.7
AB un	8-A	2B	193.0	19.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	213.0
8	8-B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	8-C	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Sum/rp		193.0	19.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	213.0
control	9--A	4C	56.0	12.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	68.0
9	9--B	2B	52.0	10.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	64.0
	9-C	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Sum/rp		54.0	11.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	66.0
Control S	10--A	3A	9.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.0
10	10--B	4D	64.0	1.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	66.0
	10-C	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Sum/rp		36.5	0.5	0.0	0.5	0.0	0.0	0.0	0.0	0.0	37.5

Table VII.C10. Benthic macroinvertebrates collected in substrate cores on November 21, 2006. AB=AquaBlok, PM=2% peat moss amendment, S=SubmerSeed, C=control

Site	Habitat	Specimens	Shannon-Weiner Index	Loc
1A	AB S	None	0	1C
1B	AB S	None	0	5D
1C	AB S	None	0	4A
Average		0	0	
2A	AB PM S	None	0	2A
2B	AB PM S	None	0	4B
2C	AB PMS	None	0	6D
Average		0	0	
3A	C	None	0	3A
3B	C	None	0	3D or 2B
3C	C	None	0	
Average		0	0	
4A	AB	None	0	4E
4B	AB	None	0	2D
4C	AB	None	0	3A
Average		0	0	
5A	AB S	None	0	9A
5B	AB S	None	0	7C or 4C
5C	AB S	None	0	
Average		0	0	
6A	AB PM S	None	0	5E
6B	AB PM S	None	0	2B or 2D
6C	AB PM S	None	0	
Average		0	0	
7A	C S	None	0	5D
7B	C S	None	0	5B
7C	C S	None	0	1C
Average		0	0	
8A	AB	None	0	4D
8B	AB	None	0	2B or 5A
8C	AB	None	0	
Average		0	0	
9A	C	None	0	4C
9B	C	None	0	2B or 4E
9C	C	None	0	
Average		0	0	
10A	C S	None	0	3A
10B	C S	None	0	4C or 2D
10C	C S	None	0	
Average		0	0	

During 2006, an analysis of biodiversity on organisms that were collected on Hester-Dendy showed large variances between plots as well as within plot replicates. This apparent inverse relationship was likely due to high abundance of only one or two taxa. Organisms that were collected on Hester-Dendy only represented some of the BMI in the marsh.

The abundance and the Shannon-Weiner Index of the macroinvertebrates on the Hester-Dendy collectors were greater in May of 2006 than it was in September of 2005 and August of 2006 (Figures VII.C5, C6).

Analyses showed nine different types of organisms. Chironomids accounted for the vast majority. Scuds were typically abundant in May, and mayflies were abundant in September. Overall, abundance was highest in September and lowest in August. The influence of DO on abundance was assessed using Pearson's Correlation coefficient (Figures VII.C7 and C8). There was a significant positive correlation in August ($r = 0.492$, $p \leq 0.05$) and a similar correlation in September ($r = 0.411$), which was not statistically significant, $p = 0.071$. It was likely that the correlation between abundance and DO was lost above 6.0 mg/L and that this accounted for the lack of significance in September. No correlation was found for May data. However, DO was similar at all sites on this date.

Between 2005 and 2006, total abundance of *Gammarus* was greatest in A, APS, C and CS in May of 2006 ($p < 0.05$). There were no other significant differences (Figure VII.C9). However between 2005 and 2006 for chironomids, total abundance was greatest in September of 2005 and August of 2006 in A, AS and APS ($p < 0.05$). It was greatest in A and C in September of 2005 and May of 2006 ($p < 0.05$). It was least in A, AS and APS in May of 2006 and November of 2006 ($p < 0.05$). It was also least in C and CS in August and November of 2006 ($p < 0.05$) (Figure VII.C10).

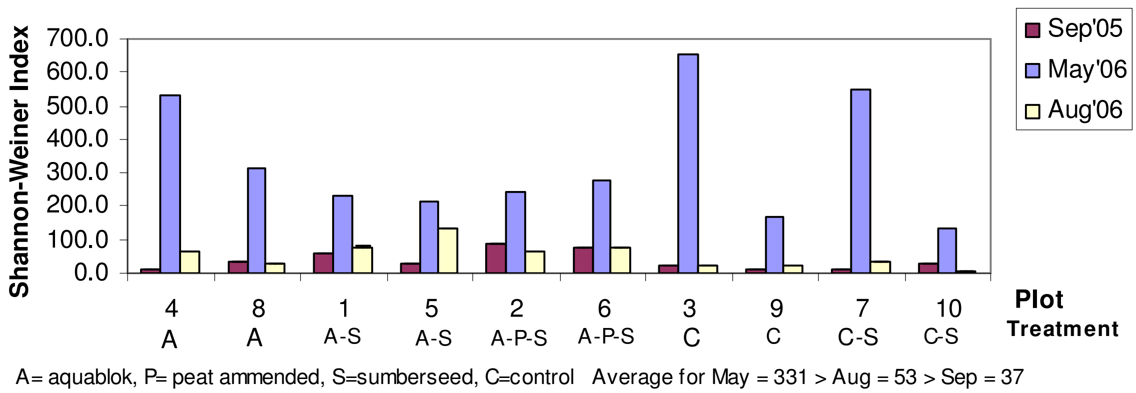


Figure VII.C5. Abundance of Organisms for each Plot and Treatment

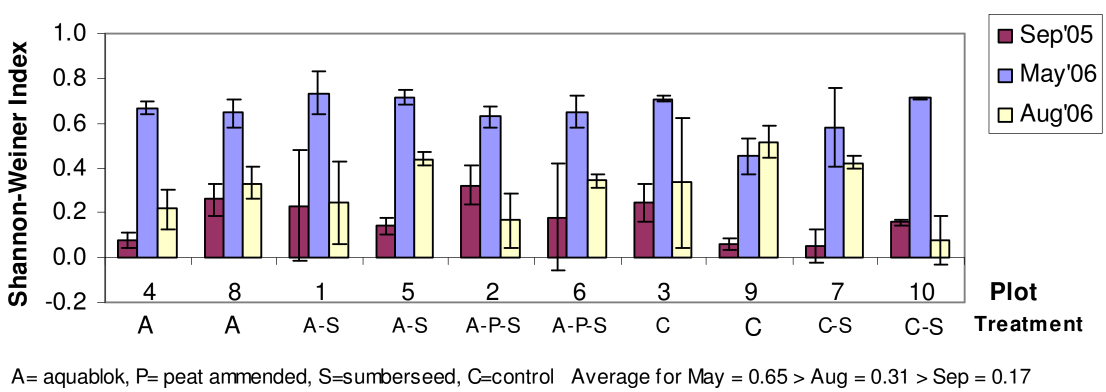


Figure VII.C6. Shannon-Weiner Diversity for each Plot and Treatment.

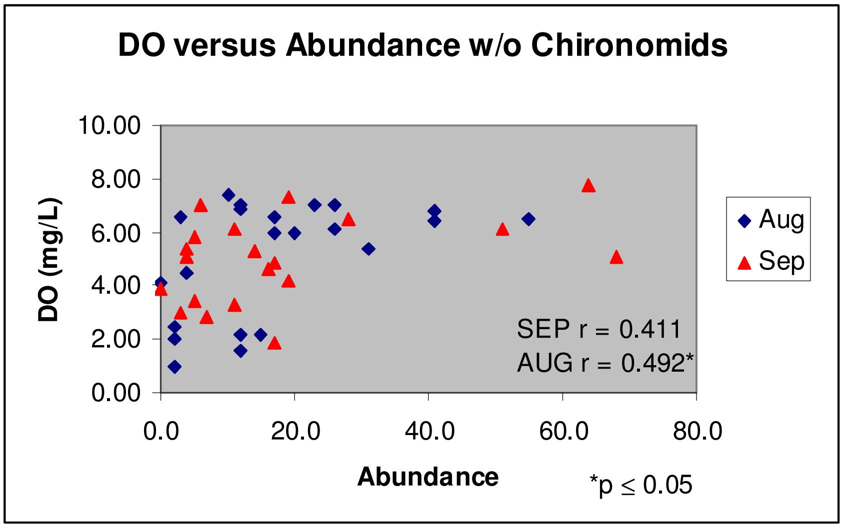


Figure VII.C7 . Correlation of benthic macroinvertebrate abundance with dissolved oxygen concentration (DO). Each value represents a replicate compared with DO at that site. The sum of organisms does not include chironomids. The correlation for August (Aug 2006) was statistically significant. That for September (SEP 2005) was nearly so, p = 0.072.

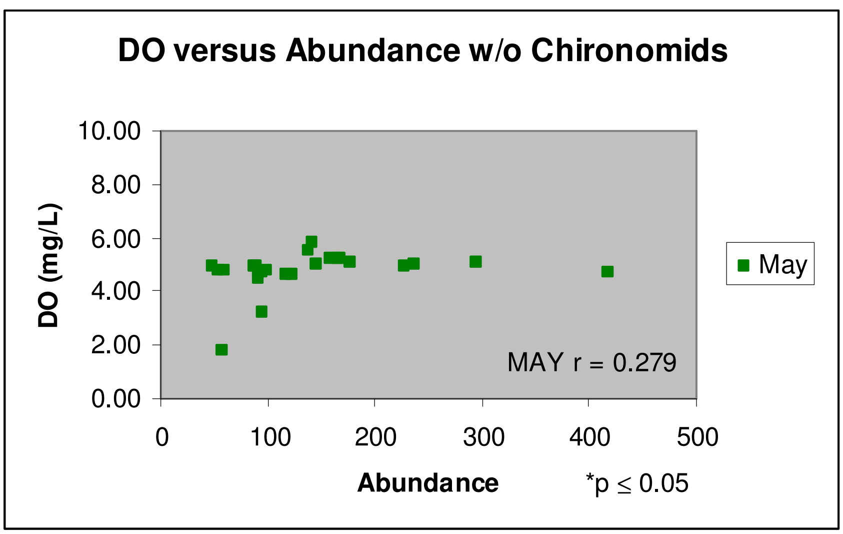


Figure VII.C8. Correlation of benthic macroinvertebrate abundance with dissolved oxygen concentration (DO) in May only. Each value represents a replicate compared with DO at that site. The sum of organisms does not include chironomids. The correlation for May was not statistically significant.

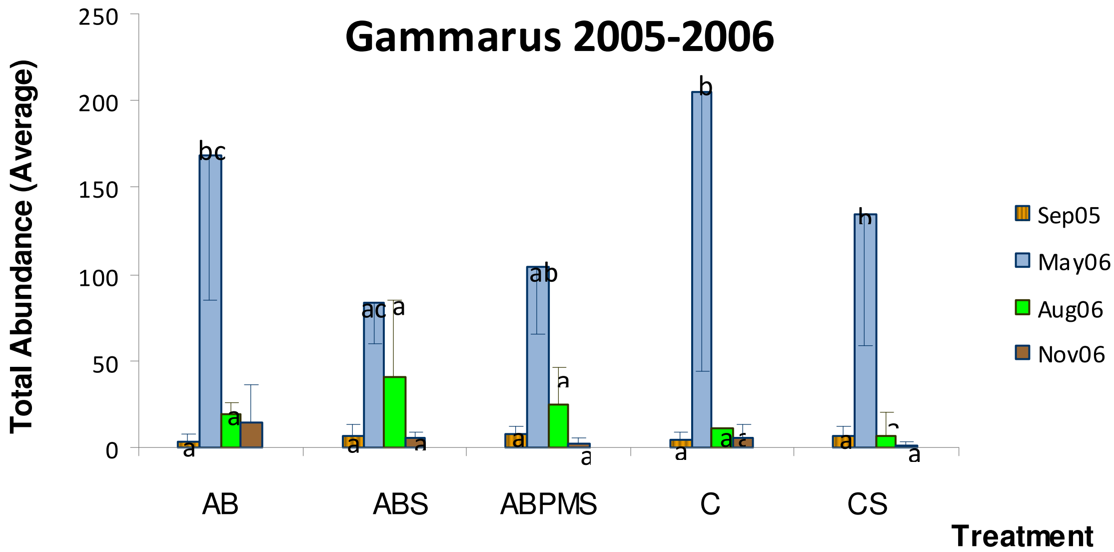


Figure VII.C9. Abundance of *Gammarus* during 2005 and 2006 period.

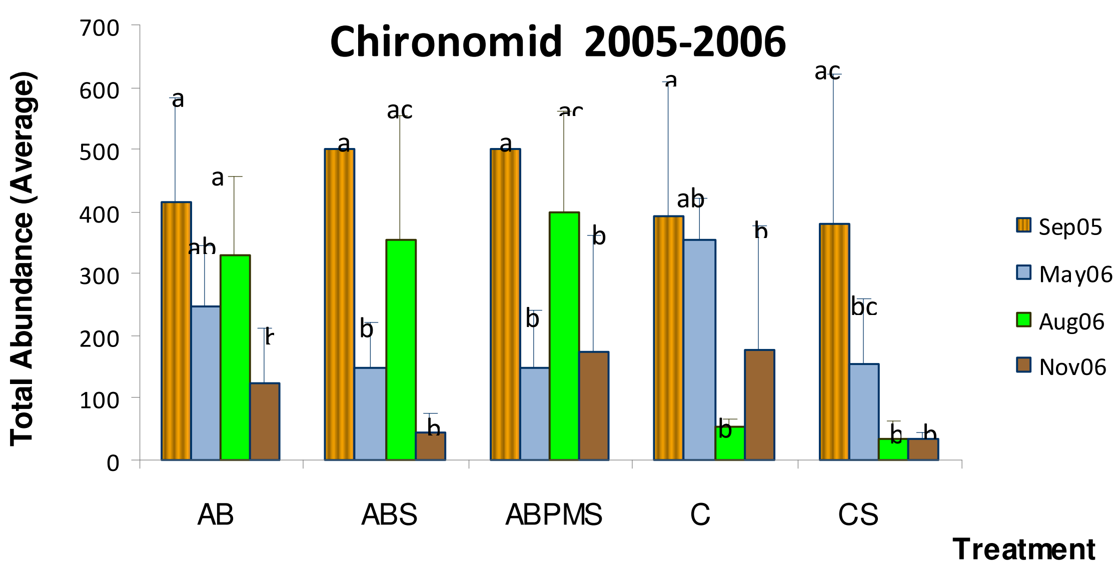


Figure VII.C10. Abundance of Chironomids during 2005 and 2006 period

2007

The abundance of macroinvertebrates on the Hester-Dendy collectors was greatest in the control and was least in the A with PM and S in May of 2007 (Figure VII.C11). Abundance in combined controls was 351 individuals and in combined A with PM and S it was 261 individuals. The majority of the individuals were chironomids and scuds (*Gammarus*) (Table VII.C11). On June 28, 2007 chironomids in substrate cores were an average of 0.7 in plots 4 and 9 (AquaBlok without peat moss and a control respectively) and an average of 1.0 in plot 2 which has AquaBlok, peat moss, and Submerseed. Chironomids were not found in any other plots. The abundance of macroinvertebrates in the substrate cores was greatest in A with PM and S followed by A without PM and S and a control and was least in all other plots in June of 2007 (Table VII.C12). Abundance in combined A with PM and S was 3 individuals and 2 individuals in both A without PM and S and a control. The individuals present were chironomids. The Shannon-Weiner index was 0 in all plots (Table VII.C12).

The abundance of macroinvertebrates on the Hester-Dendy collectors was greatest in A without PM and S and was least in the controls with S in July of 2007 (Table VII.C13). Abundance in combined A without PM and S was 1,098 individuals and in combined controls with S it was 180 individuals. The majority of the individuals were chironomids and scuds (*Gammarus*) (Table VII.C13).

On August 10, 2007 the number of limpets in substrate cores ranged from an average of 0 in plots 2-10 to an average of 0.5 in plot 1 which contains AquaBlok that is not amended with peat moss and has Submerseed. The average Shannon-Weiner Index was 0 in all plots (Table VII.C14). The number of gammarids ranged from an average of 0 in plots 1-4 and 6-10 to an average of 0.3 in plot 5 which contains AquaBlok that is not amended with peat moss and has Submerseed (Figure VII.C14). The Shannon-Weiner Index was 0 in all plots. The number of winged ants ranged from an average of 0 in plots 1-5 and 7-10 and 0.3 in plot 6 which contains AquaBlok that is amended with peat moss and has Submerseed. The Shannon-Weiner Index was 0 in all plots. The number of chironomids ranged from an average of 0 in plots 1, 3, 5, 6, 7 and 9 to an average of 0.5 in plot 2, 0.3 in plots 4, 8, and 10. Plot 2 contains AquaBlok that is amended with peat moss and has Submerseed, plots 4 and 8 contain AquaBlok that is not amended with peat moss, and plot 10 is a control that has Submerseed (Figure VII.C14). The average Shannon-Weiner Index was 0 in all plots (Table VII.C14).

On November 16, 2007 chironomids in substrate cores were an average of 0.7 in plot 5 which has AquaBlok without peat moss and Submerseed and an average of 1.0 in plot 6 which has AquaBlok, peat moss and Submerseed. Gammarids were an average of 0.7 in plot 6. No invertebrates were found in the other plots. The Shannon-Weiner index was 0.233 in plot 6 and 0 in the other plots (Table VII.C16). The abundance of macroinvertebrates on the Hester-Dendy collectors was greatest in A with PM and S and was least in the controls with S in November of 2007 (Table VII.C15). Abundance in combined A with PM and S was 316 individuals and in combined controls with S it was 36 individuals. The majority of the individuals were chironomids and scuds (*Gammarus*)

Table VII.C11. Abundance of benthic macroinvertebrates collected from Hester-Dendy on May 22, 2007. Treatm = treatment, Sample = replicate within plot, Loc = location based on plot grid, sum/rp = sum of organisms divided by number of replicates, Sum = total number of organisms. See Table VII.C1 for organism identifications.

Sample #	Loct	chironomid	Scud	Waterbug	damselfly 1	damselfly 2	Haliplus	Helobdella	mayfly	Shrimp	Snail	polykete	Dragonfly	Sum
AB S 1-A	1C	62.0	91.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	153.0
1-B	5D	40.0	6.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	46.0
1-C	4B	167.0	26.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	193.0
Sum/replicate		89.7	41.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	130.7
ABPM2-A	2A	45.0	33.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	79.0
2-B	4B	50.0	59.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	109.0
2-C	6D	40.0	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	45.0
Sum/replicate		45.0	32.3	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	77.7
Control 3-A	3A	36.0	88.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	124.0
3-B	2E	79.0	49.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	128.0
3-C	5D	2.0	34.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.0
Sum/replicate		117.3	171.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	288.0
AB 4-A	4E	100.0	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	105.0
4-B	2D	42.0	118.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	160.0
4-C	3A	39.0	28.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	67.0
Sum/replicate		60.3	50.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	110.7
AB S 5-A	9A	222.0	27.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	249.0
5-B	5B	162.0	17.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	179.0
5-C	ND	107.0	54.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	161.0
Sum/replicate		163.7	32.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	196.3
ABPM6-A	5E	222.0	44.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	266.0
6-B	2B	184.0	69.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	253.0
6-C	ND	18.0	12.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	30.0

Sample #	Loct	chironomid	Scud	Waterbug	damselfly 1	damselfly 2	Haliplus	Helobdella	mayfly	Shrimp	Snail	polykete	Dragonfly	Sum
Sum/replicate		141.3	41.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	183.7
Control S														
7-A	5D	22.0	113.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	135.0
7-B	5B	50.0	30.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	80.0
7-C	1D	266.0	107.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	373.0
Sum/replicate		112.7	83.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	196.3
AB 8-A	2B	140.0	67.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	207.0
8-B	ND	106.0	12.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	118.0
8-C	ND	145.0	86.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	231.0
Sum/replicate		130.3	55.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	185.3
Control														
9--A	4C	41.0	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	46.0
9--B	2B	84.0	10.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	96.0
9-C	ND	47.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	47.0
Sum/replicate		57.3	5.0	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	63.0
Control S														
10--A	3A	28.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	28.0
10--B	4D	74.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	76.0
10-C	ND													
Sum/replicate		102.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	104.0

Table VII.C12. Benthic macroinvertebrates collected in substrate cores on June 28, 2007. AB=AquaBlok, PM=2% peat moss amendment, S=SubmerSeed, C=control.

Site	Habitat	Specimens	Shannon-Weiner Index	Loc
1A	AB S	None	0	1C
1B	AB S	None	0	5D
1C	AB S	None	0	4A
Average		0	0	
2A	AB PM S	None	0	2A
2B	AB PM S	Chironomid (3)	0	4B
2C	AB PMS	None	0	6D
Average		1.0	0	
3A	C	None	0	3A
3B	C	None	0	3D or 2B
3C	C	None	0	
Average		0	0	
4A	AB	None	0	4E
4B	AB	Chironomid (2)	0	2D
4C	AB	None	0	3A
Average		0.7	0	
5A	AB S	None	0	9A
5B	AB S	None	0	7C or 4C
5C	AB S	None	0	
Average		0	0	
6A	AB PM S	None	0	5E
6B	AB PM S	None	0	2B or 2D
6C	AB PM S	None	0	
Average		0	0	
7A	C S	None	0	5D
7B	C S	None	0	5B
7C	C S	None	0	1C
Average		0		
8A	AB	None	0	4D
8B	AB	None	0	2B or 5A
8C	AB	None	0	
Average		0	0	
9A	C	None	0	4C
9B	C	None	0	2B or 4E
9C	C	Chironomid (2)	0	
Average		0.7	0	
10A	C S	None	0	3A
10B	C S	None	0	4C or 2D
10C	C S	None	0	
Average		0	0	

Table VII.C13. Abundance of benthic macroinvertebrates collected from Hester-Dendy on July 31, 2007. Treatm = treatment, Sample = replicate within plot, Loc = location based on plot grid, sum/rp = sum of organisms divided by number of replicates, Sum = total number of organisms. See table VII.C1 for organism identification.

Sample #	chironomid	Scud	Waterbug	damselfly 1	Damselfly 2	Haliplus	helobdella	mayfly	Shrimp	Snail	polykete	Dragonfly	Sum
AB S 1-A	416.0	43.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	1.0	460.0
1-B	259.0	10.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	269.0
1-C	133.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	136.0
Sum/replicate	269.3	18.7	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.3	288.3
ABPMS 2-A	676.0	160.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	836.0
2-B	70.0	17.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	87.0
2-C	158.0	31.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	189.0
Sum/replicate	301.3	69.3	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	370.7
Control 3-A	28.0												
3-B	349.0	93.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	442.0
3-C	523.0	72.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	595.0
Sum/replicate	300.3	82.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	518.5
AB 4-A	537.0	200.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	737.0
4-B	536.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	536.0
4-C	542.0	84.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	626.0
Sum/replicate	538.3	94.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	633.0
AB S 5-A	25.0												
5-B	ND												
5-C	232.0	62.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	294.0
Sum/replicate	128.5	62.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	294.0
ABPMS 6-A	235.0	90.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	325.0
6-B	113.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	115.0
6-C	526.0	72.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	598.0
Sum/replicate	291.3	54.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	346.0
Control S 7-A	15.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	17.0
7-B	42.0	28.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	70.0
7-C	26.0												

Sample #	chironomid	Scud	Waterbug	damselfly 1	Damselfly 2	Haliplus	helobdella	mayfly	Shrimp	Snail	polykete	Dragonfly	Sum
Sum/replicate	27.7	15.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	43.5
AB 8-A	293.0	25.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	318.0
8-B	600.0	11.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	611.0
8-C	30.0												
Sum/replicate	307.7	18.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	464.5
Control 9--A	273.0	10.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	283.0
9--B	108.0	6.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	114.0
9-C	56.0	10.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	66.0
Sum/replicate	145.7	8.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	154.3
Control S 10--A	56.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	57.0
10--B	271.0	18.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	289.0
10-C	61.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	62.0
Sum/replicate	129.3	6.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	136.0

Table VII.C14 . Benthic macroinvertebrates collected in substrate cores on August 10, 2007. AB=AquaBlok, PM=2% peat moss amendment, S=SubmerSeed, C=control.

Site	Habitat	Specimens	Shannon-Weiner Index	Loc
1A	AB S	Limpet (1)	0	1C
1B	AB S	None	0	5D
1C	AB S	ND	0	4A
Average		0.5	0	
2A	AB PM S	Chironomid (1)	0	2A
2B	AB PM S	None	0	4B
2C	AB PMS	ND	0	6D
Average		0.5	0	
3A	C	None	0	3A
3B	C	None	0	3D or 2B
3C	C	ND	0	
Average		0	0	
4A	AB	Chironomid (1)	0	4E
4B	AB	None	0	2D
4C	AB	None	0	3A
Average		0.3	0	
5A	AB S	Gammarid (1)	0	9A
5B	AB S	None	0	7C or 4C
5C	AB S	None	0	
Average		0.3	0	
6A	AB PM S	Winged ant (1)	0	5E
6B	AB PM S	None	0	2B or 2D
6C	AB PM S	None	0	
Average		0.3	0	
7A	C S	None	0	5D
7B	C S	None	0	5B
7C	C S	None	0	1C
Average		0	0	
8A	AB	None	0	4D
8B	AB	None	0	2B or 5A
8C	AB	Chironomid (1)	0	
Average		0.3	0	
9A	C	None	0	4C
9B	C	None	0	2B or 4E
9C	C	None	0	
Average		0	0	
10A	C S	Chironomid (1)	0	3A
10B	C S	None	0	4C or 2D
10C	C S	None	0	
Average		0.3	0	

Table VII.C15. Abundance of benthic macroinvertebrates collected from Hester-Dendy on November 16, 2007. Treatm = treatment, Sample = replicate within plot, Loc = location based on plot grid, sum/rp = sum of organisms divided by number of replicates, Sum = total number of organisms.

	Sample #	Loct	chironomid	scud	waterbug	damselfly 1	damselfly 2	haliplus	helobdella	mayfly	shrimp	snail	polykete	dragonfly	Sum
AB S	1-A	1C	20.0	8.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	28.0
	1-B	5D	199.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	199.0
	1-C	4B	36.0	1.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	38.0
Sum/replicate			85.0	3.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	88.3
ABPM	2-A	2A	116.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	118.0
	2-B	4B	240.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	242.0
	2-C	6D	108.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	108.0
Sum/replicate			154.7	0.7	0.0	0.0	0.0	0.0	0.0	0.7	0.0	0.0	0.0	0.0	156.0
Control	3-A	3A	28.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	29.0
	3-B	2E	12.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.0
	3-C	5D	516.0	5.0	0.0	0.0	0.0	1.0	5.0	0.0	0.0	0.0	0.0	0.0	527.0
Sum/replicate			13.3	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	20.5
AB	4-A	4E	110.0	10.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	120.0
	4-B	2D	189.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	194.0
	4-C	3A	6.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.0
Sum/replicate			101.7	4.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	106.7
AB S	5-A	9A	206.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	206.0
	5-B	5B	167.0	14.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	181.0
	5-C	ND	28.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	29.0
Sum/replicate			133.7	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	138.7
ABPMS	6-A	5E	56.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	56.0
	6-B	2B	87.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	87.0
	6-C	ND	320.0	15.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	336.0
Sum/replicate			154.3	5.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	159.7
Control S	7-A	5D	40.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	43.0
	7-B	5B	21.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	21.0
	7-C	1D	7.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	9.0
Sum/replicate			22.7	1.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	24.3

AB	8-A	2B	47.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	47.0
	8-B	ND	32.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	33.0
	8-C	ND	237.0	6.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	243.0
Sum/replicate			105.3	2.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	107.7
Control	9--A	4C	2.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.0
	9--B	2B	21.0	10.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	31.0
	9-C	ND	31.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	33.0
Sum/replicate			18.0	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	23.0
Control S	10--A	3A	10.0	5.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	16.0
	10--B	4D	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	10-C	ND	15.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	18.0
Sum/replicate			8.3	2.7	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.3

Table VII.C16. Benthic macroinvertebrates collected in substrate cores on November 16, 2007. AB=AquaBlok, PM=2% peat moss amendment, S=SubmerSeed, C=control.

Site	Habitat	Specimens	Shannon-Weiner Index	Loc
1A	AB S	None	0	1C
1B	AB S	None	0	5D
1C	AB S	None	0	4A
Average		0	0	
2A	AB PM S	None	0	2A
2B	AB PM S	None	0	4B
2C	AB PMS	None	0	6D
Average		0	0	
3A	C	None	0	3A
3B	C	None	0	3D or 2B
3C	C	None	0	
Average		0	0	
4A	AB	None	0	4E
4B	AB	None	0	2D
4C	AB	None	0	3A
Average		0	0	
5A	AB S	Chironomid (2)	0	9A
5B	AB S	None	0	7C or 4C
5C	AB S	None	0	
Average		0.7	0	
6A	AB PM S	Gammarid (2)	0	5E
6B	AB PM S	Chironomid (3)	0	2B or 2D
6C	AB PM S	None	0	
Average		0.7 (gammarid) & 1 (chironomid)	0.233	
7A	C S	None	0	5D
7B	C S	None	0	5B
7C	C S	None	0	1C
Average		0	0	
8A	AB	None	0	4D
8B	AB	None	0	2B or 5A
8C	AB	None	0	
Average		0	0	
9A	C	None	0	4C
9B	C	None	0	2B or 4E
9C	C	None	0	
Average		0	0	
10A	C S	None	0	3A
10B	C S	None	0	4C or 2D
10C	C S	None	0	
Average		0	0	

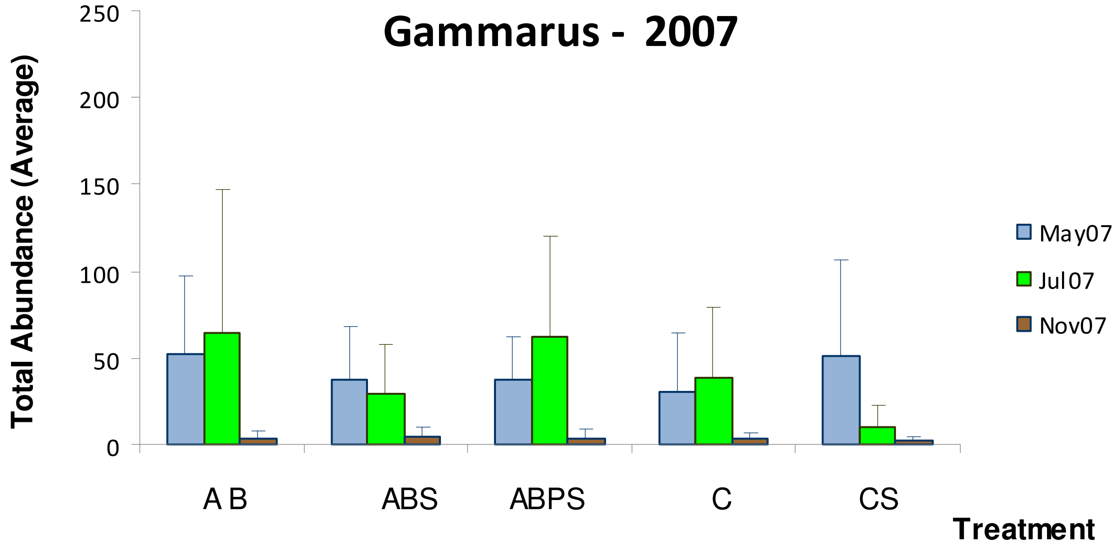


Figure VII.C11. Abundance of *Gammarus* during 2007.

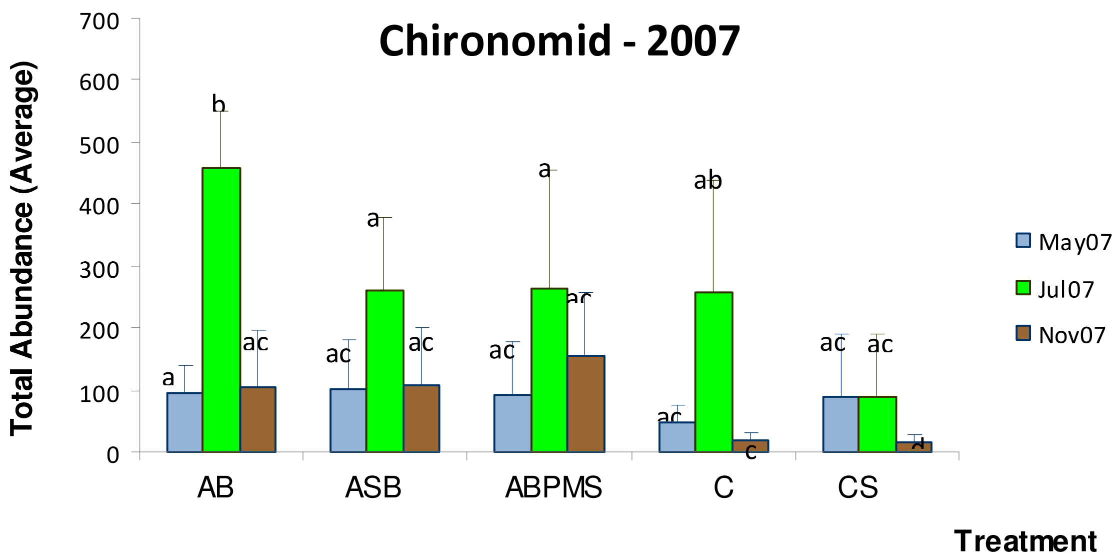


Figure VII.C12. Abundance of Chironomids during 2007.

Between September 2005 and May 2006 biodiversity decreased greatly in ABP and CN and slightly in ABP. Between May 2006 and August 2006 biodiversity decreased in ABP, AB and CN. Between August 2006 and November 2006 biodiversity increased in AB and CN and decreased slightly in ABP. Between November 2006 and May 2007 biodiversity increased in ABP and decreased slightly in CN and almost leveled in AB. Between May 2007 and July 2007 biodiversity decreased greatly in ABP, then in CN, and slightly in AB. Between July 2007 and November 2007 biodiversity increased greatly in CN and decreased in AB and decreased slightly in ABP (Figure VII.C13).

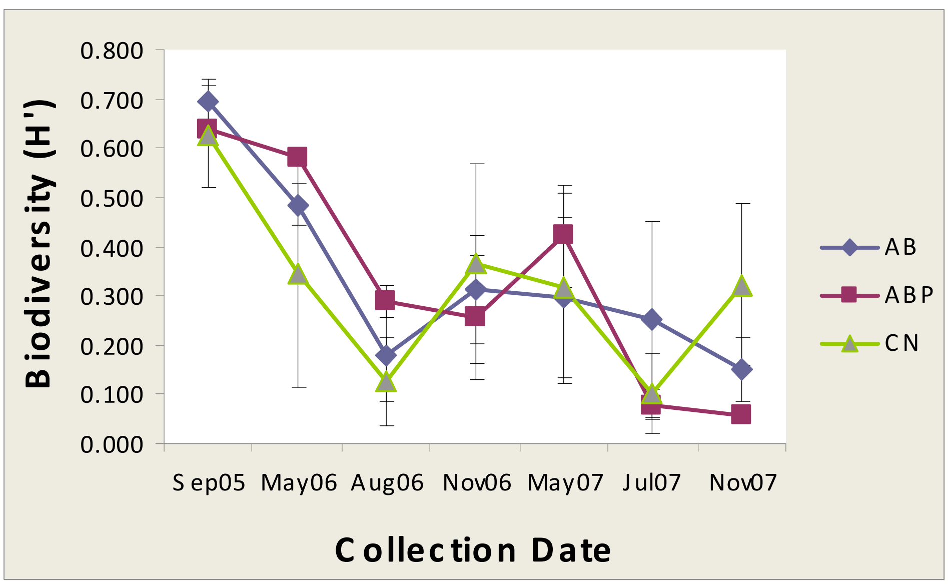


Figure VII.C13. BMI Biodiversity 2005 to 2007

In the summer biodiversity increased between September 2005, August 2006, and July 2007 in AS, APS, and C. It decreased in a C and fluctuated by increasing and decreasing or decreasing increasing in APS, AS, CS, A and CS (Figure VII.C14). In the fall biodiversity increased between November 2006 and November 2007 in A, AS, C, and CS. It decreased in A, AS, APS and a C (Figure VII.C15). In the spring biodiversity was higher in May 2006 than in May 2007 in all plots. The differences were greater in C and CS (Figure VII.C16).

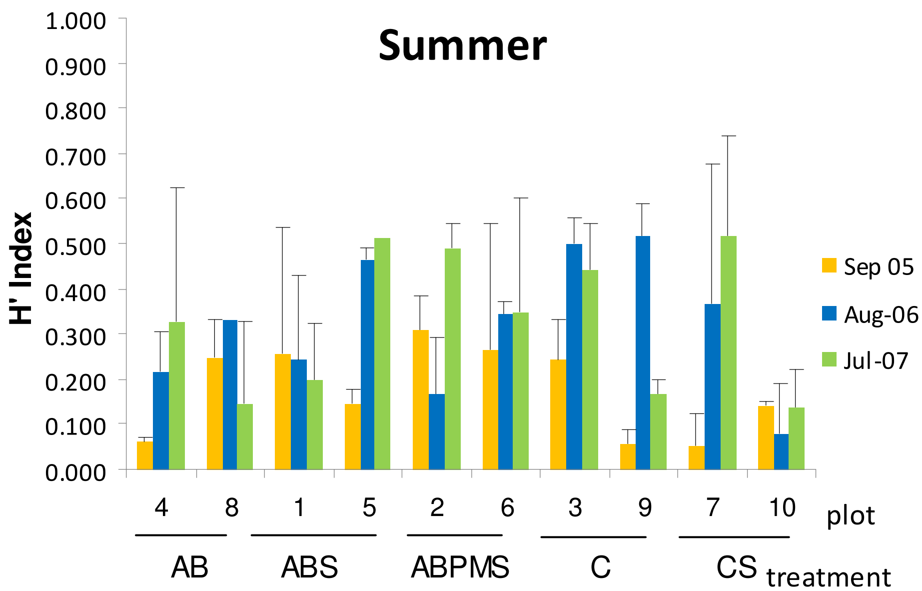


Figure VII.C14. BMI Biodiversity during the summer months

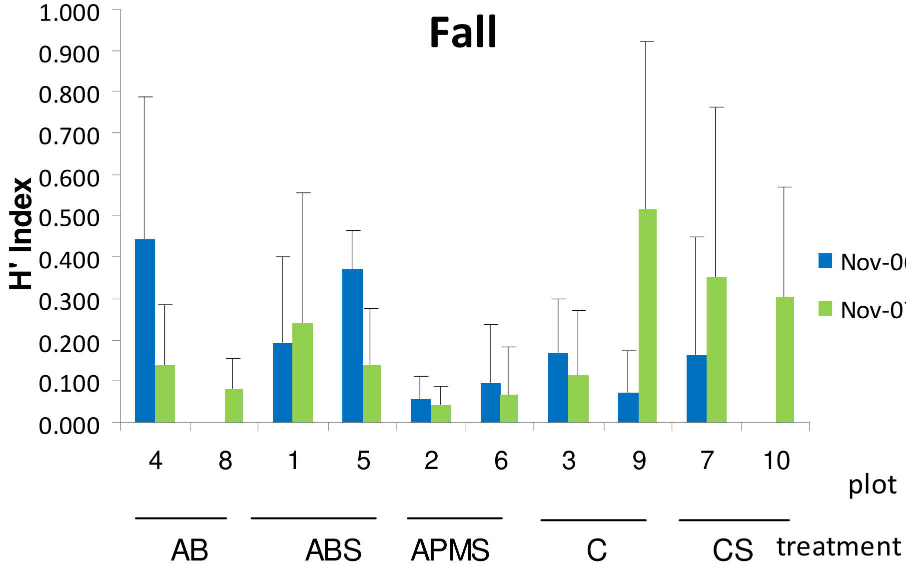


Figure VII.C 15. BMI biodiversity during the fall months

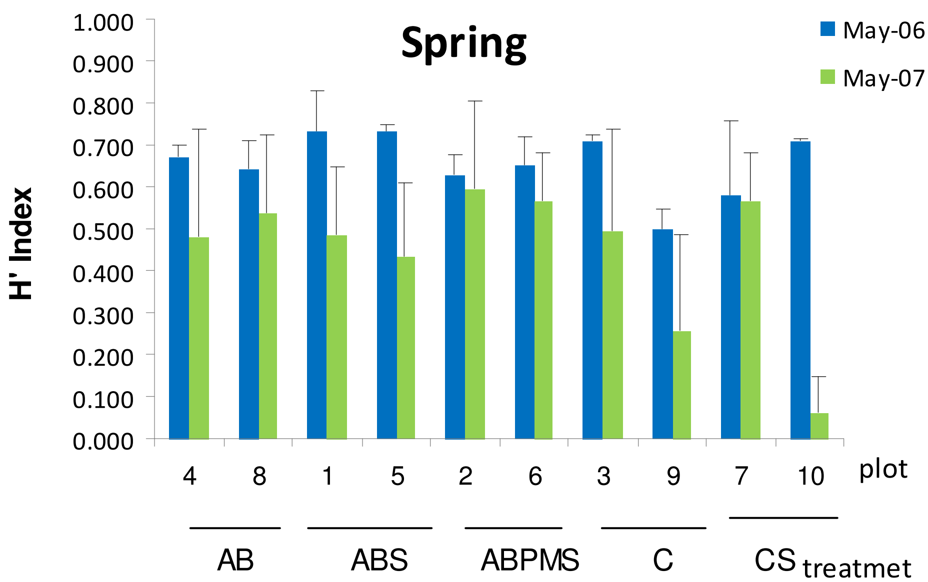


Figure VII.C16. BMI biodiversity during the Spring.

Total abundance of macroinvertebrates was highest in September 2005, August 2006 and July 2007 in A and in A with PM. It was significantly lower in August 2006 ($p < 0.05$), July 2007 ($p < 0.05$) and November 2007 ($p < 0.05$) in the controls (Figure VII.C117). BMI abundance varied during the year (Figure VII.C18). Abundance of chironomids, *Gammarus* and other species was always lowest in November and similar in 2006 and 2007. Abundance of chironomids, *Gammarus* and other species was average in May 2006 and August 2006, although in May 2007 abundance of chironomids, *Gammarus* and other species was low and only slightly higher than in was in November. Abundance of chironomids, *Gammarus* and other species was highest in September 2005 and July 2007 (Figure VII.C18).

Chironomid abundance was always highest in July, August and September for AB and ABP. It was only high for CN in September 2005. After this time chironomid abundance in CN declined and remained low, only approached by chironomid abundance in AB and ABP in May and November (Figure VII.C19). *Gammarus* abundance was highest in May 2006 for CN, AB, and then ABP. The next highest abundance of *Gammarus* was in July 2007 for ABP, AB and then CN. *Gammarus* abundance was lowest in November for CN, ABP and then AB, although the low *Gammarus* abundance for CN first occurred in August (Figure VII.C20).

