Your Creek Initiative
Love Creek Team

Love Creek Findings

Steve Britz

Steve is a Ph.D. plant scientist at the USDA in Beltsville MD where he has spent a 34-year career. He has focused much of his work there on analyzing organic micronutrients (e.g., vitamin E) in food crops, but did get his start in research studying sea lettuce at the Chesapeake Biological Laboratory early in his career - a project that eventually evolved into his thesis work split between Harvard, Marburg (Germany) and Stanford. We are fortunate to have Steve bring his knowledge and experience to the Love Creek Team and to the Citizens Monitoring Program at UD. He has owned a home on Love Creek since 1995. These are his notes from the field.

To learn more about the Your Creek initiative go to inlandbays.org To join a Your Creek team email outreach@inlandbays.org

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May 16, 2014

In case you haven't seen this book, I'm enclosing a link to a downloadable version with illustrations of an 1878 book, "The Voyage of the Paper Canoe" (http://www.gutenberg.org/ebooks/32333). It's free to download and describes a voyage from Quebec to the Gulf of Mexico designed to highlight the intracoastal waterways. After washing ashore at Slaughter Beach in a storm, the hero of the story spent a night on Love Creek in the cabin of George Webb before proceeding on his way. It's interesting to read his brief descriptions of the area including Delaware Bay and the Inland Bays.

May 18, 2014

I took a "quick" spin around Love Creek yesterday. There was abundant horned pondweed, which was visible in shallow areas in spite of the turbidity. There was even a small patch by our pier, several hundred yards downstream from where it was reported several years ago. There were also abundant mats of floating filamentous algae. Further upstream, I ventured into the marshy area. After all the rain on Friday, the water was flowing fast but clear. The horned pondweed was replaced by emergent grasses, also as had been reported before.

I paddled up Stillman Glade, which flows into Love Creek just upstream of the Rt. 24 bridge, and got as far as the homes in Fox Hollow. The water was pretty turbid by the mouth of the glade but quickly turned very clear. The bottom was covered with luxuriant vegetation. Stillman Glade drains a marshy area on the other side of Robinsonville Rd. opposite from Webb's Landing Rd. as well as the adjacent farmland. However, it flows through a large forested riparian zone before it gets to Fox Hollow.

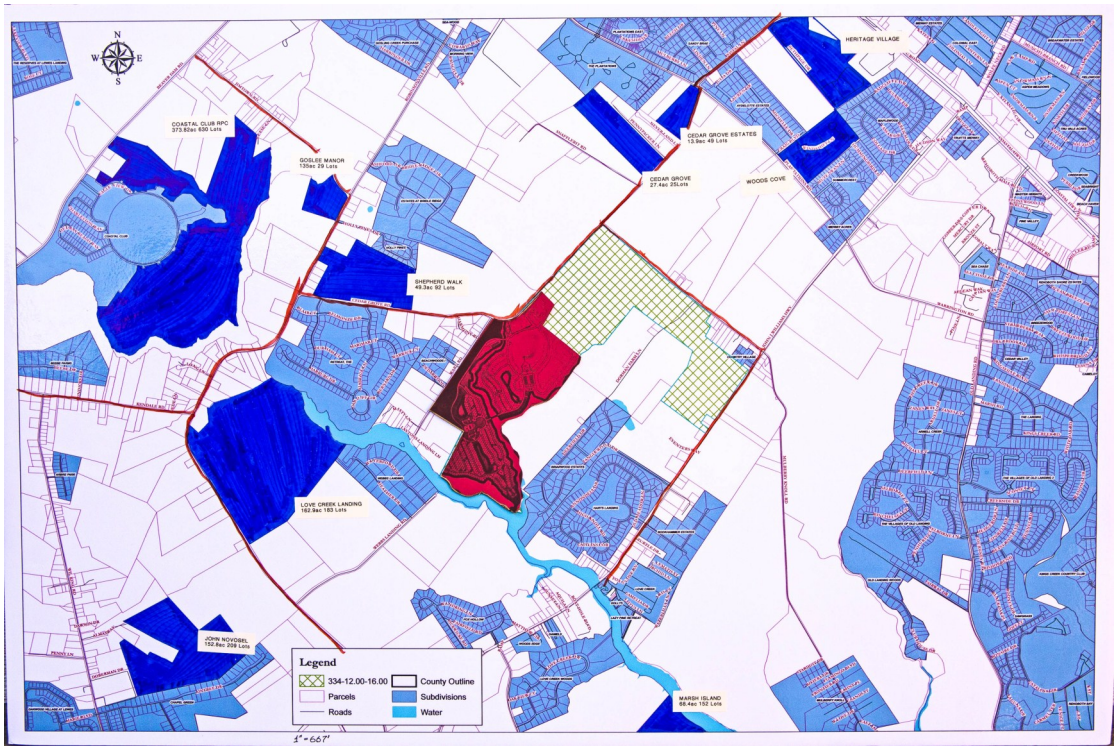
I looked at some of our horned pondweed under the dissecting scope. Several types of algae were mixed in, including *Enteromorpha* and *Spyrogyra*. The horned pondweed supported an active epizootic community of ciliated protozoans, including *Carchesium* and *Vorticella*. I also spotted a planarian worm grazing on the surface.