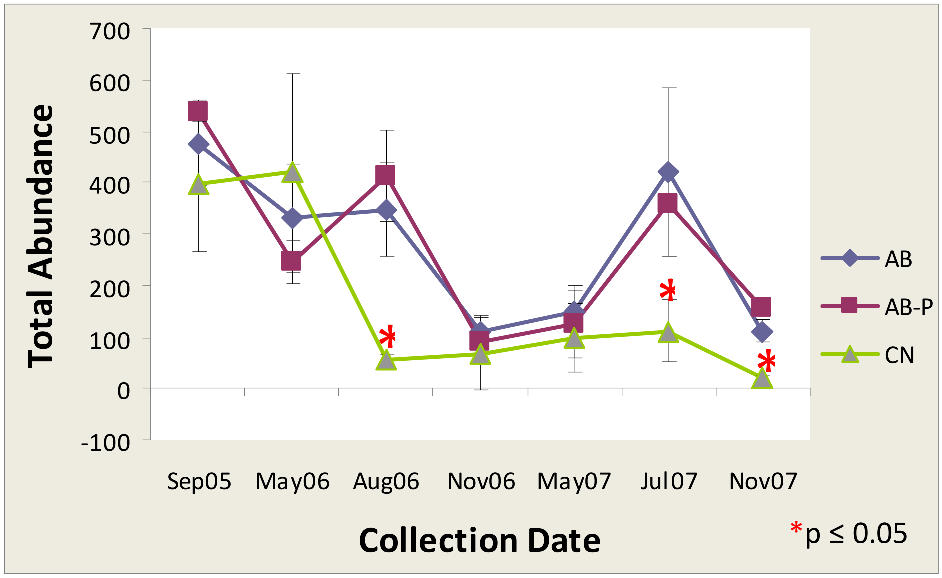


Figure VII.C17. Total abundance of BMI

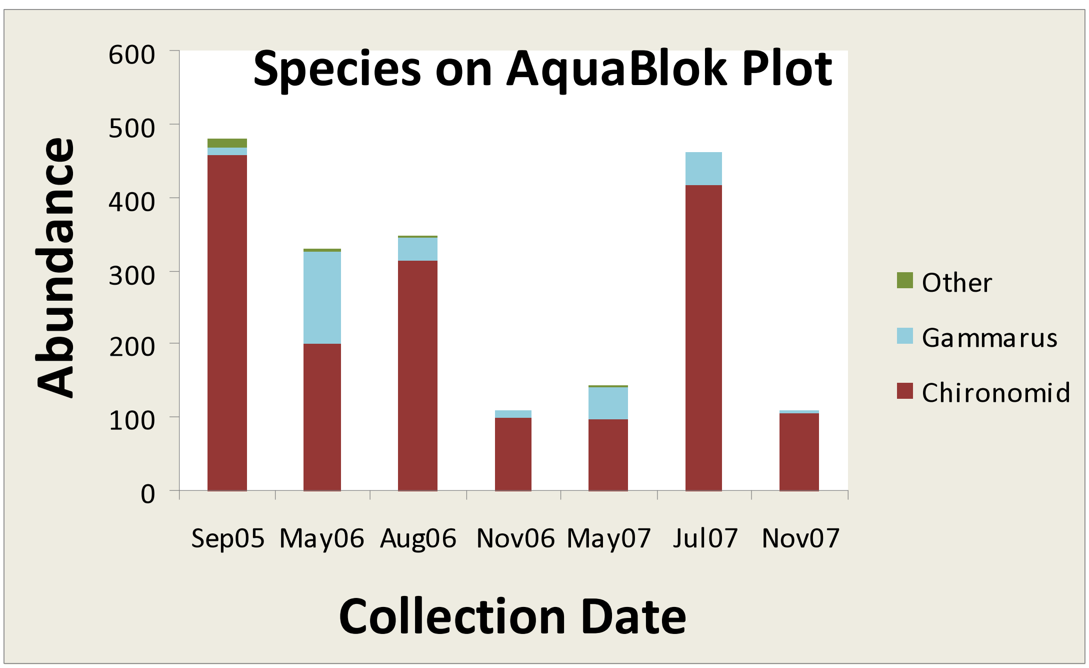


Figure VII.C18. Abundance of BMI species from 2005 to 2007

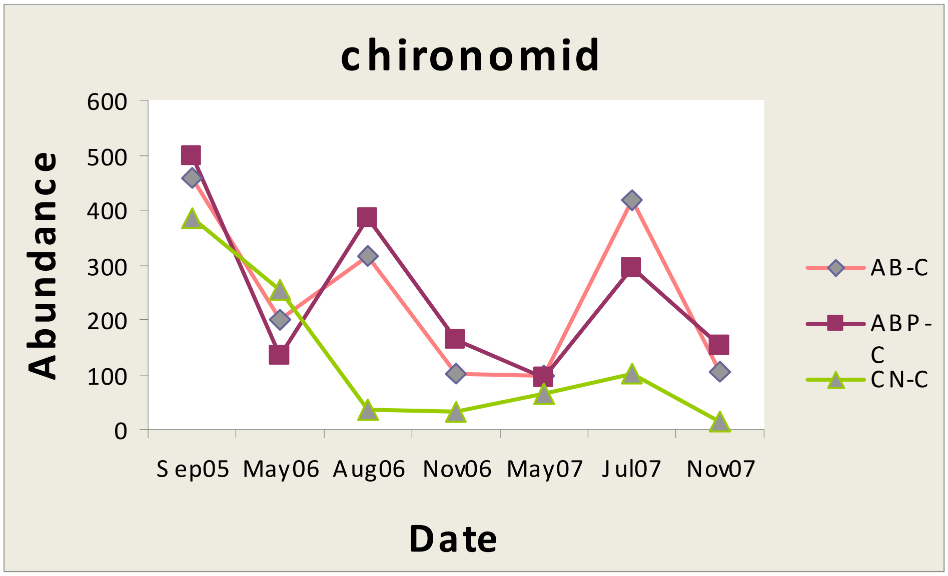


Figure VII.C19. Abundance of chironomids from 2005 to 2007

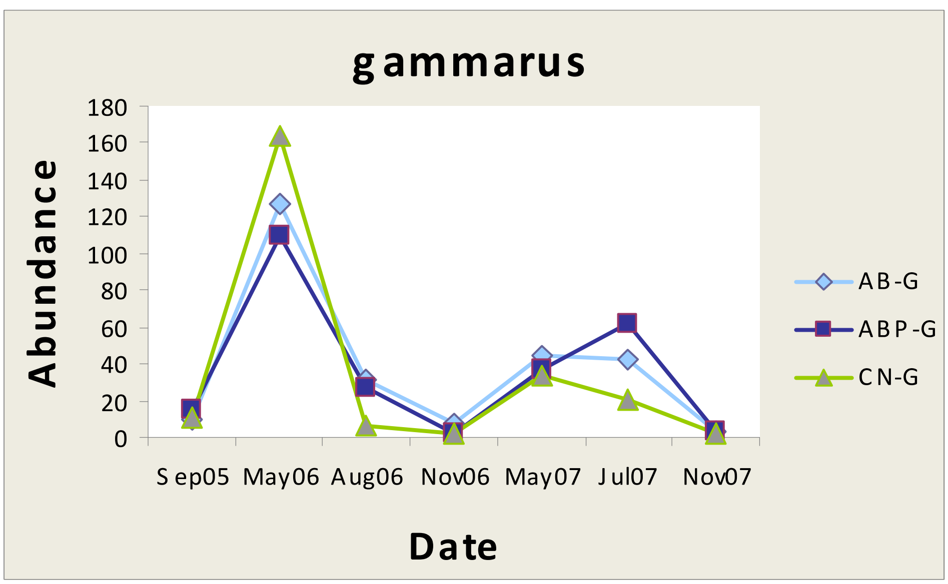


Figure VII.C20. Abundance of *Gammarus* from 2005 to 2007

There was a significant negative correlation between abundance of benthic macroinvertebrates and dissolved oxygen in plot AB3 only ($r = -0.8469$, $p = 0.0082$). (Figure VII.C21). There was a significant positive correlation between benthic macroinvertebrate abundance and redox (eH) in plot CN2 only ($r = 0.7762$, $p = 0.0235$) (Figure VII.C22). There was no significant correlation between abundance of benthic macroinvretebrates and total heavy metals in the sediment. (Figure VII.C23). However there was a significant positive correlation between benthic macroinvertebrate abundance and PCBs in the sediment for AB plots in 2007 only ($r = 0.8482$, $p < 0.0328$) (Figure VII.C24).

In conclusion, the abundance of the benthic macroinvertebrates collected on the Hester-Dendys showed seasonal patterns between two dominant species, chironomids and *Gammarus*, which over lapped slightly on occasion. Although the abundance of these species was high at the start of the study, by the end of the study their abundance started to decline but not nearly as low as the abundance found in the sediment cores. For the chironomids it was clear that abundance was lower in the controls. Heavy metals in the sediment did not seem to have a large effect on benthic macroinvertebrates, which is expected since the Hester-Dendys were placed on or slightly above the sediment. Because they were not in the sediment it is surprising that abundance would increase as PCBs increased in AB. The sample sizes in the sediment cores were too small to determine an effect of heavy metals and PCBs in the sediment on benthic macroinvertebrates. Although redox seemed to have a slight effect on the abundance of benthic macroinvertebrates in one control plot, decreasing levels of dissolved oxygen seemed to have a little more of an effect although the results are inconclusive since both replicates of each treatment or control did not agree.

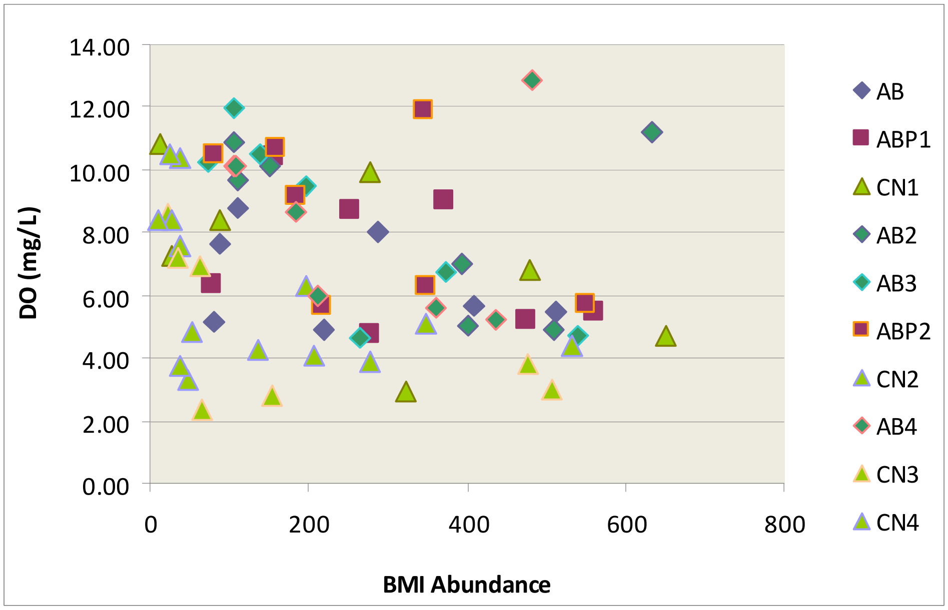


Figure VII.C.21. Correlation of benthic macroinvertebrate abundance with dissolved oxygen concentration (DO). Each value represents a replicate compared with DO at that site. The sum of organisms does not include chironomids. Data from replicate plots were not combined.

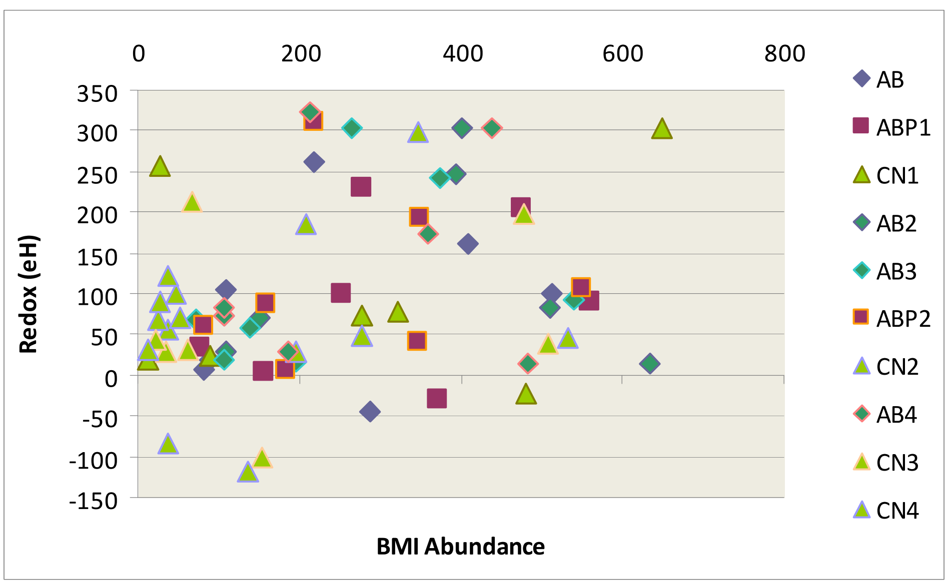


Figure VII.C22. Correlation of benthic macroinvertebrate abundance and redox potential. Data from replicate plots were not combined.

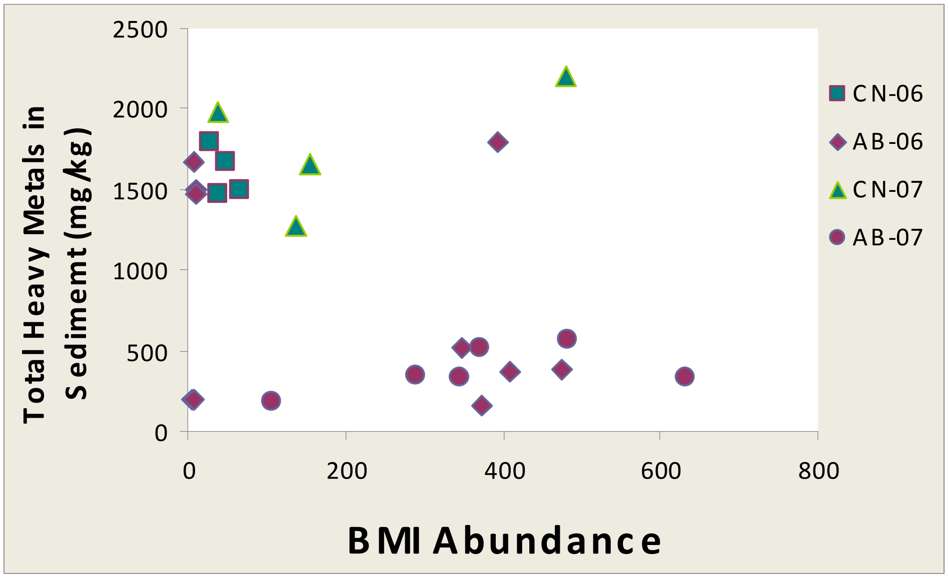


Figure VII.C23. Correlation of benthic macroinvertebrate abundance with heavy metals in the sediment in 2006 and 2007. Data from all CN replicates and AB replicates were combined.

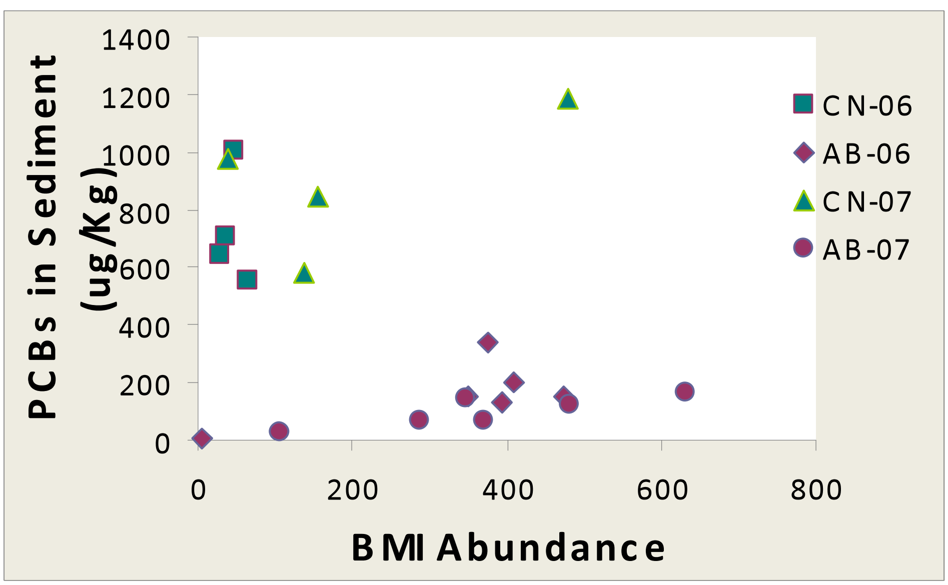


Figure VII.C24. Correlation of benthic macroinvertebrate abundance with PCBs in the sediment in 2006 and 2007. Data from all CN replicates and AB replicates were combined.

VII.D. COC in Water

Contaminants measured in water included heavy metals and organic contaminants (PCBand organochlorine pesticides). Heavy metals were analyzed by EPA SW 846 Method 7000A and included Cd, Cr, Cu, Fe, Hg, Ni, Pb and Zn. PCBs and organochlorine pesticides were analyzed by EPA SW 846 Method 8082 and EPA SW 846 Method 8081A, respectively. Data for PCBs and OCPs were compared to values established by EPA for monitoring priority pollutants in water. These values are called criteria continuous concentrations (CCC) and they should not be exceeded at any time (EPA-820-B-96-001, September 1996). Statistical analyses were performed by one-way ANOVA followed by Tukey Multiple Comparison Test.

2005

Post-capping samples for 2005 were collected on 9-28-05, which was approximately 2.5 months after capping (7-12-05). Data on water samples showed average total PCB concentrations ranging from 5.68 ng/L to 349.38 ng/L (Table VII.D2). Multiple plots had values that exceeded the CCC for total PCB, 14 ng/L. They included plots 2, 4, 5, 7, 9 and10. These plots were treated with AquaBlok amended with peat moss with SubmerSeed (AB pm S), AB unamended without S (AB un), AB un with S (AB un S), control with S (Control S), control (uncapped) and Control S, respectively. PCB concentrations did not appear to be treatment related. Data on water samples showed average total OCPs ranging from 4.17 ng/L to 187.40 ng/L (Table VII.D2.). Plots 2 and 10 had high concentrations of DDT and its metabolites (DDD and DDE). Concentrations for DDT on plot 2, which was treated with AB pm S, had an average of 133.43 ng/L and exceeded the CCC of 130 ng/L. On plot 10, which was treated with Control S, the average concentration for the sum of DDT, DDD and DDE was 101.12 ng/L and that for Aldrin was 53.9 ng/L. None of the OCP concentrations for plot 10 exceeded their CCCs. Compared to pre-capping (July 12, 2005), PCB water concentrations were down dramatically in all capped plots just two months later (September 28, 2005). Concentrations fell 2-35x in capped plots, while they actually increased approximate 15x at two for four uncapped plots, 9 and 10. A similar result was found for OCPs. Concentrations fell 12-35x in capped plots, while increasing 5-50x in three of the four upcapped plots. This indicated that capping reduced water concentrations of both PCBs and OCPs.

Table VII.D1. Heavy metals in water (µg/L) collected post capping, date October 5, 2005. CNTRL = not capped, S = with SubmerSeed, AB = AquaBlok, PM = amended with peat moss, UN = unamended, Total = sum of metals without Fe. BDL = below detection limit (Hg = 0.2 µg/L). Red shading: value > CCC[a] freshwater.

Treatment	Sample	Site	Cd	Cr	Cu	Fe	Hg	Ni	Pb	Zn	Total
AB un S	1 A	2E	10.5	4.06	16.7	78.1	0.25	40.7	137	66.6	276
	1 B	3D	11.3	3.89	18.9	67.7	0.11	46.8	137	57.8	276
	1 C	0B	10.9	3.48	11.9	75.8	0.08	42.8	128	37.2	234
	Ave-1		10.9	3.8	15.8	73.9	0.14	43.4	134.1	53.9	262
	SD-1		0.4	0.3	3.6	5.5	0.10	3.1	5.5	15.1	24
AB pm S	2 A	1D	12.5	3.41	16.9	109	0.06	41.6	134	23.4	232
	2 B	5G	12.5	3.75	18.8	103	0.04	45.8	124	20.4	225
	2 C	6B	12.1	3.34	19.4	125	0.04	42.2	110	32.0	219
	Ave-2		12.4	3.5	18.4	112.3	0.05	43.2	122.7	25.3	225
	SD-2		0.3	0.2	1.3	11.2	0.01	2.3	11.8	6.0	6
CNTRL	3 A	2C	16.9	3.37	20.3	98.8	BDL	40.2	120	29.1	230
	3 B	5C	16.7	3.41	16.6	98.0	0.03	35.2	111	25.6	209
	3 C	3G	17.1	3.28	17.5	101	0.03	42.3	116	26.3	223
	Ave-3		16.9	3.4	18.1	99.4	0.03	39.2	116.0	27.0	221
	SD-3		0.2	0.1	2.0	1.8	0.00	3.6	4.4	1.9	11
AB un	4 A	3F	13.3	3.62	16.2	105	BDL	45.3	132	27.9	239
	4 B	4C	12.3	3.21	15.8	115	BDL	42.9	123	24.9	222
	4 C	2B	12.7	4.10	18.1	106	BDL	52.2	144	21.6	253
	Ave-4		12.7	3.6	16.7	108.7		46.8	133.2	24.8	238
	SD-4		0.5	0.4	1.2	5.9		4.8	10.9	3.1	16
AB un S	5 A	3E	12.5	3.75	15.1	96.1	0.04	46.8	136	23.6	238
	5 B	5B	12.9	3.32	14.9	108	BDL	46.2	133	28.4	239
	5 C	6D	11.9	3.63	12.9	99.3	BDL	35.4	124	21.0	209
	Ave-5		12.4	3.6	14.3	101.1	0.04	42.8	131.1	24.3	228
	SD-5		0.5	0.2	1.2	6.1		6.4	6.1	3.8	17
AB pm S	6 A	2F	14.4	3.75	12.9	93.1	BDL	49.0	136	23.0	239
	6 B	4F	14.5	3.39	11.2	89.1	BDL	41.1	114	21.6	206
	6 C	6B	16.0	3.68	15.0	102	BDL	46.2	128	14.8	224
	Ave-6		15.0	3.6	13.0	94.7		45.4	126.2	19.8	223
	SD-6		0.9	0.2	1.9	6.5				4.4	16
CNTRL S	7 A	5D	15.4	4.16	15.5	137	BDL	46.5	140	28.3	250
	7 B	2C	15.0	4.03	15.8	144	0.04	42.5	135	22.5	235
	7 C	6B	13.6	3.76	14.2	141	BDL	44.2	127	20.2	223
	Ave-7		14.7	4.0	15.2	140.6	0.04	44.4	134.0	23.6	236

	SD-7		1.0	0.2	0.9	3.1		2.0	6.7	4.2	14
AB un	8 A	3D	14.1	3.56	14.7	98.3	BDL	42.4	139	19.2	233
	8 B	2B	14.7	4.00	15.3	101	BDL	40.6	141	21.3	237
	8 C	6B	14.0	3.63	14.6	92.9	BDL	45.2	134	19.8	231
	Ave-8		14.3	3.7	14.9	97.5		42.7	137.9	20.1	234
	SD-8		0.4	0.2	0.4	4.2		2.3	3.4	1.1	3
CNTRL	9 A	2C	13.4	3.59	14.6	118	BDL	43.1	113	18.2	206
	9 B	4D	13.8	6.70	19.6	118	BDL	61.5	114	19.4	235
	9 C	6B	13.3	3.85	14.9	194	BDL	44.0	138	19.3	234
	Ave-9		13.5	4.7	16.4	143.3		49.5	121.7	19.0	225
	SD-9		0.3	1.7	2.8	43.8		10.4	14.4	0.7	16
CNTRL S	10 A	3D	16.0	3.50	14.2	114	BDL	38.4	123	20.1	215
	10 B	3F	15.0	3.46	13.4	101	0.10	32.5	91.5	17.9	174
	10 C	3C	14.9	3.54	14.3	101	BDL	40.5	119	19.4	211
	Ave-10		15.3	3.5	13.9	105.3	0.10	37.1	111.0	19.1	200
	SD-10		0.6	0.0	0.5	7.4		4.1	17.0	1.2	23
CCC[a] freshwater			0.25	74	9.0	ND	0.77	52	2.5	120	
CCC salt water			8.8	ND	3.1	ND	0.94	8.2	8.1	81	

[a]CCC is criteria continuous concentration and represents the highest concentration to which aquatic organisms should be chronically exposed to priority pollutants, µg/L. (EPA-820-B-96-001, September 1996)

Table VII.D2. Concentration of organic contaminants (ng/L) in water collected post capping, September 28, 2005. Treatments were: plots 3&9 = control, 7&10 = control with SubmerSeed, 4&8 = AquaBlok unamended, 1&5 = AquaBlok unamended with Submer Seed and 2&6 = AquaBlok amended with peat moss with SubmerSeed. Values shaded in yellow exceeded the EPA's CCC[a]. These criteria are not available for all contaminants. Zero values represented non-detectable levels.

PLOT REPLIC	1A, B C	2A B C	3A B C	4A B C	5A B C	6A B C	7A B C	8A B C	9A B C	10A B C	CCC Fresh water
	TOTAL CONCENTRATION (ng/L)										
PCB	6.83	81.85	8.15	27.15	23.28	5.68	50.17	6.09	88.73	349.38	14
OCP	29.05	149.22	27.91	27.10	4.17	9.76	52.72	23.71	101.68	187.40	
Pesticide	CONC (ng/L)	CONC (ng/L)	CONC (ng/L)	CONC (ng/L)	CONC (ng/L)	CONC (ng/L)	CONC (ng/L)	CONC (ng/L)	CONC (ng/L)	CONC (ng/L)	CONC (ng/L)
a-BHC	0.00	0.00	0.00	1.56	0.00	0.37	0.00	0.00	0.84	0.21	
Aldrin	0.00	0.00	0.00	3.25	0.34	0.00	3.12	0.32	0.93	53.90	3000
b-BHC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
d-BHC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
DDD	0.76	0.44	0.00	0.96	0.00	0.33	4.76	1.38	2.14	6.57	
DDE	0.00	0.83	0.45	0.00	0.00	0.00	1.99		6.97	76.69	
DDT	19.55	133.43	23.24	7.78	0.00	2.36	16.98	15.28	72.69	17.86	130
Dieldrin	0.00	0.00	0.13	0.80	0.00	0.00	1.83	0.22	0.75	5.13	710
Endosulfan I	0.59	0.25	0.23	1.98	0.00	0.58	2.34	0.26	1.74	3.75	34
Endosulfan II	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	34
Endosulfan Sulfate	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Endrin	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	37
Endrin Aldehyde	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Endrin Ketone	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
g-BHC	1.90	1.62	0.20	6.24	1.24	1.72	6.96	1.00	8.86	9.49	160
Heptachlor	2.37	1.64	0.87	0.73	0.00	1.33	2.16	1.93	4.49	5.62	53
Heptachlor Epoxide	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.92	53
Metoxychlor	3.87	2.42	2.86	4.90	2.93	3.13	3.59	3.59	2.37	5.57	30

PLOT REPLIC	1A, B C	2A B C	3A B C	4A B C	5A B C	6A B C	7A B C	8A B C	9A B C	10A B C	CCC Fresh water
PCB Congener											
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	64.27	
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.00	
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
17	0.00	0.00	0.00	0.54	0.79	0.00	0.25	0.00	1.59	0.34	
18	0.00	0.00	0.00	1.33	0.77	0.00	0.91	0.00	2.44	0.66	
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
22	0.49	0.59	0.28	0.00	0.00	0.32	1.19	0.36	1.77	1.51	
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.74	0.12	
26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.88	3.44	
44	0.00	0.35	0.00	0.96	0.00	0.00	3.93	0.00	3.24	26.54	
45	0.29	7.55	0.93	0.00	0.00	0.79	0.00	0.26	3.49	0.81	
46	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.58	0.00	
49	0.00	0.30	0.30	0.52	0.38	0.00	0.26	0.00	1.17	0.64	
63	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
64	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
74	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.83	11.59	
82	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
83	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.84	0.00	
85	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
91	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.12	0.00	
97	0.00	0.00	0.00	0.26	0.00	0.00	0.65	0.00	0.54	5.75	
99	0.00	3.24	0.00	0.00	0.88	0.26	0.65	0.47	0.88	1.55	
100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.66	0.00	0.95	
101	0.55	7.14	0.70	1.14	0.00	0.49	3.12	0.36	2.61	1.27	
118	0.00	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.53	7.31	

PLOT REPLIC	1A, B C	2A B C	3A B C	4A B C	5A B C	6A B C	7A B C	8A B C	9A B C	10A B C	CCC Fresh water
128	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
131	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
134	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
136	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
146	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
149	0.00	0.00	0.00	0.00	0.00	0.00	0.80	0.00	0.66	9.54	
151	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.18	0.18	
158	0.41	12.00	0.49	0.19	0.00	0.25	0.76	0.19	7.90	8.27	
174	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.69	
177	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
180	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.19	
183	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
185	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
189	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
191	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
193	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
194	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
198	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
199	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
201	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
205	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
206	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
207	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
209	0.00	11.36	0.00	0.65	0.00	0.33	0.82	0.00	1.98	18.28	
105+132+153	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
107+123	1.48	16.57	1.75	9.68	1.26	1.13	8.43	1.26	12.16	13.76	
12+13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
135+144+147+ 127	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
137+176+130	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	

PLOT REPLIC	1A, B C	2A B C	3A B C	4A B C	5A B C	6A B C	7A B C	8A B C	9A B C	10A B C	CCC Fresh water
141+179	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
157+200	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.28	0.00	
16+32	0.00	0.00	0.00	0.77	0.00	0.00	0.77	0.00	0.75	9.44	
163+138	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
170+190	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
172+197	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
178+129	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.84	
187+182	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
202+171+176	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
203+196	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
208+195	0.15	0.00	0.00	4.18	3.53	0.72	1.43	0.29	5.35	5.60	
21+33+53	0.00	0.00	0.00	0.00	0.00	0.82	0.00	0.00	0.00	0.00	
24+27	2.88	1.87	4.23	5.83	6.22	2.28	4.88	2.74	7.67	6.52	
31+28	0.00	0.00	0.00	0.00	0.00	0.00	2.40	0.00	1.62	0.00	
37+42	0.33	8.82	0.43	0.00	0.00	0.28	0.57	0.19	6.26	1.75	
4+10	1.00	0.41	0.18	0.89	0.44	0.00	4.63	0.00	4.37	3.17	
41+71	0.00	2.48	0.00	0.00	0.00	0.00	0.00	0.00	0.93	0.94	
47+48	0.00	9.39	0.00	0.77	0.65	0.00	0.66	0.00	3.55	2.13	
52+43	0.00	0.00	0.00	0.15	0.00	0.00	0.00	0.00	2.70	1.64	
56+60+85	0.00	0.86	0.00	0.11	0.29	0.00	6.49	0.00	5.76	7.63	
66+95	0.00	0.24	0.00	0.00	0.00	0.00	3.39	0.00	3.17	11.14	
70+76	0.00	0.13	0.00	0.73	0.00	0.00	1.89	0.00	1.92	7.14	
77+110	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.65	0.19	
8+5	0.00	0.00	0.00	0.64	0.00	0.00	1.31	0.00	0.79	11.65	
81+87	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.17	0.86	

[a]CCC is criteria continuous concentration and represents the highest concentration to which aquatic organisms should be chronically exposed to priority pollutants, ug/L. (EPA-820-B-96-001, September 1996)

2006

In the fall of 2006, Cd ranged from an average of 3.67 mg/kg in plot 1 which contains AquaBlok that is unamended with peat moss and has Submerseed which was significantly less than the average of 6.07 mg/kg in plot 6 which contains AquaBlok that is amended with peat moss and has Submerseed ($p < 0.05$). Cr ranged from an average of 1.96 mg/kg in plot 5 which contains AquaBlok that is unamended with peat moss and has Submerseed to an average of 3.72 mg/kg in plot 4 which contains AquaBlok that is unamended with peat moss. The differences were not statistically significant. Cu ranged from an average of 21.0 mg/kg in plots 2 and 6 which contain AquaBlok that is amended with peat moss and has Submerseed to an average of 34.8 mg/kg in plot 8 which contains AquaBlok that is unamended with peat moss. The differences were not statistically significant. Fe ranged from an average of 150 mg/kg in plot 2 which contains AquaBlok that is amended with peat moss and has Submerseed which was significantly less than the average of 283 mg/kg in plot 4 which contains AquaBlok that is unamended with peat moss ($p < 0.05$). Hg ranged from an average of 0.07 mg/kg in plot 9 which is a control to an average of 17.4 mg/kg in plot 7 which is a control that has Submerseed. The differences were not statistically significant. Ni ranged from an average of 23.7 mg/kg in plot 1 which contains AquaBlok that is unamended and has Submerseed to an average of 31.7 mg/kg in plot 6 which contains AquaBlok that is amended with peat moss and has Submerseed. The differences were not statistically significant. Pb ranged from an average of 42.5 mg/kg in plot 10 which is a control which was significantly less than the average of 104 mg/kg in plot 4 which contains AquaBlok that is unamended with peat moss ($p < 0.001$), plot 1 (AquaBlok that is unamended with peat moss with Submerseed) ($p < 0.05$), plot 2 (AquaBlok that is amended with peat moss with Submerseed) ($p < 0.001$)

and plot 5 (AquaBlok that is unamended with peat moss awith Submerseed) ($p < 0.001$). Zn ranged from an average of 20.1 mg/kg in plot 3 which is a control to an average of 50.8 mg/kg in plot 4 which contains AquaBlok that is unamended with peat moss. The differences were not statistically significant (Table VII.D3). Concentrations of Cd, Cu and Pb on samples collected on 11-21-06 continue to be above the Criteria Continuous Concentration (CCC) for chronic exposure in freshwater (Table VII.D3). Water concentrations of Cd were approximately 18 times, Cu concentrations were 3 times and Pb concentrations were 38 times higher than the CCC for those metals.

Water samples collected November 21, 2006 had average total PCB concentrations ranging from 13.01 ng/L in plot 8, which contains AB pm S, to 44.59 ng/L in plot 1, which contained AB un S (Table VII.D4). All plots had at least one replicate that exceeded the CCC for PCBs, 14 ng/L; therefore, the contamination was throughout the site. Average total OCP concentrations ranged from 4.18 ng/L in plot 1, which contained AB un S, to 40.68 ng/L in plot 4, which contained AB un (Table VII.D4). None of the samples had OCP levels, including DDT, which exceeded their respective CCC. Overall PCB and OCP water concentrations from capped plots were similar in 2006 and 2005 post capping. This indicated that water over the cap did not become more contaminated during the one year period..

Table VII.D3. Heavy metals in water (µg/L) collected post capping, November 21, 2006. CNTRL = not capped, S = with SubmerSeed, AB = AquaBlok, PM = amended with peat moss, UN = unamended, Total = sum of metals without Fe. BDL = below detection limit (Hg = 0.2 µg/L). Red shading: value > CCC[a] freshwater.

Treatment	Sample	Site	Cd	Cr	Cu	Fe	Hg	Ni	Pb	Zn	Total
	1 A	2B	3.08	2.38	19.9	202	BDL	25.9	69.6	38.5	159
AB un S	1 B	5D	3.77	1.97	28.0	134	BDL	21.1	96.8	27.3	179
	1 C	1C	4.15	2.18	24.3	165	0.23	24.2	95.8	22.6	173
	Ave-1		3.67	2.18	24.1	167	0.23	23.7	87.4	29.5	171
	SD-1		0.54	0.21	4.0	34		2.4	15.5	8.2	10
	2 A	2A	4.26	2.30	15.5	149	0.03	26.0	101.7	28.3	178
AB pm S	2 B	4B	2.90	1.94	26.4	160	BDL	22.3	81.5	26.6	162
	2 C	6D	5.06	1.96	21.0	141	0.87	29.0	107.8	48.2	214
	Ave-2		4.07	2.06	21.0	150	0.45	25.8	97.0	34.4	185
	SD-2		1.09	0.20	5.5	10	0.59	3.4	13.8	12.0	27
CNTRL	3 A	3A	4.68	2.40	26.3	237	0.08	31.9	101.4	26.9	194
	3 B	2D	2.84	1.98	34.5	261	BDL	19.8	53.1	30.4	143
	3 C	5D	5.14	2.66	26.7	280	0.48	27.0	88.8	23.9	175
	Ave-3		4.22	2.34	29.2	259	0.28	26.3	81.1	27.1	170
	SD-3		1.22	0.34	4.6	21	0.28	6.1	25.1	3.3	26
AB un	4 A	4E	6.21	6.40	18.2	326	BDL	32.9	113.2	67.5	244
	4 B	2D	5.21	2.76	22.0	292	0.37	34.2	117.0	53.2	235
	4 C	3A	4.22	2.01	25.5	230	0.14	25.3	81.2	31.8	170
	Ave-4		5.22	3.73	21.9	282	0.25	30.8	103.8	50.8	216
	SD-4		0.99	2.35	3.7	49	0.16	4.8	19.7	18.0	40
AB un S	5 A	9A	5.27	2.15	14.8	242	BDL	30.6	111.2	54.7	219
	5 B	7C	6.41	1.90	19.5	235	BDL	34.0	91.0	30.7	184
	5 C	2C	3.67	1.83	41.8	203	0.15	23.9	82.3	38.9	193
	Ave-5		5.12	1.96	25.4	226	0.15	29.5	94.8	41.5	198
	SD-5		1.37	0.17	14.4	21		5.2	14.8	12.2	18
	6 A	5E	5.74	3.14	16.3	198	BDL	31.0	85.0	36.0	177
AB pm S	6 B	2B	7.03	2.14	18.5	224	BDL	33.6	97.9	34.2	193
	6 C	4B	5.45	3.52	28.2	238	0.47	30.4	57.3	29.2	154
	Ave-6		6.07	2.93	21.0	220	0.47	31.7	80.1	33.1	175
	SD-6		0.84	0.71	6.4	20		1.7	20.7	3.5	19
	7 A	5D	3.19	2.57	18.9	85	BDL	22.3	49.2	48.2	144
CNTRL S	7 B	5B	5.86	2.32	29.1	303	BDL	27.5	76.4	37.4	179
	7 C	1D	6.02	2.78	23.7	346	17.4	33.9	84.0	24.7	192
	Ave-7		5.02	2.55	23.9	245	17.43	27.9	69.8	36.8	183
	SD-7		1.59	0.23	5.1	140		5.8	18.3	11.8	25
AB un	8 A	2B	4.08	2.45	18.2	158	BDL	23.5	54.1	33.9	136
	8 B	4C	3.59	2.08	35.7	248	BDL	22.9	44.6	38.3	147
	8 C	3D	4.50	3.55	50.4	232	9.07	26.1	57.9	58.1	210
	Ave-8		4.06	2.69	34.8	212	9.07	24.2	52.2	43.4	170
	SD-8		0.45	0.76	16.1	48		1.7	6.8	12.9	40
CNTRL	9 A	4C	6.24	2.40	17.1	240	0.07	35.9	83.2	52.3	197
	9 B	2B	5.44	1.94	28.6	221	BDL	25.7	65.9	49.1	177
	9 C	4F	5.10	1.91	40.0	199	BDL	25.4	45.7	46.8	165
	Ave-9		5.59	2.08	28.6	220	0.07	29.0	64.9	49.4	180
	SD-9		0.59	0.27	11.4	21		6.0	18.8	2.8	16
	10 A	4F	4.41	2.20	17.9	281	BDL	28.0	43.1	31.8	127
CNTRL S	10 B	2B	4.32	2.09	26.8	219	BDL	28.8	52.3	72.5	187
	10 C	1A	4.42	1.76	43.1	240	BDL	27.6	32.2	45.6	155
	Ave-10		4.38	2.02	29.2	247		28.1	42.5	50.0	156
	SD-10		0.06	0.23	12.8	31		0.6	10.1	20.7	30
CCC[a] freshwater			0.25	74	9.0	ND	0.77	52	2.5	120	
CCC salt water			8.8	ND	3.1	ND	0.94	8.2	8.1	81	

[a]CCC is criteria continuous concentration and represents the highest concentration to which aquatic organisms should be chronically exposed to priority pollutants, µg

Table VII.D4. Concentration of organic contaminants (ng/L) in water collected post-capping November 21, 2006. Treatments were: plots 3&9 = control, 7&10 = control with SubmerSeed, 4&8 = AquaBlok unamended, 1&5 = AquaBlok unamended with Submer Seed and 2&6 = AquaBlok amended with peat moss with SubmerSeed. Values shaded in yellow exceeded the EPA's CCC[a]. These criteria are not available for all contaminants. Zero values represented non-detectable levels.

PLOT REPLICATE	1A, B C	2A B C	3A B C	4A B C	5A B C	6A B C	7A B C	8A B C	9A B C	10A B C	Fresh water CCC
TOTAL CONCENTRATION (ng/L)											
PCB	11.98	27.03	21.37	41.48	34.24	15.30	14.39	15.03	4.30	22.70	14
	13.02	56.50	15.55	16.02	11.64	19.89	27.55	14.77	25.05	37.27	
	22.19	50.24	35.57	13.45	44.11	19.47	14.81	9.23	14.51	9.46	
Mean	15.73	44.59	24.16	23.65	30.00	18.22	18.92	13.01	14.62	23.14	
OCP	1.82	53.86	8.44	8.48	13.41	17.68	2.67	3.81	2.15	49.41	
	5.50	7.11	16.30	101.93	30.28	73.93	79.14	5.96	2.71	29.57	
	5.23	31.99	17.14	11.62	49.08	13.73	9.33	3.35	24.68	6.80	
Mean	4.18	30.99	13.96	40.68	30.92	35.11	30.38	4.37	9.85	28.59	
SURROGATE RECOVERY (%)											
PCB 14	44%	78%	84%	53%	69%	71%	68%	62%	79%	96%	
	69	57	49	44	68	85	69	80	90	82	
	63	76	74	53	76	74	61	47	91	61	
Mean	59	70	69	50	71	77	66	63	87	80	
PCB 65	30%	55%	55%	31%	47%	44%	40%	36%	87%	107%	
	40	41	41	28	42	58	43	53	91	64	
	37	60	51	33	46	49	41	28	98	46	
Mean	36	52	49	31	45	50	41	39	92	72	
PCB 166	9%	16%	12%	5%	15%	10%	7%	9%	21%	32%	
	8	11	11	6	10	15	10	11	24	11	
	7	13	10	10	13	10	8	7	27	9	
Mean	8	13	11	7	13	12	8	9	24	17	
Dibutychlorendate	0%	40%	45%	48%	0%	0%	0%	0%	37%	35%	
	0	32	35	0	0	0	0	35	45	37	
	26	32	51	0	39	0	0	0	22	30	
Mean	9	35	44	16	13	0	0	12	35	34	
Pesticide	CONC (ng/L)	CONC (ng/L)	CONC (ng/L)	CONC (ng/L)	CONC (ng/L)	CONC (ng/L)	CONC (ng/L)	CONC (ng/L)	CONC (ng/L)	CONC (ng/L)	CONC (ng/L)
OCP a-BHC	0.00	0.00	0.00	0.00	0.00	0.00	0.30	0.00	0.00	0.00	53
	0.00	0.00	0.00	0.39	0.00	0.19	0.23	0.29	0.00	0.00	
	0.00	0.00	0.00	0.00	0.75	0.18	0.18	0.00	0.00	0.00	

PLOT REPLICATE	1A, B C	2A B C	3A B C	4A B C	5A B C	6A B C	7A B C	8A B C	9A B C	10A B C	Fresh water CCC
Mean	0.00	0.00	0.00	0.13	0.25	0.12	0.24	0.10	0.00	0.00	
OCP b-BHC	0.00	0.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.38	0.00	0.39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.13	0.06	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
OCP g-BHC	0.33	1.48	4.25	0.00	0.56	0.00	0.00	1.24	0.13	0.54	160
	2.27	1.84	6.93	0.39	2.00	0.00	2.28	2.33	0.15	1.40	
	1.86	3.91	4.95	0.43	0.00	0.05	2.13	1.31	0.00	0.60	
Mean	1.49	2.41	5.38	0.27	0.85	0.02	1.47	1.63	0.09	0.85	
OCP d-BHC	0.00	0.19	0.00	0.00	0.00	0.00	0.20	0.00	0.00	0.00	
	0.25	0.17	0.00	0.00	0.00	0.35	0.00	0.00	0.18	0.00	
	0.16	0.00	0.00	0.00	0.16	0.40	0.00	0.00	0.00	0.00	
Mean	0.14	0.12	0.00	0.00	0.05	0.25	0.06	0.00	0.06	0.00	
OCP Heptachlor	0.00	1.76	2.14	7.47	0.00	0.00	0.00	0.00	0.60	0.73	53
	0.00	1.44	3.47	0.00	0.00	0.09	1.42	0.06	0.68	1.52	
	0.40	2.39	3.49	0.00	0.01	0.00	0.00	0.00	0.06	0.00	
Mean	0.13	1.86	3.03	2.49	0.00	0.03	0.47	0.02	0.45	0.75	
OCP Aldrin	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3000
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
OCP Heptachlor Epoxide	0.21	0.17	0.00	0.00	0.00	0.32	0.30	0.00	0.00	0.00	53
	0.21	0.00	0.00	0.30	0.00	0.30	0.00	0.48	0.00	0.00	
	0.16	0.12	0.00	0.00	1.47	0.35	0.25	0.00	0.00	0.00	
Mean	0.19	0.10	0.00	0.10	0.49	0.32	0.18	0.16	0.00	0.00	
OCP Endosulfan I	0.32	0.45	0.04	0.00	0.40	0.33	0.35	0.61	0.00	0.17	34
	0.60	0.42	0.63	0.54	0.56	0.48	0.63	0.73	0.24	0.05	
	0.60	0.65	0.57	0.41	1.02	0.49	0.46	0.47	0.00	0.00	
Mean	0.51	0.51	0.41	0.32	0.66	0.43	0.48	0.60	0.08	0.07	
OCP Dieldrin	0.09	0.29	0.38	0.20	0.00	0.19	0.24	0.35	0.00	0.05	710
	0.43	0.33	0.22	0.48	0.43	0.42	0.42	0.50	0.24	0.06	
	0.37	0.13	0.35	0.31	0.39	0.47	0.16	0.32	0.00	0.10	
Mean	0.30	0.25	0.32	0.33	0.27	0.36	0.27	0.39	0.08	0.07	
OCP DDD	0.25	0.44	0.69	0.43	0.00	0.48	0.49	0.44	0.39	0.35	
	0.54	0.46	0.54	0.00	0.00	1.19	0.00	0.49	0.50	0.66	
	0.44	0.47	0.38	0.48	1.32	0.81	0.40	0.40	0.38	0.44	
Mean	0.41	0.46	0.54	0.30	0.44	0.83	0.30	0.44	0.42	0.48	

PLOT REPLICATE	1A, B C	2A B C	3A B C	4A B C	5A B C	6A B C	7A B C	8A B C	9A B C	10A B C	Fresh water CCC
OCP DDE	0.63	0.88	0.82	0.00	0.73	0.08	0.78	1.02	1.04	1.06	
	1.19	0.76	0.80	0.81	0.78	0.44	1.26	1.09	0.71	1.28	
	0.85	1.10	0.86	0.88	1.12	0.25	1.09	0.85	1.17	0.06	
Mean	0.89	0.91	0.83	0.56	0.88	0.26	1.04	0.99	0.97	0.80	
OCP DDT	0.00	48.01	0.00	0.00	9.35	0.00	0.00	0.00	0.00	46.24	130
	0.00	1.68	3.71	70.16	26.35	46.23	59.23	0.00	0.00	24.56	
	0.00	23.22	6.16	0.00	12.92	0.00	0.00	0.00	23.01	5.56	
Mean	0.00	24.30	3.29	23.39	16.21	15.41	19.74	0.00	7.67	25.45	
OCP Endrin	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.13	0.00	0.21	37
	0.00	0.00	0.00	0.00	0.17	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.38	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	0.00	0.18	0.00	0.00	0.04	0.00	0.07	
OCP Endosulfan II	0.00	0.00	0.12	0.38	0.00	0.00	0.00	0.00	0.00	0.05	34
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.04	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.05	
Mean	0.00	0.00	0.04	0.13	0.00	0.00	0.00	0.00	0.03	0.05	
OCP Endrin Aldehyde	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
OCP Endosulfan Sulfate	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
OCP Metoxychlor	0.00	0.00	0.00	0.00	2.37	16.27	0.00	0.00	0.00	0.00	30
	0.00	0.00	0.00	28.87	0.00	24.23	13.67	0.00	0.00	0.00	
	0.00	0.00	0.00	9.10	29.54	10.74	4.66	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	12.66	10.64	17.08	6.11	0.00	0.00	0.00	
PCB Congener											
PCB 1	0.00	0.00	0.00	20.50	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	6.83	0.00	0.00	0.00	0.00	0.00	0.00	
PCB 3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	

PLOT REPLICATE	1A, B C	2A B C	3A B C	4A B C	5A B C	6A B C	7A B C	8A B C	9A B C	10A B C	Fresh water CCC
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
PCB 4+10	0.00	0.00	1.49	0.21	0.00	0.00	0.00	0.00	0.37	2.25	
	0.00	0.00	1.40	0.00	0.00	0.00	0.00	0.00	0.08	1.51	
	0.00	0.93	1.10	0.00	0.91	0.00	0.00	0.00	1.11	0.00	
Mean	0.00	0.31	1.33	0.07	0.30	0.00	0.00	0.00	0.52	1.25	
PCB 7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
PCB 6	1.66	3.42	0.00	4.33	2.54	0.00	2.27	2.98	0.00	0.00	
	2.94	3.74	0.00	2.46	2.99	0.37	0.00	0.00	0.00	0.00	
	3.26	2.30	4.04	3.09	1.38	0.00	2.94	3.02	0.00	0.00	
Mean	2.62	3.15	1.35	3.29	2.30	0.12	1.74	3.99	0.00	0.00	
PCB 8+5	0.00	1.21	0.00	1.56	0.00	1.44	0.93	0.66	0.00	0.00	
	0.00	0.81	0.00	1.88	0.00	1.52	1.32	0.65	0.00	0.00	
	1.51	1.56	0.00	0.00	1.67	0.95	0.00	0.67	0.00	0.00	
Mean	0.50	1.19	0.00	1.15	0.56	1.30	0.75	0.66	0.00	0.00	
PCB 19	0.64	0.00	0.00	0.00	1.05	0.00	0.63	0.00	0.00	0.00	
	0.00	0.00	0.00	1.27	1.44	0.00	1.89	0.00	0.00	0.00	
	0.99	0.00	0.00	0.98	1.38	0.00	0.00	0.00	0.00	0.00	
Mean	0.54	0.00	0.00	0.75	1.29	0.00	0.84	0.00	0.00	0.00	
PCB 12+13	0.00	0.98	0.00	1.61	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	5.73	0.00	0.97	0.00	0.00	6.79	0.00	0.00	0.00	
	0.00	3.31	0.00	0.00	1.37	0.54	0.00	0.00	0.00	0.00	
Mean	0.00	3.34	0.00	0.86	0.46	0.18	2.26	0.00	0.00	0.00	
PCB 18	1.22	1.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	1.30	0.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	1.65	0.46	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
PCB 17	0.67	0.64	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.75	0.00	0.65	0.00	0.00	0.00	0.59	0.00	0.00	0.00	
Mean	0.47	0.21	0.22	0.00	0.00	0.00	0.20	0.00	0.00	0.00	
PCB 24+27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.65	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	

PLOT REPLICATE	1A, B C	2A B C	3A B C	4A B C	5A B C	6A B C	7A B C	8A B C	9A B C	10A B C	Fresh water CCC
PCB 16+32	0.00	0.00	0.00	0.00	0.00	0.00	0.73	0.30	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.54	0.00	0.00	0.00	0.00	
	0.83	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.28	0.00	0.00	0.00	0.00	0.18	0.24	0.10	0.00	0.00	
PCB 29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
PCB 26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.35	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	0.00	0.00	0.12	0.00	0.00	0.00	0.00	
PCB 25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.22	0.00	0.18	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.80	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	0.00	0.00	0.07	0.00	0.06	0.00	0.00	
PCB 31+28	0.00	0.00	2.42	0.50	0.00	0.00	0.00	0.00	0.00	4.87	
	0.00	0.11	3.20	1.47	0.00	0.00	0.74	0.00	0.00	4.58	
	0.00	3.35	3.27	0.00	0.47	0.00	0.54	0.00	2.45	0.82	
Mean	0.00	1.15	2.86	0.66	0.16	0.00	0.43	0.00	0.82	3.42	
PCB 21+33+53	0.86	1.34	2.00	0.00	0.00	0.85	0.86	1.03	1.39	0.00	
	1.13	2.23	3.08	0.00	0.00	1.17	1.05	1.50	0.89	2.55	
	1.33	5.23	2.45	0.00	0.00	1.29	0.92	0.00	1.72	1.86	
Mean	1.11	2.93	2.51	0.00	0.00	1.10	0.94	0.84	1.33	1.47	
PCB 22	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.40	
	0.00	0.00	0.00	0.00	0.00	0.00	0.72	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	0.01	0.00	0.00	0.24	0.00	0.00	0.13	
PCB 45	0.00	0.00	0.00	0.48	0.00	2.43	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	2.86	2.96	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	2.84	3.78	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	0.16	0.95	3.02	0.99	0.00	0.00	0.00	
PCB 46	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
PCB 52+43	0.00	0.12	0.48	0.00	0.00	0.00	0.00	0.02	0.00	0.24	
	0.06	0.09	0.36	0.00	0.00	0.09	0.01	0.26	0.00	0.64	

PLOT REPLICATE	1A, B C	2A B C	3A B C	4A B C	5A B C	6A B C	7A B C	8A B C	9A B C	10A B C	Fresh water CCC
	0.11	0.49	0.41	0.00	0.39	0.00	0.00	0.00	0.00	0.35	
Mean	0.06	0.23	0.42	0.00	0.13	0.03	0.00	0.09	0.00	0.41	
PCB 49	0.53	1.61	0.00	0.00	0.00	1.32	1.23	0.71	0.00	0.00	
	0.66	0.74	0.00	0.00	0.00	1.00	1.36	0.69	0.00	0.00	
	0.68	0.52	0.00	0.00	1.05	1.63	1.15	0.91	0.00	0.00	
Mean	0.62	0.96	0.00	0.00	0.35	1.32	1.25	0.77	0.00	0.00	
PCB 47+48	0.60	0.54	0.72	0.39	0.00	0.79	0.37	0.35	0.46	0.45	
	0.86	0.73	0.76	0.34	0.52	0.69	0.60	0.63	0.58	0.61	
	1.16	0.71	0.88	0.61	0.79	0.61	0.54	0.74	2.46	0.57	
Mean	0.87	0.66	0.79	0.45	0.44	0.70	0.50	0.57	1.17	0.54	
PCB 44	0.00	0.00	0.00	0.51	0.00	0.70	0.52	0.00	0.00	0.00	
	0.58	0.67	1.19	0.00	0.53	0.75	0.60	0.93	0.00	2.24	
	0.85	0.51	0.62	0.00	1.40	0.80	0.00	0.00	0.00	0.00	
Mean	0.48	0.39	0.60	0.17	0.64	0.5	0.37	0.31	0.00	0.75	
PCB 37+42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.58	0.00	0.00	0.00	0.00	0.00	0.00	0.88	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.19	0.00	0.00	0.00	0.00	0.00	0.00	0.29	0.00	
PCB 41+71	0.58	1.04	2.53	2.29	0.00	0.72	0.48	0.58	1.35	2.14	
	0.86	1.68	1.29	1.52	0.00	0.83	1.47	2.39	0.45	0.27	
	1.76	2.76	2.93	0.53	3.11	0.98	0.59	0.45	2.13	1.55	
Mean	1.07	1.83	2.25	1.45	1.04	0.84	0.85	1.14	1.31	1.32	
PCB 64	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
PCB 40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
PCB 100?	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
PCB 63?	0.00	0.00	0.00	0.71	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	0.24	0.00	0.00	0.00	0.00	0.00	0.00	

PLOT REPLICATE	1A, B C	2A B C	3A B C	4A B C	5A B C	6A B C	7A B C	8A B C	9A B C	10A B C	Fresh water CCC
PCB 74	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	
	0.00	0.00	0.73	0.00	0.00	0.00	0.00	0.00	0.00	0.68	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.24	0.00	0.00	0.00	0.00	0.00	0.00	0.23	
PCB 70+76	0.61	0.68	0.00	1.15	0.00	0.91	0.78	0.89	0.00	0.00	
	0.88	1.10	0.00	0.66	0.61	1.10	0.89	1.15	0.00	0.00	
	1.07	0.82	0.00	0.87	1.75	0.93	0.81	0.68	0.00	0.00	
Mean	0.85	0.87	0.00	0.89	0.79	0.98	0.83	0.91	0.00	0.00	
PCB 66+95	0.00	0.07	0.04	0.02	0.00	0.11	0.00	0.00	0.00	0.20	
	0.00	0.00	0.00	1.12	0.00	0.00	0.00	0.24	0.00	0.37	
	0.05	0.13	0.00	0.00	0.00	0.00	0.95	0.00	0.04	0.15	
Mean	0.02	0.07	0.01	0.38	0.00	0.04	0.32	0.08	0.01	0.24	
PCB 91	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
PCB 50+60+85	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.61	1.34	0.00	0.81	0.00	0.00	
	0.91	0.00	0.00	0.00	0.00	0.99	0.00	0.00	0.00	0.00	
Mean	0.30	0.00	0.00	0.00	0.23	0.78	0.00	0.27	0.00	0.00	
PCB 101	0.35	0.49	0.00	0.00	0.00	0.47	0.40	0.44	0.00	0.00	
	0.46	0.41	0.00	0.46	0.00	0.40	0.50	0.58	0.00	0.00	
	0.51	0.40	0.00	0.35	0.62	0.41	0.35	0.42	0.00	0.00	
Mean	0.44	0.43	0.00	0.27	0.21	0.43	0.42	0.48	0.00	0.00	
PCB 99	0.00	0.00	0.00	0.00	0.00	0.21	0.19	0.22	0.00	0.00	
	0.21	0.18	0.00	0.29	0.00	0.22	0.00	0.25	0.00	0.00	
	0.67	0.56	0.00	0.16	0.79	0.25	0.00	0.16	0.00	0.00	
Mean	0.29	0.25	0.00	0.15	0.26	0.23	0.06	0.21	0.00	0.00	
PCB 83	0.00	0.00	0.00	0.18	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.12	0.00	0.00	0.19	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.04	0.00	0.00	0.12	0.00	0.00	0.00	0.00	0.00	0.00	
PCB 97	0.00	0.00	0.00	0.21	0.00	0.20	0.12	0.10	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.17	0.00	0.12	0.00	0.23	
	0.00	0.00	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	0.07	0.00	0.06	0.04	0.14	0.00	0.08	
PCB 81+87	0.00	0.26	0.00	0.00	0.00	0.33	0.26	0.24	0.00	0.00	
	0.00	0.00	0.00	0.37	0.18	0.35	0.34	0.00	0.00	0.29	

PLOT REPLICATE	1A, B C	2A B C	3A B C	4A B C	5A B C	6A B C	7A B C	8A B C	9A B C	10A B C	Fresh water CCC
	0.27	0.00	0.00	0.22	0.00	0.36	0.00	0.00	0.00	0.00	
Mean	0.09	0.09	0.00	0.20	0.06	0.35	0.20	0.08	0.00	0.10	
PCB 85	0.00	0.00	0.00	1.10	0.00	0.79	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	1.37	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	0.37	0.00	0.72	0.00	0.00	0.00	0.00	
PCB 136	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
PCB 77+110	0.00	0.09	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.12	0.00	0.33	
	0.31	0.07	0.00	0.00	0.29	0.00	0.44	0.00	0.15	0.11	
Mean	0.10	0.05	0.02	0.00	0.10	0.00	0.15	0.04	0.05	0.15	
PCB 82	0.00	0.01	0.00	0.83	0.00	0.00	0.00	0.00	0.00	0.00	
	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.05	0.00	0.34	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.04	0.00	0.11	0.28	0.00	0.00	0.00	0.00	0.00	0.00	
PCB 151	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.51	0.21	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.08	0.00	0.17	0.07	0.00	0.00	0.00	0.00	0.00	0.00	
PCB 135+144+147+127	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
PCB 107+123	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
PCB 149	0.00	0.36	0.00	0.00	0.00	0.32	0.00	0.31	0.00	0.00	
	0.32	0.25	0.25	0.00	0.00	0.38	0.00	0.29	0.00	0.00	
	0.00	0.00	0.00	0.28	0.00	0.00	0.31	0.00	0.00	0.00	
Mean	0.11	0.20	0.08	0.09	0.00	0.23	0,10	0.20	0.00	0.00	
PCB 118	0.48	0.50	0.06	0.31	0.00	0.00	0.02	0.00	0.00	0.21	
	0.00	0.47	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.12	
	0.78	0.38	0.00	0.00	0.00	0.08	0.83	0.00	0.00	0.15	

PLOT REPLICATE	1A, B C	2A B C	3A B C	4A B C	5A B C	6A B C	7A B C	8A B C	9A B C	10A B C	Fresh water CCC
Mean	0.42	0.45	0.02	0.10	0.00	0.03	0.29	0.00	0.00	0.16	
PCB 134	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
PCB 131	0.00	0.00	0.00	0.09	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	
PCB 146	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
PCB 105+132+153	0.35	0.00	1.00	0.56	2.36	0.63	0.51	0.51	0.54	0.70	
	0.49	0.00	0.22	0.00	1.86	0.63	0.52	0.58	0.28	0.53	
	0.00	0.57	0.00	1.97	0.36	0.45	0.00	0.35	0.34	0.37	
Mean	0.28	0.19	0.41	0.84	1.53	0.57	0.34	0.48	0.39	0.53	
PCB 141+179	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
PCB 137+176+130	0.00	0.00	2.85	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.95	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
PCB 163+138	0.23	0.00	0.22	0.00	0.39	0.42	0.31	0.31	0.19	0.00	
	0.29	0.27	0.18	0.33	0.24	0.43	0.31	0.37	0.23	0.00	
	0.00	0.00	0.21	0.26	0.29	0.34	0.25	0.25	0.00	0.53	
Mean	0.17	0.09	0.20	0.20	0.31	0.40	0.29	0.31	0.14	0.18	
PCB 158	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.33	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.11	
PCB 178+129	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
PCB 187+182	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	

PLOT REPLICATE	1A, B C	2A B C	3A B C	4A B C	5A B C	6A B C	7A B C	8A B C	9A B C	10A B C	Fresh water CCC
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	12.31	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.10	0.00	
PCB 183	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.27	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.00	0.00	
PCB 128	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
OCP Endrin Ketone	0.00	0.00	0.00	0.00	21.18	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.90	
	0.00	6.09	6.88	0.00	21.11	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	2.03	2.29	0.00	14.10	0.00	0.00	0.00	0.00	2.30	
PCB 185	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
PCB 174	0.00	0.00	0.00	0.46	0.00	0.49	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.57	0.68	0.00	0.00	0.00	
	0.35	0.00	0.00	0.00	0.46	0.00	0.00	0.00	0.00	0.00	
Mean	0.12	0.00	0.00	0.15	0.15	0.35	0.23	0.00	0.00	0.00	
PCB 177	0.00	0.00	0.00	0.00	2.02	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	0.00	0.67	0.00	0.00	0.00	0.00	0.00	
PCB 202+171+176	0.00	0.00	0.00	0.00	1.79	0.00	0.00	0.46	0.00	0.00	
	0.00	17.26	0.00	0.50	0.00	0.00	0.43	0.00	0.00	0.00	
	0.28	0.00	0.00	0.00	0.11	0.00	0.25	0.00	0.00	0.00	
Mean	0.09	5.75	0.00	0.17	0.63	0.00	0.23	0.15	0.00	0.00	
PCB 157+200	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
PCB 204	3.19	3.19	2.63	3.48	2.91	1.28	2.08	2.63	0.00	4.95	
	2.63	0.00	2.91	2.36	2.63	3.19	3.19	2.63	1.55	7.14	
	2.08	0.00	2.36	2.91	0.00	2.91	2.63	1.55	4.05	1.81	

PLOT REPLICATE	1A, B C	2A B C	3A B C	4A B C	5A B C	6A B C	7A B C	8A B C	9A B C	10A B C	Fresh water CCC
Mean	2.63	1.06	2.63	2.92	1.85	2.46	2.63	2.27	1.87	4.63	
PCB 172+197	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
PCB 180	0.00	0.00	0.00	0.00	0.00	0.85	1.67	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.69	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	1.57	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	0.00	0.52	0.51	0.56	0.00	0.00	0.00	
PCB 193	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
PCB 191	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
PCB 199	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.48	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.16	0.00	
PCB 170+190	0.00	1.57	4.85	0.00	0.00	0.00	0.00	0.00	0.00	6.69	
	0.00	7.04	0.00	0.00	0.00	0.00	0.00	0.27	0.00	7.54	
	0.00	3.07	0.00	0.00	0.00	0.00	0.00	0.00	0.06	1.18	
Mean	0.00	3.89	1.62	0.00	0.00	0.00	0.00	0.09	0.02	5.14	
PCB 198	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
PCB 201	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
PCB 203+196	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	0.00	0.00	000	0.00	0.00	0.00	0.00	
PCB 189	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.00	0.00	

PLOT REPLICATE	1A, B C	2A B C	3A B C	4A B C	5A B C	6A B C	7A B C	8A B C	9A B C	10A B C	Fresh water CCC
	0.00	0.00	0.00	0.00	0.00	0.00	0.17	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.07	0.00	0.00	
PCB 208+195	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.63	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	1.70	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.57	0.54	0.00	0.00	
PCB 207	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
PCB 194	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
PCB 205	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
PCB 206	0.00	7.74	0.00	0.00	0.00	0.00	0.00	0.16	0.00	0.00	
	0.00	12.41	0.00	0.00	0.00	0.00	0.00	0.10	7.32	0.00	
	0.00	16.25	8.93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	12.13	2.98	0.00	0.00	0.00	0.00	0.05	2.44	0.00	
PCB 209	0.01	0.00	0.00	0.00	0.00	0.02	0.03	0.02	0.00	0.00	
	0.01	0.00	0.00	0.00	0.02	0.03	0.02	0.02	0.00	0.00	
	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.04	0.00	0.00	
Mean	0.00	0.00	0.00	0.00	0.00	0.02	0.02	0.03	0.00	0.00	

2007

Data on heavy metals in water collected on October 17, 2007 (Table VII.D6) showed toxic levels of Hg, Cu and Pb. Concentrations were above the Criteria Continuous Concentration (CCC) for chronic exposure in freshwater for Hg, Cu and Pb. Water concentrations for Hg were about 2.9 times higher that the CCC, Cu concentrations were about 1.5 times and about 3.5 times for Pb. Cd is no longer a concern, water concentrations for this metal has dropped to acceptable levels. Water concentrations for Pb have also dropped considerably from 50 times to 3.5 times higher than the CCC. Over the two and a half year period from 2005 to 2007, Hg has increased from acceptable concentrations to 2.9 times higher than the CCC.

Water samples collected October 10, 2007 had average total PCB concentrations ranging from 1.54 ng/L in plot 10, which was Control S, to 22.38 ng/L in plot 8, which was AB un (Table VII.D6). PCB concentrations exceeded the CCC, 14 ng/L, in one or more replicates collected from plots 5, 7 and 8, which were AB unS, Control S and ABun, respectively. Average total OCP concentrations ranged from 2.65 ng/L in plot 10, which is Control S, to192.0 ng/L in plot 8, which is AB un (Table VII.D6). DDT concentrations exceeded the CCC, 130 ng/L, in two replicates from plot 7 and all three replicates from plot 8. This suggested a “hot spot” for this contaminant as plot 7 was uncapped and plot 8 had AB un. Other than PCBs in plots 9 and 10 in 2005 and DDT in plots 7 and 8 in 2007, water concentrations of PCBs and OCPs were similar between 2005, 2006 and 2007 post capping.

Table VII.D5. Heavy metals in water (µg/L) collected post capping, October 17, 2007. CNTRL = not capped, S = with SubmerSeed, AB = AquaBlok, PM = amended with peat moss, UN = unamended, Total = sum of metals without Fe. Red shading: value > CCC[a] freshwater.

Treatment	Sample	Site	Cd	Cr	Cu	Fe	Hg	Ni	Pb	Zn	Total
AB un S	1 A	1C	0.19	6.61	7.07	113	4.04	3.39	2.85	29.63	54
	1 B	4D	0.22	3.97	5.75	100	1.31	5.21	3.12	51.71	71
	1 C	2E	0.18	3.21	9.92	143	1.22	2.26	1.94	39.08	58
	Ave-1		0.20	4.60	7.58	118	2.19	3.62	2.64	40.14	61
	SD-1		0.02	1.78	2.13	22	1.60	1.49	0.62	11.08	9
AB pm S	2 A	2A	0.16	2.93	7.27	118	0.56	2.86	1.20	15.44	30
	2 B	3B	0.16	3.40	5.99	118	0.50	4.28	2.56	24.82	42
	2 C	4C	0.16	3.27	12.97	133	0.49	3.20	2.14	38.93	61
	Ave-2		0.16	3.20	8.74	123	0.52	3.45	1.97	26.40	44
	SD-2		0.00	0.24	3.71	9	0.04	0.74	0.70	11.83	16
CNTRL	3 A	1B	0.13	2.81	11.57	107	0.36	2.78	1.36	29.57	49
	3 B	4D	0.15	2.80	11.30	113	0.46	3.31	1.04	32.03	51
	3 C	5A	0.17	2.68	9.20	113	0.36	3.73	1.42	22.41	40
	Ave-3		0.15	2.76	10.69	111	0.39	3.27	1.27	28.00	47
	SD-3		0.02	0.07	1.30	4	0.06	0.48	0.20	5.00	6
AB un	4 A	2C	0.20	2.61	11.44	57	0.36	6.32	3.94	51.98	77
	4 B	3A	0.14	2.60	9.97	101	0.36	3.52	2.01	32.13	51
	4 C	4E	0.16	2.85	22.40	99	0.35	4.20	1.09	29.17	60
	Ave-4		0.16	2.69	14.60	86	0.36	4.68	2.35	37.76	63
	SD-4		0.03	0.14	6.79	25	0.01	1.46	1.45	12.40	13
AB un S	5 A	5B	0.16	2.65	12.22	83	0.36	2.79	1.26	42.39	62
	5 B	4D	0.10	2.75	11.31	95	0.31	4.22	1.13	26.31	46
	5 C	7B	0.10	2.77	13.40	117	0.29	2.07	1.17	14.61	34
	Ave-5		0.12	2.72	12.31	98	0.32	3.03	1.19	27.77	47
	SD-5		0.03	0.06	1.05	18	0.04	1.09	0.07	13.94	14
AB pm S	6 A	5E	0.34	17.43	20.95	244	0.89	9.83	6.88	38.13	94

[a] CCC is criteria continuous concentration and represents the highest concentration to which aquatic organisms should be chronically exposed to priority pollutants, µg/L. (EPA-820-B-96-001, September 1996).

Treatment	Sample	Site	Cd	Cr	Cu	Fe	Hg	Ni	Pb	Zn	Total
	6 B	2B	0.28	7.05	15.50	167	2.91	8.74	2.98	42.22	80
	6 C	2D	0.21	4.79	6.47	107	0.47	3.23	3.66	35.18	54
	Ave-6		0.28	9.76	14.31	172	1.42	7.27	4.51	38.51	76
	SD-6		0.07	6.74	7.31	69	1.30	3.54	2.08	3.54	20
CNTRL S	7 A	3A	0.29	4.70	13.77	86	0.49	5.99	4.20	6.32	36
	7 B	5D	0.37	4.87	8.17	119	0.43	6.10	5.54	41.31	67
	7 C	2D	0.41	3.94	7.23	112	0.29	3.88	5.51	29.58	51
	Ave-7		0.36	4.50	9.72	106	0.40	5.32	5.08	25.74	51
	SD-7		0.06	0.50	3.53	17	0.10	1.25	0.77	17.81	16
AB un	8 A	1A	0.37	5.59	10.11	192	1.57	5.21	5.29	15.23	43
	8 B	3C	0.42	4.41	11.42	104	0.53	3.77	6.92	19.02	46
	8 C	3B	0.38	3.44	13.47	138	0.46	3.07	5.30	6.77	33
	Ave-8		0.39	4.48	11.67	144	0.85	4.02	5.84	13.67	41
	SD-8		0.03	1.08	1.69	45	0.62	1.09	0.94	6.27	7
CNTRL	9 A	1C	0.38	4.04	11.16	84	0.94	2.98	7.21	23.87	51
	9 B	4A	0.39	3.91	15.76	70	0.26	3.30	4.77	3.16	32
	9 C	4D	0.37	3.12	8.05	67	0.42	3.33	4.74	3.59	24
	Ave-9		0.38	3.69	11.66	74	0.54	3.20	5.57	10.21	35
	SD-9		0.01	0.50	3.88	9	0.36	0.19	1.42	11.83	14
CNTRL S	10 A	3C	0.46	4.45	29.46	142	0.47	2.89	80.47	18.90	57
	10 B	2A	0.46	3.63	7.94	122	0.29	3.31	7.24	4.21	27
	10 C	5A	0.42	3.35	7.68	136	0.37	3.23	6.07	7.09	28
	Ave-10		0.45	3.81	15.03	133	0.38	3.14	6.66	10.07	37
	SD-10		0.03	0.57	12.50	10	0.09	0.22	0.83	7.78	17
CCC[a] freshwater			0.25	74	9.0	ND	0.77	52	2.5	120	
CCC salt water			8.8	ND	3.1	ND	0.94	8.2	8.1	81	

Table VII.D6. Concentration of organic contaminants (ng/L) in water collected post-capping October 17, 2007. Treatments were: plots 3&9 = control, 7&10 = control with SubmerSeed, 4&8 = AquaBlok unamended, 1&5 = AquaBlok unamended with Submer Seed and 2&6 = AquaBlok amended with peat moss with SubmerSeed. Values shaded in yellow exceeded the EPA's CCC[a]. These criteria are not available for all contaminants. Zero values represented non-detectable levels.

PLOT REPLICATE	1A, B C	2A B C	3A B C	4A B C	5A B C	6A B C	7A B C	8A B C	9A B C	10A B C	Fresh water CCC
TOTAL CONCENTRATION (ng/L)											
PCB	4.05	5.26	10.44	3.33	2.47	10.31	10.81	26.48	1.03	1.44	14
	6.22	2.82	6.45	9.12	18.22	4.54	5.77	21.90	5.68	1.38	
	8.32	3.73	2.25	5.88	3.60	8.63	18.84	18.77	1.28	1.79	
Mean	6.35	3.94	6.38	6.11	8.10	7.83	11.81	22.38	2.66	1.54	
OCP	42.44	26.85	36.87	9.01	13.22	5.47	165.80	195.86	8.25	7.11	
	65.02	6.91	32.17	37.51	54.21	28.53	46.85	173.21	9.17	0.61	
	53.32	41.35	12.07	30.07	19.88	118.78	186.44	206.93	7.00	0.23	
Mean	53.59	25.04	27.04	25.53	29.10	50.93	133.03	192.0	8.14	2.65	
Pesticide	CONC (ng/L)	CONC (ng/L)	CONC (ng/L)	CONC (ng/L)	CONC (ng/L)	CONC (ng/L)	CONC (ng/L)	CONC (ng/L)	CONC (ng/L)	CONC (ng/L)	CONC (ng/L)
OCP a-BHC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.12	
	0.20	0.13	0.00	0.23	0.00	0.00	0.12	0.00	0.10	0.10	
	0.00	0.00	0.00	0.14	0.15	0.00	0.18	0.00	0.05	0.10	
Mean	0.07	0.04	0.00	0.12	0.05	0.00	0.10	0.00	0.05	0.11	
OCP b-BHC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	1.13	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.04	0.38	0.00	0.00	0.00	0.00	0.00	0.00	
OCP g-BHC	0.06	0.22	0.05	0.51	0.18	1.71	2.17	2.26	0.00	0.00	
	0.08	0.55	0.00	1.51	2.72	0.76	0.73	2.10	0.00	0.09	160
	0.32	0.41	0.00	0.90	0.41	1.17	2.38	0.88	0.00	0.08	
Mean	0.15	0.39	0.02	0.67	1.10	1.21	1.76	1.75	0.00	0.03	
OCP d-BHC	0.00	0.00	0.00	0.00	0.00	0.68	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.21	0.00	0.00	0.17	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.41	0.00	0.00	0.00	0.00	

PLOT REPLICATE	1A, B C	2A B C	3A B C	4A B C	5A B C	6A B C	7A B C	8A B C	9A B C	10A B C	Fresh water CCC
Mean	0.00	0.00	0.00	0.07	0.00	0.36	0.06	0.00	0.00	0.00	
OCP Heptachlor	1.62	1.18	1.26	2.21	0.38	0.98	1.97	3.86	0.26	0.28	53
	0.29	0.00	1.02	0.87	0.90	1.40	1.67	3.91	0.87	0.27	
	2.77	1.28	1.30	1.02	0.56	0.55	3.57	4.59	0.51	0.05	
Mean	1.56	0.82	1.19	1.37	0.61	0.98	2.40	4.12	0.55	0.20	
OCP Aldrin	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3000
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
OCP Heptachlor Epoxide	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	53
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
OCP Endosulfan I	0.16	0.23	0.26	0.14	0.10	0.34	0.35	0.65	0.00	0.00	34
	0.27	0.15	0.01	0.49	0.87	0.34	0.26	0.56	0.13	0.07	
	0.13	0.34	0.01	0.39	0.22	0.21	0.59	0.63	0.09	0.00	
Mean	0.17	0.24	0.09	0.34	0.40	0.30	0.40	0.61	0.07	0.02	
OCP Dieldrin	0.00	0.10	0.00	0.00	0.00	0.08	0.00	0.00	0.00	0.00	710
	0.07	0.00	0.00	0.02	0.34	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.18	0.00	0.00	0.17	0.22	0.00	0.00	
Mean	0.02	0.03	0.00	0.07	0.11	0.03	0.06	0.07	0.00	0.00	
OCP DDD	0.00	0.00	0.00	0.33	0.48	0.00	1.10	0.32	0.00	0.00	
	0.00	0.00	0.00	0.62	1.48	0.00	0.59	0.72	0.36	0.00	
	0.00	0.00	0.00	0.63	0.29	0.00	0.00	0.91	0.00	0.00	
Mean	0.00	0.00	0.00	0.53	0.75	0.00	0.56	0.65	0.12	0.00	
OCP DDE	0.21	1.58	0.43	0.04	0.66	1.68	1.78	0.88	0.06	0.00	
	0.92	0.17	0.13	0.46	2.16	0.24	0.19	0.56	0.09	0.08	
	1.69	0.29	0.34	0.48	0.08	0.38	0.59	0.90	0.24	0.00	
Mean	0.94	0.68	0.30	0.33	0.97	0.77	0.85	0.78	0.13	0.03	

PLOT REPLICATE	1A, B C	2A B C	3A B C	4A B C	5A B C	6A B C	7A B C	8A B C	9A B C	10A B C	Fresh water CCC
OCP DDT	40.38	23.53	34.86	5.87	8.94	0.00	158.42	187.89	7.92	6.71	130
	63.20	5.91	31.01	31.97	45.50	25.79	43.04	165.36	7.62	0.00	
	48.41	39.02	10.21	26.34	18.17	116.06	178.96	198.82	6.10	0.00	
Mean	50.66	22.82	25.36	21.39	24.20	64.48	126.81	184.02	7.21	2.24	
OCP Endrin	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	37
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
OCP Endosulfan II	0.00	0.00	0.00	0.00	0.08	0.00	0.00	0.00	0.00	0.00	14
	0.00	0.00	0.00	0.00	0.26	0.00	0.08	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	0.00	0.11	0.00	0.023	0.00	0.00	0.00	
OCP Endrin Aldehyde	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
OCP Endosulfan Sulfate	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
OCP Metoxychlor	0.00	0.00	0.00	0.00	2.40	0.00	0.00	0.00	0.00	0.00	30
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	0.00	0.80	0.00	0.00	0.00	0.00	0.00	
PCB Congener											
PCB 1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	

PLOT REPLICATE	1A, B C	2A B C	3A B C	4A B C	5A B C	6A B C	7A B C	8A B C	9A B C	10A B C	Fresh water CCC
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
PCB 3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
PCB 4+10	0.00	0.00	0.00	0.00	0.81	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.22	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	0.00	0.27	0.07	0.00	0.00	0.00	0.00	
PCB 7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
PCB 6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
PCB 8+5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.73	0.00	0.00	
	0.00	0.00	0.00	0.28	0.19	0.02	0.02	0.42	0.13	0.00	
	0.06	0.00	0.00	0.00	0.00	0.00	0.19	0.00	0.00	0.00	
Mean	0.02	0.00	0.00	0.09	0.06	0.00	0.07	0.38	0.04	0.00	
PCB 19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
PCB 12+13	0.00	0.00	0.00	0.00	0.00	1.75	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	0.00	0.00	0.59	0.00	0.00	0.00	0.00	

PLOT REPLICATE	1A, B C	2A B C	3A B C	4A B C	5A B C	6A B C	7A B C	8A B C	9A B C	10A B C	Fresh water CCC
PCB 18	0.02	0.00	0.00	1.05	0.00	0.00	0.00	1.34	0.00	0.00	
	0.10	0.00	0.00	0.18	0.27	0.00	0.02	1.33	0.00	0.00	
	0.10	0.14	0.00	0.00	0.00	0.00	0.86	1.03	0.00	0.00	
Mean	0.07	0.05	0.00	0.35	0.09	0.00	0.29	1.23	0.00	0.00	
PCB 17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.24	0.00	0.00	
	0.00	0.00	0.00	0.15	0.12	0.00	0.00	0.45	0.00	0.00	
	0.00	0.02	0.00	0.00	0.00	0.00	0.15	0.14	0.00	0.00	
Mean	0.00	0.00	0.00	0.05	0.04	0.00	0.05	0.28	0.00	0.00	
PCB 24+27	0.04	0.00	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	
Mean	0.01	0.01	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.02	
PCB 16+32	0.06	0.04	0.45	0.00	0.00	0.12	0.13	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.23	0.00	
	0.00	0.00	0.00	0.00	0.00	1.22	0.00	0.00	0.00	0.00	
Mean	0.02	0.01	0.15	0.00	0.00	0.46	0.04	0.00	0.08	0.00	
PCB 29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
PCB 26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
PCB 25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
PCB 31+28	0.39	0.58	0.08	0.23	0.08	1.85	0.26	4.87	0.00	0.00	

PLOT REPLICATE	1A, B C	2A B C	3A B C	4A B C	5A B C	6A B C	7A B C	8A B C	9A B C	10A B C	Fresh water CCC
	0.82	0.00	0.95	1.47	2.27	0.34	0.04	3.64	0.58	0.00	
	0.47	0.37	0.26	0.80	0.37	1.58	3.99	2.25	0.00	0.00	
Mean	0.56	0.32	0.43	0.83	0.91	1.26	1.43	3.59	0.19	0.00	
PCB 21+33+53	0.31	0.42	0.30	0.07	0.00	0.03	0.26	1.29	0.00	0.00	
	0.43	0.07	0.44	0.38	0.43	0.12	0.50	1.71	0.29	0.00	
	0.66	0.34	0.16	0.00	0.55	0.23	0.57	1.64	0.01	0.00	
Mean	0.47	0.28	0.30	0.15	0.33	0.13	0.44	1.55	0.10	0.00	
PCB 22	0.22	0.12	0.00	0.00	0.00	0.00	0.00	0.59	0.00	0.05	
	0.23	0.05	0.04	0.00	0.00	0.00	0.00	0.77	0.06	0.00	
	0.13	0.03	0.00	0.18	0.00	0.00	0.66	0.44	0.00	0.00	
Mean	0.19	0.07	0.01	0.06	0.00	0.00	0.22	0.60	0.02	0.02	
PCB 45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.27	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	
PCB 46	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
PCB 52+43	0.29	0.27	0.07	0.09	0.08	0.29	0.35	1.52	0.00	0.00	
	0.53	0.05	0.41	0.34	0.96	0.47	0.46	1.23	0.23	0.00	
	0.56	0.12	0.10	0.32	0.22	0.15	1.38	1.33	0.00	0.00	
Mean	0.46	0.15	0.19	0.25	0.42	0.30	0.73	1.36	0.08	0.00	
PCB 49	0.35	0.33	0.27	0.07	0.03	0.17	0.54	1.46	0.00	0.00	
	0.61	0.09	0.77	0.41	0.98	0.14	0.44	0.00	0.24	0.00	
	1.04	0.05	0.17	0.31	0.21	0.11	0.00	0.00	0.00	0.05	
Mean	0.67	0.16	0.40	0.26	0.41	0.14	0.33	0.49	0.08	0.02	
PCB 47+48	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.35	0.00	0.00	0.00	0.00	0.50	0.27	

PLOT REPLICATE	1A, B C	2A B C	3A B C	4A B C	5A B C	6A B C	7A B C	8A B C	9A B C	10A B C	Fresh water CCC
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	0.12	0.00	0.00	0.00	0.00	0.17	0.09	
PCB 44	0.13	0.17	0.07	0.14	0.07	0.20	0.45	0.62	0.00	0.00	
	0.10	0.05	0.26	0.26	0.53	0.17	0.18	0.00	0.29	0.02	
	0.29	0.14	0.10	0.14	0.40	0.22	0.31	0.00	0.01	0.31	
Mean	0.14	0.12	0.14	0.18	0.33	0.20	0.31	0.21	0.10	0.11	
PCB 37+42	0.00	0.00	0.00	0.00	0.00	0.97	0.20	0.00	0.00	0.00	
	0.00	0.00	0.41	0.00	0.00	0.01	0.27	0.00	0.00	0.00	
	0.00	0.00	0.25	0.00	0.00	0.13	0.00	0.00	0.00	0.19	
Mean	0.00	0.00	0.22	0.00	0.00	0.37	0.16	0.00	0.00	0.06	
PCB 41+71	0.27	0.41	0.10	0.12	0.00	0.19	0.07	1.79	0.00	0.01	
	0.41	0.00	0.26	0.17	0.74	0.27	0.13	1.58	0.24	0.00	
	0.44	0.42	0.03	0.31	0.07	0.03	1.16	1.35	0.00	0.00	
Mean	0.37	0.28	0.13	0.20	0.27	0.16	0.45	1.57	0.08	0.00	
PCB 64	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
PCB 40	0.00	0.00	0.00	0.06	0.04	0.00	0.00	0.17	0.05	0.00	
	0.00	0.00	0.00	0.00	0.17	0.00	0.00	0.05	0.03	0.01	
	0.00	0.00	0.00	0.15	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	0.07	0.07	0.00	0.00	0.07	0.03	0.00	
PCB 100?	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
PCB 63?	0.80	0.71	0.04	0.00	0.73	0.00	0.00	0.00	0.66	0.65	
	0.47	0.00	0.00	0.00	0.74	0.49	0.48	0.65	0.55	0.00	
	0.65	0.25	0.57	0.69	0.76	0.00	0.00	0.00	0.51	0.00	

PLOT REPLICATE	1A, B C	2A B C	3A B C	4A B C	5A B C	6A B C	7A B C	8A B C	9A B C	10A B C	Fresh water CCC
Mean	0.64	0.32	0.20	0.23	0.74	0.16	0.16	0.22	0.57	0.22	
PCB 74	0.00	0.00	0.17	0.19	0.00	0.20	0.23	1.79	0.00	0.00	
	0.32	0.18	0.41	0.36	0.71	0.15	0.22	1.30	0.10	0.01	
	0.51	0.43	0.13	0.00	0.13	0.16	1.79	1.32	0.00	0.02	
Mean	0.28	0.20	0.24	0.18	0.28	0.17	0.75	1.47	0.03	0.01	
PCB 70+76	0.17	0.35	0.12	0.35	0.03	0.33	0.38	0.91	0.01	0.02	
	0.24	0.17	0.42	0.27	0.68	0.14	0.08	0.22	0.50	0.03	
	0.57	0.00	0.10	0.48	0.20	0.20	0.45	0.24	0.02	0.14	
Mean	0.33	0.17	0.21	0.37	0.30	0.22	0.30	0.46	0.18	0.06	
PCB 66+95	0.48	0.49	0.18	0.39	0.00	1.76	4.25	1.78	0.00	0.04	
	0.68	0.32	0.70	0.63	1.60	0.32	0.34	1.72	0.48	0.01	
	0.72	0.38	0.16	0.71	0.00	3.14	1.54	1.76	0.00	0.14	
Mean	0.63	0.40	0.35	0.58	0.53	1.74	2.04	1.75	0.16	0.06	
PCB 91	0.00	0.00	0.00	0.00	0.23	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.33	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	0.00	0.19	0.00	0.00	0.00	0.00	0.00	
PCB 50+60+85	0.00	0.46	0.05	1.09	0.00	0.27	0.41	2.55	0.00	0.00	
	0.28	0.66	0.41	0.00	2.77	0.11	0.00	2.34	0.60	0.52	
	0.61	0.00	0.00	0.00	0.00	0.00	0.68	2.15	0.00	0.44	
Mean	0.30	0.37	0.15	0.36	0.92	0.13	0.36	2.35	0.20	0.32	
PCB 101	0.10	0.08	0.18	0.15	0.00	0.28	0.29	0.37	0.00	0.00	
	0.18	0.22	0.35	0.37	0.48	0.21	0.33	0.31	0.14	0.04	
	0.25	0.16	0.07	0.15	0.07	0.22	0.32	0.39	0.12	0.13	
Mean	0.18	0.15	0.20	0.22	0.18	0.24	0.31	0.36	0.09	0.06	
PCB 99	0.00	0.00	0.15	0.09	0.19	0.18	0.21	0.00	0.00	0.07	
	0.00	0.13	0.00	0.00	0.55	0.17	0.00	0.00	0.15	0.06	
	0.00	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.16	0.07	
Mean	0.00	0.07	0.05	0.03	0.25	0.12	0.07	0.00	0.10	0.07	

PLOT REPLICATE	1A, B C	2A B C	3A B C	4A B C	5A B C	6A B C	7A B C	8A B C	9A B C	10A B C	Fresh water CCC
PCB 83	0.00	0.00	0.00	0.00	0.07	0.00	0.00	0.00	0.05	0.07	
	0.00	0.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.11	
	0.00	0.00	0.00	0.00	0.07	0.00	0.00	0.00	0.00	0.08	
Mean	0.00	0.04	0.00	0.00	0.05	0.00	0.00	0.00	0.02	0.09	
PCB 97	0.00	0.05	0.05	0.00	0.00	0.08	0.09	0.00	0.00	0.00	
	0.00	0.06	0.00	0.07	0.15	0.00	0.00	0.00	0.06	0.00	
	0.08	0.04	0.00	0.00	0.00	0.00	0.00	0.11	0.00	0.00	
Mean	0.03	0.05	0.02	0.02	0.05	0.03	0.03	0.04	0.02	0.00	
PCB 81+87	0.00	0.10	0.00	0.00	0.00	0.00	0.01	0.00	0.04	0.04	
	0.08	0.10	0.00	0.02	0.11	0.00	0.16	0.07	0.00	0.06	
	0.11	0.00	0.00	0.00	0.00	0.00	0.10	0.13	0.00	0.00	
Mean	0.06	0.07	0.00	0.00	0.04	0.00	0.09	0.07	0.01	0.03	
PCB 85	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
PCB 136	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
PCB 77+110	0.15	0.16	0.02	0.08	0.00	0.19	0.24	0.38	0.00	0.01	
	0.11	0.05	0.15	0.22	0.35	0.15	0.13	0.42	0.09	0.00	
	0.22	0.08	0.00	0.27	0.04	0.09	0.43	0.58	0.05	0.02	
Mean	0.16	0.10	0.06	0.19	0.13	0.14	0.27	0.46	0.05	0.01	
PCB 82	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	
PCB 151	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.00	0.00	0.00	

PLOT REPLICATE	1A, B C	2A B C	3A B C	4A B C	5A B C	6A B C	7A B C	8A B C	9A B C	10A B C	Fresh water CCC
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.11	0.00	0.00	
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.00	
PCB 135+144+147+127	0.00	0.00	0.22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.03	0.00	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
PCB 107+123	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
PCB 149	0.11	0.25	0.15	0.11	0.09	0.24	0.26	0.44	0.07	0.00	
	0.13	0.23	0.14	0.20	0.47	0.15	0.21	0.36	0.12	0.08	
	0.16	0.09	0.11	0.19	0.00	0.18	0.38	0.20	0.08	0.04	
Mean	0.13	0.19	0.13	0.17	0.19	0.19	0.28	0.33	0.09	0.04	
PCB 118	0.13	0.14	0.20	0.00	0.00	0.06	0.11	0.75	0.02	0.02	
	0.21	0.06	0.09	0.09	0.57	0.20	0.21	0.58	0.01	0.00	
	0.19	0.18	0.00	0.18	0.16	0.03	0.68	0.75	0.00	0.03	
Mean	0.18	0.13	0.10	0.09	0.24	0.10	0.33	0.69	0.01	0.02	
PCB 134	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
PCB 131	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
PCB 146	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	

PLOT REPLICATE	1A, B C	2A B C	3A B C	4A B C	5A B C	6A B C	7A B C	8A B C	9A B C	10A B C	Fresh water CCC
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
PCB 105+132+153	0.05	0.06	0.00	0.00	0.00	0.86	1.31	0.32	0.00	0.01	
	0.29	0.10	0.00	0.00	0.00	0.70	0.04	0.39	0.00	0.05	
	0.09	0.35	0.01	0.14	0.00	0.73	0.34	0.63	0.09	0.00	
Mean	0.14	0.17	0.00	0.05	0.00	0.76	0.56	0.45	0.03	0.02	
PCB 141+179	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00	
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	
PCB 137+176+130	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
PCB 163+138	0.00	0.03	0.25	0.00	0.00	0.21	0.17	0.16	0.00	0.00	
	0.01	0.06	0.15	0.10	0.36	0.04	0.08	0.19	0.05	0.00	
	0.19	0.00	0.00	0.16	0.01	0.00	0.23	0.10	0.01	0.06	
Mean	0.07	0.03	0.13	0.09	0.12	0.08	0.16	0.15	0.02	0.02	
PCB 158	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.00	0.00	
	0.00	0.00	0.09	0.00	0.00	0.00	0.00	0.13	0.03	0.01	
	0.12	0.00	0.00	0.00	0.00	0.00	0.63	0.00	0.04	0.00	
Mean	0.04	0.00	0.03	0.00	0.00	0.00	0.21	0.10	0.02	0.00	
PCB 178+129	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
PCB 187+182	0.00	0.00	0.00	0.00	0.00	0.00	0.24	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	

PLOT REPLICATE	1A, B C	2A B C	3A B C	4A B C	5A B C	6A B C	7A B C	8A B C	9A B C	10A B C	Fresh water CCC
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.00	0.00	0.00	
PCB 183	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
PCB 128	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
OCP Endrin Ketone	0.00	0.00	3.29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	1.21	1.56	0.00	1.24	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	1.10	0.40	0.52	0.00	0.41	0.00	0.00	0.00	
PCB 185	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
PCB 174	0.00	0.00	1.13	0.00	0.00	0.07	0.14	0.30	0.00	0.00	
	0.00	0.00	0.00	0.09	0.21	0.00	0.07	0.28	0.00	0.02	
	0.00	0.00	0.00	0.07	0.00	0.00	0.00	0.41	0.03	0.01	
Mean	0.00	0.00	0.38	0.05	0.07	0.02	0.07	0.33	0.01	0.01	
PCB 177	0.00	0.00	0.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
PCB 202+171+176	0.00	0.00	0.00	0.00	0.00	0.00	0.11	0.81	0.00	0.00	
	0.00	0.00	0.00	0.13	0.25	0.13	0.11	0.77	0.00	0.00	
	0.00	0.00	0.00	0.32	0.00	0.00	0.83	0.75	0.00	0.00	
Mean	0.00	0.00	0.00	0.15	0.08	0.04	0.35	0.78	0.00	0.00	

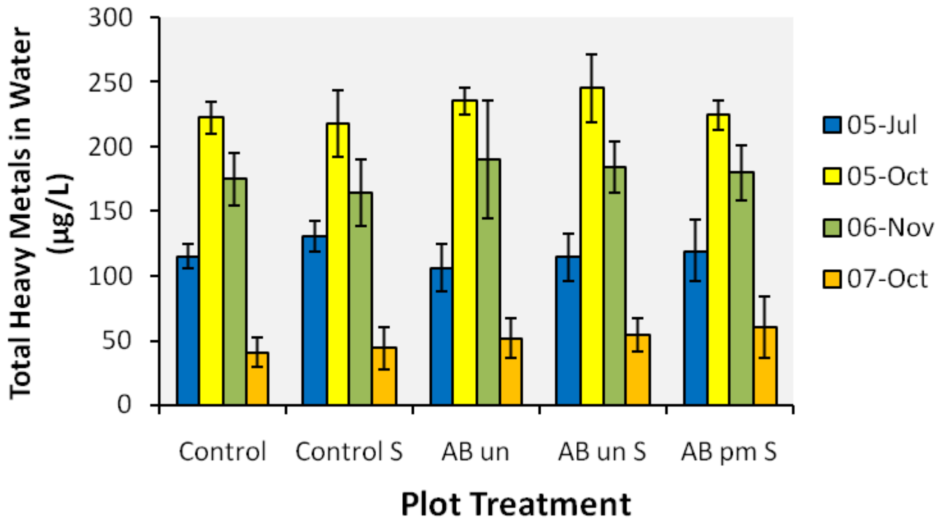
PLOT REPLICATE	1A, B C	2A B C	3A B C	4A B C	5A B C	6A B C	7A B C	8A B C	9A B C	10A B C	Fresh water CCC
PCB 157+200	0.00	0.00	0.00	0.09	0.00	0.00	0.00	0.00	0.10	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.14	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	0.08	0.00	0.00	0.00	0.00	0.03	0.00	
PCB 172+197	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
PCB 180	0.00	0.00	0.56	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.46	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.19	0.15	0.00	0.00	0.00	0.00	0.00	0.00	
PCB 193	0.00	0.00	1.19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
PCB 191	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
PCB 199	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
PCB 170+190	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.66	0.00	0.08	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.62	0.48	0.00	0.00	
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.21	0.58	0.00	0.03	
PCB 198	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.13	0.00	0.00	

PLOT REPLICATE	1A, B C	2A B C	3A B C	4A B C	5A B C	6A B C	7A B C	8A B C	9A B C	10A B C	Fresh water CCC
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.16	0.15	0.00	0.00	
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.11	0.00	0.00	
PCB 201	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
PCB 203+196	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
PCB 189	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.49	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.16	0.00	0.00	
PCB 208+195	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
PCB 207	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
PCB 194	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
PCB 205	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	

PLOT REPLICATE	1A, B C	2A B C	3A B C	4A B C	5A B C	6A B C	7A B C	8A B C	9A B C	10A B C	Fresh water CCC
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
PCB 206	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.35	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.18	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.34	0.41	0.07	0.00	
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.11	0.31	0.02	0.00	
PCB 209	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.01	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.03	
	0.00	0.00	0.03	0.00	0.00	0.00	0.04	0.00	0.02	0.02	
Mean	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.01	0.02	0.02	

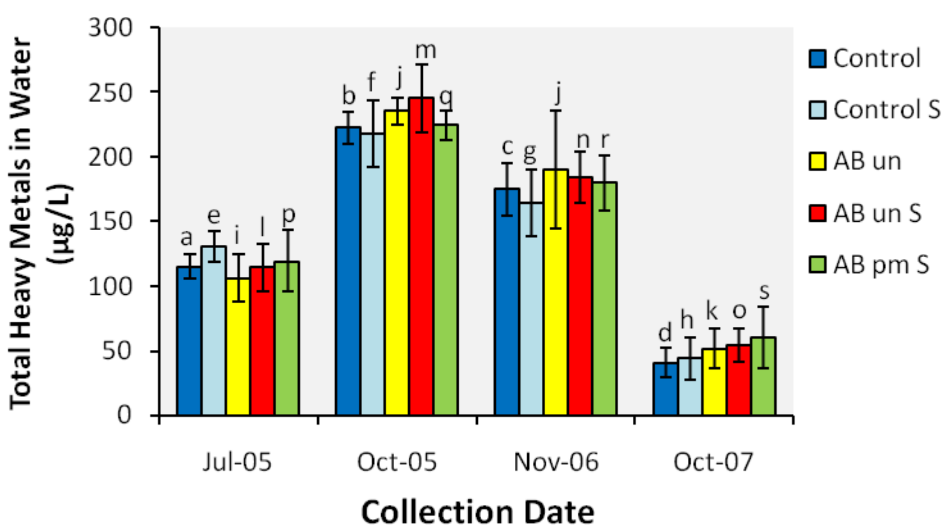
Statistical analyses were run in order to compare treatment and collection date effects on water concentrations of heavy metals, PCBs and OCPs (Figures VII.D1-6). For heavy metals in water, there were no significant difference in treatment for samples collected on the same date (Figure VII.D1). It was likely due to the movement of the surface water around the site. However, there was a significant increase in total heavy metals between pre-capping and post capping in 2005 (VII.D2). This occurred across all plots. These concentrations appeared to further decrease in 2006 and 2005. The results for 2007 were dramatically lower, but this was an artifact of sample processing (Table VII.D5). A number of the heavy metals were measured by graphite furnace instead of flame in 2007. The lower detection limits made it appear as though the metal levels were declining over time. The heavy metal measurements could not be repeated. So data were compared by summing together selected metals. Selected metals consisted of those with similar detection levels (graphite and flame) or those that were measured the same way in previous studies. These results showed more similar metal concentrations between pre-capping 2005 and post capping 2005 (Figure VII.D3). Heavy metal concentrations were stastically higher in 2006 versus 2005 (pre and post-capping); however, 2006 levels declined to 2005 post capping levels by 2007. Overall, there did appear to be some changes in water heavy metal concentrations over time in the marsh, but it was not treatment related.