May 19, 2014

The filamentous green alga we found floating on the surface of the creek is clearly *Spirogyra* based on the helical chloroplast. It's a fresh water alga supposedly common in "clean" eutrophic water. I think this could be a problem with respect to shading of benthic plants and hypoxia as the alga dies, sinks and starts to break down. My impression is that there was a lot more on Saturday. We may want to think about techniques to map the proportion of the water surface covered by alga.

May 22, 2014

At the recent CAC (Citizens Advisory Committee) meeting, I ventured that one of the reasons to focus on Love Creek is all the development planned for the area. The attached map was prepared by Dick and Carolyn Snyder of the Retreat to depict the status of some of this development as of about one year ago. There were over 1000 new homesites envisioned at the time.



Current developments are shown in light blue; planned (P&Z approved) developments are shown in dark blue. The proposed RV park is shown in red (no value judgment intended) and the remainder of the Townsend parcel is shown in green cross-hatching.

The new elementary school and the relocated state police barracks will be in the green cross-hatched area.

The proposed community at Windswept Stables off Rte. 24 is not shown.

Several approved developments are worth highlighting:

Coastal Club - 630 lots adjacent to Goslee Pond.

Vesco - now approved for 213 lots adjacent to Love Creek - intended initially to link up with Wandendale for sewage, they've now opted (and been approved by P&Z) to have their own community waste water treatment with a drain field along Love Creek.

Novosel - although this property (which actually fronts along Robinsonville Rd.) plans to send their sewage to the plant at Angola Neck, the land drains into Stillman Glade, which is a tributary of Love Creek. The runoff, which can be impressive, drains through culverts under Robinsonville Rd. and thence across farmland through ditches or swales.

RV park - their stated plan is to send sewage to the West Rehoboth plant - my concern is that these plans can easily change - even after approval - as witnessed by the Coastal Club and Vesco developments.

May 30, 2014

I will check out the horned pond weed and *Spirogyra* this weekend. At least in Maryland, we've had a lot of rain, so I hope water levels may be up and I can explore more of the upper reaches.

Spirogyra

Meanwhile, I will try to record video of the ciliates we found associated with horned pondweed. They might be a useful teaching tool - examples of the extraordinary life forms found within an ordinary creek.

Some of the motile unicells are phototactic (meaning they move towards or away from light sources), so it's possible to concentrate them on a slide for better viewing. That might be interesting too.

June 6, 2014

Playing more with the microscope last weekend, I found abundant *Hydra* growing on stalks of horned pondweed from the area around our dock. They're easily visible with a dissecting scope. Doing some reading I found that *Hydra* are mostly fresh water and very sensitive to pollution. So, finding them is a good sign. They're in the same phylum as jellyfish, I believe.

I would definitely like to work with the Citizens' Monitoring Program. I think there are numerous potential sites to collect samples in the creek and in the various tributaries. It would be good to get something going while conditions are still relatively good (even though N is high).

June 8, 2014

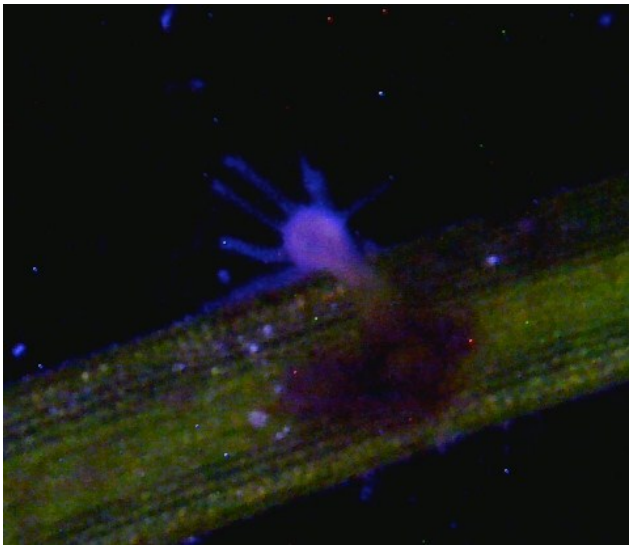
I'm attaching some photos for consideration in advance of our upcoming Your Creek meeting.