Water concentrations of PCBs and OCPs were highly variable. There were no significant treatment (Figure VII.D4) or collection date effects (Figure VII.D5). Concentrations of total PCBs and DDT exceeded the CCC and continue to be of concern.



There were no significant differences between treatments for a particular collection date.

Figure VII.D1. Effect of plot treatment on total heavy metals in water (µg/L) for all collection dates. Samples for July 2005 were taken pre-capping, all other samples were taken post-capping. Total heavy metals in cluded Cd, Cr, Cu, Hg, Ni, Pb and Zn. Control = not capped, S = with SubmerSeed, AB = AquaBlok, PM = amended with peat moss, UN = unamended. Treatment did not affect metal concentration is water, p>0.05.

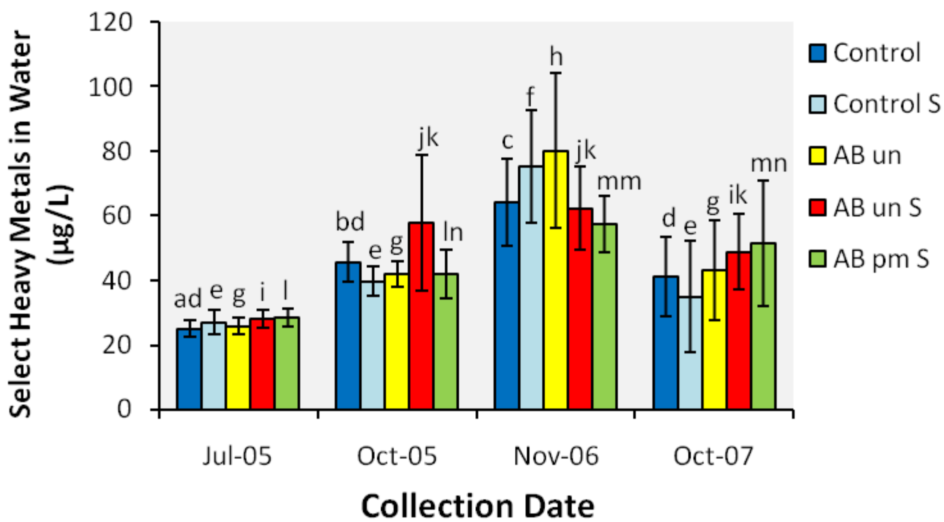


Values with shared letters were not different, p>0.0.5, for collection dates with the same treatment.

Figure VII.D2. Effect of collection date on total heavy metals in water (µg/L) for all treatments. Samples for July 2005 were taken pre-capping, all other samples were taken post-capping. Total heavy metals in cluded Cd, Cr, Cu, Hg, Ni, Pb and Zn. Control = not capped, S = with SubmerSeed, AB = AquaBlok, PM = amended with peat moss, UN = unamended. Metal concentrations in water appeared significantly lower pre-capping and in 2007. However, the analytical method for some metals was done differently in 2007, which affected the results. See Table VII.D7.

Table VII.D7. Detection limits for metals that were analyzed by different techniques. Date = when the water sample was collected. G= analyzed by graphite furnace, F = analyzed by Flame

Date	Cd	Cr	Cu	Ni	Pb
7/12/05	3.88F	0.1G	0.48G	21.4F	52F
10/05/05	3.88F	0.1G	2.81F	21.4F	52F
11/21/06	3.88F	0.1G	2.81F	21.4F	52F
10/17/07	0.05G	0.1G	0.05G	0.43G	0.51G



Values with shared letters were not different, p>0.0.5, for collection dates with the same treatment.

Figure VII.D3. Effect of collection date on select heavy metals in water (µg/L) for all treatments. Samples for July 2005 were taken pre-capping, all other samples were taken post-capping. Limited heavy metals included the sum of Cr, Cu, Hg, Ni and Zn: these metals were analyzed the same way for each date, except Cu. The detection limit for Cu was low compared to the concentrations detected, so the type of analysis made little difference. Control = not capped, S = with SubmerSeed, AB = AquaBlok, PM = amended with peat moss, UN = unamended. Data showed that 2007 metal concentrations were not significantly lower than all other dates. Data for 2006 was statistically higher than other dates for Control, Control S and AB un.

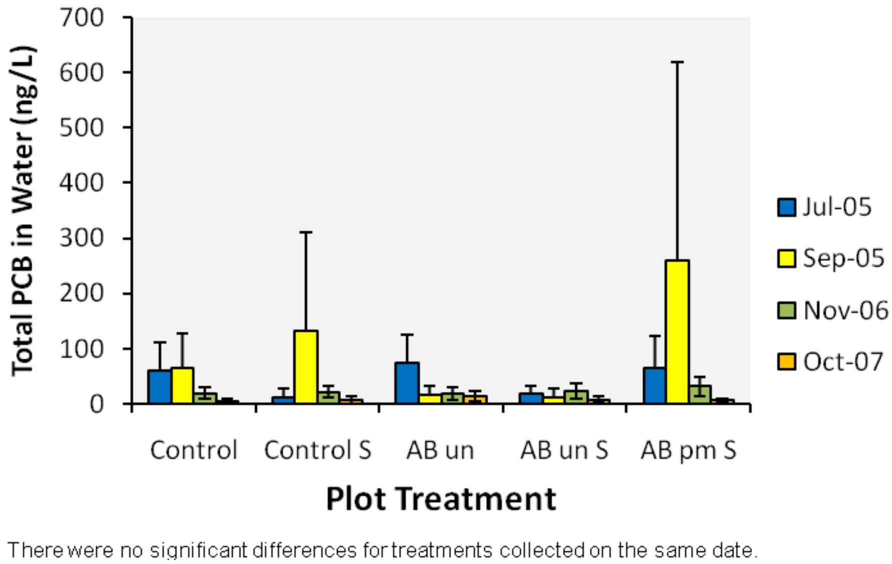


Figure VII.D4. Effect of plot treatment on total PCB in water (ng/L) for all collection dates. Samples for July 2005 were taken pre-capping, all other samples were taken post-capping. See Table VII.D6 for the list of PCBs analyzed. Control = not capped, S = with SubmerSeed, AB = AquaBlok, PM = amended with peat moss, UN = unamended.

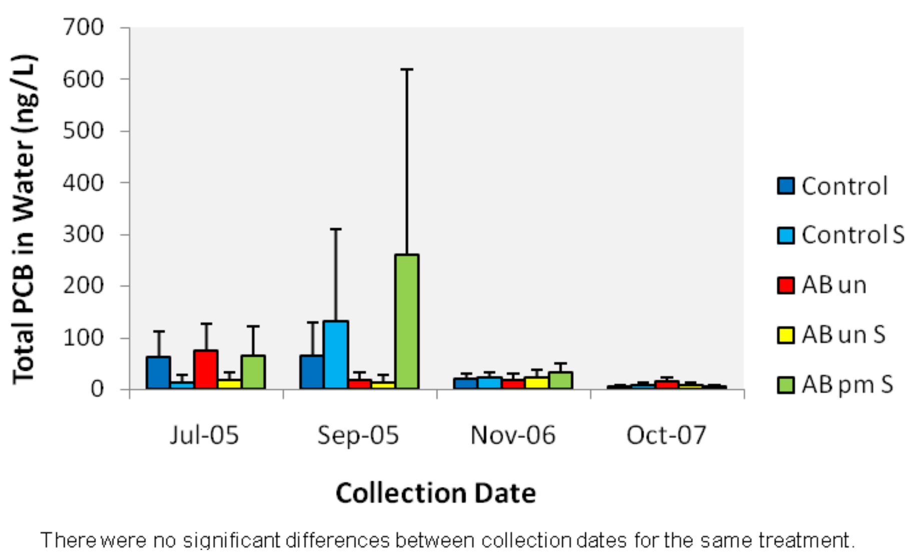


Figure VII.D5. Effect of collection date on total PCB in water (ng/L) for all treatments. Samples for July 2005 were taken pre-capping, all other samples were taken post-capping. See Table VII.D6 for the list of PCBs analyzed. Control = not capped, S = with SubmerSeed, AB = AquaBlok, PM = amended with peat moss, UN = unamended.

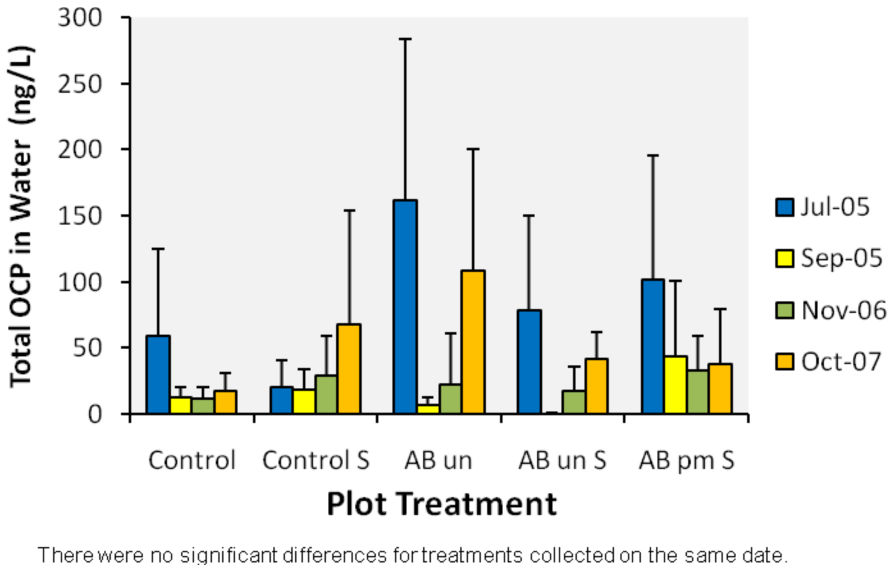


Figure VII.D6. Effect of plot treatment on total OCP in water (ng/L) for all collection dates. Samples for July 2005 were taken pre-capping, all other samples were taken post-capping. See Table VII.D.6 for the list of OCPs analyzed. Control = not capped, S = with SubmerSeed, AB = AquaBlok, PM = amended with peat moss, UN = unamended.

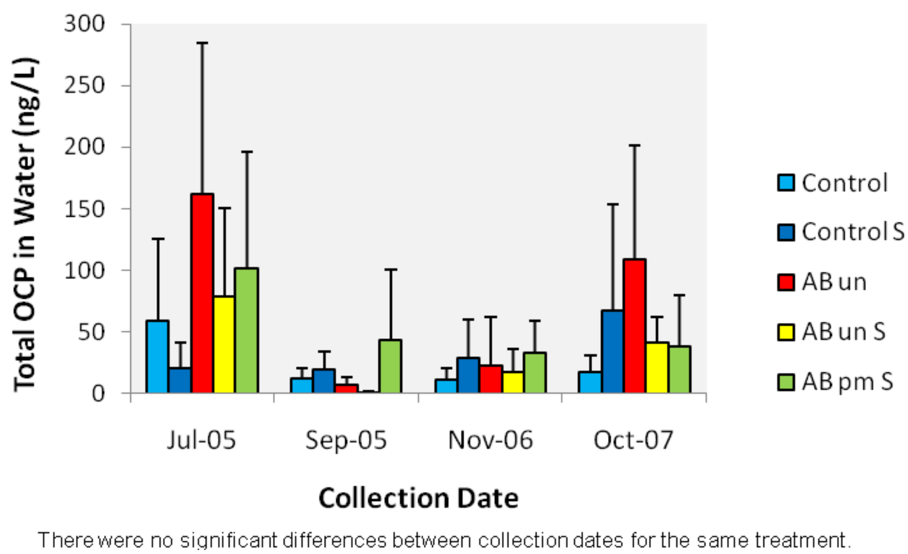


Figure VII.D7. Effect of collection date on OCP in water (ng/L) for all treatments. Samples for July 2005 were taken pre-capping, all other samples were taken post-capping. See Table VII.D.6 for the list of OCPs analyzed. Control = not capped, S = with SubmerSeed, AB = AquaBlok, PM = amended with peat moss, UN = unamended.

VII.E. COC in Sediment/Cap

Sediment samples were collected in triplicate from each plot and analyzed. Metals were analyzed by digesting 1-2 g dry weight in HNO_3 and microwaving in Teflon bombs. Cd, Cr, Cu, Fe, Pb and Zn were analyzed by flame or by graphite furnace atomic absorption spectrophotometry. The Hg analysis was done using cold-vapor AA in a Bacharach MAS-50D mercury analyzer. Semivolatile organic compounds (PCBs and organochlorine pesticides- OCPs) were analyzed by gas chromatography (GC-ECD and GC-MSD) based on EPA method 608, 8081 and 8082. The sediment samples (15 to 30 g wet weight) were extracted within 14 days of collection by ultrasonic extraction method (EPA Method 3550). Quality assurance for organics was accomplished using surrogates and determining % recovery as well taking field blanks. Surrogates included PCB14, PCB65, PCB166 and dibutyl chorendate and their average recovery was 83-100 %, 91-108 % and 2-31 %, respectively. Concentrations of heavy metals in samples were compared to the low effect level (LEL) and severe effect level (SEL) criterons based on the Ontario Freshwater Sediment Criterion (Persaud et al, 1993). PCBs and OCPs were compared to SEL based on U.S.E.P.A guidelines (U.S.E.P.A, 1988). For organic contaminants, SEL values depended on the percent of total organic carbon (TOC) in sediments. TOC in marsh sediments were approximately 85 %. The limit for SEL calculation was 10 % TOC, so the SEL values in Tables VII.E.2, 4 and 6 were calculated base on 10 % TOC. Sediment concentrations near or exceeding SEL would be expected to have detrimental effects on the benthic macroinvertebrate community. Statistical analyses were done using a one-way ANOVA followed by Tukey Multiple Comparison Test.

2005

In September and October of 2005, Cd ranged from an average of 2.35 mg/kg in plot 8 which contains AquaBlok that is unamended with peat moss which was significantly less than the average of 6.44 mg/kg in plot 3 which is a control ($p < 0.001$). Cr ranged from an average of 5.02 mg/kg in plot 8 which contains AquaBlok that is unamended with peat moss which was significantly less than the average of 102 mg/kg in plot 10 which is a control that has Submerseed ($p < 0.001$), plot 3 (a control) ($p < 0.001$), plot 7 (a control with Submerseed) ($p < 0.001$) and plot 9 (another control) ($p < 0.001$). Cu ranged from an average of 9.8 mg/kg in plot 6 which contains AquaBlok that is amended with peat moss and has Submerseed which is significantly less than the average of 324 mg/kg in plot 3 which is a control ($p < 0.001$), plot 7 (a control with Submerseed) ($p < 0.001$), plot 9 (a control) ($p < 0.001$) and plot 10 (a control with Submerseed) ($p < 0.001$). Fe ranged from an average of 6240 mg/kg in plot 4 which contains AquaBlok that is unamended with peat moss which was significantly less than the average of 35271 mg/kg in plot 3 which is a control ($p < 0.001$). Hg ranged from an average of 0.67 mg/kg in plot 5 which contains AquaBlok that is unamended with peat moss and has Submerseed to an average of 12.0 mg/kg in plot 10 which is a control has Submerseed. The differences were not statistically significant. Ni ranged from an average of 33.9 mg/kg in plot 2 which contains AquaBlok that is amended with peat moss and has Submerseed which was significantly less than the average of 531 mg/kg in plot 3 which is a control ($p < 0.05$). Pb ranged from an average of 42.5 mg/kg in plot 4 which contains AquaBlok that is unamended with peat moss which was significantly less than the average of 786 mg/kg in plot 3 which is a control ($p < 0.001$), plot 7 (a control with Submerseed) ($p < 0.001$), plot 9 (a control) ($p < 0.001$), and plot 10 (a control with Submerseed) ($p < 0.001$). Zn ranged from an average of

96.9 mg/kg in plot 4 which contains AquaBlok that is unamended with peat moss which was significantly less than the average of 660 mg/kg in plot 7 which is a control that has Submerseed ($p < 0.001$), plot 3 (a control) ($p < 0.001$), plot 9 (another control) ($p < 0.001$), and plot 10 (a control with Submerseed) ($p < 0.001$) (Table VII.E1).

Sediment samples collected September 28, 2005 had average total PCB concentrations in capped sites ranging from 69.78 µg/Kg in plot 6, which had AB pm S, to 123.04 µg/Kg in plot 2, which had AB pm S (Table VII.E2). For uncapped plots, levels were approximately 10x higher. Average concentrations ranged from 610.27 µg/Kg in plot 3, which is Control, to 943.2 µg/Kg in plot 7, which was Control S. None of the PCB concentrations in sediment exceeded SEL. Average total OCP concentrations in capped sites ranged from 77.44 µg/Kg in plot 4, which was AB un, to 295.9 in plot 1, which was AB un (Table VII.E2). For uncapped plots, levels were approximately 4-10x higher than in capped plots. Average concentrations ranged from 287.3 µg/Kg in plot 10, which was Control, to 3877.0 µg/Kg in plot 7, which was Control S. Two replicates in plot 7, Control S, exceeded the SEL for DDE (190 µg/Kg). One replicate in plot 3, which was Control, and two replicates in plot 7, which was Control S, exceeded the SEL for DDD (600µg/Kg). All other OCP were below SELs. The data indicated that DDT metabolites could be a significant problem at Kearny Marsh. Compared to pre-capping data from July 12, 2005 (Table V.F2), total average PCBs in AquaBlok substrate were 10-20x lower than in the sediment they covered. For OCPs, total averages were 7-18x lower in AquaBlok substrate than in pre-capped sediments. The high levels of DDD and DDE were similar in uncapped sites. This results demonstrated that AquaBlok was not allowing the organic contaminants in the sediment to break through the cap.

Table VII.E1. Heavy metals in sediment (mg/L) collected post capping, September 28, 2005. CNTRL = not capped, S = with SubmerSeed, AB = AquaBlok, PM = amended with peat moss, UN = unamended, Total = sum of metals without Fe. Orange shading- data point not included in the average. Red shading: value > SEL.

Treatment	Sample	Site	Cd	Cr	Cu	Fe	Hg	Ni	Pb	Zn	Total
AB un S	1 A	2E	3.13	5.55	23.33	13762	3.19	116.2	32.18	72.43	256
	1 B	3D	4.66	49.91	198.48	17099	0.27	60.94	394.21	414.56	1123
	1 C	0B	2.72	0.52	2.91	61	0.04	76.93	4.58	41.94	130
Average			3.50	18.66	74.91	10307	1.17	84.69	213.19	176.31	502.9
SD			1.02	27.18	107.50	9029	1.76	28.43	256.00	206.89	541
AB pm S	2 A	1D	3.65	12.22	60.90	14756	6.47	38.40	245.23	144.11	511
	2 B	5G	5.32	15.04	73.22	17058	16.3	36.19	217.31	169.83	533
	2 C	6B	4.68	5.61	16.34	11406	1.03	27.03	92.60	101.74	249
Average			4.55	10.96	50.15	14406	7.92	33.87	185.05	138.56	431
SD			0.85	4.84	29.92	2842	7.72	6.03	81.27	34.38	165
CNTRL	3 A	2C	5.71	94.16	332.31	28411	2.33	155.6	934.90	459.26	1984
	3 B	5C	9.00	89.63	408.56	77004	7.82	1122	721.13	807.73	3167
	3 C	3G	4.62	63.36	229.97	26398	5.42	312.5	702.25	455.47	1774
Average			6.44	82.38	323.61	43938	5.19	530.3	786.10	574.15	2308
SD			2.28	16.63	89.61	28654	2.75	519.1	129.22	202.29	962
AB un	4 A	3F	3.69	5.35	10.83	6938	0.10	36.51	64.16	71.88	193
	4 B	4C	3.81	6.66	25.87	11262	6.94	70.59	36.41	86.92	237
	4 C	2B	2.82	5.15	8.65	520	4.35	41.80	26.78	132.32	222
Average			3.44	5.72	15.12	6240	3.79	49.64	42.45	97.04	217
SD			0.54	0.82	9.38	5405	3.45	18.34	19.41	31.47	83
AB pm S	5 A	3E	3.69	25.25	66.52	18865	1.75	274.9	128.98	175.41	677
	5 B	5B	2.89	21.84	42.15	14227	0.17	140.6	78.55	158.96	445
	5 C	6D	4.09	4.14	13.60	9118	0.08	42.91	27.61	158.34	251
Average			3.56	17.08	40.76	14070	0.66	152.8	78.38	164.24	457
SD			0.61	11.33	26.49	4875	0.94	116.5	50.68	9.68	216
AB pm S	6A	2F	3.63	13.16	35.33	12566	1.43	143.9	71.63	92.88	362
	6B	4F	1.69	7.40	11.14	9991	0.32	9.14	62.80	120.65	213
	6C	6B	2.91	3.30	14.97	7469	0.17	59.53	85.30	90.25	256
Average			2.75	7.95	20.48	10009	0.64	70.86	73.24	101.26	277
SD			0.98	4.95	13.00	2549	0.68	68.09	11.34	16.84	116
CNTRL S	7 A	5D	4.28	62.35	175.51	17629	28.3	86.57	460.08	525.59	1343
	7 B	2C	4.75	60.46	313.85	29605	4.10	161.1	711.31	581.55	1837
	7 C	6B	4.88	34.70	254.15	9021	2.62	71.71	171.32	871.47	1411
Average			4.64	52.50	247.84	18752	11.66	106.4	447.57	659.54	1530
SD			0.31	15.45	69.38	10338	14.40	47.88	270.21	185.66	603
AB un	8 A	3D	3.28	5.05	23.92	9557	0.23	67.35	49.15	76.56	226
	8 B	2B	2.59	6.92	22.18	12245	0.28	94.75	50.07	119.37	296
	8 C	6B	1.19	3.08	15.39	6058	1.74	139.2	42.81	130.84	334
Average			2.35	5.02	20.50	9287	0.75	100.4	47.35	108.92	285
SD			1.06	1.92	4.51	3102	0.86	36.27	3.95	28.61	77
CNTRL	9 A	2C	3.88	104.18	283.86	20256	3.22	126.1	823.72	428.63	1774
	9 B	4D	2.66	58.28	181.67	21300	4.91	384.9	470.97	466.60	1570
	9 C	6B	4.73	94.58	232.72	19801	2.51	98.13	730.08	519.69	1682
Average			3.76	85.68	232.75	20452	3.54	203.1	674.92	471.64	1675
SD			1.04	24.21	51.09	769	1.23	158.2	182.73	45.74	464
CNTRL S	10 A	3D	3.41	85.26	216.57	20738	17.4	240.4	752.11	407.33	1723
	10 B	3F	3.83	81.16	250.78	19124	15.7	199.1	793.79	385.27	1730
	10 C	3C	5.40	137.86	288.14	31750	2.88	306.3	775.51	676.35	2192
Average			4.21	101.43	251.83	23871	11.98	248.6	773.80	489.65	1882
SD			1.05	31.62	35.80	6871	7.93	54.11	20.89	162.07	313
LEL			0.6	26	16		0.20	16	31	120	
SEL			10.0	110	110		2.00	75	250	820	

LEL = Lowest Effects Limit based on Ontario Aquatic Sediment Criterion.
SEL = Severe Effects Limit based on Ontario Aquatic Sediment Criterion.

Table VII.E2. Concentration of organic contaminants (μg/Kg) in sediment collected post-capping, 9-28-05. Treatments were: plots 3&9 = control, 7&10 = control with SubmerSeed, 4&8 = AquaBlok unamended, 1&5 = AquaBlok unamended with Submer Seed and 2&6 = AquaBlok amended with peat moss with SubmerSeed. Values shaded in yellow exceeded the EPA's SELs for PCB and OCP. These criteria are not available for all contaminants. Zero values represented non-detectable levels.

PLOT REPLICATE	1A, B & C	2A, B & C	3A, B & C	4A, B & C	5A, B & C	6A, B & C	7A, B & C	8A, B & C	9 A, B & C	10A, B & C	SEL μg/Kg
			TOTAL CONCENTRATION (μg/Kg)								
PCB	96.44	255.84	69.66		97.65	90.68	897.57	91.28	702.65	997.27	53,000
	66.39	43.62	988.01	54.41	82.20	56.88	489.23	73.14	1233.26	651.70	
	60.65	69.66	773.15	127.85		61.79	1442.82	142.08	855.61	952.74	
Mean	74.49	123.04	610.27	91.13	89.9	69.78	943.2	102.17	930.51	867.24	
OCP	165.38	413.32	47.03		177.99	175.18	9703.39	84.11	365.53	298.76	
	49.74	7.36	754.76	71.07	79.63	71.34	541.51	69.71	591.37	140.87	
	672.60	47.03	1798.02	83.81		95.87	1386.09	366.10	442.67	422.17	
Mean	295.91	155.9	866.60	77.44	128.81	114.13	3877	173.31	466.52	287.27	
				SURROGATE RECOVERY (%)							
PCB 14	89%	113%	79%		73%	84%	90%	85%	109%	76%	
	92	64	85	80	86	75	103	90	123	99	
	78	79	86	87		83	107	94	98	82	
Mean	86	85	83	84	80	81	100	90	110	86	
PCB 65	115%	84%	97%		95%	106%	107%	104%	112%	82%	
	112	91	93	101	108	97	106	111	113	102	
	94	97	98	108		111	100	80	99	82	
Mean	107	91	96	105	102	105	104	98	108	89	

PLOT REPLICATE	1A, B & C	2A, B & C	3A, B & C	4A, B & C	5A, B & C	6A, B & C	7A, B & C	8A, B & C	9 A, B & C	10A, B & C	SEL μg/Kg
PCB 166	116%	93%	103%		90%	102%	104%	103%	113%	74%	
	126	96	82	93	113	94	105	113	103	101	
	93	103	89	108		104	88	111	90	82	
Mean	112	97	91	101	102	100	99	109	102	86	
Dibutychlorendate	0%	3%	12%		16%	13%	28%	15%	12%	4%	
	5	0	7	15	15	24	39	23	7	5	
	0	12	8	11		20	21	54	5	0	
Mean	2	5	9	13	16	19	29	31	8	3	
Pesticide	CONC (μg/Kg)	CONC (μg/Kg)	CONC (μg/Kg)	CONC (μg/Kg)	CONC (μg/Kg)	CONC (μg/Kg)	CONC (μg/Kg)	CONC (μg/Kg)	CONC (μg/Kg)	CONC (μg/Kg)	
OCP a-BHC	1.26	4.91	0.33		0.94	1.36	4.17	1.11	5.04	3.10	100
	0.33	0.00	1.86	0.99	0.75	0.68	2.31	1.05	2.90	3.44	
	0.89	0.33	6.93	0.00		1.15	0.00	7.83	3.19	5.85	
Mean	0.83	1.75	3.04	0.50	0.85	1.06	2.16	3.33	3.71	4.13	
OCP b-BHC	0.00	1.93	0.00		0.00	0.00	4.53	0.00	10.94	3.76	210
	0.43	0.00	2.91	0.00	0.00	0.00	0.00	0.00	5.77	4.25	
	0.00	0.00	6.93	0.00		0.00	2.14	0.00	6.82	4.99	
Mean	0.14	0.64	3.28	0.00	0.00	0.00	2.22	0.00	7.84	4.33	
OCP g-BHC	10.79	19.69	8.39		12.36	14.28	13.79	12.90	17.88	8.10	600
	9.40	0.94	11.09	13.64	13.19	11.85	13.23	8.77	11.13	9.22	
	10.02	8.39	6.85	12.38		14.55	12.86	47.02	13.96	8.34	
Mean	10.07	9.67	8.78	13.01	12.78	13.56	13.29	22.90	14.32	8.55	

PLOT REPLICATE	1A, B & C	2A, B & C	3A, B & C	4A, B & C	5A, B & C	6A, B & C	7A, B & C	8A, B & C	9 A, B & C	10A, B & C	SEL μg/Kg
OCP d-BHC	0.00	1.15	0.00		0.00	0.00	0.00	0.00	17.08	2.09	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.12	1.23	
	0.00	0.00	5.14	0.00		0.00	0.00	0.00	6.48	4.10	
	0.00	0.38	1.71	0.00	0.00	0.00	0.00	0.00	8.89	2.47	
OCP Heptachlor	10.79	7.83	4.52		7.18	7.73	17.53	9.54	3.06	2.36	2400
	3.90	2.62	7.49	7.68	6.39	9.74	17.26	9.79	3.05	2.11	
	8.83	4.52	1.64	6.12		10.66	17.23	48.00	2.41	2.12	
Mean	7.84	4.99	4.55	6.90	6.79	9.38	17.34	22.44	2.84	2.20	
OCP Aldrin	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	800
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.35	0.00		0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
OCP Heptachlor Epoxide	0.00	1.84	0.31		0.87	0.00	2.90	0.00	2.24	0.80	500
	0.65	0.00	0.00	0.00	0.71	0.95	0.00	0.57	1.54	0.74	
	0.80	0.31	0.00	1.45		0.80	2.22	4.60	2.62	1.27	
Mean	0.48	0.72	0.10	0.48	0.53	0.58	1.71	1.72	2.13	0.67	
OCP Endosulfan I	2.98	5.13	3.40		3.37	0.00	0.00	4.10	5.12	2.80	
	3.25	0.00	3.98	3.17	3.92	3.30	4.14	2.69	3.40	2.65	
	3.84	3.40	0.00	3.24		3.77	2.92	13.82	4.17	2.54	
Mean	3.36	2.84	2.46	2.14	3.65	3.54	3.53	6.87	4.23	2.66	
OCP Dieldrin	1.63	2.69	1.19		1.82	2.06	1.96	2.18	2.44	1.40	9100
	1.74	0.00	1.93	1.19	2.22	1.59	1.26	1.39	2.17	1.30	

PLOT REPLICATE	1A, B & C	2A, B & C	3A, B & C	4A, B & C	5A, B & C	6A, B & C	7A, B & C	8A, B & C	9 A, B & C	10A, B & C	SEL μg/Kg
	1.49	1.19	3.04	1.32		1.91	1.70	7.41	3.41	2.02	
Mean	1.62	1.29	2.05	1.26	2.02	1.85	1.64	3.66	2.67	1.57	
OCP DDE	2.78	31.47	4.74		7.15	14.65	956.74	4.69	41.47	37.86	190
	4.49	2.00	81.08	3.36	6.19	3.03	85.37	3.57	59.34	19.69	
	3.72	4.47	95.22	10.79		3.76	282.60	7.32	37.94	62.91	
Mean	3.66	12.65	60.35	7.08	6.67	7.15	441.57	5.19	46.25	40.15	
OCP Endrin	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	13,000
	0.00	0.00	1.27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
OCP Endosulfan II	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
OCP DDD	6.90	283.44	17.10		26.55	95.84	8118.66	10.67	215.04	206.97	600
	15.10	0.00	509.94	6.52	18.57	4.63	356.99	7.69	440.06	64.72	
	11.07	17.10	1593.88	31.63		7.58	953.08	5.61	260.90	292.80	
Mean	11.02	100.18	706.97	19.08	22.56	36.02	3142.91	7.99	305.33	188.16	
OCP Endrin Aldehyde	0.00	1.34	0.00		0.00	0.00	0.00	0.86	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00		0.00	0.00	5.23	0.00	0.00	
Mean	0.00	0.45	0.00	0.00	0.00	0.00	0.00	3.05	0.00	0.00	

PLOT REPLICATE	1A, B & C	2A, B & C	3A, B & C	4A, B & C	5A, B & C	6A, B & C	7A, B & C	8A, B & C	9 A, B & C	10A, B & C	SEL µg/Kg
OCP Endosulfan Sulfate	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
OCP DDT	85.76	10.96	7.06		25.75	30.46	234.15	31.28	19.66	12.10	1200
	4.67	1.80	54.97	22.23	17.27	25.66	60.96	26.71	17.25	9.83	
	591.95	7.06	46.23	16.88		35.41	101.77	172.73	15.94	17.70	
Mean	227.46	6.61	36.09	19.56	21.51	30.51	132.27	76.91	17.62	13.21	
Endrin Ketone	0.00	13.44	0.00		0.00	0.00	0.00	0.00	0.00	17.42	
	0.00	0.00	72.85	0.00	0.00	0.00	0.00	0.00	27.56	13.94	
	0.00	0.00	24.63	0.00		0.00	0.00	0.00	51.27	17.52	
Mean	0.00	4.48	32.49	0.00	0.00	0.00	0.00	0.00	26.28	16.29	
OCP Metoxychlor	42.48	27.49	0.00		92.00	8.80	348.95	6.79	25.57	0.00	
	5.78	0.00	5.39	12.30	10.42	9.91	0.00	7.49	14.09	7.75	
	39.98	0.00	7.17	0.00		16.28	9.57	46.54	33.55	0.00	
Mean	29.41	9.16	4.19	6.15	51.21	11.66	119.51	20.27	24.40	2.58	
PCB Congener											
PCB 1	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	

PLOT REPLICATE	1A, B & C	2A, B & C	3A, B & C	4A, B & C	5A, B & C	6A, B & C	7A, B & C	8A, B & C	9 A, B & C	10A, B & C	SEL μg/Kg
PCB 3	0.00	8.85	0.00		0.00	0.00	0.00	0.00	18.61	0.00	
	0.00	0.00	14.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	18.78	
Mean	0.00	2.95	4.70	0.00	0.00	0.00	0.00	0.00	6.20	6.26	
PCB 4+10	0.87	0.00	0.94		0.00	0.00	0.00	0.93	0.00	1.78	
	0.00	0.00	13.24	0.00	0.00	0.00	0.00	1.12	6.72	11.28	
	1.09	0.94	0.00	0.00		0.00	0.00	1.48	0.00	0.00	
Mean	0.65	0.31	4.73	0.00	0.00	0.00	0.00	1.18	2.24	4.35	
PCB 7	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.32	0.00	
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.11	0.00	
PCB 6	0.00	0.00	0.00		0.00	0.00	0.00	0.58	0.77	5.03	
	0.45	0.56	1.01	0.00	0.00	0.00	0.00	0.44	0.00	0.00	
	0.49	0.00	0.61	0.00		0.00	1.94	0.00	1.25	1.19	
Mean	0.31	0.19	0.54	0.00	0.00	0.00	0.65	0.34	0.67	2.07	
PCB 8+5	2.90	0.00	3.15		0.00	0.00	0.00	3.68	2.92	4.21	
	3.44	3.27	3.06	2.32	0.00	0.00	0.00	3.06	3.97	3.03	
	2.67	3.15	0.00	0.00		0.00	13.96	3.92	2.34	3.26	
Mean	3.00	2.14	2.07	0.74	0.00	0.00	4.65	3.55	3.08	3.50	
PCB 19	0.00	0.00	0.00		0.00	0.00	0.00	0.00	4.06	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.72	0.00	
	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	

PLOT REPLICATE	1A, B & C	2A, B & C	3A, B & C	4A, B & C	5A, B & C	6A, B & C	7A, B & C	8A, B & C	9 A, B & C	10A, B & C	SEL μg/Kg
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.26	0.00	
PCB 12+13	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	1.86	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00		0.00	0.00	2.95	3.13	3.58	
Mean	0.00	0.00	0.62	0.00	0.00	0.00	0.00	0.98	1.04	1.19	
PCB 18	4.65	0.59	1.84		10.12	2.89	8.39	2.76	5.15	7.84	
	2.01	1.95	1.11	8.40	2.48	1.92	5.69	1.13	6.07	2.73	
	3.63	1.84	5.96	2.82		2.36	17.40	9.25	6.48	6.03	
Mean	3.43	1.46	2.97	5.61	6.30	2.39	10.49	4.38	5.90	5.53	
PCB 17	0.86	0.94	0.95		1.21	1.48	4.51	1.58	2.53	3.43	
	0.84	0.75	85.50	1.07	1.40	1.06	3.14	0.57	5.07	2.49	
	0.56	0.95	0.20	1.56		1.02	8.81	0.86	3.29	3.39	
Mean	0.75	0.88	28.88	1.32	1.31	1.19	5.49	1.00	3.63	3.10	
PCB 24+27	0.47	0.69	0.33		0.00	0.58	1.22	0.53	0.00	0.00	
	0.58	0.00	1.09	0.51	0.54	0.56	0.93	0.71	0.00	0.00	
	0.49	0.33	0.00	0.73		0.67	1.55	0.75	0.00	0.20	
Mean	0.51	0.34	0.47	0.41	0.27	0.60	1.23	0.66	0.00	0.07	
PCB 16+32	0.00	0.00	0.00		0.00	0.00	0.00	0.69	0.00	4.29	
	1.60	0.00	4.36	0.00	0.00	0.00	0.00	0.00	5.36	2.83	
	0.40	0.00	4.37	0.00		0.00	0.00	0.00	2.79	2.36	
Mean	0.67	0.00	2.91	0.00	0.00	0.00	0.00	0.23	2.72	3.16	
PCB 29	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	

PLOT REPLICATE	1A, B & C	2A, B & C	3A, B & C	4A, B & C	5A, B & C	6A, B & C	7A, B & C	8A, B & C	9 A, B & C	10A, B & C	SEL μg/Kg
	0.00	0.00	0.18	0.00		0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
PCB 26	0.84	4.93	0.00		0.00	0.00	4.16	0.00	1.54	3.13	
	0.89	0.00	4.41	0.00	0.00	0.00	0.00	0.00	3.51	0.00	
	0.00	0.00	1.77	1.50		0.00	6.14	0.00	2.09	1.97	
Mean	0.58	1.64	2.06	0.75	0.00	0.00	3.43	0.00	2.38	1.70	
PCB 25	0.22	6.96	0.19		0.85	0.00	1.91	0.24	0.74	1.68	
	0.61	0.34	2.30	0.00	0.48	0.00	0.95	0.28	1.76	0.99	
	0.70	0.19	0.90	2.89		0.00	3.24	0.17	1.03	1.18	
Mean	0.51	2.50	1.13	1.45	0.67	0.00	2.03	0.23	1.18	1.28	
PCB 31+28	13.93	14.42	8.51		6.90	18.05	41.33	16.57	22.78	28.47	
	9.11	6.42	42.79	6.99	14.23	13.54	31.43	9.94	35.86	18.92	
	12.11	8.51	14.39	15.01		17.22	61.90	57.07	28.07	33.59	
Mean	11.72	9.78	21.90	11.00	10.57	16.27	44.89	27.86	28.90	26.99	
PCB 21+33+53	2.56	9.97	2.71		7.11	7.34	19.21	3.04	7.44	10.69	
	6.06	2.15	9.87	6.22	5.86	5.96	13.97	1.90	12.83	4.85	
	1.51	2.71	12.11	7.10		6.85	23.77	1.97	7.60	10.06	
Mean	3.38	4.94	8.23	6.66	6.49	6.72	18.98	2.30	9.29	8.53	
PCB 22	1.93	5.02	2.32		3.14	3.57	9.86	3.42	4.95	7.55	
	2.36	0.93	10.16	1.27	3.38	2.77	5.28	3.30	8.88	3.67	
	2.62	2.32	6.45	1.18		3.12	11.31	7.34	8.55	9.83	
Mean	2.30	2.76	6.31	1.23	3.26	3.15	8.82	4.69	7.46	7.02	
PCB 45	1.36	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	

PLOT REPLICATE	1A, B & C	2A, B & C	3A, B & C	4A, B & C	5A, B & C	6A, B & C	7A, B & C	8A, B & C	9 A, B & C	10A, B & C	SEL µg/Kg
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00		0.00	9.13	5.42	0.00	0.00	
Mean	0.45	0.00	0.00	0.00	0.00	0.00	3.04	1.81	0.00	0.00	
PCB 46	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	
	0.46	0.00	0.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.18	0.00	0.56	0.00		0.00	0.00	0.00	0.00	0.00	
Mean	0.21	0.00	0.42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
PCB 52+43	2.86	9.48	2.39		4.04	4.88	15.67	4.98	9.39	13.52	
	2.86	2.46	21.57	2.26	4.11	2.15	11.19	3.67	18.05	7.21	
	3.43	2.39	16.66	4.27		4.19	29.76	10.90	14.17	17.93	
Mean	3.05	4.78	13.54	3.27	4.08	3.74	18.87	6.52	13.87	12.89	
PCB 49	1.57	7.95	1.13		1.54	2.31	11.64	2.40	4.73	9.93	
	1.08	1.42	16.49	1.48	2.38	1.85	8.57	1.51	13.53	5.08	
	1.15	1.13	9.61	2.83		1.81	23.35	1.56	8.43	11.31	
Mean	1.27	3.50	9.08	2.16	1.96	1.99	14.52	1.82	8.90	8.77	
PCB 47+48	0.00	0.00	1.15		1.86	1.88	4.50	0.00	4.55	5.30	
	0.00	3.99	7.82	0.84	1.85	1.25	3.37	0.00	7.47	3.95	
	0.00	1.15	4.48	2.42		1.25	7.66	0.76	4.48	5.03	
Mean	0.00	39.66	4.48	1.63	1.86	1.46	5.18	0.25	5.50	4.76	
PCB 44	1.42	0.00	1.43		2.40	2.47	15.73	2.61	6.77	8.18	
	1.83	1.38	17.48	1.71	2.19	1.89	8.68	1.74	23.01	5.97	
	1.23	1.43	13.05	2.99		0.00	28.32	1.33	8.94	13.48	
Mean	1.49	0.94	10.65	2.35	2.30	1.45	17.58	1.89	12.91	9.21	

PLOT REPLICATE	1A, B & C	2A, B & C	3A, B & C	4A, B & C	5A, B & C	6A, B & C	7A, B & C	8A, B & C	9 A, B & C	10A, B & C	SEL μg/Kg
PCB 37+42	0.00	0.00	0.00		0.00	0.00	8.30	0.00	3.80	0.00	
	0.00	0.00	6.27	0.00	0.00	0.00	4.28	5.87	8.53	1.82	
	0.00	0.00	5.66	1.17		0.00	10.79	0.00	25.65	5.07	
Mean	0.00	0.00	3.98	0.59	0.00	0.00	7.79	1.96	12.66	2.30	
PCB 41+71	1.51	3.59	3.22		5.09	5.09	22.71	4.81	12.73	14.65	
	3.40	1.59	24.29	2.12	4.39	4.01	12.81	3.49	20.57	6.22	
	3.81	3.22	19.98	6.12		0.00	35.61	10.44	12.92	10.21	
Mean	2.91	2.80	15.83	4.12	4.74	3.03	23.71	6.25	15.41	10.36	
PCB 64	38.48	0.00	10.11		0.00	0.00	0.00	0.00	0.00	0.00	
	4.71	0.00	11.77	0.00	0.00	0.00	0.00	5.92	0.00	0.00	
	0.00	10.11	22.80	0.00		0.00	0.00	5.16	88.21	0.00	
Mean	14.40	3.37	14.89	0.00	0.00	0.00	0.00	3.69	29.40	0.00	
PCB 40	0.00	4.28	0.00		0.00	0.00	162.16	0.00	333.02	435.76	
	0.00	0.00	60.10	0.00	0.00	0.00	63.32	0.00	568.41	300.15	
	0.00	0.00	8.03	0.00		0.00	163.43	0.00	242.51	214.08	
Mean	0.00	1.43	22.71	0.00	0.00	0.00	129.64	0.00	381.31	316.66	
PCB 100	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.64	1.83	
	0.00	0.00	1.96	0.00	0.00	0.00	0.00	0.00	1.14	0.00	
	0.00	0.00	0.94	0.00		0.00	1.86	0.00	0.85	0.00	
Mean	0.00	0.00	0.97	0.00	0.00	0.00	0.62	0.00	0.88	0.61	
PCB 63	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00		0.00	0.00	0.00	1.55	0.00	

PLOT REPLICATE	1A, B & C	2A, B & C	3A, B & C	4A, B & C	5A, B & C	6A, B & C	7A, B & C	8A, B & C	9 A, B & C	10A, B & C	SEL μg/Kg
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.52	0.00	
PCB 74	1.04	0.00	1.29		1.65	4.48	9.31	4.29	2.90	5.59	
	1.14	1.19	8.27	1.33	1.51	1.70	7.47	1.15	7.20	2.61	
	2.85	1.29	6.65	2.35		1.93	17.10	1.13	4.98	12.86	
Mean	1.68	0.83	5.40	1.84	1.58	2.70	11.29	2.19	5.03	7.02	
PCB 70+76	1.92	0.00	2.00		3.24	3.67	27.82	3.10	14.34	20.42	
	3.80	2.25	30.56	2.07	2.98	2.11	16.90	2.13	28.60	12.62	
	4.30	2.00	25.29	4.44		2.89	43.94	1.66	15.35	35.74	
Mean	3.34	2.13	19.28	3.26	3.11	2.89	29.55	2.30	19.43	22.93	
PCB 66+95	2.48	14.71	3.68		5.56	5.58	42.51	4.52	19.80	34.65	
	3.34	3.13	50.91	3.04	5.09	2.96	29.20	2.63	44.26	16.09	
	2.70	3.68	47.14	7.49		3.47	80.52	3.05	30.63	27.21	
Mean	2.84	7.17	33.91	5.27	5.33	4.00	50.74	3.40	31.56	25.98	
PCB 91	0.15	0.00	0.43		0.00	0.00	6.78	0.28	1.51	3.83	
	0.25	0.00	3.93	0.00	0.00	0.00	0.00	0.23	4.25	1.79	
	0.00	0.43	4.44	0.00		0.00	5.51	0.00	2.87	6.16	
Mean	0.13	0.14	2.93	0.00	0.00	0.00	4.10	0.17	2.88	3.93	
PCB 50+60	1.61	0.00	1.88		0.00	0.00	0.00	1.88	0.00	0.00	
	0.00	1.54	0.00	0.00	0.00	2.41	0.00	2.42	0.00	6.50	
	1.54	1.88	0.00	0.00		0.00	0.00	1.46	10.21	48.58	
Mean	1.05	1.14	0.63	0.00	0.00	0.80	0.00	1.92	3.40	18.36	
PCB 101	0.88	7.12	1.26		2.28	6.54	34.26	1.85	8.56	14.27	
	1.26	1.08	24.88	1.29	2.01	1.41	11.59	1.16	16.61	7.75	

PLOT REPLICATE	1A, B & C	2A, B & C	3A, B & C	4A, B & C	5A, B & C	6A, B & C	7A, B & C	8A, B & C	9 A, B & C	10A, B & C	SEL μg/Kg
	0.81	1.26	18.51	3.27		1.62	33.69	0.96	12.92	18.74	
Mean	0.98	3.15	14.88	2.28	2.15	3.19	26.51	1.32	12.70	13.59	
PCB 99	0.39	3.75	0.63		1.50	1.10	8.83	0.92	4.20	7.17	
	0.58	0.57	10.61	0.89	1.14	0.00	5.78	0.66	7.86	4.21	
	0.00	0.63	9.40	1.65		0.69	16.16	0.71	7.33	4.43	
Mean	0.32	1.65	6.88	1.27	1.32	0.60	10.26	0.76	6.46	5.27	
PCB 83	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.36	0.00	
	0.00	0.00	0.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.60	0.00		0.00	1.47	0.00	0.00	0.00	
Mean	0.00	0.00	0.43	0.00	0.00	0.00	0.49	0.00	0.12	0.00	
PCB 97	0.26	2.78	0.30		0.64	0.00	4.71	0.43	1.46	3.91	
	0.33	0.26	5.68	0.47	0.53	0.00	2.92	0.29	4.73	1.96	
	0.00	0.30	5.82	0.68		0.00	8.85	0.28	3.48	5.16	
Mean	0.20	1.11	3.93	0.58	0.59	0.00	5.49	0.33	3.22	3.68	
PCB 81+87	1.35	3.86	2.25		2.14	1.84	8.67	1.21	4.39	7.66	
	3.16	1.19	10.02	0.93	2.03	1.44	5.24	1.11	8.04	3.56	
	0.00	2.25	9.99	2.39		1.89	14.37	1.05	6.74	9.48	
Mean	1.50	2.43	7.42	1.66	2.09	1.72	9.43	1.12	6.39	6.90	
PCB 85+148+120	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00		0.00	0.00	0.00	5.15	0.00	
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.72	0.00	
PCB 136	0.23	3.26	0.23		0.00	1.83	2.94	0.41	1.40	2.53	

PLOT REPLICATE	1A, B & C	2A, B & C	3A, B & C	4A, B & C	5A, B & C	6A, B & C	7A, B & C	8A, B & C	9 A, B & C	10A, B & C	SEL μg/Kg
	0.22	0.14	3.41	0.00	0.00	0.00	1.69	0.11	4.08	1.77	
	0.20	0.23	3.46	0.00		0.00	5.16	0.00	2.48	2.56	
Mean	0.22	1.21	2.37	0.00	0.00	0.61	3.26	0.17	2.65	2.29	
PCB 77+110	0.78	10.59	1.17		2.66	0.00	19.43	1.85	8.98	16.76	
	0.88	0.60	24.23	1.17	1.80	0.85	12.24	0.99	18.14	10.17	
	0.87	1.17	22.13	3.44		1.03	36.65	0.77	13.32	22.05	
Mean	0.84	4.12	15.84	2.31	2.23	0.63	22.77	1.20	13.48	16.33	
PCB 82	0.00	3.38	0.25		1.52	1.57	2.83	1.27	0.18	2.46	
	0.00	0.13	4.10	1.57	1.75	1.22	1.96	0.31	2.97	2.38	
	0.00	0.25	3.31	1.27		0.78	4.92	3.66	3.73	2.67	
Mean	0..0	1.25	2.55	1.42	1.64	1.19	3.24	1.75	2.29	2.50	
PCB 151	0.63	0.00	0.42		1.07	0.00	7.71	1.17	3.54	5.82	
	0.52	0.33	9.63	0.52	0.85	0.00	4.57	0.30	7.80	2.99	
	0.00	0.42	9.13	1.32		0.00	14.90	0.72	5.28	7.24	
Mean	0.38	0.25	6.39	0.92	0.96	0.00	9.06	0.73	5.54	5.35	
PCB 135+144+147+124	1.75	3.21	0.13		0.00	0.00	5.55	0.27	2.36	5.10	
	0.26	0.15	6.85	0.00	0.00	0.00	0.00	0.10	4.69	2.19	
	0.00	0.13	6.25	0.98		0.00	0.00	0.00	4.10	4.29	
Mean	0.67	1.16	4.41	0.49	0.00	0.00	1.85	0.09	3.72	3.86	
PCB 107+123	0.00	0.00	0.00		0.00	0.00	2.75	0.00	0.89	1.20	
	0.00	0.00	1.82	0.00	0.00	0.00	0.00	0.00	1.29	0.94	
	0.00	0.00	1.83	0.00		0.00	3.35	0.00	1.00	1.52	

PLOT REPLICATE	1A, B & C	2A, B & C	3A, B & C	4A, B & C	5A, B & C	6A, B & C	7A, B & C	8A, B & C	9 A, B & C	10A, B & C	SEL μg/Kg
Mean	0.00	0.00	1.22	0.00	0.00	0.00	2.03	0.00	2.51	1.22	
PCB 149	0.69	11.32	0.99		2.20	2.00	30.23	1.51	11.76	20.55	
	1.07	0.70	33.26	1.25	1.72	0.56	17.24	0.94	22.72	10.72	
	0.59	0.99	31.16	3.50		0.84	50.64	0.46	17.68	25.75	
Mean	0.78	4.34	21.80	1.58	1.96	1.13	32.70	0.97	17.39	19.01	
PCB 118	0.59	6.81	0.00		1.49	1.22	17.01	0.95	7.49	13.48	
	1.01	0.00	18.66	1.23	1.36	1.72	10.32	1.02	14.69	7.16	
	0.75	0.00	14.99	2.30		1.11	28.09	0.59	10.76	16.87	
Mean	0.78	2.27	11.22	1.77	1.43	1.35	18.47	0.85	10.98	12.50	
PCB 134	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.27	0.00	
	0.00	0.00	1.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	1.18	0.00		0.00	0.00	0.00	0.96	0.00	
Mean	0.00	0.00	0.76	0.00	0.00	0.00	0.00	0.00	0.41	0.00	
PCB 131	0.00	0.15	0.00		0.00	0.00	0.00	0.00	0.07	0.00	
	0.00	0.00	0.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.16	0.00		0.00	0.00	0.00	0.21	0.00	
Mean	0.00	0.05	0.11	0.00	0.00	0.00	0.00	0.00	0.09	0.00	
PCB 146	0.00	2.87	0.00		0.00	0.00	9.72	0.33	2.74	6.98	
	0.00	0.00	9.35	0.00	0.00	0.00	5.54	0.00	8.32	3.16	
	0.00	0.00	10.04	0.00		0.00	16.72	0.00	5.17	8.05	
Mean	0.00	0.96	6.46	0.00	0.00	0.00	10.66	0.11	5.41	6.06	
PCB 105+132+153	1.47	19.51	2.49		5.21	2.62	57.49	6.91	26.21	56.58	

PLOT REPLICATE	1A, B & C	2A, B & C	3A, B & C	4A, B & C	5A, B & C	6A, B & C	7A, B & C	8A, B & C	9 A, B & C	10A, B & C	SEL μg/Kg
	2.11	1.76	68.24	2.19	3.71	1.63	33.36	6.10	55.08	26.24	
	2.04	2.49	77.87	9.48		1.69	108.72	0.00	38.34	63.01	
Mean	1.87	7.92	49.53	5.84	4.46	1.98	66.52	4.34	39.88	48.61	
PCB 141+179	0.00	6.09	0.00		1.02	0.00	8.19	0.29	0.00	0.00	
	0.00	0.00	10.70	0.00	0.80	0.00	6.19	0.00	0.00	3.62	
	0.00	0.00	0.00	1.37		0.00	15.05	0.00	6.72	8.11	
Mean	0.00	2.03	3.57	0.69	0.91	0.00	9.81	0.10	2.24	3.91	
PCB 137+176+130	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	1.64	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
PCB 163+138	0.72	17.19	1.43		4.13	2.28	43.78	2.55	19.30	33.63	
	0.34	0.68	51.10	0.00	3.15	0.76	26.86	1.04	40.01	16.80	
	0.75	1.43	50.49	6.20		0.85	83.45	1.79	28.99	44.50	
Mean	0.60	6.43	34.34	3.10	3.64	1.30	51.36	1.79	29.43	31.64	
PCB 158	0.59	5.22	1.24		0.00	0.00	6.65	1.42	3.07	7.41	
	0.85	0.66	9.88	0.69	0.79	0.00	4.17	1.65	6.66	5.60	
	0.63	1.24	8.81	0.00		0.00	12.15	2.45	4.79	8.52	
Mean	0.69	2.37	6.64	0.35	0.40	0.00	7.66	1.84	4.84	7.18	
PCB 178+129	0.00	0.00	0.00		0.00	0.00	4.79	0.00	1.54	3.65	
	0.00	0.00	4.54	0.00	0.00	0.00	0.00	0.00	4.16	1.79	
	0.00	0.00	5.19	0.00		0.00	8.66	0.00	2.76	4.38	

PLOT REPLICATE	1A, B & C	2A, B & C	3A, B & C	4A, B & C	5A, B & C	6A, B & C	7A, B & C	8A, B & C	9 A, B & C	10A, B & C	SEL μg/Kg
Mean	0.00	0.00	3.24	0.00	0.00	0.00	4.48	0.00	2.82	3.27	
PCB 187+182	0.50	7.40	0.62		1.62	0.88	19.61	0.87	11.30	13.22	
	0.78	0.00	21.05	0.58	1.29	0.00	11.81	0.49	15.55	9.89	
	0.00	0.62	23.70	2.22		0.45	35.12	0.00	11.76	17.62	
Mean	0.43	2.67	15.12	1.40	1.46	0.44	22.18	0.45	12.87	13.58	
PCB 183	0.00	3.82	0.43		3.82	0.00	13.75	0.62	5.94	10.09	
	0.52	0.00	14.30	0.00	0.98	0.00	7.58	0.00	10.12	6.05	
	0.00	0.43	15.04	1.94		0.00	23.10	0.00	7.90	10.78	
Mean	0.17	1.42	9.923	0.97	1.91	0.00	14.81	0.21	7.99	8.97	
PCB 128	0.00	0.75	0.00		0.00	0.00	0.00	0.00	0.66	1.75	
	0.00	0.00	2.63	0.00	0.00	0.00	0.00	0.00	2.11	1.68	
	0.00	0.00	2.62	0.00		0.00	4.66	0.00	1.33	2.27	
Mean	0.00	0.25	1.75	0.00	0.00	0.00	1.55	0.00	1.37	1.90	
PCB 185	0.00	1.96	0.00		0.00	0.00	1.94	0.00	0.95	1.96	
	0.00	0.00	2.39	0.00	0.00	0.00	2.14	0.00	2.03	1.12	
	0.00	0.00	2.77	0.00		0.00	3.94	0.00	1.34	1.98	
Mean	0.00	0.65	1.72	0.00	0.00	0.00	2.67	0.00	1.44	1.69	
PCB 174	0.00	8.26	0.00		0.00	0.00	16.79	0.00	9.80	13.48	
	0.00	0.00	20.84	0.00	0.00	0.00	10.85	1.33	17.09	7.70	
	0.00	0.00	18.90	3.46		0.00	30.02	0.00	11.55	15.34	
Mean	0.00	2.75	13.25	1.73	0.00	0.00	19.22	0.44	12.81	12.17	
PCB 177	0.38	2.41	0.00		0.00	0.00	7.56	0.36	3.22	5.55	
	0.00	0.00	6.75	0.00	0.00	0.00	4.54	0.00	6.61	3.53	

PLOT REPLICATE	1A, B & C	2A, B & C	3A, B & C	4A, B & C	5A, B & C	6A, B & C	7A, B & C	8A, B & C	9 A, B & C	10A, B & C	SEL μg/Kg
	0.00	0.00	10.48	0.00		0.00	14.44	0.00	5.17	7.05	
Mean	0.13	0.80	5.74	0.00	0.00	0.00	8.85	0.12	5.00	5.38	
PCB 202+171	0.00	4.15	0.00		0.00	0.00	5.87	0.00	7.07	6.45	
	0.21	0.00	0.00	0.00	0.00	0.00	5.87	0.93	8.36	5.30	
	0.00	0.00	13.61	0.00		0.00	11.07	0.00	13.83	4.96	
Mean	0.07	1.38	4.54	0.00	0.00	0.00	7.60	0.31	9.75	5.57	
PCB 157	0.00	0.00	0.00		0.00	0.00	2.77	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.92	0.00	0.00	0.00	
PCB 172+197	0.00	0.32	0.00		0.00	0.00	3.78	0.00	1.30	2.98	
	0.00	0.00	3.43	0.00	0.00	0.00	0.00	0.00	1.70	1.97	
	0.00	0.00	4.58	0.00		0.00	8.36	0.00	2.04	3.01	
Mean	0.00	0.11	2.67	0.00	0.00	0.00	4.05	0.00	1.68	2.65	
PCB 180	0.00	11.74	5.38		4.72	3.75	35.83	0.00	17.00	27.45	
	0.00	0.00	42.24	0.00	3.73	0.00	23.15	0.00	29.70	15.43	
	0.00	5.38	41.05	5.93		0.00	68.07	0.00	21.01	31.77	
Mean	0.00	5.71	29.56	2.97	4.23	1.25	42.35	0.00	22.57	24.88	
PCB 193	0.00	0.00	0.00		0.00	0.00	2.28	0.00	0.92	3.42	
	0.00	0.00	2.78	0.00	0.00	0.00	0.00	0.00	0.00	1.45	
	0.00	0.00	3.64	0.00		0.00	5.14	0.00	0.00	2.89	
Mean	0.00	0.00	2.14	0.00	0.00	0.00	2.47	0.00	0.31	2.59	
PCB 191	1.26	0.00	0.00		0.00	0.00	0.00	0.00	0.37	0.88	

PLOT REPLICATE	1A, B & C	2A, B & C	3A, B & C	4A, B & C	5A, B & C	6A, B & C	7A, B & C	8A, B & C	9 A, B & C	10A, B & C	SEL µg/Kg
	0.00	0.00	1.44	0.00	0.00	0.00	0.00	0.14	0.89	0.98	
	2.43	0.00	1.03	0.00		0.00	2.02	0.00	0.85	0.97	
Mean	1.23	0.00	0.82	0.00	0.00	0.00	0.67	0.05	0.70	0.94	
PCB 199	0.00	0.47	0.00		0.00	0.00	0.71	0.00	0.37	0.58	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.36	0.38	
	0.00	0.00	0.87	0.00		0.00	1.31	0.00	0.60	0.74	
Mean	0.00	0.16	0.29	0.00	0.00	0.00	0.67	0.00	0.44	0.57	
PCB 170+190	0.00	5.40	0.68		1.96	0.76	25.44	0.81	10.40	21.02	
	0.00	0.00	30.61	0.00	1.70	0.00	15.07	0.31	21.83	9.18	
	0.00	0.68	29.82	3.01		0.00	48.66	0.00	14.03	23.67	
Mean	0.00	2.03	20.37	1.51	1.83	0.25	29.72	0.37	15.42	17.96	
PCB 198	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.44	0.58	
	0.00	0.00	0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.62	
	0.00	0.00	0.74	0.00		0.00	0.00	0.00	0.54	0.34	
Mean	0.00	0.00	0.45	0.00	0.00	0.00	0.00	0.00	0.33	0.51	
PCB 201	0.00	1.03	0.00		1.09	0.00	14.65	0.73	8.89	10.05	
	0.00	0.00	13.19	0.00	0.00	0.00	8.70	0.33	9.95	11.42	
	0.00	0.00	18.16	1.58		0.00	25.27	0.00	7.96	13.85	
Mean	0.00	0.34	10.45	0.79	0.55	0.00	16.21	0.35	8.93	11.77	
PCB 203+196	0.00	3.54	0.00		2.22	0.00	20.06	0.90	12.53	14.45	
	0.00	0.00	22.27	0.00	0.00	0.00	11.95	0.38	17.18	13.94	
	4.13	0.00	25.31	2.20		0.00	35.28	0.00	14.86	18.98	
Mean	1.38	1.18	15.86	1.10	1.11	0.00	22.43	0.43	14.86	15.79	

PLOT REPLICATE	1A, B & C	2A, B & C	3A, B & C	4A, B & C	5A, B & C	6A, B & C	7A, B & C	8A, B & C	9 A, B & C	10A, B & C	SEL μg/Kg
PCB 189	0.00	0.00	0.00		0.00	0.00	2.08	0.00	1.63	1.83	
	0.00	0.00	2.81	0.00	0.00	0.00	0.00	0.00	1.77	1.22	
	0.00	0.00	2.57	0.00		0.00	3.94	0.00	1.42	2.92	
Mean	0.00	0.00	1.79	0.00	0.00	0.00	2.01	0.00	1.61	1.99	
PCB 208+195	0.00	0.00	0.00		0.00	0.00	11.20	0.00	2.15	6.82	
	0.00	0.00	12.30	0.00	0.00	0.00	0.00	0.00	7.46	8.68	
	0.00	0.00	13.55	1.11		0.00	19.46	0.00	6.95	12.02	
Mean	0.00	0.00	8.52	0.56	0.00	0.00	10.22	0.00	5.52	9.17	
PCB 207	0.00	0.00	0.00		0.00	0.00	0.89	0.00	0.65	0.69	
	0.00	0.00	0.87	0.00	0.00	0.00	0.00	0.00	0.68	0.84	
	0.00	0.00	1.13	0.00		0.00	1.26	0.00	0.94	0.00	
Mean	0.00	0.00	0.67	0.00	0.00	0.00	0.72	0.00	0.76	0.51	
PCB 194	0.00	2.97	0.00		0.66	0.00	8.36	0.33	4.14	5.61	
	0.25	0.00	9.48	0.00	0.00	0.00	4.85	0.20	6.58	4.35	
	0.00	0.00	9.47	0.78		0.00	14.98	0.00	4.55	7.41	
Mean	0.08	0.99	6.32	0.39	0.33	0.00	9.40	0.18	5.09	5.79	
PCB 205	0.00	0.00	0.00		0.00	0.00	0.73	0.00	0.00	1.06	
	0.00	0.00	1.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.68	0.00		0.00	1.99	0.00	0.62	0.75	
Mean	0.00	0.00	0.56	0.00	0.00	0.00	0.91	0.00	0.21	0.60	
PCB 206	0.23	2.14	0.00		0.69	0.00	7.88	0.31	6.37	4.98	
	0.00	0.00	7.64	0.00	0.00	0.00	4.52	0.00	6.15	8.51	
	0.00	0.00	8.25	0.87		0.00	12.10	0.00	4.60	9.89	

PLOT REPLICATE	1A, B & C	2A, B & C	3A, B & C	4A, B & C	5A, B & C	6A, B & C	7A, B & C	8A, B & C	9 A, B & C	10A, B & C	SEL μg/Kg
Mean	0.08	0.71	5.30	0.44	0.35	0.00	8.17	0.10	5.71	7.79	
PCB 209	0.14	0.00	0.08		0.27	0.00	2.12	0.09	2.12	1.44	
	0.22	0.04	1.86	0.00	0.00	0.00	1.39	0.07	1.52	3.64	
	0.00	0.08	2.61	0.00		0.00	2.60	0.03	1.19	3.10	
Mean	0.12	0.04	1.52	0.00	0.14	0.00	2.04	0.06	1.61	2.73	

2006

On November 21, 2006, Cd ranged from an average of 0.77 mg/kg in plot 8 which contains AquaBlok that is unamended with peat moss to an average of 4.77 mg/kg in plot 7 which is a control that has Submerseed. Cr ranged from an average of 9.73 mg/kg in plot 8 which contains AquaBlok that is unamended with peat moss to an average of 102 mg/kg in plot 7 which is a control that has Submerseed. Cu ranged from an average of 8.00 mg/kg in plot 8 which contains AquaBlok that is unamended with peat moss to an average of 216 mg/kg in plot 7 which is a control that has Submerseed. Fe ranged from an average of 4026.8 mg/kg in plot 8 which contains AquaBlok that is unamended with peat moss to an average of 42354 mg/kg in plot 7 which is a control that has Submerseed. Hg ranged from an average of 0.02 mg/kg in plot 8 which contains AquaBlok that is unamended with peat moss to an average of 0.67 mg/kg in plot 7 which is a control that has Submerseed and 0.73 in plot 4 which contains AquaBlok that is unamended with peat moss. Ni ranged from an average of 5.01 mg/kg in plot 8 which contains AquaBlok that is unamended to an average of 70.9 mg/kg in plot 7 which is a control that has Submerseed. Pb ranged from an average of 26.2 mg/kg in plot 8 which contains AquaBlok that is unamaded with peat moss to an average of 516 mg/kg in plot 7 which is a control that has Submerseed. Zn ranged from an average of 63.2 mg/kg in plot 8 which contains AquaBlok that is unamended with peat moss to an average of 860 mg/kg in plot 7 which is a control that has Submerseed (Table VII.E3).

Sediment samples collecte November 21, 2006 had average total PCB concentrations in capped sites ranging from 9.12 µg/Kg in plot 8, which had AB un, to 337.70 µg/Kg in plot 5, which had AB u S (Table VII.E4). For uncapped plots, levels were approximately 200- 3x higher. Average concentrations ranged from 555.4 µg/Kg in plot 9, which is Control, to

1007.3 μg/Kg in plot 7, which was Control S. None of the PCB concentrations in sediment exceeded SEL. Average total OCP concentrations in capped sites ranged from 10.85 μg/Kg in plot 8, which was AB un, to 459.3 in plot 5, which was AB un S (Table VII.E4). For uncapped plots, levels were approximately 2-8x higher than in capped plots. Total average concentrations ranged from 775.3 μg/Kg in plot 3, which was Control, to 1419.8 μg/Kg in plot 7, which was Control S. Two replicates in plot 7, which was Control S, exceeded the SEL for DDE (190 μg/Kg). All other OCP were below SEL. PCB and OCP values were similar in November 21, 2006 to those found in September 28, 2005, post-capping. This was true for both capped and uncapped sites. Results indicated that organic contaminants were still not breaking through the cap.

Table VII.E3. Heavy metals in sediment (mg/L) collected post capping, November 21,06. CNTRL =not capped, S = with SubmerSeed, AB = AquaBlok, PM = amended with peat moss, UN = unamended, Total = sum of metals without Fe. Orange shading- data point not included in the average. Red shading: value > SEL.

Treatment	Sample	Site	Cd	Cr	Cu	Fe	Hg	Ni	Pb	Zn	Total
AB un S	1 A	2B	1.15	15.39	39.96	11702	0.28	14.16	86.96	163.50	321
	1 B	5D	0.47	8.69	8.71	3642	0.01	4.48	28.53	50.49	101
	1 C	1C	1.04	11.20	32.72	18264	0.13	11.50	84.74	131.32	273
Average			0.89	11.76	27.13	11203	0.14	10.05	66.74	115.10	232
SD			0.37	3.38	16.36	7324	0.14	5.00	33.12	58.22	116
AB pm S	2 A	2A	1.41	16.45	69.92	20296	0.06	20.97	133.42	163.91	406
	2 B	4B	0.73	6.89	14.54	9176	0.12	6.79	50.98	104.37	184
	2 C	6D	1.58	16.32	50.26	23648	0.17	18.53	113.54	202.36	403
Average			1.24	13.22	44.91	17707	0.12	15.43	99.31	156.88	331
SD			0.45	5.48	28.07	7575	0.05	7.58	43.02	49.37	127
CNTRL	3 A	3A	3.55	68.22	201.55	42603	0.37	53.50	384.06	630.15	1341
	3 B	2D	3.36	71.01	181.77	37037	0.47	52.65	299.84	573.52	1183
	3 C	5D	3.55	61.89	192.94	36247	0.38	54.16	332.68	675.48	1321
Average			3.49	67.04	192.09	38629	0.41	53.44	338.86	626.39	1282
SD			0.11	4.67	9.92	3465	0.05	0.76	42.45	51.09	86
AB un	4 A	4E	4.01	94.35	267.23	35009	0.09	79.81	759.90	705.45	149
	4 B	2D	0.72	12.24	15.43	6040	0.04	5.99	40.86	73.29	58
	4 C	3A	0.88	8.22	2.16	2402	0.88	2.03	13.66	29.75	149
Average			0.80	10.23	8.79	4221	0.46	4.01	27.26	51.52	103
SD			0.12	2.84	9.38	2573	0.60	2.80	19.24	30.79	64
AB pm S	5 A	9A	1.31	14.63	58.66	16052	0.19	14.77	110.01	169.19	369
	5 B	7C	1.70	17.97	84.57	30726	0.30	22.56	147.83	256.04	531
	5 C	2C	2.31	25.12	130.49	24491	0.30	29.85	229.76	406.42	824
Average			1.77	19.24	91.24	23757	0.27	22.39	162.53	277.22	575
SD			0.50	5.35	36.38	7365	0.07	7.54	61.21	120.02	231
AB pm S	6A	5E	1.04	10.32	7.18	4157	0.02	4.28	24.29	56.05	103
	6B	2B	2.72	39.07	139.80	28833	0.30	37.14	5.12	482.13	706
	6C	4B	0.99	9.74	11.55	4596	0.02	4.89	28.32	66.53	122
Average			1.02	10.03	9.36	4377	0.02	4.58	26.31	61.29	113
SD			0.04	0.41	3.09	310	0.00	0.43	2.85	7.41	13
CNTRL S	7 A	5D	5.01	92.54	303.24	45697	1.08	67.65	448.27	889.20	1807
	7 B	5B	5.16	122.22	53.40	45251	0.42	83.07	497.45	1025.5	1787
	7 C	1D	4.22	95.47	316.66	40430	0.67	64.87	676.12	696.48	1854
Average			4.80	103.41	224.43	43793	0.72	71.86	540.61	870.41	1816
SD			0.50	16.36	148.27	2921	0.33	9.81	119.90	165.33	35
AB un	8 A	2B	0.69	9.50	3.13	2633	0.03	3.34	16.26	37.95	71
	8 B	4C	0.77	11.09	7.97	3483	0.01	4.26	25.06	48.68	98
	8 C	3D	0.86	8.60	12.90	6965	0.02	7.43	37.13	102.99	170
Average			0.78	9.73	8.00	4360	0.02	5.01	26.15	63.21	113

Treatment	Sample	Site	Cd	Cr	Cu	Fe	Hg	Ni	Pb	Zn	Total
SD			0.08	1.27	4.89	2295	0.01	2.14	10.48	34.87	51
CNTRL	9 A	4C	3.87	120.44	277.03	22181	0.30	87.69	785.29	618.41	1893
	9B	2B	4.45	8.61	41.53	6841	0.09	25.82	123.88	417.01	621
	9 C	4F	2.49	87.20	242.49	34191	0.38	68.00	518.10	525.40	1444
Average			3.60	72.09	187.02	21071	0.26	60.50	475.76	520.27	1319
SD			1.01	57.43	127.17	13709	0.15	31.61	332.73	100.80	645
CNTRL S	10 A	2B	3.35	78.99	209.61	32108	0.41	64.19	422.17	617.25	1396
	10 B	1A	1.49	9.42	60.41	13032	0.07	22.81	190.41	227.18	512
	10 C	2B	3.78	60.71	205.83	28285	0.47	59.34	381.50	557.74	1269
Average			2.87	49.71	158.61	24475	0.32	48.78	331.36	467.39	1059
SD			1.22	36.07	85.07	10093	0.21	22.62	123.75	210.15	478
LEL			0.6	26	16		0.20	16	31	120	
SEL			10.0	110	110		2.00	75	250	820	

LEL = Lowest Effects Limit based on Ontario Aquatic Sediment Criterion.
SEL = Severe Effects Limit based on Ontario Aquatic Sediment Criterion

Table VII.E4. Concentrations of organic contaminants (µg/Kg) in sediment collected post-capping, 11-21-06. Treatments were: plots 3&9 = control, 7&10 = control with SubmerSeed, 4&8 = AquaBlok unamended, 1&5 = AquaBlok unamended with Submer Seed and 2&6 = AquaBlok amended with peat moss with SubmerSeed. Values shaded in yellow exceeded the EPA's SELs for PCBs and OCPs. These criteria are not available for all contaminants. Zero values represented non-detectable levels.

PLOT REPLICATE	1A, B & C	2A, B & C	3A, B & C	4A, B & C	5A, B & C	6A, B & C	7A, B & C	8A, B & C	9 A, B & C	10A, B & C	SEL µg/Kg
				TOTAL CONCENTRATION (µg/kg)							
PCB	298.12	265.96	697.50	396.84	258.88	5.65	1062.36	1.60	492.42	772.97	53,000
	5.16	25.17	659.26	2.55	339.42	446.27	1201.95	9.88	84.18	83.37	
	300.94	171.93	587.25	0.38	414.79	3.40	757.45	15.87	1089.65	1263.58	
Mean	201.4	154.35	648.00	133.26	337.70	151.77	1007.25	9.12	555.42	706.64	
OCP	1262.42	547.50	750.78	187.04	253.30	5.31	1521.39	1.31	766.41	1117.90	
	19.07	27.65	465.45	2.97	555.14	758.07	1259.47	8.79	145.80	84.13	
	450.33	191.72	1109.45	0.25	569.59	89.08	1478.58	22.46	1453.82	1169.96	
Mean	577.27	255.62	775.23	63.42	459.34	284.15	1419.81	10.85	788.68	790.66	
				SURROGATE RECOVERY (%)							
PCB 14	76%	99%	84%	112%	90%	27%	82%	70%	80%	0%	
	99	83	73	26	43	91	86	77	59	85	
	77	71	63	37	85	96	85	49	54	0	
Mean	84	84	73	58	73	71	84	65	64	28	
PCB 65	105%	100%	94%	86%	`	34%	96%	80%	99%	109%	
	98	90	82	56	100	113	123	114	80	91	
	97	80	73	62	110	101	109	145	117	104	
Mean	100	60	83	68	105	83	109	113	99	101	
PCB 166	133%	136%	127%	165%	155%	37%	122%	106%	126%	138%	
	130	127	88	45	130	156	166	145	93	123	
	123	101	73	85	148	127	125	129	179	134	
Mean	129	121	96	98	144	107	138	127	133	132	
Dibutychlorendate	29%	32%	11%	0%	0%	0%	0%	0%	0%	21%	
	0	14	10	0	0	0	0	0	19	17	
	27	11	0	0	0	0	0	0	20	10	
Mean	19	19	7	0	0	0	0	0	20	16	
Pesticide	CONC (ug/Kg)	CONC (ug/Kg)	CONC (ug/Kg)	CONC (ug/Kg)	CONC (ug/Kg)	CONC (ug/Kg)	CONC (ug/Kg)	CONC (ug/Kg)	CONC (ug/Kg)	CONC (ug/Kg)	
OCP a-BHC	1.35	2.26	5.39	0.00	0.00	0.00	6.30	0.00	4.52	5.57	100
	0.00	0.38	0.60	0.00	6.36	6.08	8.59	0.00	2.13	2.19	
	0.00	0.06	0.00	0.00	5.50	0.00	1.97	0.00	8.40	5.95	
Mean	0.45	0.9	2.00	0.00	3.95	2.03	5.62	0.00	5.02	4.57	

PLOT REPLICATE	1A, B & C	2A, B & C	3A, B & C	4A, B & C	5A, B & C	6A, B & C	7A, B & C	8A, B & C	9 A, B & C	10A, B & C	SEL µg/Kg
OCP b-BHC	0.00	0.00	0.00	0.00	0.00	0.00	1.80	0.00	5.42	2.08	210
	0.00	0.00	0.92	0.00	0.00	0.00	4.61	0.00	2.27	0.00	
	0.00	0.00	0.00	0.01	2.58	0.00	3.36	0.00	1.87	1.96	
Mean	0.00	0.00	0.31	0.00	0.86	0.00	3.26	0.00	3.19	1.35	
OCP g-BHC	6.46	7.70	8.25	4.24	5.15	0.00	8.73	0.33	6.03	10.87	600
	0.09	2.47	7.73	0.15	10.55	11.54	8.95	0.44	7.23	5.49	
	10.73	3.73	8.44	0.11	8.10	85.00	11.81	1.30	16.66	14.83	
Mean	5.76	4.63	8.14	1.50	7.93	32.18	9.83	0.69	9.97	10.40	
OCP d-BHC	0.00	0.23	0.00	0.00	0.00	0.00	0.81	0.00	2.31	1.12	
	0.00	0.00	0.00	0.00	0.25	0.48	1.80	0.00	2.62	0.37	
	0.00	0.00	0.00	0.00	0.54	0.00	0.77	0.00	1.26	1.93	
Mean	0.00	0.08	0.00	0.00	0.26	0.16	1.13	0.00	2.06	1.14	
OCP Heptachlor	5.75	4.20	6.00	4.12	5.47	0.00	10.50	0.64	5.76	11.02	2400
	0.36	0.92	5.75	0.00	9.04	9.47	7.54	0.70	4.36	3.96	
	5.70	2.07	5.22	0.00	5.50	0.42	4.81	1.35	5.43	10.48	
Mean	3.94	2.40	5.66	1.37	6.67	3.30	7.62	0.90	5.18	8.49	
OCP Aldrin	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	800
	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.30	0.00	
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.00	
OCP Heptachlor Epoxide	0.00	0.75	0.76	0.56	0.78	0.00	0.00	0.00	0.00	0.00	500
	0.00	0.00	0.00	0.00	0.93	1.27	1.34	0.00	0.00	0.00	
	0.00	0.32	0.77	0.01	0.93	0.00	0.00	0.00	0.71	1.55	
Mean	0.00	0.36	0.51	0.19	0.88	0.42	0.45	0.00	0.24	0.52	
OCP Endosulfan I	0.94	0.00	0.35	0.44	0.67	0.00	0.00	0.00	0.00	0.55	
	0.00	0.37	0.35	0.00	0.34	1.45	0.39	0.00	0.97	0.85	
	1.68	0.56	0.41	0.07	0.72	0.00	0.00	0.33	1.21	1.16	
Mean	0.87	0.31	0.37	0.15	0.58	0.48	0.13	0.11	0.73	0.74	
OCP Dieldrin	0.04	0.00	0.08	0.00	0.00	0.00	0.43	0.00	0.24	0.00	9100
	0.00	0.00	0.00	0.00	0.00	0.34	0.51	0.00	1.01	0.26	
	0.30	0.00	0.00	0.00	0.19	0.00	0.00	0.00	0.00	0.00	
Mean	0.11	0.00	0.03	0.00	0.06	0.11	0.31	0.00	0.42	0.09	
OCP DDE	27.36	23.38	45.30	18.15	16.58	0.29	266.32	0.00	41.38	53.35	190
	0.60	1.64	29.07	0.04	22.52	46.20	131.65	0.69	2.38	3.29	
	19..38	11.49	25.80	0.00	37.32	0.26	272.01	0.40	66.69	85.73	
Mean	15.78	12.17	33.39	6.06	25.47	15.58	223.33	0.36	36.82	47.46	
OCP Endrin	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	13,000
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	

PLOT REPLICATE	1A, B & C	2A, B & C	3A, B & C	4A, B & C	5A, B & C	6A, B & C	7A, B & C	8A, B & C	9 A, B & C	10A, B & C	SEL µg/Kg
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
OCP Endosulfan II	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.77	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.26	
OCP DDD	485.03	429.10	369.74	77.32	128.25	4.77	720.00	0.34	590.49	751.53	600
	17.88	18.99	274.62	2.61	187.25	271.51	687.06	5.90	32.20	30.75	
	326.81	165.23	393.23	0.05	212.68	3.32	623.56	3.71	772.07	652.13	
Mean	276.57	204.44	345.86	26.66	176.06	93.2	676.87	3.32	464.92	478.14	
OCP Endrin Aldehyde	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.36	
	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.45	
OCP Endosulfan Sulfate	11.35	0.00	0.00	0.00	0.00	0.20	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	39.97	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	3.78	0.00	0.00	0.00	0.00	13.32	0.00	0.00	0.00	0.00	
OCP DDT	720.76	74.68	314.91	66.90	67.98	0.00	498.10	0.00	96.64	274.60	1200
	0.00	2.88	142.44	0.00	311.10	364.97	397.38	0.88	90.62	36.98	
	84.20	7.40	671.38	0.00	270.13	0.00	560.29	15.20	575.65	386.11	
Mean	268.32	28.32	376.24	22.3	216.40	121.66	485.26	5.07	254.30	232.56	
Endrin Ketone	3.37	5.21	0.00	1.72	6.85	0.05	8.39	0.00	2.03	5.09	
	0.12	0.00	3.95	0.15	6.80	4.79	9.65	0.18	0.00	0.00	
	1.53	0.85	4.20	0.00	6.50	0.07	0.00	0.17	3.59	8.13	
Mean	1.67	2.02	2.72	0.62	6.72	1.64	6.01	0.12	1.87	4.41	
OCP Metoxychlor	0.00	0.00	0.00	13.60	21.56	0.00	0.00	0.00	11.59	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	18.91	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	4.53	13.50	0.00	0.00	0.00	3.86	0.00	
PCB Congener											
PCB 1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	

PLOT REPLICATE	1A, B & C	2A, B & C	3A, B & C	4A, B & C	5A, B & C	6A, B & C	7A, B & C	8A, B & C	9 A, B & C	10A, B & C	SEL µg/Kg
PCB 3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
PCB 4+10	0.00	0.00	1.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	1.53	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	1.83	0.00	0.00	0.00	
Mean	0.00	0.00	1.07	0.00	0.00	0.00	0.61	0.00	0.00	0.00	
PCB 7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
PCB 6	4.33	0.00	4.44	1.56	1.93	0.00	7.21	0.00	0.00	5.36	
	0.00	0.00	5.46	0.00	4.05	6.06	7.01	0.00	3.12	2.31	
	0.00	1.47	6.08	0.00	4.14	0.00	7.80	0.00	6.83	7.67	
Mean	1.44	0.49	5.33	0.52	3.37	2.02	7.34	0.00	3.32	5.11	
PCB 8+5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	2.59	1.78	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.86	0.59	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
PCB 19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.83	0.00	
	0.00	0.00	2.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	1.65	1.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.77	
Mean	0.55	0.37	0.71	0.00	0.00	0.00	0.00	0.00	0.94	0.92	
PCB 12+13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.06	2.85	
	0.00	0.00	10.65	0.00	0.00	0.00	0.00	0.00	5.62	2.84	
	0.00	0.00	11.42	0.00	0.00	0.00	0.00	0.00	5.30	3.22	
Mean	0.00	0.00	7.36	0.00	0.00	0.00	0.00	0.00	4.66	2.97	
PCB 18	0.00	0.00	11.32	6.85	7.01	0.04	11.36	0.00	1.87	9.17	
	0.00	0.00	12.48	0.05	0.00	5.39	9.91	0.00	0.00	0.00	
	0.00	0.00	12.92	0.00	3.58	0.00	10.96	0.00	13.46	10.92	
Mean	0.00	0.00	12.24	2.30	3.53	1.81	10.74	0.00	5.11	6.70	
PCB 17	1.32	0.64	5.04	1.79	2.28	0.00	2.06	0.00	2.70	1.35	
	0.02	0.01	7.62	0.03	1.07	1.73	14.54	0.00	0.00	0.41	
	3.06	0.00	6.11	0.00	2.26	0.00	0.00	0.00	1.66	1.87	
Mean	1.47	0.22	6.26	0.61	1.87	0.58	5.53	0.00	1.45	1.21	
PCB 24+27	0.00	0.00	7.52	0.00	0.00	0.00	0.00	0.00	4.83	0.00	
	0.07	0.00	7.69	0.00	0.00	6.76	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	5.20	

PLOT REPLICATE	1A, B & C	2A, B & C	3A, B & C	4A, B & C	5A, B & C	6A, B & C	7A, B & C	8A, B & C	9 A, B & C	10A, B & C	SEL µg/Kg
Mean	0.02	0.00	5.07	0.00	0.00	2.26	0.00	0.00	1.61	1.73	
PCB 16+32	0.00	0.00	2.41	0.00	0.00	0.00	0.00	0.00	0.00	3.06	
	0.00	0.00	2.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.91	2.28	0.00	0.00	0.00	0.00	0.00	1.86	5.11	
Mean	0.00	0.30	2.26	0.00	0.00	0.00	0.00	0.00	0.62	2.72	
PCB 29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
PCB 26	0.00	1.64	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	1.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	1.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
PCB 25	0.35	0.38	3.62	0.00	0.00	0.00	0.00	0.00	1.10	0.00	
	0.00	0.00	2.69	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.44	2.71	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.12	0.27	3.01	0.00	0.00	0.00	0.00	0.00	0.37	0.00	
PCB 31+28	20.03	17.77	36.99	16.08	16.31	0.00	51.72	0.11	28.26	39.28	
	0.00	2.42	38.34	0.00	25.87	33.22	58.76	0.98	7.95	8.61	
	16.65	8.27	34.39	0.00	21.98	0.11	1.97	2.37	59.10	54.90	
Mean	12.23	9.49	36.57	5.36	21.39	11.11	37.48	1.15	31.77	34.26	
PCB 21+33+53	7.04	6.99	4.10	4.24	7.68	0.00	15.05	0.00	2.76	2.51	
	0.00	1.38	4.81	0.00	0.00	6.06	4.61	0.00	2.58	3.88	
	9.41	1.86	9.57	0.13	9.32	0.00	0.00	1.11	5.94	4.52	
Mean	5.48	3.41	6.16	1.46	5.67	2.02	6.55	0.37	3.76	3.64	
PCB 22	3.85	3.29	4.08	2.03	0.00	0.00	8.37	0.00	2.59	3.82	
	0.00	0.80	5.55	0.00	3.85	3.07	2.27	0.39	1.16	1.55	
	4.29	1.51	4.62	0.00	3.66	0.00	6.54	0.00	8.47	9.78	
Mean	2.71	1.60	4.75	0.68	2.50	1.02	5.73	0.13	4.07	5.05	
PCB 45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.08	0.00	3.68	0.00	0.00	
Mean	0.00	0.00	0.00	0.00	0.00	0.03	0.00	1.23	0.00	0.00	
PCB 46	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
PCB 52+43	8.23	7.29	15.85	8.00	6.73	0.24	23.33	0.14	9.28	16.99	
	0.22	1.89	15.33	0.15	9.27	10.54	24.84	0.37	2.67	2.79	