Photo 1 shows the continued presence on June 6 of floating *Spirogyra* mats on the portion of Love Creek upstream of Fisher's Landing (Ward Rd.). The mats appeared to be focused in this area by wind blowing downstream and the incoming tide. Later that evening the mats traveled downstream as the tide went out.

The next morning at low tide the shoreline was coated in *Spirogyra* (photo 2). I am reminded of sea lettuce infestation.

On the positive side, the horned pondweed is persisting in Love Creek. In addition, I observed extensive beds of horned pondweed along Hetty Fisher Glade with very little *Spirogyra* (also the evening of June 6). The water was quite clear upstream of Briarwood. Numerous small fish could be seen darting in and out of the vegetation.

Also positive, I observed numerous *hydra* colonizing the stems of horned pondweed collected last weekend from near our dock. These primitive freshwater metazoans are distant relatives of jellyfish and are reported to be extremely sensitive to pollution. I'm not sure if this sensitivity extends to high nitrogen levels. The attached dark field photomicrograph is taken from a video clip using an inexpensive ($45) video microscope I got several years ago. The video shows the pseudopodia "waving" slowly. *Hydra* are motile and can move in a somersaulting fashion.



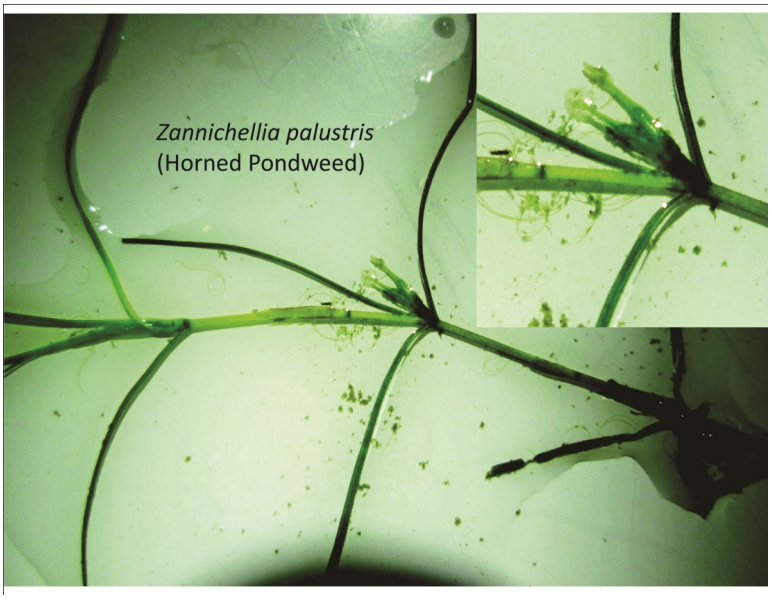
June 13, 2014

By the way, I've been wondering about the horned pondweed (*Zannichellia palaustris*) in Love Creek and its tributaries. It's a positive to have widespread SAV (submerged aquatic vegetation) and we usually think of that as indicating better water quality. But we still have high nitrogen and nuisance *Spirogyra* in large amounts. How do these observations jibe?

From my reading, it appears the horned pondweed is either tolerant of high nitrogen or may require it. In a comparison of 150 British fresh water plants, horned pondweed was ranked number 150 with respect to association with eutrophic conditions. In another comparison based on the Ellenberg scale, horned pondweed was rated 7 out of 9, with 9 signifying plants that required or were adapted to very high nitrogen levels (e.g., active cow pastures).

So, it appears horned pondweed is itself an indicator of eutrophied conditions. It's not surprising to find *Spriogyra* thriving in the same water.

Steve



June 16, 2014

Just to be clear. I'm not suggesting the horned pondweed is a negative. There are lots of positives (habitat, food for water fowl, water filtration). I was curious about the coincidence with large amounts of *Spirogyra*, which is associated with eutrophic conditions and which may be a problem. As it turns out, horned pondweed is also used as a indicator of eutrophic conditions. A British study scored it 150 out of 150 aquatic plants for tolerance to eutrophic conditions. According to the Ellenberg scale, it's just a couple notches below plants associated with active cow pastures. So, is horned pondweed widely distributed in other tributaries of the inland bays?