PLOT REPLICATE	1A, B & C	2A, B & C	3A, B & C	4A, B & C	5A, B & C	6A, B & C	7A, B & C	8A, B & C	9 A, B & C	10A, B & C	SEL µg/Kg
	7.78	4.09	14.30	0.08	10.21	0.00	0.00	0.48	24.23	27.14	
Mean	5.41	4.42	15.16	2.74	8.74	3.59	16.06	0.33	12.06	15.64	
PCB 49	4.67	4.27	15.79	7.77	5.30	0.00	18.89	0.00	5.43	12.80	
	0.00	1.06	12.41	0.00	9.40	8.07	19.52	0.00	2.49	1.29	
	4.23	3.84	10.82	0.00	9.16	0.00	15.75	0.01	19.52	19.77	
Mean	2.97	3.06	13.01	2.59	7.95	2.69	18.05	0.00	9.15	11.29	
PCB 47+48	2.31	2.77	6.42	3.52	3.45	0.06	0.00	0.00	3.85	0.00	
	0.00	0.40	5.55	0.00	0.00	3.67	0.00	0.00	0.86	1.72	
	3.44	1.75	4.97	0.00	0.00	0.00	0.00	0.00	0.50	0.58	
Mean	1.92	1.64	5.65	1.17	1.15	1.24	0.00	0.00	1.74	0.77	
PCB 44	3.72	3.07	13.73	7.68	4.78	0.09	20.78	0.00	1.79	2.48	
	0.08	0.00	10.60	0.05	5.05	8.36	6.26	0.06	0.73	0.00	
	4.62	3.17	9.84	0.00	2.05	0.02	0.00	0.00	2.94	3.42	
Mean	2.81	2.08	11.39	2.58	3.96	2.82	9.01	0.02	1.88	1.97	
PCB 37+42	0.00	2.25	4.93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	3.54	0.00	0.00	5.65	0.00	0.56	1.25	2.54	
	0.00	0.00	2.91	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.75	3.79	0.00	0.00	1.88	0.00	0.19	0.42	0.85	
PCB 41+71	9.44	10.51	19.20	8.04	5.21	0.16	30.99	0.24	13.62	18.41	
	0.22	1.49	17.40	0.15	14.25	15.45	34.11	0.00	4.02	6.13	
	11.04	5.36	15.23	0.13	13.93	0.35	28.00	0.37	20.06	30.49	
Mean	6.90	5.79	17.28	2.77	11.13	5.32	31.03	0.20	12.57	18.34	
PCB 64	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
PCB 40	3.07	0.00	4.29	2.29	0.00	0.53	9.75	0.00	3.65	4.84	
	0.11	0.00	3.91	0.00	2.82	5.38	0.00	0.10	4.26	1.41	
	0.00	1.19	5.91	0.00	3.38	0.00	7.27	0.00	5.75	7.49	
Mean	1.06	0.40	4.70	0.73	2.07	1.97	5.67	0.03	4.55	4.58	
PCB 100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	2.95	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.98	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
PCB 63	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
PCB 74	4.29	2.06	9.73	3.98	3.70	0.00	18.23	0.00	0.00	1.29	

PLOT REPLICATE	1A, B & C	2A, B & C	3A, B & C	4A, B & C	5A, B & C	6A, B & C	7A, B & C	8A, B & C	9 A, B & C	10A, B & C	SEL µg/Kg
	0.00	0.39	10.24	0.07	0.00	5.58	16.18	0.49	0.40	2.26	
	5.24	1.73	7.89	0.00	6.08	0.14	0.00	1.46	16.33	19.52	
Mean	3.18	1.39	9.29	1.35	3.26	1.91	11.47	0.65	5.58	7.69	
PCB 70+76	8.88	7.24	11.95	8.98	7.63	0.00	0.00	0.00	9.19	16.32	
	0.00	0.72	18.83	0.00	10.39	0.00	0.00	0.00	2.90	4.25	
	6.22	3.94	19.25	0.00	0.00	0.00	0.00	0.00	29.59	23.86	
Mean	5.03	3.97	16.68	2.99	6.01	0.00	0.00	0.00	13.89	14.81	
PCB 66+95	1.89	13.43	36.48	17.87	14.21	0.00	52.34	0.00	16.57	36.43	
	0.00	1.33	30.64	0.00	15.89	16.73	68.19	0.36	3.43	4.47	
	13.07	7.55	22.09	0.00	27.19	0.00	0.00	0.11	23.63	61.32	
Mean	4.99	7.44	29.74	5.96	19.10	5.58	40.18	0.16	14.54	34.07	
PCB 91	1.21	1.10	2.62	1.70	1.34	0.04	4.53	0.00	1.49	2.96	
	0.06	0.00	2.93	0.02	0.99	0.00	0.00	0.00	0.00	0.00	
	0.78	0.70	1.94	0.00	1.35	0.00	3.78	0.00	4.81	4.53	
Mean	0.68	0.60	2.50	0.57	1.23	0.01	2.77	0.00	2.10	2.50	
PCB 50+60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.54	0.00	31.17	
	0.00	0.00	7.34	0.00	0.00	0.00	21.35	0.00	6.56	0.00	
	0.00	0.00	26.87	0.00	0.00	0.11	0.00	1.99	13.92	15.04	
Mean	0.00	0.00	11.40	0.00	0.00	0.04	7.12	0.84	6.83	15.40	
PCB 101	6.41	5.54	14.63	7.80	6.10	0.08	26.64	0.00	11.46	16.25	
	0.11	0.59	13.99	0.00	9.08	9.73	25.85	0.40	0.91	1.16	
	4.71	4.20	11.55	0.00	9.29	0.10	21.82	0.00	13.49	28.83	
Mean	3.74	3.44	13.39	2.60	8.16	3.30	24.77	0.13	8.62	15.41	
PCB 99	3.46	2.53	6.16	3.77	3.05	0.11	23.22	0.13	14.48	19.28	
	0.12	0.33	7.17	0.22	9.35	4.50	13.21	0.51	2.24	2.65	
	2.71	2.14	12.11	0.00	9.87	0.26	13.09	0.35	5.96	33.24	
Mean	2.10	1.67	8.48	1.33	7.42	1.62	16.51	0.33	7.56	18.39	
PCB 83	40.53	23.17	0.00	7.01	8.14	0.01	0.47	0.03	0.32	0.84	
	0.00	1.79	16.04	0.00	13.06	21.26	32.72	0.00	0.99	0.78	
	41.18	0.00	21.72	0.00	12.74	0.00	96.47	0.30	34.40	1.52	
Mean	27.24	8.32	12.59	2.34	11.31	7.09	43.22	0.02	11.90	1.05	
PCB 97	2.52	1.35	4.42	1.91	1.42	0.05	5.68	0.00	3.48	4.38	
	0.06	0.00	3.79	0.02	2.51	2.51	7.29	0.11	0.73	0.38	
	1.34	1.04	3.14	0.00	2.71	0.01	5.43	0.00	7.07	1.53	
Mean	1.31	0.80	3.78	0.64	2.21	0.86	6.13	0.04	3.76	2.10	
PCB 81+87	3.77	3.12	9.66	3.33	2.56	0.00	12.97	0.00	4.57	8.09	
	0.00	0.38	6.16	0.00	3.37	7.19	14.53	0.00	0.62	1.36	
	2.50	1.79	4.36	0.00	6.79	0.00	0.00	0.00	11.48	15.49	
Mean	2.09	1.76	6.73	1.11	4.24	2.40	9.17	0.00	5.56	8.31	

PLOT REPLICATE	1A, B & C	2A, B & C	3A, B & C	4A, B & C	5A, B & C	6A, B & C	7A, B & C	8A, B & C	9 A, B & C	10A, B & C	SEL µg/Kg
PCB 85+148+120	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	6.53	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.00	0.00	0.00	0.00	0.00	0.00	2.18	0.00	0.00	0.00	
PCB 136	0.79	0.63	0.00	1.31	1.10	0.04	0.00	0.00	1.42	2.37	
	0.00	0.00	1.56	0.02	0.00	0.00	7.08	0.00	0.00	0.00	
	0.66	0.51	1.30	0.00	0.00	0.00	0.00	0.00	0.00	4.76	
Mean	0.48	0.38	0.95	0.44	0.37	0.01	2.36	0.00	0.47	2.38	
PCB 77+110	8.90	6.76	21.38	8.55	7.29	0.20	34.52	0.00	15.27	24.46	
	0.17	0.32	18.44	0.12	10.64	5.85	40.42	0.51	1.87	2.10	
	6.10	4.81	14.12	0.00	12.35	0.26	19.79	0.22	30.58	43.27	
Mean	5.06	3.96	17.98	2.89	10.09	2.10	31.58	0.24	15.91	23.28	
PCB 82	2.24	1.86	2.99	1.33	0.00	0.04	3.95	0.17	3.04	3.70	
	0.00	0.00	3.82	0.05	1.98	2.61	6.62	0.06	0.79	0.85	
	1.31	0.00	2.47	0.00	2.26	0.04	4.49	0.12	11.78	6.36	
Mean	1.18	0.62	3.09	0.46	1.41	0.90	5.02	0.17	5.20	3.64	
PCB 151	4.42	2.90	7.01	5.77	3.25	0.13	12.82	0.12	5.75	8.18	
	0.13	0.49	7.55	0.08	3.50	5.92	15.62	0.25	1.45	1.62	
	3.84	2.24	5.16	0.00	6.05	0.01	12.65	0.00	11.96	14.75	
Mean	2.80	1.88	6.57	1.95	4.27	2.02	13.70	0.12	6.39	8.18	
PCB 135+144+147+124	2.18	1.91	3.88	3.43	1.54	0.00	7.55	0.00	4.26	5.00	
	0.07	0.00	4.78	0.00	1.92	4.40	11.51	0.00	0.00	0.00	
	1.92	1.51	3.61	0.00	0.00	0.00	7.34	0.00	7.51	8.84	
Mean	1.39	1.14	4.09	1.14	1.15	1.47	8.80	0.00	3.92	4.61	
PCB 107+123	0.60	0.64	1.42	0.00	0.00	0.00	0.00	0.00	1.92	0.00	
	0.00	0.00	1.92	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.76	0.61	0.91	0.00	0.00	0.00	2.92	0.00	0.00	0.00	
Mean	0.45	0.42	1.42	0.00	0.00	0.00	0.97	0.00	0.64	0.00	
PCB 149	12.53	9.76	28.17	16.82	10.17	0.07	48.64	0.00	20.15	32.12	
	0.16	0.84	25.93	0.00	16.00	20.03	57.87	0.47	0.00	0.00	
	9.72	7.31	21.36	0.00	15.79	0.09	45.76	0.10	45.73	54.09	
Mean	7.47	5.97	25.15	5.61	13.99	6.73	50.76	0.19	21.96	28.74	
PCB 118	7.95	9.20	20.61	8.92	6.98	0.00	13.74	0.00	12.81	22.47	
	0.01	1.58	16.93	0.00	11.54	14.45	34.75	0.31	4.36	3.99	
	10.54	5.77	14.77	0.00	11.83	0.01	29.74	0.10	33.21	36.06	
Mean	6.17	5.52	17.44	2.97	10.12	4.82	26.08	0.14	16.79	20.84	
PCB 134	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.91	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	

PLOT REPLICATE	1A, B & C	2A, B & C	3A, B & C	4A, B & C	5A, B & C	6A, B & C	7A, B & C	8A, B & C	9 A, B & C	10A, B & C	SEL µg/Kg
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.16	
Mean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.69	
PCB 131	0.00	0.08	0.00	0.00	0.00	0.00	0.00	0.13	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.24	0.00	0.00	
	0.00	0.00	0.00	0.03	0.00	0.14	0.00	0.00	0.00	0.00	
Mean	0.00	0.03	0.00	0.01	0.00	0.05	0.00	0.12	0.00	0.00	
PCB 146	3.53	3.00	7.73	4.38	3.24	0.10	15.01	0.00	6.48	8.30	
	0.12	0.00	6.95	0.04	4.28	5.75	17.35	0.00	0.00	0.00	
	2.83	2.04	4.70	0.00	4.90	0.00	13.19	0.00	12.12	13.73	
Mean	2.16	1.68	6.46	1.47	4.14	1.95	15.18	0.00	6.20	7.34	
PCB 105+132+153	25.83	25.38	71.08	37.96	20.55	0.00	120.35	0.00	53.71	84.21	
	0.00	1.56	64.84	0.00	33.90	35.07	112.60	0.63	2.83	5.03	
	25.35	18.09	50.94	0.00	29.51	0.00	87.12	0.00	115.89	142.59	
Mean	17.06	15.01	62.29	12.65	27.99	11.69	106.69	0.21	57.48	77.28	
PCB 141+179	3.78	2.79	8.71	5.62	3.01	0.16	13.63	0.00	4.39	12.87	
	0.08	0.31	7.97	0.00	4.53	6.08	17.04	0.21	0.00	0.58	
	2.58	1.96	5.27	0.00	5.43	0.13	13.18	0.00	18.19	18.07	
Mean	2.15	1.69	7.32	1.87	4.32	2.12	14.62	0.07	7.53	10.51	
PCB 137+176+130	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.85	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.61	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.28	0.00	
PCB 163+138	1.31	18.03	48.46	25.15	17.35	0.60	76.62	0.00	34.20	52.13	
	0.67	1.29	39.63	0.34	23.90	2.15	0.00	1.22	1.82	2.00	
	16.44	12.24	29.58	0.00	28.42	0.54	0.00	0.49	74.93	87.14	
Mean	6.14	10.52	39.22	8.50	23.22	1.10	25.54	0.57	36.98	47.09	
PCB 158	1.31	3.47	6.01	3.69	3.51	0.10	10.53	0.00	6.13	9.35	
	0.13	0.00	5.31	0.04	6.31	5.30	17.86	0.00	1.84	0.64	
	1.99	1.85	3.88	0.00	5.86	0.00	14.97	0.00	14.10	14.29	
Mean	1.14	1.77	5.07	1.24	5.23	1.80	14.45	0.00	7.36	8.09	
PCB 178+129	1.64	0.00	3.76	2.74	0.00	0.07	6.44	0.00	2.66	3.42	
	0.08	0.00	2.28	0.03	1.36	1.73	9.42	0.00	0.00	0.00	
	2.13	0.93	1.99	0.00	0.00	0.00	4.95	0.00	4.58	5.75	
Mean	1.28	0.31	2.68	0.92	0.45	0.60	6.94	0.00	2.41	3.06	
PCB 187+182	8.28	5.87	16.36	12.98	6.15	0.23	30.12	0.00	12.85	18.27	
	0.27	0.57	13.39	0.11	8.90	12.25	38.58	0.43	0.00	1.14	
	5.36	4.32	11.11	0.00	10.05	0.20	26.73	0.00	24.84	28.83	

PLOT REPLICATE	1A, B & C	2A, B & C	3A, B & C	4A, B & C	5A, B & C	6A, B & C	7A, B & C	8A, B & C	9 A, B & C	10A, B & C	SEL µg/Kg
Mean	4.64	3.59	13.62	4.36	8.37	4.23	31.81	0.14	12.56	16.08	
PCB 183	5.37	4.00	9.95	8.31	3.57	0.14	20.44	0.00	5.06	12.82	
	0.19	0.00	8.78	0.09	5.69	8.30	26.62	0.00	0.00	0.87	
	4.14	2.95	7.08	0.00	7.60	0.00	19.79	0.00	17.20	21.69	
Mean	3.23	2.32	8.60	2.80	5.62	2.81	22.28	0.00	7.42	11.79	
PCB 128	2.19	1.08	4.80	0.00	0.00	0.08	12.18	0.00	3.86	6.81	
	0.03	0.00	3.99	0.06	3.02	3.60	11.92	0.10	0.00	0.00	
	0.46	1.30	3.01	0.00	2.37	0.00	7.24	0.00	7.23	12.60	
Mean	0.89	0.79	3.93	0.02	1.80	1.23	10.45	0.03	3.70	6.47	
PCB 185	0.79	0.40	1.93	1.49	0.00	0.02	3.57	0.00	1.36	2.40	
	0.02	0.00	1.55	0.02	0.99	1.49	4.54	0.00	0.00	0.00	
	0.51	0.35	1.20	0.00	1.75	0.00	3.73	0.00	4.60	3.75	
Mean	0.44	0.25	1.56	0.50	0.91	0.50	3.95	0.00	1.99	2.05	
PCB 174	7.88	6.63	16.36	12.85	7.10	0.21	27.46	0.00	12.05	19.19	
	0.26	0.00	14.24	0.15	9.66	12.16	33.22	0.48	1.12	0.00	
	6.83	5.25	12.00	0.00	10.47	0.25	27.45	0.54	26.51	30.63	
Mean	4.99	3.96	14.20	4.33	9.08	4.21	29.38	0.34	13.23	16.61	
PCB 177	1.50	2.15	6.88	3.81	2.09	0.06	12.69	0.00	5.94	6.39	
	0.09	0.00	4.63	0.03	2.14	3.91	15.98	0.00	0.35	0.73	
	1.76	1.27	3.11	0.00	2.48	0.00	13.69	0.00	10.48	9.91	
Mean	1.12	1.14	4.87	1.28	2.24	1.32	14.12	0.00	5.59	5.68	
PCB 202+171	3.38	2.45	12.03	7.15	4.29	0.09	12.13	0.00	7.09	5.43	
	0.15	0.47	8.51	0.00	0.00	11.52	10.19	0.44	2.79	3.83	
	3.88	2.86	7.07	0.00	0.00	0.23	21.47	0.00	3.48	37.24	
Mean	2.47	1.93	9.20	2.38	1.43	3.95	14.60	0.15	4.45	15.5	
PCB 157	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	1.47	0.88	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.49	0.46	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
PCB 172+197	1.04	0.00	2.30	0.00	0.00	0.03	6.46	0.00	2.83	0.00	
	0.00	0.00	1.81	0.01	1.98	1.59	8.10	0.00	0.00	0.00	
	0.00	0.42	1.34	0.00	0.00	0.00	6.42	0.00	0.00	1.76	
Mean	0.35	0.14	1.82	0.00	0.66	0.54	6.99	0.00	0.94	0.59	
PCB 180	16.06	11.60	48.02	27.05	15.91	0.56	65.26	0.00	35.74	58.19	
	0.00	1.33	35.97	0.00	0.00	35.18	87.19	0.00	3.98	4.11	
	11.19	9.37	32.66	0.00	29.25	0.00	0.00	0.00	90.73	84.20	
Mean	9.08	7.43	38.88	9.02	15.05	11.91	50.82	0.00	43.48	48.83	
PCB 193	1.00	0.00	1.96	1.78	0.00	0.08	5.31	0.00	10.72	0.00	
	0.00	0.00	1.30	0.00	0.00	0.00	6.49	0.00	0.00	0.00	

PLOT REPLICATE	1A, B & C	2A, B & C	3A, B & C	4A, B & C	5A, B & C	6A, B & C	7A, B & C	8A, B & C	9 A, B & C	10A, B & C	SEL µg/Kg
	1.15	0.64	1.17	0.00	0.00	0.00	0.00	0.00	27.16	0.00	
Mean	0.72	0.21	1.48	0.59	0.00	0.03	3.93	0.00	12.63	0.00	
PCB 191	0.72	0.00	0.00	0.00	0.00	0.00	1.97	0.00	0.00	2.06	
	0.00	0.00	0.00	0.00	0.00	0.00	2.56	0.00	0.00	0.00	
	0.49	0.42	2.81	0.00	0.00	0.00	4.03	0.00	4.30	2.65	
Mean	0.40	0.14	0.94	0.00	0.00	0.00	2.85	0.00	1.43	1.57	
PCB 199	0.00	0.00	0.29	0.51	0.00	0.02	0.96	0.00	10.17	0.00	
	0.00	0.00	0.26	0.00	0.00	0.00	1.40	0.00	0.00	0.00	
	0.25	0.18	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00	
Mean	0.08	0.06	0.18	0.17	0.08	0.00	0.79	0.00	3.39	0.00	
PCB 170+190	10.71	8.16	26.97	16.80	9.18	0.33	47.76	0.00	16.86	31.43	
	0.48	0.81	23.35	0.17	12.72	20.26	59.03	0.00	1.39	0.93	
	7.92	6.22	16.23	0.00	13.41	0.32	52.70	0.00	50.66	51.37	
Mean	6.37	5.06	22.18	5.66	11.77	6.97	53.16	0.00	22.97	27.91	
PCB 198	0.00	0.00	0.00	0.95	0.00	0.02	1.27	0.00	0.00	5.44	
	0.00	0.00	0.50	0.01	0.79	0.00	1.76	0.00	0.00	0.00	
	0.00	0.00	0.52	0.00	0.00	0.00	3.04	0.00	11.00	5.73	
Mean	0.00	0.00	0.34	0.32	0.26	0.00	2.02	0.00	3.67	3.72	
PCB 201	3.90	4.38	11.45	9.83	3.79	0.16	21.44	0.00	0.00	10.50	
	0.16	0.00	8.84	0.08	4.65	7.55	31.01	0.00	0.72	0.00	
	4.39	2.82	6.22	0.00	6.44	0.00	19.91	0.00	13.24	21.54	
Mean	2.82	2.40	8.84	3.30	4.96	2.57	24.12	0.00	4.65	10.68	
PCB 203+196	8.87	7.50	21.46	14.64	7.78	0.23	33.03	0.00	31.57	21.76	
	0.25	0.00	16.76	0.13	9.40	13.21	43.89	0.00	0.90	0.00	
	7.38	5.01	15.49	0.00	12.32	0.00	31.84	0.00	26.77	34.38	
Mean	5.50	4.17	17.90	4.92	9.83	4.48	36.25	0.00	19.75	18.71	
PCB 189	0.72	0.00	6.24	6.46	0.00	0.11	4.17	0.00	0.00	0.00	
	0.16	0.00	2.49	0.00	0.00	0.00	19.16	0.00	0.83	0.00	
	0.95	0.00	2.65	0.00	17.14	0.00	0.00	0.00	0.00	0.00	
Mean	0.61	0.00	3.79	2.15	5.71	0.04	7.78	0.00	0.28	0.00	
PCB 208+195	0.00	0.00	7.03	4.51	0.00	0.13	21.06	0.00	0.00	8.00	
	0.08	0.00	6.68	0.00	0.00	7.34	22.73	0.00	0.00	0.00	
	3.22	2.45	5.34	0.00	4.97	0.00	10.44	0.00	3.53	23.79	
Mean	1.10	0.82	6.35	1.50	1.66	2.49	18.08	0.00	1.18	10.60	
PCB 207	0.49	0.00	0.00	0.00	0.00	0.00	1.51	0.00	0.00	1.42	
	0.00	0.00	0.00	0.01	0.00	0.00	2.13	0.00	0.00	0.00	
	0.50	0.00	0.00	0.00	0.00	0.00	2.16	0.00	0.00	2.30	
Mean	0.33	0.00	0.00	0.00	0.00	0.00	1.93	0.00	0.00	1.24	
PCB 194	3.37	2.45	7.98	6.30	3.11	0.11	14.20	0.00	5.02	8.77	

PLOT REPLICATE	1A, B & C	2A, B & C	3A, B & C	4A, B & C	5A, B & C	6A, B & C	7A, B & C	8A, B & C	9 A, B & C	10A, B & C	SEL µg/Kg
	0.13	0.00	5.77	0.06	4.64	5.49	17.40	0.21	0.49	0.33	
	2.36	1.73	4.91	0.00	4.45	0.00	12.37	0.00	13.46	13.79	
Mean	1.95	1.39	6.22	2.12	4.07	1.87	14.66	0.07	6.32	7.63	
PCB 205	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
PCB 206	2.37	2.47	5.56	9.51	9.12	0.11	10.70	0.00	9.05	24.22	
	0.17	0.00	4.69	0.12	14.69	5.68	22.23	0.00	0.90	1.42	
	2.68	1.65	4.61	0.00	9.75	0.00	15.28	2.07	37.05	26.82	
Mean	1.74	1.37	4.95	3.21	11.19	1.93	16.07	0.69	15.67	17.49	
PCB 209	1.13	0.00	1.65	0.00	0.00	0.04	1.28	0.00	0.00	0.47	
	0.05	0.13	1.24	0.00	0.00	0.47	0.00	0.00	0.29	0.43	
	0.46	0.31	0.71	0.00	0.00	0.00	2.34	0.00	0.52	0.00	
Mean	0.55	0.15	1.20	0.00	0.00	0.17	1.21	0.00	0.27	0.30	

2007

Heavy metal analysis of the October 10, 2007 sediment sample (Table VII.E5) confirm the presence of high concentrations, above the Severe Effects Limit (SEL) based on Ontario Aquatic Sediment Criterion, of Cr, Cu, Hg, Ni, and Pb in uncapped control plots. Cr concentrations in control plots we 1.2 times, Cu concentrations were 2.8 times, Hg and Ni concentrations were 1.3 times, Pb concentrations were 2.2 times higher SEL . Control plots (7 and 9) also had Hg concentrations of 1.5 times above the SEL guidelines. AB plots 2 and 8 sediments had concentration 2.5 times higher that the SEL.

Sediment samples collecte October 10, 2007 had average total PCB concentrations in capped sites ranging from 27.63 μg/Kg in plot 5, which had AB un S, to 163.2 μg/Kg in plot 1, which had AB u S (Table VII.E6). For uncapped plots, levels were approximately 10x higher. Average concentrations ranged from 584.6 μg/Kg in plot 10, which is Control S, to 1181.62 μg/Kg in plot 3, which was Control (uncapped). None of the PCB concentrations in sediment exceeded SEL. Average total OCP concentrations in capped sites ranged from 89.3 μg/Kg in plot 5, which was AB un, to 342.1 in plot 1, which was AB un (Table VII.E6). For uncapped plots, levels were again approximately 10x higher than in capped plots. Average concentrations ranged from 897.6 μg/Kg in plot 10, which was Control S, to 2825.8 μg/Kg in plot 7, which was Control S. Concentrations of the DDT metabolites, DDD and DDE, did exceed SELs in uncapped plots. DDE exceeded the SEL (190 μg/Kg) in plot 7, which was Control S. DDD exceeded the SEL (600 μg/Kg) in plots, 3, 7 and 9. This result indicated that these two OCPs continue to be a problem in the marsh. Concentrations for PCB and OCP in

AquaBlok postcapping were similar in 2005, 2006 and 2007, indicating that organic contaminants were not breaking through the cap after two years.

Table VII.E5. Heavy metals in sediment (mg/L) collected post capping October 10, 2007. CNTRL = not capped, S = with SubmerSeed, AB = AquaBlok, PM = amended with peat moss, UN = unamended, Total = sum of metals without Fe. Red shading: value > SEL.

Treatment	Samaple	Site	Cd	Cr	Cu	Fe	Hg	Ni	Pb	Zn	Total
AB UN S	1 A	1C	1.04	15.72	91.53	14023	0.40	16.29	114.45	175.96	415
	1 B	4D	1.31	18.41	80.89	15539	1.04	17.19	124.34	188.09	431
	1 C	2E	0.76	4.59	38.89	9356	0.16	8.21	66.18	88.82	208
Average			1.04	12.91	70.44	12973	0.53	13.90	101.66	150.96	351
SD			0.28	7.33	27.83	3223	0.45	4.95	31.12	54.15	125
AB PM S	2 A	2A	1.19	8.69	55.41	11109	0.21	11.47	94.08	130.99	302
	2 B	3B	1.02	9.03	72.72	10485	0.22	14.02	96.30	131.80	325
	2 C	4C	1.48	19.79	339.54	14673	0.33	23.05	195.65	337.17	918
Average			1.23	12.50	155.89	12089	0.25	16.18	128.68	199.99	515
SD			0.23	6.31	159.28	2259	0.07	6.08	58.01	118.80	349
CNTRL	3 A	1B	4.18	116.42	313.68	44222	1.31	76.14	488.08	639.22	1639
	3 B	4D	5.26	168.76	484.26	58899	2.56	93.58	647.95	1266.56	2669
	3 C	5A	3.40	156.32	429.38	32448	1.68	125.0	867.84	698.66	2282
Average			4.28	147.16	409.11	45190	1.85	98.23	667.96	868.15	2197
SD			0.94	27.34	87.08	13252	0.64	24.75	190.67	346.31	521
AB UN	4 A	2C	0.84	8.76	62.80	13042	0.52	14.31	95.66	155.23	338
	4 B	3A	0.23	0.78	22.50	8515	0.09	5.31	45.23	72.99	147
	4 C	4E	1.38	23.16	96.24	16664	0.48	24.48	143.99	234.06	524
Average			0.82	10.90	60.51	12740	0.37	14.70	94.96	154.10	336
SD			0.58	11.34	36.92	4083	0.24	9.59	49.38	80.54	188
AB UN S	5 A	5B	0.47	0.33	22.41	7538	0.19	5.73	45.48	82.87	158
	5 B	4D	0.47	0.58	23.21	8262	0.18	5.36	52.61	63.14	145
	5 C	7B	0.66	8.28	50.35	11563	0.19	10.99	82.52	116.57	270
Average			0.53	3.06	31.99	9121	0.19	7.36	60.21	87.53	191
SD			0.11	4.52	15.91	2145	0.01	3.15	19.65	27.01	69
AB PM S	6 A	5E	1.39	19.33	86.37	14927	0.45	22.43	141.84	236.39	508
	6 B	2B	0.82	4.99	53.62	11540	0.32	12.48	94.00	140.45	306
	6 C	2D	0.56	1.74	31.33	6769	0.36	7.16	60.47	78.92	181
Average			0.92	8.69	57.11	11079	0.38	14.02	98.77	151.92	332
SD			0.42	9.36	27.69	4099	0.07	7.75	40.90	79.36	165
CNTRL S	7 A	3A	5.18	118.67	338.96	47562	2.35	82.45	499.91	985.05	2033
	7 B	5D	6.85	131.10	459.89	50942	2.64	93.04	597.26	1321.31	2611
	7 C	2D	3.49	73.91	210.63	30412	1.33	59.00	358.20	574.35	1281
Average			5.17	107.89	336.49	42972	2.11	78.17	485.12	960.24	1975
SD			1.68	30.08	124.65	11008	0.69	17.42	120.22	374.10	667
AB UN	8 A	1A	0.79	9.33	223.39	13598	0.26	12.72	97.51	200.39	544
	8 B	3C	1.44	20.21	159.52	17793	0.82	25.43	168.27	295.90	672
	8 C	3B	0.13	2.75	273.67	8456	0.07	6.70	53.94	151.81	490
Average			0.79	10.77	218.86	13283	0.38	14.95	106.58	216.03	568
SD			0.66	8.82	57.21	4676	0.39	9.56	57.71	73.31	94
CNTRL	9 A	1C	3.69	127.02	380.15	28922	1.63	86.48	674.73	715.33	1989
	9 B	4A	3.38	82.96	299.13	25689	1.24	67.47	509.56	520.68	1485
	9 C	4D	3.39	95.38	269.01	24641	1.13	66.81	506.50	549.48	1491
Average			3.49	101.79	316.10	26418	1.34	73.58	563.60	595.16	1655
SD			0.18	22.72	57.48	2232	0.26	11.17	96.26	105.06	289
CNTRL S	10 A	3C	2.73	44.00	233.10	14850	0.70	56.28	403.11	420.62	1161
	10 B	2A	2.81	118.47	309.87	33615	1.27	81.52	605.76	718.80	1839
	10 C	5A	2.21	36.74	158.37	16429	0.53	43.18	280.01	298.87	820
Average			2.58	66.41	233.78	21632	0.83	60.33	429.63	479.43	1273
SD			0.33	45.24	75.76	10408	0.39	19.49	164.48	216.05	519
LEL			0.6	26	16		0.20	16	31	120	
SEL			10.0	110	110		2.00	75	250	820	

LEL = Lowest Effects Limit based on Ontario Aquatic Sediment Criterion.
SEL = Severe Effects Limit based on Ontario Aquatic Sediment Criterion.

Table VII.E.6. Concentrations of organic contaminants (ng/L) in sediment collected post-capping October 10, 2007. Values represented the average for each plot, n=3. Treatments were: plots 3&9 = control, 7&10 = control with SubmerSeed, 4&8 = AquaBlok unamended, 1&5 = AquaBlok unamended with Submer Seed and 2&6 = AquaBlok amended with peat moss with SubmerSeed. Values shaded in yellow exceeded the EPA's SEL for PCB and OCP. These criteria are not available for all contaminants. Zero values represented non-detectable levels.

PLOT REPLICATE		1A 1B 1C	2A 2B 2C	3A 3B 3C	4A 4B 4C	5A 5B 5C	6A 6B 6C	7A 7B 7C	8A 8B 8C	9A 9B 9C	10A 10B 10C	SEL (µg/kKg)
				TOTAL CONCENTRATION *(µg/Kg)*								
	PCB	71.00	67.32	1181.62	163.20	27.63	144.66	977.79	124.49	845.09	584.62	53,000
	OCP	342.10	204.24	1682.67	322.62	89.27	278.73	2825.78	124.65	1223.87	897.62	
Pesticide	**Compound**	**CONC *(ng/L)***	**CONC *(ng/L)***	**CONC *(ng/L)***	**CONC *(ng/L)***	**CONC *(ng/L)***	**CONC *(ng/L)***	**CONC *(ng/L)***	**CONC *(ng/L)***	**CONC *(ng/L)***	**CONC *(ng/L)***	
OCP	a-BHC	0.03	0.06	2.16	0.98	0.00	0.03	0.54	0.00	6.68	1.07	100
OCP	b-BHC	0.00	0.00	1.35	0.00	0.00	0.00	0.00	0.00	7.83	0.00	210
OCP	g-BHC	0.86	1.91	6.59	1.98	1.51	2.65	6.15	3.42	19.60	7.75	600
OCP	d-BHC	0.00	0.00	0.54	0.00	0.00	0.00	0.17	0.00	57.08	0.82	
OCP	Heptachlor	0.68	0.56	6.23	2.87	0.48	1.86	6.45	2.52	4.42	4.64	2400
OCP	Aldrin	0.00	0.06	0.07	0.66	0.00	0.00	0.47	0.00	0.08	0.06	800
OCP	Heptachlor Epoxide	0.11	0.12	1.22	0.60	0.02	0.14	0.93	0.36	0.55	0.38	500
OCP	Endosulfan I	0.05	0.10	0.21	0.16	0.10	0.16	0.06	0.15	0.13	0.40	
OCP	Dieldrin	0.07	0.09	0.67	0.19	0.04	0.21	0.33	0.31	0.59	0.75	9100
OCP	DDE	13.89	12.33	149.96	18.42	3.16	17.68	302.04	10.47	89.39	60.77	190
OCP	Endrin	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	13,000
OCP	Endosulfan II	0.00	0.11	0.00	0.00	0.00	0.00	1.19	0.00	0.44	0.00	
OCP	DDD	54.04	163.97	1057.93	66.19	10.98	100.79	1909.46	45.79	718.98	435.51	600
OCP	Endrin Aldehyde	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
OCP	Endosulfan Sulfate	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
OCP	DDT	52.41	23.62	415.98	226.63	72.04	146.99	564.69	60.34	257.22	372.87	1200

OCP	Endrin Ketone	1.93	1.31	39.75	3.94	0.94	8.22	33.30	1.29	6.38	12.59	
OCP	Metoxychlor	218.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	54.50	0.00	
PCB Congener												
PCB	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
PCB	3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
PCB	4+10	0.00	0.00	0.00	0.14	0.00	0.16	0.28	0.00	0.43	0.00	
PCB	7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07	
PCB	6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
PCB	8+5	0.00	0.39	5.93	7.67	0.09	0.57	4.27	3.13	7.71	7.69	
PCB	19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
PCB	12+13	0.00	0.00	0.76	1.12	0.63	0.74	1.29	0.30	1.64	1.99	
PCB	18	0.66	0.51	5.87	1.60	0.39	0.98	6.63	1.41	4.99	4.28	
PCB	17	0.25	0.24	3.95	0.90	0.10	0.49	4.83	0.82	3.84	2.65	
PCB	24+27	0.07	0.08	3.72	0.00	0.00	0.22	0.98	0.19	0.51	0.08	
PCB	16+32	0.02	0.04	8.02	0.65	0.05	0.57	4.59	0.46	5.73	4.95	
PCB	29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
PCB	26	0.20	0.26	2.67	0.07	0.00	0.54	2.98	0.00	1.92	0.74	
PCB	25	0.02	0.11	1.06	0.00	0.00	0.14	1.20	0.22	1.29	0.88	
PCB	31+28	2.01	2.40	32.49	5.23	0.98	5.50	38.51	5.65	24.38	18.86	
PCB	21+33+53	0.81	1.03	9.02	1.93	0.44	1.65	9.01	1.83	7.01	6.10	
PCB	22	0.46	0.58	7.10	1.07	0.23	1.19	6.99	1.19	5.42	4.31	
PCB	45	0.00	0.00	0.00	0.21	0.00	0.41	0.00	0.00	0.00	0.00	
PCB	46	0.00	0.00	1.14	0.00	0.02	0.00	0.18	0.11	0.72	0.34	
PCB	52+43	1.44	1.59	19.19	3.03	0.63	3.36	18.27	2.91	15.37	9.93	
PCB	49	1.43	1.57	17.28	3.47	0.65	3.53	17.53	3.39	14.67	10.11	
PCB	47+48	0.94	1.13	6.70	1.69	0.27	1.41	6.96	1.78	6.08	5.05	
PCB	44	0.83	0.92	22.11	3.00	0.17	1.71	17.16	1.85	14.32	8.78	
PCB	37+42	0.31	0.39	11.07	2.63	0.32	1.14	6.42	1.51	7.61	6.12	
PCB	41+71	1.39	1.52	22.78	4.36	0.68	3.46	20.64	3.27	15.21	10.43	
PCB	64	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
PCB	40	0.38	0.59	8.44	0.89	0.10	0.84	3.69	0.64	23.14	3.80	
PCB	100	0.00	0.07	0.60	0.00	0.00	0.00	0.81	0.00	0.71	0.25	
PCB	63	0.00	0.04	0.41	0.00	0.00	0.00	0.52	0.00	0.36	0.17	

PCB	74	0.74	0.58	10.72	2.07	0.38	1.73	10.16	2.12	7.64	6.56	
PCB	70+76	1.92	1.63	34.45	2.47	0.64	3.71	27.42	3.00	27.29	23.03	
PCB	66+95	3.55	3.25	59.62	5.69	1.32	6.99	48.81	6.05	42.85	28.06	
PCB	91	0.25	0.29	4.01	0.49	0.08	0.59	4.34	0.31	2.78	1.92	
PCB	56+60+85	1.33	0.87	38.55	9.61	1.35	8.04	20.71	6.01	19.04	17.78	
PCB	101	1.66	1.60	24.63	2.76	0.58	3.21	21.35	2.60	17.62	11.75	
PCB	99	0.79	0.77	10.90	1.51	0.34	1.65	9.51	1.50	8.06	5.66	
PCB	83	0.00	0.03	0.61	0.04	0.00	0.05	0.47	0.09	6.66	2.07	
PCB	97	0.37	0.42	6.74	0.75	0.12	0.79	5.31	0.66	4.79	3.15	
PCB	81+87	0.84	0.74	10.25	1.51	0.25	1.48	8.87	1.34	8.03	5.51	
PCB	85	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
PCB	136	0.16	0.25	4.48	0.60	0.10	0.39	2.86	0.33	2.21	1.70	
PCB	77+110	2.13	2.11	35.25	4.29	0.75	4.44	29.58	3.84	26.34	17.26	
PCB	82	0.35	0.27	4.75	1.93	0.08	0.73	3.21	0.72	3.85	2.29	
PCB	151	0.83	0.75	14.64	1.83	0.27	1.46	9.98	1.10	8.88	5.53	
PCB	135+144+147 +127	0.62	0.54	9.30	0.99	0.16	1.10	7.64	0.69	5.93	4.18	
PCB	107+123	0.09	0.08	2.57	0.00	0.00	0.17	1.30	0.00	1.02	0.58	
PCB	149	2.99	2.68	49.54	5.06	0.92	5.25	39.01	3.99	33.10	21.95	
PCB	118	1.95	1.87	26.14	3.77	0.81	3.61	23.95	3.35	20.85	14.80	
PCB	134	0.05	0.05	0.71	0.24	0.00	0.40	0.80	0.00	0.54	0.39	
PCB	131	0.02	0.02	0.31	0.00	0.00	0.00	0.22	0.00	0.23	0.15	
PCB	146	0.78	0.73	14.35	1.30	0.18	1.44	10.69	0.15	8.56	5.88	
PCB	105+132+153	7.88	7.36	124.85	13.29	2.47	14.26	103.56	10.87	87.54	58.52	
PCB	141+179	0.84	0.71	13.41	1.30	0.29	1.59	10.67	1.39	8.97	5.57	
PCB	137+176+130	0.11	0.08	1.95	0.19	0.00	0.23	1.95	0.00	1.16	0.94	
PCB	163+138	5.12	4.82	83.48	9.19	1.57	9.55	69.31	6.67	56.97	37.94	
PCB	158	0.65	0.75	10.87	1.25	0.21	1.08	8.85	0.88	8.24	5.35	
PCB	178+129	0.33	0.52	6.28	0.75	0.14	0.64	6.00	0.52	5.44	2.75	
PCB	187+182	1.86	1.68	30.26	3.06	0.50	2.88	23.20	1.92	19.97	12.51	
PCB	183	1.17	0.98	20.77	1.89	0.30	1.82	16.46	1.26	12.81	8.34	
PCB	128	0.69	0.71	10.05	1.33	0.23	1.20	7.43	0.99	7.17	4.56	
PCB	185	0.22	0.24	3.41	0.44	0.07	0.40	2.56	0.29	2.64	1.51	
PCB	174	1.93	1.71	28.38	3.18	0.66	3.13	23.72	2.38	19.68	13.91	

PCB	177	0.56	0.44	14.52	1.17	0.22	1.00	9.28	1.06	6.71	5.61	
PCB	202+171+176	1.13	1.05	17.04	3.22	0.62	2.30	14.55	2.88	12.94	13.43	
PCB	157+200	0.00	0.00	4.56	1.22	0.00	0.00	4.61	0.00	3.29	1.70	
PCB	172+197	0.19	0.16	5.50	0.51	0.09	0.39	3.66	0.33	2.57	2.09	
PCB	180	4.31	3.64	72.86	10.47	2.33	9.24	62.71	10.26	47.38	36.61	
PCB	193	0.37	0.39	5.17	0.99	0.11	0.62	3.74	0.77	3.21	2.42	
PCB	191	0.13	0.08	1.84	0.76	0.00	0.30	1.51	0.52	1.24	0.77	
PCB	199	0.10	0.10	1.52	0.33	0.05	0.22	1.10	0.07	0.96	0.73	
PCB	170+190	2.89	2.51	52.82	4.84	0.80	5.00	42.67	2.95	34.66	23.79	
PCB	198	0.19	0.14	1.60	0.55	0.14	0.28	1.51	0.35	1.16	1.14	
PCB	201	1.08	0.97	23.54	2.32	0.37	2.04	17.99	1.42	13.62	9.58	
PCB	203+196	2.06	1.81	36.65	3.60	0.59	3.73	31.14	2.42	24.52	15.93	
PCB	189	1.52	0.81	9.17	4.10	1.02	2.39	7.92	3.00	8.46	9.61	
PCB	208+195	0.89	0.75	16.82	1.69	0.00	1.02	12.82	0.11	10.74	5.25	
PCB	207	0.17	0.07	1.27	0.40	0.00	0.21	1.23	0.00	1.12	0.61	
PCB	194	0.85	0.74	16.05	1.55	0.21	1.51	14.31	0.90	10.76	7.01	
PCB	205	0.00	0.00	0.14	0.00	0.00	0.00	0.00	0.00	0.29	0.00	
PCB	206	1.03	1.00	13.09	2.75	0.46	1.65	12.39	1.53	10.72	8.37	
PCB	209	0.08	0.11	0.93	0.27	0.10	0.18	1.00	0.24	0.82	0.31	

Statistical analyses were run to compare treatment and collection date effects on substrate heavy metals and organic contaminants. The results were similar for heavy metals and both organic contaminants (Figures VII.E1-6). There was no significant difference between controls with or without SubmerSeed. However, there was a significant decrease in heavy metals and organics in AquaBlok substrate from capped plots compared to sediments in uncapped plots, $p > 0.05$. The treatment of the AquaBlok, amended versus unamended and with or without SubmerSeed, had no significant effect: contaminant levels were similar. This result indicated that AquaBlok had lower levels of heavy metals, PCBs and OCPs than sediments.

Analyses for collection date showed no significant differences in heavy metals and organic contaminants in plots prior to capping. Therefore, the contaminants were largely similar throughout the marsh prior to capping. Post capping, the concentrations of all contaminants measured in AquaBlok substrates were significantly reduced compared to uncapped sediments. Concentrations were reduced approximately 7.5x, 10x and 8x for total heavy metals, PCBs and OCPs, respectively. Post capping concentrations were similar in 2005, 2006 and 2007. In addition, contaminant concentrations in uncapped plots did not change significantly over time. Together, this result indicated that the AquaBlok did not allow contaminants to break through the cap over a two year period, and it was not significantly contaminated by heavy metals and organics in the surface water during the same time period.

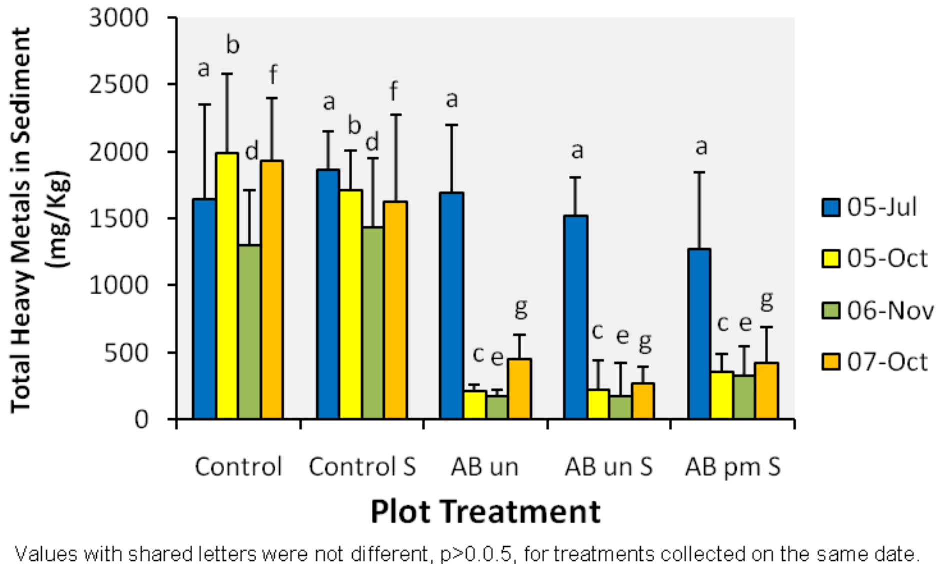


Figure VII.E1. Effect of plot treatment on total heavy metals in sediment (mg/kg) for all collection dates. Samples for July 2005 were taken pre-capping, all other samples were taken post-capping. Total heavy metals included Cd, Cr, Cu, Hg, Ni, Pb and Zn. Control = not capped, S = with SubmerSeed, AB = AquaBlok, PM = amended with peat moss, UN = unamended.

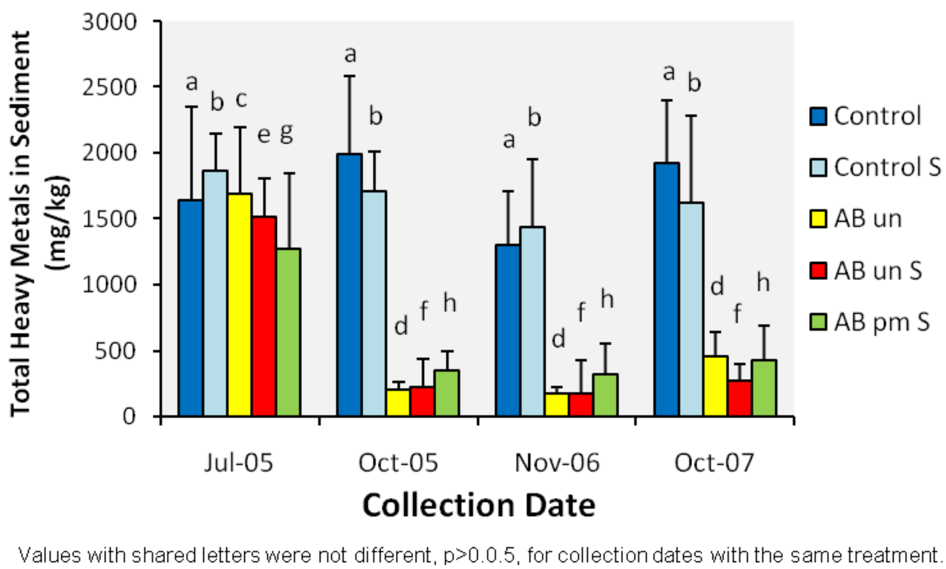


Figure VII.E2. Effect of collection date on total heavy metals in sediment (mg/kg) for all treatments. Samples for July 2005 were taken pre-capping, all other samples were taken post-capping. Total heavy metals in cluded Cd, Cr, Cu, Hg, Ni, Pb and Zn. Control = not capped, S = with SubmerSeed, AB = AquaBlok, PM = amended with peat moss, UN = unamended.

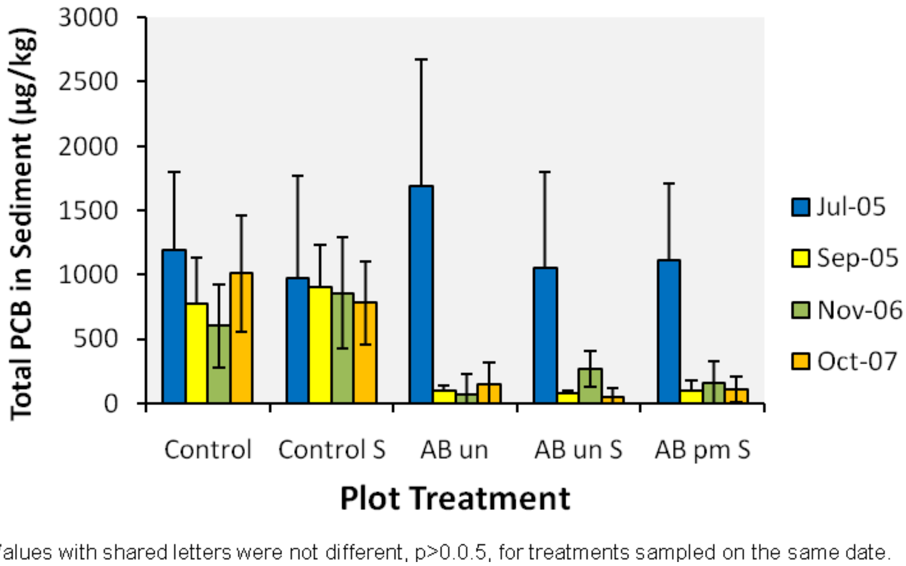


Figure VII.E3. Effect of plot treatment on total PCB in sediment (µg/kg) for all collection dates. Samples for July 2005 were taken pre-capping, all other samples were taken post-capping. See Table VII.E.6 for the list of PCBs analyzed. Control = not capped, S = with SubmerSeed, AB = AquaBlok, PM = amended with peat moss, UN = unamended.

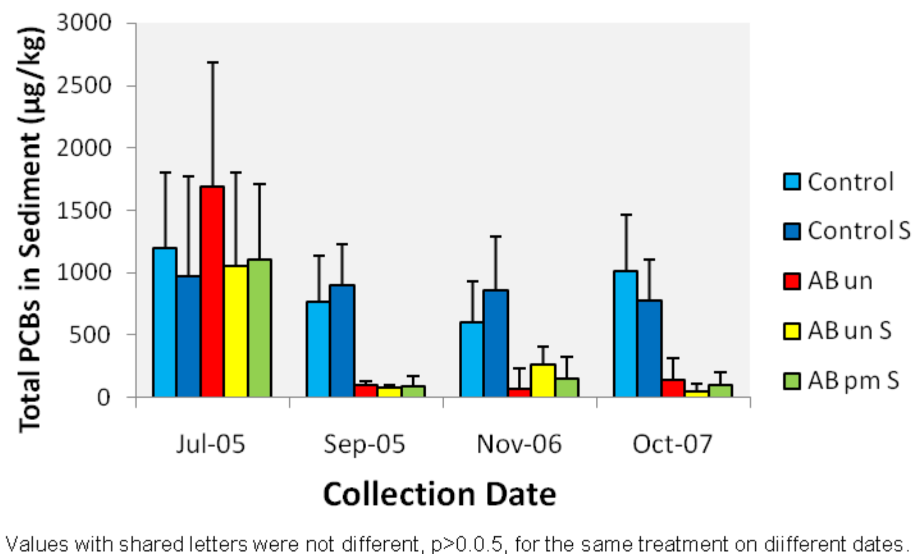


Figure VII.E4. Effect of collection date on PCB in sediment (µg/kg) for all treatments. Samples for July 2005 were taken pre-capping, all other samples were taken post-capping. See Table VII.E.6 for the list of PCBs analyzed. Control = not capped, S = with SubmerSeed, AB = AquaBlok, PM = amended with peat moss, UN = unamended.

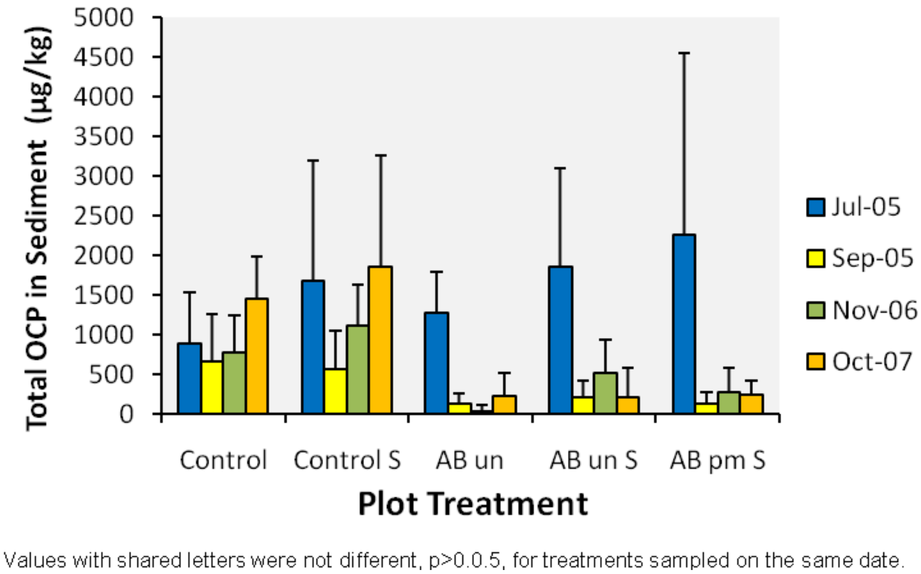


Figure VII.E5. Effect of plot treatment on total OCP in sediment (µg/kg) for all collection dates. Samples for July 2005 were taken pre-capping, all other samples were taken post-capping. See Table VII.E.6 for the list of PCBs analyzed. Control = not capped, S = with SubmerSeed, AB = AquaBlok, PM = amended with peat moss, UN = unamended.

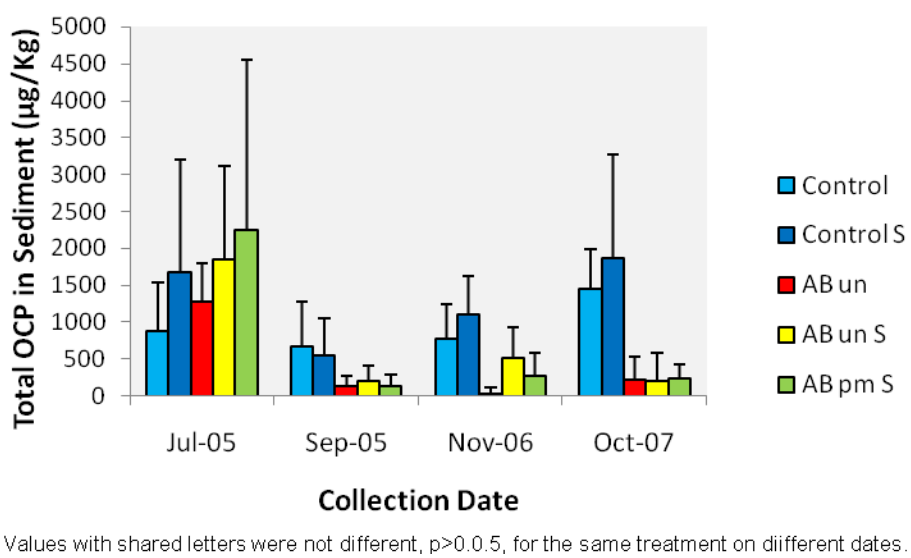


Figure VII.E6. Effect of collection date on OCP in sediment (µg/kg) for all treatments. Samples for July 2005 were taken pre-capping, all other samples were taken post-capping. See Table VII.E.6 for the list of OCPs analyzed. Control = not capped, S = with SubmerSeed, AB = AquaBlok, PM = amended with peat moss, UN = unamended.

VII.F. COC in Plants

VII.F1. Alternative Field experiment

During 2007, nine 100 gallons tubs were submerged nearby the research area as described on section V of this report. During the growing season, a large amount of seedlings germinated but unfortunately most of those seedlings were not able to establish themselves on the experimental tubs. Only two of the experimental SubmerSeed plant species, *Scirpus sp*. and *Peltandra virginica* were able to grow successfully on our experimental tubs. Despite our efforts to net the research tubs, most of the growing vegetation was heavily grazed. At the end of the season all *Scirpus sp.* samples were harvested analyzed for heavy metals (Figure VII.F1 and Table VII.F1). *Peltandra virginica* plant material was not sufficient for accurate metal analysis.

Scirpus sp. plants growing on 2% peat amended AquaBlok underlined by marsh soil, accumulated most its heavy metals in its roots with exception of Fe. The total amount of heavy metals present on the root tissues was 2.5 Times (349.94 mg/kg vs 136.94 mg/kg) more than the amount present in the leaves and stalks (Figure VII.F1). On the other hand, plants growing on 2% peat amended AquaBlok underlined by sand accumulated most of their heavy metals on their leaves and stalk with exception of Cd and Cu which were found to be double on its quantities in their root system. Despite of this finding, the total amount of heavy metals without Fe accumulated on the roots 252.75 mg/kg is not significantly different from 275.25 mg/kg found in leave and stalk tissue (Figure VII.F1). When compared to our control (uncapped sediment) were plants had accumulated almost twice as much (293.35

mg/kg vs 165.72 mg/kg) heavy metals (without Fe) in their root as they did in their leaves and stalks (Figure VII.F1).

When examining the total amount of heavy metals (without Fe) that were present on the different substrates before and after planting (table VII.F1), we observed that the amounts had decreased from 21,195.4 mg/kg to 9,421.2 mg/kg that is 11,774.2 mg/kg on the tubs containing peat amended AquaBlok underlined by marsh soil. Tubs containing peat amended AquaBlok underlined by sand showed a total heavy metals without Fe content decrease of 2,226.07 mg/kg (from 3,731.45 mg/kg to 1,505.38 mg/kg) Our control tubs also showed a decrease on the total amount of heavy metals without Fe from 35,439.2 mg/kg to 28,761.4 mg/kg that is 6,678.2 mg/kg.

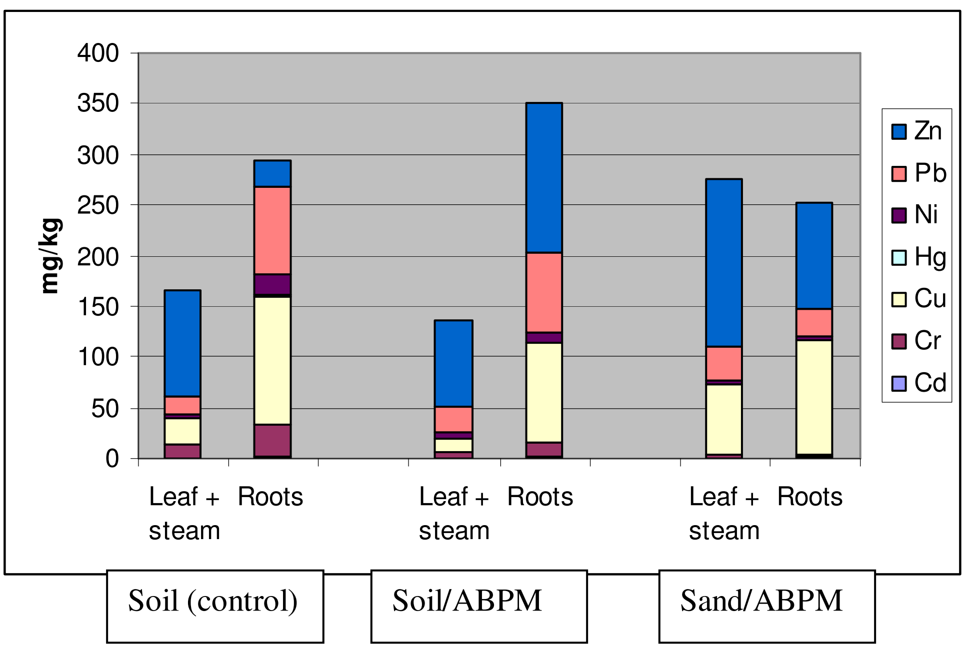


Figure VII.F1. Amount of Heavy metals present on *Scirpus sp.*

Table VII.F1. Heavy metal concentrations (mg/kg) in substrate and vegetation tissue of ***Scirpus sp.*** growing in submerged tubs at the experimental site. Soil= controle (no cap), AB= AquaBlok, PM = peat moss.

Plant Material *Scirpus sp*	Cd mg/kg	Cr mg/kg	Cu mg/kg	Hg mg/kg	Ni mg/kg	Pb mg/kg	Zn mg/kg	Fe mg/kg	Total w/o Fe mg/kg
Marsh soil									
Leaf + steam	0.18	13.5	26.01	0.22	2.53	18.84	104.44	2882.46	165.72
Roots	1.9	30.73	126.96	1.85	20.74	85.99	25.19	52272	293.35
Total	2.08	44.22	152.97	2.07	23.27	104.83	129.63	55154.7	459.07
Initial substrate before planting	3.78	61.79	172.01	2.4	47.63	201.75	488.17	3.78	35439.2
Post- vegetation	3.83	56.54	141.98	3.23	47.08	190.8	382.18	3.83	28761.4
Soil/ABPM									
Leaf + steam	0.28	5.72	14.39	0.29	5.16	26.12	84.98	3088.81	136.94
Roots	2.03	14.49	97.62	0.32	10.3	78.33	146.79	10213	349.88
Total	2.31	20.22	112.01	0.61	15.46	104.45	231.76	13302.1	486.82
Initial substrate before planting	3.02	35.64	108.14	1.82	30.93	154.26	332.77	3.02	21195.4
Post- vegetation	2	21.87	54.15	0.93	18.75	82.46	158.61	2	9421.2
Sand/ABPM									
Leaf + steam	0.58	3.94	67.71	0.38	4.64	32.42	165.57	7624.78	275.25
Roots	1.21	2.85	112.8	0.15	2.74	27.06	105.94	3976	252.75
Total	1.79	6.79	180.51	0.53	7.38	59.49	271.52	11600.7	528.01
Initial substrate before planting	0.13	2.05	15	0.04	3.34	17.41	49.46	0.13	3731.45
Post- vegetation	0.88	2.17	13.16	0.02	0.6	5.84	18.15	0.88	1505.38

VII.F2. Alternative Green house experiment

Table VII.F2 summarizes the amount of heavy metals concentrated on the different plants growing in the Green House settings. Plants growing in the control Marsh soil tended to concentrate higher amounts of heavy metals into their roots and/or underground portion of their stems, between 2.5 and 5 times more than the amounts concentrated in their stems and leave portions. *Zizania aquatica* has a total of 653.7 mg/kg of heavy metals excluding Fe, were 84% was found on their root tissues. Heavy metals with exception of Hg were found to be almost 5 times more concentrated on their roots than on their stem and leaves. *Alisma Subcordatum* has a total of 1230.31 mg/kg of heavy metals excluding Fe, were 73% was found on their root tissues. Like on *Zizania aquatica* most of the metals with exception of Hg were concentrated on the underground portion of the plants 2.5 times higher than at the stem and leaves. *Typha angustifolia* has accumulated 840.08 mg/kg of heavy metals excluding Fe, were 78.2% was found on their roots. Most heavy metals were found in higher quantities approximately 4 times more in the roots than the leaves with exception of Hg and Cr which had similar amounts throughout the plant. *Phragmatis sp.* like the other plants, accumulates higher quantities (5 times more) of heavy metals on their underground portions (rhizomes and roots). From its 510.6 mg/kg of total heavy metals excluding Fe, 84% was found on tissues bellow the substrate surface.

Plants growing in AquaBlok and amended AquaBlok substrate tend to concentrate less amounts of heavy metals on their tissues (Figure VII.F2). Total amount of heavy metals varied from 357.9 mg/kg in *Phragmatis sp.* to 542.726 mg/kg in *Zizania aquatica* growing on AquaBlok and from 409.97 mg/kg in mg/kg in *Alisma Subcordatum* to 633.12 mg/kg in *Typha angustifolia* growing on AquaBlok amended with 2% peat moss.

It also worth mentioning that each of the heavy metals of concern was concentrated differently by each plant depending on the substrate they were growing. Cadmium amounts varied from 0.427 mg/kg in *Phragmatis sp.* growing on AquaBlok amended with 2% peat moss to 7.084 mg/kg in *Alisma Subcordatum* growing on marsh soil. Chromium amounts varied from 4.23 mg/kg in *Alisma Subcordatum* growing on AquaBlok to 34.78 mg/kg in *Alisma Subcordatum* growing on marsh soil. Cupper amounts varied from 29.528 mg/kg in *Alisma Subcordatum* growing on AquaBlok to 209.312 mg/kg in *Alisma Subcordatum* growing on marsh soil. Mercury concentrations varied from 0.16 mg/kg in *Phragmatis sp.* growing on AquaBlok amanded with 2% peat moss to 4.83 mg/kg in *Alisma Subcordatum* growing on marsh soil. Nickel concentrations varied from 7.89 mg/kg in *Alisma Subcordatum* growing on AquaBlok to 40.78 mg/kg in *Alisma Subcordatum* growing on marsh soil. Lead concentrations varied from 45.903 mg/kg in *Alisma Subcordatum* growing on AquaBlok to 334.301mg/kg in *Alisma Subcordatum* growing on marsh soil. Zink concentrations varied from 142.65 mg/kg in *Alisma Subcordatum* growing on AquaBlok to 729.388 mg/kg in *Alisma Subcordatum* growing on marsh soil.

Table VII.F2. Heavy metal concentrations (mg/kg) in substrate and plants growing in tubs at the Green House. Soil= controle (no cap), AB= AquaBlok,, PM= 2% peat moss amendment, Y1= 2006 growing season, Y2=2007 growing season.

Species	Treatment	Description	Cd mg/kg	Cr mg/kg	Cu mg/kg	Fe mg/kg	Hg mg/kg	Ni mg/kg	Pb mg/kg	Zn mg/kg	Total w/out Fe mg/kg
Substrate before Planting	SOIL	Initial substrate	5.556	71.205	220.735	49099.602	2.382	66.856	304.372	733.594	1404.701
After Planting	SOIL	Oct-07	2.560	51.885	450.671	23235.491	1.210	45.728	460.638	382.219	1394.911
Zizania aquatica	SOIL	Stem/leaf	0.470	3.010	4.470	209.170	0.670	0.860	5.970	87.840	103.290
		Roots	1.775	20.345	119.631	21219.451	0.297	17.340	137.238	253.826	550.453
		Total	2.245	23.355	124.101	21428.621	0.967	18.200	143.208	341.666	653.743
		Substrate	1.775	20.345	119.631	21219.451	0.297	17.340	137.238	253.826	550.453
		Above Substrate	0.470	3.010	4.470	209.170	0.670	0.860	5.970	87.840	103.290
Alisma subcordatum (Y1)	SOIL	Leaves	0.970	3.772	26.660	1188.248	0.184	3.371	16.980	202.138	254.075
		Stems	0.570	1.470	14.130	232.580	0.140	1.150	5.190	50.280	72.930
		Roots	5.543	21.530	150.150	36200.769	0.255	25.262	223.539	476.970	903.249
		Total	7.084	26.772	190.940	37621.597	0.579	29.783	245.709	729.388	1230.253
		Substrate	5.543	21.530	150.150	36200.769	0.255	25.262	223.539	476.970	903.249
		Above Substrate	1.540	5.242	40.790	1420.828	0.324	4.521	22.170	252.418	327.005
Alisma subcordatum (Y2)	SOIL	Leaves	1.069	14.984	65.956	16291.456	4.310	15.494	94.006	229.343	425.162
		Stems	0.169	0.920	6.266	161.899	0.191	2.259	1.603	22.813	34.219
		Roots	1.930	18.880	137.091	29549.491	0.330	23.031	238.692	347.383	767.337
		Total	3.167	34.784	209.312	46002.846	4.831	40.784	334.301	599.539	1226.718
		Substrate	1.930	18.880	137.091	29549.491	0.330	23.031	238.692	347.383	767.337
		Above Substrate	1.237	15.903	72.221	16453.355	4.501	17.753	95.609	252.156	459.381
Typha angustifolia (Y2)	SOIL	Leaves	0.128	10.250	6.956	450.645	0.068	4.512	4.862	35.692	62.469
		Stems	0.482	1.343	14.595	997.382	0.121	1.784	7.052	95.167	120.545
		Roots	3.210	11.644	84.694	17567.401	0.194	10.263	177.706	369.354	657.066
		Total	3.821	23.237	106.245	19015.428	0.384	16.559	189.621	500.213	840.080

Species	Treatment	Description	Cd mg/kg	Cr mg/kg	Cu mg/kg	Fe mg/kg	Hg mg/kg	Ni mg/kg	Pb mg/kg	Zn mg/kg	Total w/out Fe mg/kg
		Substrate	3.210	11.644	84.694	17567.401	0.194	10.263	177.706	369.354	657.066
		Above Substrate	0.611	11.593	21.552	1448.027	0.190	6.295	11.915	130.859	183.014
Phragmatis sp (Y2)	**SOIL**	Leaves	0.065	2.806	8.205	461.130	0.030	2.584	5.471	48.391	67.552
		Stems	0.271	8.924	9.881	731.774	0.023	4.275	9.050	49.666	82.092
		Roots	1.852	5.691	54.098	17838.913	1.860	7.406	119.140	170.995	361.042
		Total	2.187	17.422	72.184	19031.817	1.913	14.265	133.662	269.052	510.686
		Substrate	2.122	14.616	63.979	18570.687	1.883	11.681	128.191	220.661	443.134
		Above Substrate	0.065	2.806	8.205	461.130	0.030	2.584	5.471	48.391	67.552
Substrate before Planting	**AB**	Initial substrate	5.556	71.205	220.735	49099.602	2.382	66.856	304.372	733.594	1404.701
After Planting	**AB**	Oct-07	1.358	12.955	70.570	13121.425	0.220	11.585	115.576	118.443	330.707
Zizania aquatica	**AB**	Stem/leaf	0.369	5.635	5.909	541.479	0.290	2.416	11.974	115.620	142.211
		Roots	1.528	19.676	33.763	8335.286	ND	8.746	54.746	282.055	400.515
		Total	1.897	25.311	39.671	8876.765	0.290	11.162	66.720	397.675	542.726
		Substrate	1.528	19.676	33.763	8335.286	ND	8.746	54.746	282.055	400.515
		Above Substrate	0.369	5.635	5.909	541.479	0.290	2.416	11.974	115.620	142.211
Alisma subcordatum (Y1)	**AB**	Leaves	0.723	2.379	20.327	377.571	0.109	1.535	9.936	130.726	165.735
		Stems	0.356	2.075	15.896	416.075	0.000	0.879	8.587	86.446	114.239
		Roots	1.191	4.783	26.402	8439.251	0.173	5.455	49.705	159.445	247.154
		Total	2.271	9.237	62.625	9232.897	0.282	7.869	68.228	376.618	527.129
		Substrate	1.191	4.783	26.402	8439.251	0.173	5.455	49.705	159.445	247.154
		Above Substrate	1.079	4.454	36.223	793.646	0.109	2.414	18.523	217.172	279.974
Alisma subcordatum (Y2)	**AB**	Leaves	0.329	1.278	10.592	628.875	1.382	2.983	6.903	43.923	67.390
		Stems	0.235	0.508	4.260	168.664	0.650	8.637	1.015	20.999	36.305
		Roots	0.565	2.444	14.676	6145.983	0.056	6.282	37.984	77.736	139.744
		Total	1.129	4.231	29.528	6943.522	2.088	17.903	45.903	142.657	243.439

Species	Treatment	Description	Cd mg/kg	Cr mg/kg	Cu mg/kg	Fe mg/kg	Hg mg/kg	Ni mg/kg	Pb mg/kg	Zn mg/kg	Total w/out Fe mg/kg
		Substrate	0.565	2.444	14.676	6145.983	0.056	6.282	37.984	77.736	139.744
		Above Substrate	0.564	1.787	14.852	797.539	2.032	11.621	7.919	64.921	103.695
Phragmatis sp (Y2)	**AB**	Leaves	0.042	7.155	3.940	228.301	0.048	4.009	5.099	65.143	85.435
		Stems	0.081	1.303	8.130	896.878	0.039	0.654	7.206	69.194	86.607
		Roots	0.304	5.537	38.660	9240.517	0.074	4.598	46.940	89.751	185.864
		Total	0.427	13.995	50.729	10365.697	0.162	9.261	59.245	224.089	357.907
		Substrate	0.385	6.840	46.790	10137.395	0.113	5.252	54.146	158.945	272.471
		Above Substrate	0.042	7.155	3.940	228.301	0.048	4.009	5.099	65.143	85.435
Before Planting	**ABPM**	Initial sustrate	5.556	71.205	220.735	49099.602	2.382	66.856	304.372	733.594	1404.701
After Planting	**ABPM**	Oct-07	1.488	9.894	62.481	11282.079	0.228	9.917	92.718	138.455	315.181
Zizania aquatica	**ABPM**	Stem/leaf	0.631	3.078	7.670	274.000	0.050	1.694	9.088	117.582	139.793
		Roots	1.064	8.012	20.784	17665.614	0.134	7.428	47.247	223.313	307.982
		Total	1.695	11.090	28.454	17939.614	0.184	9.122	56.335	340.895	447.775
		Substrate	1.064	8.012	20.784	17665.614	0.134	7.428	47.247	223.313	307.982
		Above Substrate	0.631	3.078	7.670	274.000	0.050	1.694	9.088	117.582	139.793
Alisma subcordatum (Y1)	**ABPM**	Leaves	0.863	5.902	16.800	665.270	0.022	2.157	10.952	129.845	166.541
		Stems	0.341	1.867	13.276	180.339	0.000	1.609	7.658	55.799	80.549
		Roots	2.324	12.124	24.093	2938.025	1.505	8.492	48.783	102.971	200.291
		Total	3.527	19.893	54.170	3783.634	1.527	12.258	67.392	288.615	447.382
		Substrate	2.324	12.124	24.093	2938.025	1.505	8.492	48.783	102.971	200.291
		Above Substrate	1.204	7.769	30.077	845.609	0.022	3.766	18.610	185.644	247.091
Alisma subcordatum (Y2)	**ABPM**	Leaves	0.414	5.393	8.609	1337.833	0.173	5.686	17.297	76.846	114.417
		Stems	0.957	6.150	4.916	164.569	0.097	2.772	1.275	26.998	43.165
		Roots	1.224	3.767	20.009	7321.154	0.079	5.920	41.572	142.408	214.980

Species	Treatment	Description	Cd mg/kg	Cr mg/kg	Cu mg/kg	Fe mg/kg	Hg mg/kg	Ni mg/kg	Pb mg/kg	Zn mg/kg	Total w/out Fe mg/kg
		Total	2.595	15.310	33.534	8823.556	0.349	14.378	60.144	246.252	372.562
		Substrate	1.224	3.767	20.009	7321.154	0.079	5.920	41.572	142.408	214.980
		Above Substrate	1.370	11.543	13.525	1502.402	0.270	8.458	18.572	103.844	157.582
Typha angustifolia (Y2)	**ABPM**	Leaves	0.658	3.204	7.534	217.269	0.108	2.498	4.123	22.828	40.955
		Stems	0.903	0.763	9.091	237.322	0.014	0.946	6.082	47.125	64.924
		Roots	3.474	8.325	122.188	26052.324	0.202	10.627	149.460	232.971	527.246
		Total	5.035	12.292	138.813	26506.914	0.325	14.071	159.665	302.923	633.125
		Substrate	3.474	8.325	122.188	26052.324	0.202	10.627	149.460	232.971	527.246
		Above Substrate	1.562	3.968	16.626	454.591	0.123	3.444	10.205	69.952	105.879
Phragmatis sp (Y2)	**ABPM**	Leaves	0.507	2.282	9.113	977.624	0.102	2.300	12.153	56.894	83.351
		Stems	1.711	0.929	7.626	96.023	0.089	1.330	2.592	36.510	50.787
		Roots	2.315	3.184	93.542	3427.085	0.095	4.718	26.129	78.076	208.059
		Total	4.533	6.395	110.281	4500.732	0.286	8.348	40.874	171.480	342.197
		Substrate	4.026	4.113	101.168	3523.108	0.184	6.047	28.721	114.587	258.846
		Above Substrate	0.507	2.282	9.113	977.624	0.102	2.300	12.153	56.894	83.351

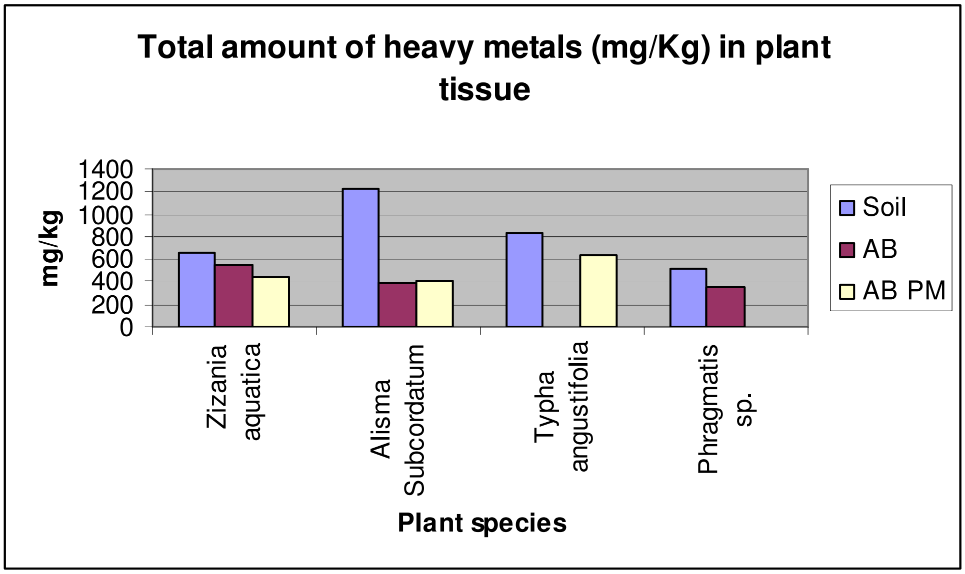


Figure VII.F2 Total amount of heavy metals concentrated on plants growing in a green house setting.

VII.G. COC in BMI

In September 28, 2005, Cd in the Hester-Dendy chironomids ranged from an average of 0.05 mg/kg in plot 9 which is a control with Submerseed to an average of 1.71 mg/kg in plot 8 which has AquaBlok which is not amended with peat moss. Cr in the Hester-Dendy chironomids ranged from an average of 0.71 mg/kg in plot 9 which is a control to an average of 16.66 mg/kg in plot 8 which contains AquaBlok that is not amended with peat moss. Cu in the Hester-Dendy chironomids ranged from an average of 12.93 mg/kg in plot 9 which is a control to an average of 3163.99 mg/kg in plot 10 which is a control and has Submerseed. Fe in the Hester-Dendy chironomids ranged from an average of 645 mg/kg in plot 9 which is a control to an average of 10897 mg/kg in plot 8 which contains AquaBlok that is not amended with peat moss. Hg in the Hester-Dendy chironomids ranged from an average of 0.06 mg/kg in plot 9 which is a control to an average of 1.66 mg/kg in plot 3 which is a control. Ni in the Hester-Dendy chironomids ranged from an average of 1.22 mg/kg in plot 6 which has AquaBlok that is amended with peat moss and has Submerseed to an average of 46.19 mg/kg in plot 8 which contains AquaBlok that is not amended with peat moss. Pb in the Hester-Dendy chironomids ranged from an average of 2.52 mg/kg in plot 1 which has AquaBlok with out peat moss but with Submerseed to an average of 33.45 mg/kg in plot 8 which contains AquaBlok that is not amended with peat moss. Zn in the Hester-Dendy chironomids ranged from an average of 379.72 mg/kg in plot 7 which is a control that has Submerseed to an average of 4533.63 mg/kg in plot 8 which contains AquaBlok that is not amended with peat moss (Table VII.G1).

On May 10, 2006 Cd in the Hester-Dendy chironomids ranged from an average of 0.10 mg/kg in plot 1 which contains AquaBlok that is not amended with peat moss and has Submerseed to an average of 0.48 mg/kg in plot 10 which is a control that has Submerseed. Cr in the Hester-Dendy chironomids ranged from an average of 2.78 mg/kg in plot 1 which contains AquaBlok that is not unamended with peat moss and has Submerseed to an average of 10.80 mg/kg in plot 2 which has AquaBlok that is amended with peat moss and has Submerseed. Cu in the Hester-Dendy chironomids ranged from an average of 11.4 mg/kg in plot 5 which contains AquaBlok that is unamended with peat moss and has Submerseed to an average of 38.5 mg/kg in plot 2 which has AquaBlok that is amended with peat moss and has Submerseed. Fe in the Hester-Dendy chironomids ranged from an average of 1038 mg/kg in plot 1 which contains AquaBlok that is unamended with peat moss and has Submerseed to an average of 2948 mg/kg in plot 2 which contains AquaBlok that is amended with peat moss and has Submerseed. Hg in the Hester-Dendy chironomids ranged from an average of 0.009 mg/kg in plot 10 which is a control that has Submerseed to an average of 0.208 mg/kg in plot 1 which contains AquaBlok that is unamended with peat moss and has Submerseed.. Ni in the Hester-Dendy chironomids ranged from an average of 1.6 mg/kg in plot 9 which is a control to an average of 8.1 mg/kg in plot 2 which contains AquaBlok that is amended with peat moss and has Submerseed. Pb in the Hester-Dendy chironomids ranged from an average of 6.6 mg/kg in plot 10 which is a control and has Submerseed to an average of 17.6 mg/kg in plot 2 which has AquaBlok that is amended with peat moss and has Submerseed. Zn in the Hester-Dendy chironomids ranged from an average of 161.3 mg/kg in plot 1 which contains AquaBlok that is unamended with peat moss and has Submerseed to an average of 416.9 mg/kg in plot 2 which contains AquaBlok that is amended with peat moss and has Submerseed (Table VII.G2).

On August 10, 2006 Cd in the Hester-Dendy chironomids ranged from an average of 0.08 mg/kg in plots 6 and 8 which contains AquaBlok that is amended with peat moss and has Submerseed and AquaBlok that is unamended with peat moss respectively to an average of 0.44 mg/kg in plot 1 which contains AquaBlok that is unamended with peat moss and has Submerseed. The differences were not statistically significant. Cr in the Hester-Dendy chironomids ranged from an average of 3.13 mg/kg in plot 5 which contains AquaBlok that is unamended with peat moss and has Submerseed to an average of 86.2 mg/kg in plot 7 which is a control that has Submerseed. The differences were not statistically significant. Cu in the Hester-Dendy chironomids ranged from an average of 10.5 mg/kg in plot 4 which contains AquaBlok that is unamended with peat moss to an average of 42.6 mg/kg in plot 7 which is a control that has Submerseed. The differences were not statistically significant. Fe in the Hester-Dendy chironomids ranged from an average of 881 mg/kg in plot 1 which contains AquaBlok that is unamended with peat moss and has Submerseed to an average of 42043 mg/kg in plot 7 which is a control that has Submerseed. The differences were not statistically significant. Hg in the Hester-Dendy chironomids ranged from an average of 0.05 mg/kg in plot 10 which is a control that has Submerseed to an average of 10.2 mg/kg in plot 7 which is a control that has Submerseed. The differences were not statistically significant. Ni in the Hester-Dendy chironomids ranged from an average of 5.94 mg/kg in plot 2 which has AquaBlok that is amended with peat moss and has Submerseed to an average of 13.65 mg/kg in plot 5 which contains AquaBlok that is unamended with peat moss and has Submerseed. The differences were not statistically significant. Pb in the Hester-Dendy chironomids ranged from an average of 2.93 mg/kg in plot 6 which contains AquaBlok that is amended with peat moss and has Submerseed to an average of 16.6 mg/kg in plot 10 which is a control. The differences were not statistically significant. Zn in the Hester-Dendy chironomids ranged from an average of 46.4 mg/kg in plot 5 which contains AquaBlok that is unamended with peat moss and has Submerseed to an average of 146 mg/kg in plot 2 which contains AquaBlok that is amended with peat moss and has Submerseed. The differences were not statistically significant (Table VII.G3).

Table VII.G1. Heavy metal concentrations (mg/kg) in chironomids collected from Hester-Dendy on September 28, 2005. CNTRL = not capped, S = with SubmerSeed, AB = AquaBlok, PM = amended with peat moss, UN = unamended, ND = no data. Total = sum of metals without Fe. Value was not included in the average for that treatment in Figure VII.G1-2.

Treatment	Sample	Site	Cd	Cr	Cu	Hg	Fe	Ni	Pb	Zn	Total
AB un S	1 - 1	2E	0.04	0.18	2.69	0.05	117	0.20	0.46	97.93	101.55
	1 -2	3D	0.10	2.92	32.38	0.68	1617	3.08	4.58	858.45	902.19
	1 - 3	0B	ND	ND	ND	ND	ND	ND	ND	ND	
	Mean		0.07	1.55	17.53	0.37	867	1.64	2.52	478.19	501.87
	SD		0.04	1.94	20.99	0.45	1060	2.03	2.91	537.77	566.13
AB pm S	2 - 1	1D	0.13	2.15	23.16	0.49	1455	1.76	4.25	746.84	778.79
	2 - 2	5G	0.22	4.70	31.79	0.58	1653	2.03	4.87	1144.6	1188.8
	2 - 3	6B	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Mean		0.18	3.43	27.47	0.54	1554	1.90	4.56	945.72	983.80
	SD		0.06	1.80	6.10	0.06	140	0.19	0.44	281.27	289.92
CNTRL	3 - 1	2C	0.40	7.99	54.43	1.66	3655	8.48	13.22	4016.3	4102.5
	3 - 2	5C	ND	ND	ND	ND	ND	ND	ND	ND	ND
	3 - 3	3G	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Mean		0.40	7.99	54.43	1.66	3655	8.48	13.22	4016.3	4102.5
	SD										
AB un	4 - 1	3F	0.02	0.48	4.61	0.05	236	1.01	0.93	134.88	141.97
	4 - 2	4C	0.08	2.00	27.52	0.65	1514	1.79	4.52	509.28	545.84
	4 - 3	2B	0.14	3.32	36.21	0.50	2307	2.57	7.47	1000.4	1050.6
	Mean		0.08	1.93	22.78	0.40	1353	1.79	4.30	548.20	579.48
	SD		0.06	1.42	16.33	0.31	1045	0.78	3.28	434.08	455.27
AB un S	5 - 1	3E	0.17	2.38	36.69	0.65	1932	1.70	5.09	702.67	749.36
	5 - 2	5B	0.10	1.78	27.08	0.50	1208	1.48	4.11	927.50	962.54
	5 - 3	6D	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Mean		0.14	2.08	31.89	0.58	1570	1.59	4.60	815.08	855.95
	SD		0.05	0.43	6.80	0.11	512	0.16	0.70	158.98	150.75
	6 - 1	2F	0.17	2.94	18.04	0.32	1350	1.09	4.60	679.75	706.91
AB pm S	6 - 2	4F	0.24	2.84	25.71	0.27	1842	1.36	4.30	602.54	637.26
	6 -3	6B	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Mean		0.20	2.89	21.87	0.30	1596	1.22	4.45	641.15	672.08
	SD		0.05	0.07	5.42	0.04	348	0.19	0.21	54.60	49.25
	7 – 1	5D	0.33	8.32	74.90	0.25	3225	5.84	13.91	288.02	391.55
CNTRL S	7 – 2	2C	0.20	4.44	24.85	0.66	2495	3.33	0.22	471.42	505.12
	7 – 3	6B	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Mean		0.27	6.38	49.88	0.45	2860	4.58	7.06	379.72	448.34
	SD		0.09	2.75	35.39	0.29	516	1.77	9.68	129.68	80.30

Table VII.G2. Heavy metal concentrations (mg/kg) in chironomids collected from Hester-Dendy on May 10, 2006. CNTRL = not capped, S = with SubmerSeed, AB = AquaBlok, PM = amended with peat moss, UN = unamended. Pink cells have unusually high concentrations.