From Bart Wilson, CIB Science Coordinator
Ed Whereat (Citizen Monitoring Program, UD) is correct, Horned Pond Weed is not widely distributed. In discussions with CIB staff, this is most likely the largest stand of reported Horned Pond Weed in the Bays, and likely the largest stand of SAV in the Inland Bays. A great way to think of Horned Pond weed, is that it is the most tolerant of eutrophic conditions of all the species we normally find in the Bays, and it has found a niche that suits its wide nutrient and salinity tolerances.

June 17, 2014

This is really neat! I have lots of questions but we can talk at the Thursday Your Creek meeting or later.

P.S. I found what I think is a water plant called "coon tail" further up Love Creek, which I have now followed all the way to Robinsonville Rd. It's a beautiful stretch.

July 16, 2014

Kayaked up Love Creek Sunday. The board [that had been blocking the channel] was dislodged and I was able to get almost all the way. More on Thursday.

July 21, 2014

Yes! After a gray and drizzly weekend the sun is dawning clear and bright. In a few minutes I'm off to collect water samples for bacteria measurements thanks to the Citizen Monitoring Program. I'll collect samples at Bundicks Branch at Beaverdam, Goslee Creek at Jimtown, Love Creek at Robinsonville and also Love Creek off our pier. One of the other volunteers is collecting a sample at the usual site near the Rte. 24 bridge. Unfortunately the numbers won't be available until tomorrow.

Meanwhile, salinities in Love Creek continue to run low following all the rain we had a couple weeks ago. Dissolved oxygen values were running less than 4 mg/liter yesterday morning. I also measured high nitrate values in Bundicks Branch and Goslee Creek as well as upper Hetty Fisher Glade using a somewhat more sensitive test than I had available last week. Nitrates were lower below Goslee Pond (Robinsonville Rd.) and went to undetectable by the time Love Creek passed through the upstream marsh area. The values remained undetectable by my test down to the bridge.

Bill Ullman highlighted the importance of upstream ponds in buffering nutrient input to the Inland Bays in his lecture last Thursday night. My measurements so far seem to support this interpretation for the role of Goslee Pond. Nitrates also appear to be go down in Hetty Fisher Glade as it winds down to Love Creek, supporting the importance of marshes to filter nutrients. Maybe these are things that can be brought out during our tour this afternoon.

July 25, 2014

I just got home after a long visit with Ed Whereat at Citizen Monitoring at UD, who provided me with additional sterile containers to sample bacteria on Monday next week. Given the high bacteria counts from Monday this week, I want to get a longitudinal transect of Love Creek from the bridge to the marsh along with Hetty Fisher Glade where I've also been finding high nitrate values.

Coincidentally, we talked about Bill McAvoy, who identified a rare (uncommon?) species of Lobelia, *Lobelia elongata*, in the Love Creek marsh. It should also be flowering about now, so Judy and I will go out tomorrow and see if we can find it. I'll try to photograph everything I can.

August 10 2014

Hi All,
Judy and I went out again yesterday and captured some additional images that I thought you might enjoy. I hope I'm not overloading your in-boxes.

The marsh at the upper reaches of Love Creek is nearly in full bloom although we have not spotted the rare *Lobelia elongata* yet. The mating damselflies forming an inverted heart could be emblematic of Love Creek. The little guys were quivering so they're a little blurry in all my shots. In retrospect, I wish I had ratcheted up the camera speed.

However, I really like the blow-up of *Sabatia dodecandra*, another rare plant in Delaware, depicting the anthers. Truly, a perfect flower.

Although the tide was quite low thanks to the Super Moon, I deployed my helium balloon buoyancy booster (no, not really) and made it up Hetty Fisher Glade. Once again I was struck by the apparent absence of most of these plants (I did see one marsh mallow). Even though the water in upper HFG has been consistently fresh when I measure it (much less than 1ppt), the nitrates were once again very high (around 30 ppm NO3, where they've been consistently). HFG has relatively wide forested buffers, which makes me wonder about the source of the nitrates and what will happen if and when we see more development. I also wonder if high nitrate is a factor affecting botanical diversity. Nitrates for upper Love Creek are much lower, although still detectable with my relatively insensitive test.

I can see I need to expand my repertoire to include Stillman Glade as a comparison with Hetty Fisher Glade.

I should have the chance to capture more water samples for bacterial measurements (thanks to Ed Whereat) on August 18. My initial marathon sampling session a couple weeks ago revealed very high levels for upper Hetty Fisher Glade (nearly 1000 colony-forming units per 100 ml). The levels were slightly lower at Sipes Point where HFG merges with Love Creek. These levels were considerably higher than other measurements from Love Creek both upstream and downstream.