Treatment	Replicate	Location	Cd	Cr	Cu	Hg	Fe	Ni	Pb	Zn
AB un S	1 - 1	1C	0.13	2.58	14.5	0.46	1559	3.0	16.2	241.2
	1 -2	5D	0.14	4.58	16.7	0.13	1173	2.3	12.4	163.8
	1 - 3	4B	0.03	1.18	4.7	0.04	385	0.5	2.3	79.0
	Mean		0.10	2.78	12.0	0.208	1038.904	1.9	10.3	161.3
	SD		0.06	1.71	6.4	0.220	598.544	1.3	7.2	81.1
AB pm S	2 - 1	2A	0.09	3.25	15.2	0.08	1427	2.7	7.9	158.3
	2 - 2	4B	0.11	3.10	15.0	0.09	1222	2.2	8.7	240.5
	2 - 3	6D	0.65	26.04	85.3	0.18	6196	19.3	36.3	851.9
	Mean		0.29	10.80	38.5	0.118	2948.463	8.1	17.6	416.9
	SD		0.32	13.20	40.5	0.051	2814.561	9.7	16.1	379.0
CNTRL	3 - 1	3A	0.15	8.14	22.2	0.04	1539	1.8	8.9	218.5
	3 - 2	2E	0.26	3.76	18.4	0.03	1647	2.3	9.4	146.7
	3 - 3	5D	ND	ND	ND	ND	ND	ND	ND	ND
	Mean		0.20	5.95	20.3	0.031	1593.325	2.0	9.2	182.6
	SD		0.08	3.10	2.7	0.008	76.263	0.4	0.3	50.8
AB un	4 - 1	4E	0.13	3.10	19.3	0.03	1689	2.2	7.8	215.8
	4 - 2	2D	0.17	5.19	23.2	0.02	2155	5.3	9.4	324.9
	4 - 3	3A	0.15	3.79	18.8	0.01	1767	3.9	10.7	186.0
	Mean		0.15	4.03	20.4	0.016	1870.288	3.8	9.3	242.2
	SD		0.02	1.07	2.4	0.008	249.280	1.5	1.4	73.2
AB un S	5 - 1	9A	0.15	3.95	11.5	0.01	1399	2.1	9.5	302.2
	5 - 2	5B	0.15	2.58	11.4	0.01	1028	3.9	6.8	135.1
	5 - 3	3A	ND	ND	ND	ND	ND	ND	ND	ND
	Mean		0.15	3.26	11.4	0.011	1213.224	3.0	8.1	218.7
	SD		0.00	0.97	0.1	0.004	262.045	1.2	1.9	118.2
AB pm S	6 - 1	5E	0.17	2.95	16.0	0.02	1128	2.2	4.5	207.4
	6 - 2	2B	0.21	3.89	19.3	0.01	1616	2.3	10.7	262.0
	6 -3	5A	ND	ND	ND	ND	ND	ND	ND	ND
	Mean		0.19	3.42	17.6	0.013	1371.810	2.3	7.6	234.7
	SD		0.03	0.67	2.3	0.009	345.339	0.0	4.4	38.6
CNTRL S	7 - 1	5D	0.11	3.49	8.6	0.02	624	5.9	5.2	179.2
	7 - 2	5B	0.18	3.75	20.7	0.01	1368	2.6	9.7	248.9
	7 - 3	1D	0.11	4.91	15.0	0.04	1282	3.1	7.4	201.2
	Mean		0.13	4.05	14.7	0.026	1091.493	3.9	7.4	209.7
	SD		0.04	0.75	6.0	0.012	406.850	1.8	2.2	35.6
AB un	8 - 1	2B	0.10	2.87	16.3	0.02	1226	2.5	6.5	97.0
	8 - 2	4E	0.30	3.37	15.8	0.03	1178	1.7	8.5	253.7
	8 - 3	5B	ND	ND	ND	ND	ND	ND	ND	ND

Treatment	Replicate	Location	Cd	Cr	Cu	Hg	Fe	Ni	Pb	Zn
	Mean		0.20	3.12	16.1	0.025	1202.011	2.1	7.5	175.3
	SD		0.14	0.35	0.4	0.010	33.762	0.5	1.4	110.8
CNTRL	9 - 1	4C	0.16	3.79	23.8	0.05	1926	2.7	16.3	248.9
	9 - 2	2B	0.14	2.90	14.4	0.01	1179	0.5	9.7	148.4
	9 - 3	3F	ND	ND	ND	ND	ND	ND	ND	ND
	Mean		0.15	3.34	19.1	0.033	1552.813	1.6	13.0	198.7
	SD		0.01	0.63	6.7	0.031	528.204	1.6	4.7	71.0
CNTRL S	10 - 1	3A	0.80	5.72	24.9	0.01	1372	6.1	10.1	178.8
	10 - 2	4D	0.17	2.26	12.9	0.00	1317	1.6	3.0	196.6
	10 - 3	1A	ND	ND	ND	ND	ND	ND	ND	ND
	Mean		0.48	3.99	18.9	0.009	1344.197	3.8	6.6	187.7
	SD		0.44	2.45	8.4	0.007	38.682	3.2	5.1	12.6

Table VII.G3. Heavy metal concentrations (mg/kg) in chironomids collected from Hester-Dendy on August 10, 2006. CNTRL = not capped, S = with SubmerSeed, AB = AquaBlok, PM = amended with peat moss, UN = unamended. Pink cells have unusually high concentrations. Values in olive cells may be erroneous.

Treatment	Replicate	Location	Cd	Cr	Cu	Hg	Fe	Ni	Pb	Zn
AB un S	1 - 1	1C	0.11	3.2	12.6	0.75	774	11.7	4.4	113.6
	1 -2	5D	0.76	3.0	10.1	0.85	988	11.4	5.2	68.5
	1 - 3	4B	ND	ND	ND	ND	ND	ND	ND	ND
	Mean		0.43	3.1	11.4	0.80	881	11.5	4.8	91.1
	SD		0.46	0.1	1.7	0.07	152	0.2	0.6	31.8
AB pm S	2 - 1	2A	0.32	8.4	44.4	1.85	3766	12.8	14.4	297.9
	2 - 2	4B	0.07	2.4	23.0	0.65	965	2.1	3.8	89.1
	2 - 3	6D	0.06	2.4	10.2	0.41	886	2.9	3.2	52.1
	Mean		0.15	4.4	25.9	0.97	1872	6.0	7.1	146.4
	SD		0.15	3.5	17.3	0.77	1640	6.0	6.3	132.6
Control	3 - 1	3A	0.32	21.9	46.0	0.93	4967	12.7	25.3	252.9
	3 - 2	2E	0.06	5.3	14.6	0.10	747	3.0	3.8	39.2
	3 - 3	5D	0.12	5.0	15.2	0.24	2109	18.7	9.6	57.1
	Mean		0.16	10.7	25.3	0.42	2608	11.5	12.9	116.4

Treatment	Replicate	Location	Cd	Cr	Cu	Hg	Fe	Ni	Pb	Zn
	SD		0.13	9.7	18.0	0.45	2154	7.9	11.1	118.5
AB un	4 - 1	4E	0.09	3.7	9.8	0.18	1060	5.1	4.4	75.8
	4 - 2	2D	0.08	2.8	8.4	0.17	1292	8.3	2.7	54.5
	4 - 3	3A	0.14	5.9	13.2	2.04	3465	29.2	5.7	180.3
	Mean		0.10	4.1	10.5	0.80	1939	14.2	4.3	103.5
	SD		0.03	1.6	2.5	1.07	1327	13.1	1.5	67.3
AB un S	5 - 1	9A	0.09	1.8	11.6	0.03	915	117.4	2.8	59.4
	5 - 2	5B	0.10	4.5	10.7	0.08	1698	2613.2	3.2	33.3
	5 - 3	3A	ND	ND	ND	ND	ND	ND	ND	ND
	Mean		0.10	3.1	11.1	0.06	1307	1365.3	3.0	46.4
	SD		0.01	2.0	0.6	0.04	554	1764.8	0.2	18.4
AB pm S	6 - 1	5E	0.08	4.4	8.9	0.03	1610	48.9	3.3	56.2
	6 - 2	2B	0.07	21.9	21.7	9.99	40072	1228.2	2.6	71.3
	6 -3	5A	ND	ND	ND	ND	ND	ND	ND	ND
	Mean		0.08	13.2	15.3	5.01	20841	638.5	2.9	63.8
	SD		0.01	12.4	9.0	7.04	27196	833.9	0.5	10.7
Control S	7 - 1	5D	0.40	231.9	34.7	30.0	98600	512.6	9.1	128.0
	7 - 2	5B	0.22	20.8	79.1	0.58	23239	1040.9	11.2	95.5
	7 - 3	1D	0.10	5.9	13.9	0.12	4289	390.8	10.6	55.3
	Mean		0.24	86.2	42.6	10.23	42042	648.1	10.3	92.9
	SD		0.15	126.4	33.3	17.12	49888	345.6	1.1	36.5
AB un	8 - 1	2B	0.08	5.6	19.3	0.43	7574	159.0	5.8	100.9
	8 - 2	4E	0.08	57.5	17.5	2.92	25243	28.1	2.7	70.9
	8 - 3	5B	ND	ND	ND	ND	ND	ND	ND	ND
	Mean		0.08	31.5	18.4	1.67	16409	93.6	4.2	85.9
	SD		0.00	36.7	1.3	1.76	12494	92.6	2.2	21.2
Control	9 - 1	4C	0.10	13.2	17.8	0.61	10659	68.0	8.6	73.4
	9 - 2	2B	0.12	8.8	30.4	0.19	10015	339.2	12.5	59.2
	9 - 3	3F	ND	ND	ND	ND	ND	ND	ND	ND
	Mean		0.11	11.0	24.1	0.40	10337	203.6	10.6	66.3
	SD		0.01	3.1	8.9	0.29	455	191.8	2.8	10.1
Control S	10 - 1	3A	0.04	4.0	17.6	0.05	4036	19.3	12.0	65.6
	10 - 2	4D	0.16	6.8	16.7	ND	2569	13.5	21.1	64.7
	10 - 3	1A	ND	ND	ND	ND	ND	ND	ND	ND
	Mean		0.10	5.4	17.1	0.05	3302	16.4	16.5	65.2
	SD		0.087	2.0	0.7		1038	4.1	6.5	0.6

On May 22, 2007, Cd in the Hester-Dendy chironomids ranged from an average of 0.08 mg/kg in plot 8 which contains AquaBlok that is unamended with peat moss to an average of 0.95 mg/kg in plot 3 which is a control. Cr in the Hester-Dendy chironomids ranged from an average of 1.06 mg/kg in plot 5 which contains AquaBlok that is unamended with peat moss and has Submerseed to an average of 13.88 mg/kg in plot 6 which contains AquaBlok that is amended with peat moss and has Submerseed. Cu in the Hester-Dendy chironomids ranged from an average of 19.40 mg/kg in plot 5 which contains AquaBlok that is unamended with peat moss and has Submerseed to an average of 138.19 mg/kg in plot 3 which is a control. Fe in the Hester-Dendy chironomids ranged from an average of 1181.19 mg/kg in plot 9 which is a control to an average of 4603 mg/kg in plot 3 which is a control. Hg in the Hester-Dendy chironomids ranged from an average of 0.13 mg/kg in plot 7 which is a control that has Submerseed to an average of 19.88 mg/kg in plot 3 which is a control. Ni in the Hester-Dendy chironomids ranged from an average of 2.24 mg/kg in plot 5 which has AquaBlok that is unamended with peat moss and has Submerseed to an average of 26.55 mg/kg in plot 10 which contains a control that has Submerseed. Pb in the Hester-Dendy chironomids ranged from an average of 0.17 mg/kg in plot 6 which contains AquaBlok that is amended with peat moss and has Submerseed to an average of 15.58 mg/kg in plot 3 which is a control. Zn in the Hester-Dendy chironomids ranged from an average of 107.03 mg/kg in plot 9 which is a control to an average of 338.97 mg/kg in plot 3 which is a control (Table VII.G4).

On July 31, 2007, Cd in the Hester-Dendy chironomids ranged from an average of 0.09 mg/kg in plot 8 which contains AquaBlok that is unamended with peat moss to an average of 0.33 mg/kg in plot 1 which contains AquaBlok theat is unamended with peat moss and has Submerseed. Cr in the Hester-Dendy chironomids ranged from an average of 3.16 mg/kg in plot 6 which contains AquaBlok that is amended with peat moss and has Submerseed to an average of 25.39 mg/kg in plot 1 which contains AquaBlok that is unamended with peat moss and has Submerseed. Cu in the Hester-Dendy chironomids ranged from an average of 44.94 mg/kg in plot 6 which contains AquaBlok that is amended with peat moss and has Submerseed to an average of 137 mg/kg in plot 7 which is a control. Fe in the Hester-Dendy chironomids ranged from an average of 1432 mg/kg in plot 6 which contains AquaBlok that is amended with peat moss and has Submerseed to an average of 3601 mg/kg in plot 1 which contains AquaBlok that is unamended with peat moss and has Submerseed. Hg in the Hester-Dendy chironomids ranged from an average of 0.23 mg/kg in plot 10 which is a control that has Submerseed to an average of 5.62 mg/kg in plot 1 which contains AquaBlok that is unamended with peat moss and has Submerseed. Ni in the Hester-Dendy chironomids ranged from an average of 9.19 mg/kg in plot 2 which has AquaBlok that is amended with peat moss and has Submerseed to an average of 40.78 mg/kg in plot 4 which has AquaBlok that is unamended with peat moss. Pb in the Hester-Dendy chironomids ranged from an average of 0.85 mg/kg in plot 8 which contains AquaBlok that is unamended with peat moss to an average of 14.84 mg/kg in plot 1 which contains AquaBlok that is unamended with peat moss and has Submerseed. Zn in the Hester-Dendy chironomids ranged from an average of 107.43 mg/kg in plot 3 which is a control to an average of 343.15 mg/kg in plot 1 which contains AquaBlok that is unamended with peat moss and has Sumerseed (Table VII.G5).

On November 16, 2007 Cd ranged from 0.15 mg/kg in chironomids from plot 2 which has AquaBlok that has peat moss and Submerseed to an average of 0.70 mg/kg in chironomids from plot 1 which has AquaBlok that lacks peat moss but has Submerseed. Cr ranged from an average of 4.81 mg/kg in chironomids from plot 2 which has AquaBlok, peat moss and Submerseed to 17.5 mg/kg in chironomids from plot 10 which is a control with Submerseed. Cu ranged from an average of 14.4 mg/kg in chironomids from plot 2 which has AquaBlok, peat moss and Submerseed to 64.5 mg/kg in chironomids from plot 10 which is a control with Submerseed. Fe ranged from an average of 1844 mg/kg in chironomids from plot 4 which has AquaBlok that lacks peat moss to 6576 mg/kg in chironomids from plot 10 which is a control with Submerseed. Hg raged from an average of 0.42 mg/kg in chironomids from plot 2 which has AquaBlok, peat moss and Submerseed to 3.00 mg/kg in chironomids from plot 1 which has AquaBlok that lacks peat moss and has Submerseed. Ni ranged from an average of 4.38 mg/kg in chironomids from plot 2 which has AquaBlok, peat moss and Submerseed to an average of 153 mg/kg in chironomids from plot 9 which is a control. Pb ranged from an average of 10.5 mg/kg in chironomids from plot 2 which has AquaBlok, peat moss and Submerseed to 56.3 mg/kg in chironomids from plot 10 which is a control with Submerseed. Zn ranged from an average of 127 mg/kg in chironomids from plot 7 which is a control with Submerseed to 973 mg/kg in chironomids from plot 1 which has AquaBlok that lacks peat moss but has Submerseeed (Table VII.G6).

Table VII.G4. Heavy metal concentrations (mg/kg) in chironomids collected from Hester-Dendy on May 22, 2007. CNTRL = not capped, S = with SubmerSeed, AB = AquaBlok, PM = amended with peat moss, UN = unamended, ND = no data. Total = sum of metals without Fe. Value was not included in the average for that treatment in Figure VII.G1-2. Multiple samples were lost due to technical error.

Treatment	Sample	Site	Cd	Cr	Cu	Hg	Fe	Ni	Pb	Zn	Total
AB un S	1 - 1	1C	ND	ND	ND	ND	ND	ND	ND	ND	ND
	1 -2	4D	ND	ND	ND	ND	ND	ND	ND	ND	ND
	1 - 3	2E	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Mean										
	SD										
AB pm S	2 - 1	2A	0.51	7.83	66.74	1.85	4272	18.09	15.75	221.94	332.71
	2 - 2	3B	0.38	6.36	40.46	1.34	2495	5.89	13.70	150.58	218.72
	2 - 3	4C	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Mean		0.45	7.09	53.60	1.59	3383	11.99	14.73	186.26	275.71
	SD		0.09	1.04	18.59	0.36	1256	8.63	1.45	50.46	80.61
CNTRL	3 - 1	1B	ND	ND	ND	ND	ND	ND	ND	ND	ND
	3 - 2	4D	0.95	11.57	138.19	19.88	4603	15.39	15.58	338.97	540.53
	3 - 3	5A	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Mean		0.95	11.57	138.19	19.88	4603	15.39	15.58	338.97	540.53
	SD										
AB un	4 - 1	2C	ND	ND	ND	ND	ND	ND	ND	ND	ND
	4 - 2	3A	ND	ND	ND	ND	ND	ND	ND	ND	ND
	4 - 3	4E	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Mean										
	SD										
AB un S	5 - 1	5B	0.11	1.87	19.87	0.45	1131	2.03	2.07	96.19	122.60
	5 - 2	4D	0.15	0.24	18.92	0.55	1615	2.45	3.40	168.83	194.53
	5 - 3	7B	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Mean		0.13	1.06	19.40	0.50	1373	2.24	2.73	132.51	158.56
	SD		0.03	1.16	0.67	0.07	342	0.29	0.94	51.37	50.87
AB pm S	6 - 1	5E	0.18	13.88	23.91	0.97	1808	24.34	0.17	138.79	202.25
	6 - 2	2B	ND	ND	ND	ND	ND	ND	ND	ND	ND
	6 -3	2D	0.23	3.27	24.00	0.03	1895	5.06	0.12	143.19	175.90
	Mean		0.18	13.88	23.91	0.97	1808	24.34	0.17	138.79	189.07
	SD		0.03	7.50	0.07	0.66	61.16	13.64	0.04	3.11	18.63
CNTRL S	7 - 1	3A	0.24	6.36	38.27	0.09	2286	4.58	5.09	176.38	231.01
	7 - 2	5D	0.13	4.09	36.79	0.13	1822	3.35	4.48	120.50	169.46
	7 - 3	2D	0.12	3.49	32.00	0.18	1840	3.97	5.03	122.44	167.24
	Mean		0.16	4.65	35.69	0.13	1983	3.96	4.87	139.77	189.24
	SD		0.07	1.51	3.27	0.05	263	0.62	0.34	31.72	36.20

Treatment	Sample	Site	Cd	Cr	Cu	Hg	Fe	Ni	Pb	Zn	Total
AB un	8 - 1	1A	0.13	2.24	23.32	0.10	1678	16.32	2.86	115.35	160.33
	8 - 2	3C	0.03	1.94	23.18	0.17	1431	2.88	2.86	106.57	137.63
	8 - 3	3B	0.16	2.80	29.49	1.48	1999	3.16	3.16	121.05	161.30
	Mean		0.08	2.09	23.25	0.14	1554	9.60	2.86	110.96	153.09
	SD		0.08	0.21	0.10	0.04	174	9.50	0.00	6.21	13.39
CNTRL	9 - 1	1C	0.42	5.39	68.32	0.40	1801	12.26	5.41	161.01	253.21
	9 - 2	4A	0.13	2.43	30.59	0.15	1597	4.05	4.80	146.62	188.78
	9 - 3	4D	0.06	0.21	3.17	0.02	146	1.79	0.35	13.46	19.07
	Mean		0.20	2.68	34.03	0.19	1181.19	6.03	3.52	107.03	153.69
	SD		0.19	2.60	32.71	0.19	902.18	5.51	2.76	81.35	120.95
CNTRL S	10 - 1	3C	0.30	12.94	40.20	0.17	2413	49.36	8.40	134.73	246.10
	10 - 2	2A	0.10	4.17	25.98	0.26	1770	3.73	3.60	86.63	124.49
	10 - 3	5A	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Mean		0.20	8.56	33.09	0.21	2091	26.55	6.00	110.68	185.29
	SD		0.14	6.20	10.05	0.06	455	32.27	3.39	34.01	86.00

Table VII.G5. Heavy metal concentrations (mg/kg) in chironomids collected from Hester-Dendy on July 31, 2005. CNTRL = not capped, S = with SubmerSeed, AB = AquaBlok, PM = amended with peat moss, UN = unamended, ND = no data. Total = sum of metals without Fe. Value was not included in the average for that treatment in Figure VII.G1-2. .

Treatment	Sample	Site	Cd	Cr	Cu	Hg	Fe	Ni	Pb	Zn	Total
AB un S	1 - 1	1C	0.45	41.91	170.71	9.17	3509	52.33	14.16	360.29	649.03
	1 -2&3	4D	0.21	8.86	88.33	2.08	3694	12.71	15.52	326.01	453.72
	1 - 3	2E									
	Mean		0.33	25.39	129.52	5.62	3601	32.52	14.84	343.15	551.37
	SD		0.17	23.37	58.25	5.02	130	28.01	0.97	24.24	138.10
AB pm S	2 - 1	2A	0.09	3.67	72.65	2.72	2057	7.87	5.75	120.80	213.57
	2 - 2	3B	0.10	4.02	65.67	1.03	2311	4.09	6.90	97.61	179.43
	2 - 3	4C	0.12	4.72	66.37	2.03	2212	15.62	4.96	139.29	233.11
	Mean		0.11	4.14	68.23	1.93	2193	9.19	5.87	119.24	208.70
	SD		0.02	0.53	3.85	0.85	128	5.88	0.98	20.88	27.17
CNTRL	3 - 1	1B	0.13	5.96	108.28	3.50	1676	9.47	5.67	115.61	248.62
	3 - 2	4D	0.08	3.60	43.29	1.47	1299	5.03	2.91	93.59	149.97
	3 - 3	5A	0.15	5.72	115.34	0.88	2618	87.00	5.58	113.09	327.76
	Mean		0.12	5.09	88.97	1.95	1864	33.84	4.72	107.43	242.12
	SD		0.04	1.30	39.72	1.38	679	46.10	1.57	12.05	89.07
AB un	4 - 1	2C	0.13	4.75	93.21	2.30	1813	96.60	3.89	107.06	307.94
	4 - 2	3A	0.18	6.50	157.70	1.04	2519	11.76	4.55	152.79	334.51
	4 - 3	4E	0.14	4.92	78.02	0.15	1572	13.99	3.21	119.18	219.61
	Mean		0.15	5.39	109.64	1.16	1968	40.78	3.88	126.34	287.35

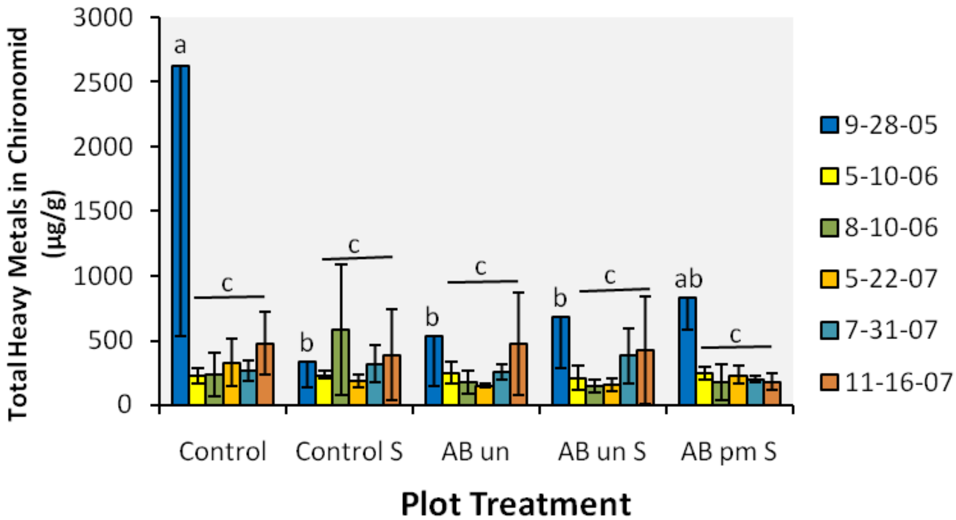
Treatment	Sample	Site	Cd	Cr	Cu	Hg	Fe	Ni	Pb	Zn	Total
	SD		0.02	0.96	42.31	1.08	492	48.35	0.67	23.69	60.15
AB un S	5 - 1	5B	0.11	0.27	46.31	1.20	1807	3.61	3.84	115.26	170.60
	5 - 2	4D	ND	ND	ND	ND	ND	ND	ND	ND	ND
	5 - 3	7B	0.14	8.72	62.79	1.54	1942	24.36	7.21	153.53	258.30
	Mean		0.13	4.49	54.55	1.37	1874.93	13.99	5.53	134.39	214.45
	SD		0.03	5.98	11.65	0.24	96	14.67	2.38	27.06	62.01
AB pm S	6 - 1	5E	0.09	2.95	43.75	0.64	1323	8.94	2.91	115.18	174.45
	6 - 2	2B	0.10	3.38	46.14	0.56	1541	18.11	0.95	146.03	215.27
	6 -3	2D	0.09	2.97	71.07	0.98	1472	5.87	3.54	103.58	188.09
	Mean		0.10	3.16	44.94	0.60	1432	13.53	1.93	130.60	192.60
	SD		0.01	0.30	1.69	0.06	154	6.49	1.39	21.81	20.78
CNTRL S	7 - 1	3A	0.38	8.37	123.98	0.49	2859	16.71	15.93	205.65	371.51
	7 - 2	5D	0.25	10.94	191.22	0.53	3993	13.07	15.35	167.68	399.04
	7 - 3	2D	0.11	2.92	95.80	0.57	1521	4.09	1.11	100.81	205.42
	Mean		0.25	7.41	137.00	0.53	2791	11.29	10.80	158.05	325.32
	SD		0.14	4.09	49.03	0.04	1237	6.50	8.39	53.08	104.75
AB un	8 - 1	1A	0.09	4.91	67.70	0.89	1449	23.72	0.85	122.16	220.32
	8 - 2	3C	ND	ND	ND	ND	ND	ND	ND	ND	ND
	8 - 3	3B	0.07	3.83	38.88	0.28	1317	9.92	0.85	152.79	206.62
	Mean		0.09	4.91	67.70	0.89	1449	23.72	0.85	122.16	213.47
	SD		0.01	0.76	20.38	0.43	93	9.76	0.00	21.66	4.84
CNTRL	9 – 1&2	1C	0.14	5.03	98.60	0.84	1766	9.10	3.38	139.88	256.97
	9 - 2	4A									
	9 - 3	4D	0.14	7.41	103.00	0.20	1958	10.16	8.81	218.17	347.88
	Mean		0.14	6.22	100.80	0.52	1862.15	9.63	6.09	179.02	302.43
	SD		0.00	1.68	3.11	0.45	136	0.75	3.84	55.36	64.29
CNTRL S	10 – 1&3	3C	0.21	25.16	149.05	0.12	2588	20.76	15.02	270.61	480.92
	10 - 2	2A	0.06	5.90	26.34	0.34	788	3.54	3.29	99.18	138.64
	10 - 3	5A									
	Mean		0.14	15.53	87.69	0.23	1688	12.15	9.15	184.89	309.8
	SD		0.10	13.62	86.77	0.16	1273	12.17	8.30	121.22	242.03

Table VII.G6. Heavy metal concentrations (mg/kg) in chironomids collected from Hester-Dendy on November 16, 2007. CNTRL = not capped, S = with SubmerSeed, AB = AquaBlok, PM = amended with peat moss, UN = unamended, ND = no data. Total = sum of metals without Fe. Value was not included in the average for that treatment in Figures VII.G1-G2.

Treatment	Sample	Site	Cd	Cr	Cu	Hg	Fe	Ni	Pb	Zn	Total
AB un S	1 - 1	1C	0.70	7.25	30.10	3.00	2207	9.16	19.88	972.91	1043.00
	1 -2	4D	ND	ND	ND	ND	ND	ND	ND	ND	ND
	1 - 3	2E	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Mean		0.70	7.3	30.10	3.00	2207	9.16	19.88	972.91	1043.00
	SD										
AB pm S	2 - 1	2A	0.19	6.09	15.24	0.14	3491	6.39	14.50	224.82	267.38
	2 - 2	3B	0.12	3.57	13.58	0.70	1319	2.36	6.58	102.03	128.94
	2 - 3	4C	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Mean		0.15	4.8	14.41	0.42	2405	4.38	10.54	163.42	198.16
	SD		0.05	1.8	1.17	0.40	1536	2.85	5.60	86.83	97.89
CNTRL	3 - 1	1B	0.08	9.54	3.56	1.50	839	13.74	21.60	2.34	52.36
	3 - 2	4D	1.23	3.58	31.49	0.28	3866	9.27	25.34	221.01	292.19
	3 - 3	5A	0.25	5.54	21.62	0.40	2637	64.27	14.95	212.77	319.79
	Mean		0.52	6.2	18.89	0.73	2447	29.09	20.63	145.37	221.45
	SD		0.62	3.0	14.16	0.67	1523	30.54	5.26	123.94	147.08
AB un	4 - 1	2C	0.56	10.5	38.15	0.50	3710	151.70	22.97	212.44	436.85
	4 - 2	3A	0.01	4.48	16.95	0.80	1104	4.86	9.22	299.65	335.97
	4 - 3	4E	0.60	13.7	47.73	0.60	718	31.95	23.93	1149.76	1268.21
	Mean		0.39	9.5	34.27	0.63	1844	62.84	18.71	553.95	680.34
	SD		0.33	4.7	15.75	0.15	1627	78.14	8.23	517.82	511.60
AB un S	5 - 1	5B	0.12	4.40	19.89	0.60	864	6.23	10.94	132.57	174.74
	5 - 2	4D	0.27	9.31	15.98	0.60	3850	7.62	28.30	249.71	311.80
	5 - 3	7B	0.23	7.42	18.46	0.60	4157	5.93	17.63	120.75	171.02
	Mean		0.21	7.04	18.11	0.60	2956.79	6.59	18.96	167.68	219.19
	SD		0.08	2.5	1.98	0.00	1819	0.90	8.76	71.29	2.64
AB pm S	6 - 1	5E	0.19	8.00	21.14	0.40	3974	5.70	16.69	143.04	195.17
	6 - 2	2B	0.14	3.24	12.44	1.00	970	3.41	5.39	115.55	141.17
	6 -3	2D	0.50	22.4	37.25	0.70	6873	18.48	44.88	1036.49	1160.68
	Mean		0.16	5.6	16.79	0.70	2472	4.56	11.04	129.29	499.00
	SD		0.03	3.4	6.15	0.42	2124	1.62	8.00	19.44	573.66
CNTRL S	7 - 1	3A	0.45	9.43	20.61	0.60	2913	19.74	21.64	147.75	220.22
	7 - 2	5D	ND	ND	ND	ND	ND	ND	ND	ND	ND
	7 - 3	2D	0.08	4.23	20.53	0.70	1873	5.72	7.67	105.84	144.76
	Mean		0.26	6.8	20.57	0.65	2393	12.73	14.65	126.80	182.49

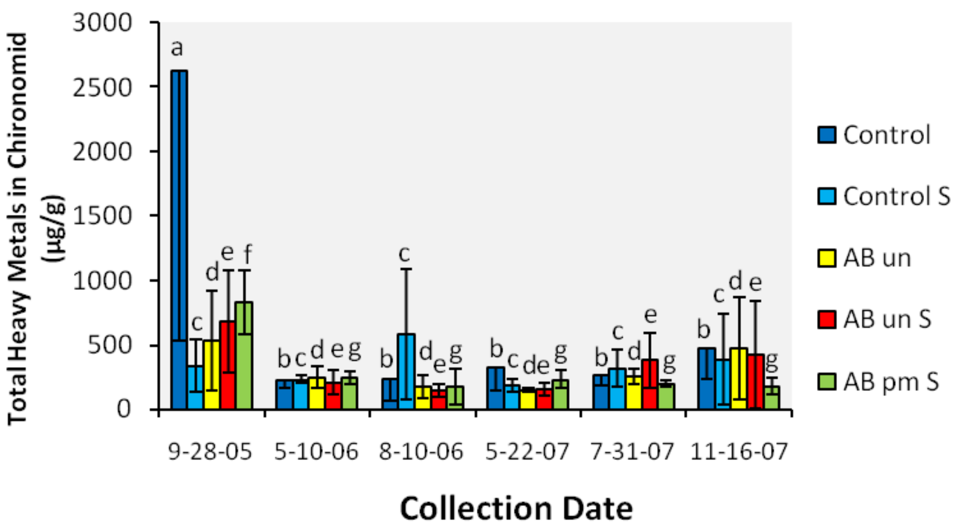
Treatment	Sample	Site	Cd	Cr	Cu	Hg	Fe	Ni	Pb	Zn	Total
	SD		0.26	3.7	0.06	0.07	736	9.91	9.88	29.63	53.35
AB un	8 - 1	1A	0.22	10.2	20.77	0.50	4251	17.81	20.34	166.81	236.66
	8 - 2	3C	0.21	9.22	15.73	0.70	4869	33.75	19.27	209.13	288.01
	8 - 3	3B	0.29	6.97	15.12	0.80	3649	11.85	20.09	218.90	274.01
	Mean		0.22	9.7	18.25	0.60	4560	25.78	19.80	187.97	266.23
	SD		0.04	1.7	3.10	0.15	610	11.32	0.56	27.69	26.55
CNTRL	9 - 1	1C	0.45	14.0	44.81	0.60	7546	12.71	36.36	513.37	622.34
	9 - 2	4A	0.12	4.10	22.62	0.80	487	433.14	6.99	367.85	835.61
	9 - 3	4D	0.27	9.84	24.21	0.70	2622	13.62	26.17	243.37	318.19
	Mean		0.28	9.33	30.55	0.70	3551.35	153.16	23.17	374.86	592.04
	SD		0.17	5.0	12.38	0.10	3620	242.47	14.91	135.14	260.03
CNTRL S	10 - 1	3C	0.54	17.5	64.48	0.70	6576	23.70	56.34	628.64	791.92
	10 - 2	2A	ND	ND	ND	ND	ND	ND	ND	ND	ND
	10 - 3	5A	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Mean		0.54	17.5	64.48	0.70	6576	23.70	56.34	628.64	791.9
	SD										

Total heavy metals in chironomids collected in control plots on September 28, 2005 were significantly higher than total heavy metals in chironomids collected on any other date ($p < 0.05$) or any other plot other than AB pm S on September 28, 2005. AB pm S on September 28, 2005 was not significantly different from control S AB un and AB un S on September 28, 2005 (Figure VII.G1). Total heavy metals in chironomids collected from each plot were always significantly different within a sampling date ($p < 0.05$) (Figure VII.G2). The only plots that had chironomids with significantly higher total heavy metals than chironomids from any other plot or sampling date were chironomids collected from the controls on September 28, 2005 ($p < 0.05$) (Figure VII.G2).



Values with shared letters were not different, p>0.0.5, for treatments collected on the same date.

Figure VII.G1. Effect of plot treatment on total heavy metals in chironomids (µg/g) for all collection dates. There were no pre-capping data. Total heavy metals included Cd, Cr, Cu, Hg, Ni, Pb and Zn. Control = not capped, S = with SubmerSeed, AB = AquaBlok, PM = amended with peat moss, UN = unamended. Some data points were excluded from the treatment averages. See Tables VII.G1-G6.



Values with shared letters were not different, p>0.0.5, for collection dates with the same treatment..

Figure VII.G2. Effect of collection date on total heavy metals in chironomid (µg/g) for all treatments. There were no pre-capping data. Total heavy metals included Cd, Cr, Cu, Hg, Ni, Pb and Zn. Control = not capped, S = with SubmerSeed, AB = AquaBlok, PM = amended with peat moss, UN = unamended. Some data points were excluded from the treatment averages. See Tables VII.G1-G

In conclusion, heavy metals in chironomids were highly variable. This variation is not a surprise given the fact that both the lowest value and the highest value for a metal were at times obtained within replicate plots. Although this was the case, the fact that the control values of September 28, 2005 were able to stand out in all of this variation deserves mention. Besides the control, other plots on September 28, 2005 were also higher than other sampling dates although not significantly higher. However after nearly a year later all of the values came down, including those of the control. The reason why the values declined over time is unknown. One possibility could be the construction of a permanent cap at the nearby Keegan Landfill during the course of the study. However once the values came down after 2005 there have been no significant differences between plots, largely due to the variation within and between plots. It is for these reasons that there is difficulty drawing conclusions about heavy metals in chironomids.

VIII. CONCLUSIONS:

BMI were not able to successfully colonize AquaBlok. Core samples contained very few organisms, ranging from 0-3 individuals per core. The average Shannon-Weiner Index was 0 in these plots. The number of chironomid larvae and aquatic snails averaged 0.3 in plot 2. This was not statistically significant. The average Shannon-Weiner Index was 0.231 in this plot. This was not statistically significant. The abundance of the benthic macroinvertebrates collected on the Hester-Dendys showed seasonal patterns between two dominant species, chironomids and *Gammarus*, which over lapped slightly on occasion. Although the abundance of these species was high at the start of the study, by the end of the study their abundance started to decline but not nearly as low as the abundance found in the sediment cores. For the chironomids it was clear that abundance was lower in the controls. Heavy metals in the sediment did not seem to have a large effect on benthic macroinvertebrates, which is expected since the Hester-Dendys were placed on or slightly above the sediment. Because they were not in the sediment it is surprising that abundance would increase as PCBs increased in AB. The sample sizes in the sediment cores were too small to determine an effect of heavy metals and PCBs in the sediment on benthic macroinvertebrates. Although redox seemed to have a slight effect on the abundance of benthic macroinvertebrates in one control plot, decreasing levels of dissolved oxygen seemed to have a little more of an effect although the results are inconclusive since both replicates of each treatment or control did not agree.

Limited number of species of marsh vegetation was able to colonize AquaBlok. Only six, *Zizania aquatica* , *Alisma Subcordatum* , *Typha angustifolia, Peltandra virginica Scirpus validus* and *Scirpus sp.* of the original 128 species prepared as SubmerSeeds were able to establish themselves in AquaBlok. Natural occurring Phragmatis from the sediments seed/rhizome banks were also able to colonize AquaBlok on the green house settings. During the first growing season, plants were able to germinate and grow better on 2% amended AquaBlook when compared to unamended AquaBlok. During the second growing season whatsoever, there was no difference on plant germination and growth rates between the two AquaBlok treatments. In general, plants growing on AquaBlok as an alternative sediment source were less robust than plants growing on uncapped sediments (control). Root systems of plants growing in AquaBlook were reduced in size and less robust than roots growing in uncapped marsh sediments. Total plant dry weight was also reduced in most species when compared to the control group. The average plant dry weight growing in marsh sediments (control) were 3.8g/plant for *Zizania aquatica,* 5.4g/plant for *Alisma subcordatum,* 12.9g/plant for *Typha angustifolia* and 158.5gr/plant for *Phragmatis sp.* Plants growing in AquaBlok (unamendded and amended with 2% peat moss) have produced smaller plants with lower dry weight 1.2g/plant and 1.33g/plant for *Zizania aquatica* and 2.1g/plant 1.7g/plant for *Alisma subcordatum,* and 10.1 gm/plant for *Typha angustifolia* when compared to those growing in soil. AquaBlok can serve as an alternative plant substrate when restoring heavy contaminated sites. AquaBlok does reduce the amount of contaminates that becomes available to the plant but does not provide the plant with adequate amounts of nutrients necessary for a healthy marsh growth.

Heavy metal concentrations in water were similar across the site, and there were no treatment related effects for a particular collection date. However, metal concentrations did appear to change across the site after capping. Metal concentrations were statistically higher in September after capping compared to July pre-capping concentrations. Heavy metals concentrations declined between post capping 2005 and 2006; however, concentrations were still significantly higher than pre-capping. These dates could be compared as metal analyses were conducted the same way for these dates. Results in 2007 were difficult to compare to earlier dates as the detect method was changed. If analyses were modified to include only select metals (those with similar detection limits for all dates), then water concentrations in 2007 were similar to those in 2005 and 2006 post capping. The increase in water heavy metals post capping might have occurred due to increased dissolved oxygen and redox levels associated with AquaBlok capped sites.

Results for heavy metal concentrations in water also showed that Cu and Pb were of serious concern as they exceeded the freshwater CCC on all dates. Cd appeared to be of concern as its concentrations were above its CCC in 2005 and 2006. However, when the detection limit was lower in 2007 analyses, Cd was below its CCC and therefore possibly not a serious concern. Data for Hg showed concentrations above its CCC in 2007 only. It was not know why water concentrations of Hg apparently increased in 2007: there was a considerable disturbance of the nearby Keegan landfill in 2007 that might have put Hg into the water during that collection date.

Heavy metal concentrations in sediment did show treatment related effects. Metal concentrations in AquaBlok treated plots declined significantly after capping. The concentrations of metals in the cap itself were much lower than in the sediments they covered. Comparison of collection dates showed no significant increase in heavy metals in the cap between 2005 and 2007. This indicated that the heavy metals below the cap were not breaking through it. Amending the AquaBlok with peat moss did not affect metal concentrations. In uncapped plots concentrations of Cu, Hg, and Pb were consistently above their CCCs. Ni was above its CCC in 2005 and 2007. These results indicated that these four metals were of serious concern in sediments. These results corresponded with high water concentrations of Cu, Pb and Hg and indicated an overall environmental concern for these metals in the marsh.

Heavy metal analyses in BMI (chironomids) showed no significant treatment or collection date effects. Only one of the uncapped treatments, Control, had statistically higher levels of metals than other treatments, including Control S, and that difference only occurred on one collection date, September 28, 2005. Overall, it appeared that chironomids were able to control their accumulation of heavy metals such that they were not affected by substrate concentrations. While highly variable, data did show a trend for higher tissue concentrations of metals in September 2005 in all treatments. This was consistent with the spike in heavy metal water concentrations found at the same time. This suggested that the BMI were accumulating metals from water as oppose to the benthic substrate. The lack of treatment related effect in water concentrations of heavy metals most likely explains the lack of treatment effect on BMI concentrations.

Heavy metals in plants growing in AquaBlok and amended AquaBlok substrate tend to concentrate less amounts of heavy metals on their tissues. Total amount of heavy metals varied from 357.9 mg/kg in *Phragmatis sp.* to 542.726 mg/kg in *Zizania aquatica* growing on AquaBlok and from 409.97 mg/kg in mg/kg in *Alisma Subcordatum* to 633.12 mg/kg in *Typha angustifolia* growing on AquaBlok amended with 2% peat moss.
It also worth mentioning that each of the heavy metals of concern was concentrated differently by each plant depending on the substrate they were growing. Most of the plants growing in AquaBlok concentrated higher amounts of heavy metals on their root tissue as

they did on the control marsh sediment. In all, the reduction of heavy metals in capping the substrate, AquaBlok, did not increase the growth of vegetation on contaminated sites.

Organic contamination of the marsh was evaluated by measuring PCB and OCP concentrations in water and benthic substrate pre- and post capping. Concentrations of total average PCBs in water exceeded the CCC (14 ng/L) across the site before capping. Concentrations were 2-17x the CCC indicating that water concentrations of PCBs were an environmental problem in the marsh. Concentrations of DDT were also high, exceeding its CCC (130 ng/L) by 1-6x, and thereby indicating that DDT in water was of serious concern. None of the other OCPs exceeded their CCC in water pre-capping. Capping with AquaBlok significantly reduced water concentrations of PCBs and OCPs. Total PCBs declined 2-35x and OCPs declined 12-35x. This indicated that the cap had an effect on these contaminants in water. However, the decline was not treatment related as there were no statistically significant differences between plot treatments for samples collected on the same day. This was probably due to the circulation of water throughout the site. The decline in organics found for post capping samples in 2005 continued through 2006 and 2007. This suggested that if the cap had removed the organics from water, that it was not releasing them back into it over time. However, the concentrations of PCBs and DDT left in the water post capping were still too high. Multiple samples of PCB and several samples of DDT continued to exceed their respective CCC.

Sediment concentrations of organic contaminants pre-capping showed levels of PCBs spread throughout the site, but the average total PCBS were well below its SEL (53,000 µg/Kg). OCPs were also spread throughout the site. For OCPs, only the metabolites of DDT, DDD and DDE, exceeded their SELs (600 and 130 µg/Kg, respectively). This result indicated that DDT was of serious concern in the marsh. After capping, the concentrations of PCBs and OCPs in AquaBlok substrate was significantly lower than in sediments left uncapped. Total PCB and OCP concentrations were 10x and 8x lower, respectively. Substrate concentrations of both organics in AquaBlok were similar in 2005, 2006 and 2007 post capping. In addition, organic contamination of sediments from uncapped plots remained post capping. There were no significant differences in PCB or OCP concentrations between the July 2005 collection date and all post capping collection dates. In uncapped sediments, multiple replicates had concentrations of DDD and DDE that exceeded their SELs. Taken together, these results indicated that the AquaBlok did not allow PCBs and OCPs to break through the cap over a two year period, and it did not become significantly contaminated by organics in the surface water during the same time period.

Overall, capping provided a less contaminated substrate in the marsh. Results indicated that it might have removed PCBs and OCPs from the water column, and it did not allow contaminants in the sediment below the cap to break through. However, water concentrations of Cu, Pb, Hg and DDT continue to be of concern in the marsh post capping.

REFERENCES

Best, E. P., M. E. Zappi, H. L. Fredrickson, S. L. Sprecher, S. L. Larson and M. Ochman. 1997. Screening of aquatic and wetland plant species for phytoremediation of explosives-contaminated groundwater from the Iowa Army Ammunition Plant. Annals of the New York Academy of Sciences, Vol 829, Issue 1 179-194.

Edmunds, G. F. Jr., S. L. Jensen and L. Berner. 1976. The Mayflies of North and Central America. Univ. Minnesota Press, Minneapolis, MN. 330 pp.

Gersberg R.M., B.V. Elkins, S.R. Lyon and C.R. Goldman. 1986. Role of aquatic plants in wastewater treatment by artificial wetlands. Water Res 20:363-368.

Gloyd, L.K. and M. Wright. 1956. Odonata pp. 917-940 in w. T. Edmondson (ed.) Freshwater Biology, (2nd ed.) John Wiley and Sons, New York City, NY. 1248 pp.

Hugo Coops and Gerard van der Velde 1995. Seed dispersal, germination and seedling growth of six helophyte species in relation to water-level zonation. Freshwater Biology. Volume 34 Issue 1. pp 1-13

Hull, J.H., J.M. Jersak, and H.F. Crowell. 2000a. 'Biofriendly' Remediation of Impacted Wetlands. In: JR Means and RE Hitchee (eds') Wetlands and Remediation International Conference Proceedings, pp 229-236.

Hull, J.H., J.M. Jersak. 2000b. In Situ Capping: A Flexible approach for managing contaminated sediments. *World Dredging, Mining, & Construction*, October 2000 issue.

Kellogg, Chev H. Scott D. Bridgham† and Stacey A. Leicht 2003. Effects of water level, shade and time on germination and growth of freshwater marsh plants along a simulated successional gradien Journal of Ecology Volume 91 Page 274.

Leech, H. B. and M. W. Sanderson. 1959. Coleoptera, pp. 981-1023, in W. T. Edmondson (ed.) Freshwater Viology (2nd ed.) John Wiley and Sons, New York City, NY, 1248p

Menke, A. E. 1979. The Semiaquatic and aquatic Hemiptera of California (Heleroptera: Hemiptera) Ball. Calf. Insect Survey 21:1-166.

Needham, J.G. and M.J. Estfall, Jr. 1955. a manual of the dragonflies of North America (Anisoptera) including the Greater Antilles and the provinces of the Mexican boarder. Univ. Calif. Press, Berkeley, 615 pp.

Persaud, D., Jaagumagi, R., and Hayton, A. 1993. Guidelines for the protection and management of aquatic sediment quality in Ontario. ISBN 0-7729-9248-7. Ontario Ministry of the Environment, Ottawa, Ontario. 23p.

Screening of aquatic and wetland plant species for phytoremediation of explosives-contaminated groundwater from the Iowa Army Ammunition Plant.

Walker, E.M. 1953. The Odonata of Canada and Alaska, Part I. General, Part II. The Zygoptera-damselflies, Vol. I. Toronto Press, Toronto. 292 pp.

U.S. Environmental Protection Agency. 1988. Interim sediment criteria values for nonpolar hydrophobic organic contaminants. Office of Water Regulations and Standards, Criteria and Standards Division. SCD #17.