

OBSERVATIONS ON THE BIOLOGY OF NOXONTOWN POND, 1947-1984

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The analogy comparing a pond to a living organism is familiar to those who are interested in, and concerned about, standing bodies of fresh water. A pond has (a) an origin or birth from natural or man-made causes, (b) a period of youth during which aquatic plants and animals increase in variety and populations; (c) a long period of stable maturity in which variety of organisms is at its peak; (d) a decline into senescence with a reduced number of species; and (e) final oblivion so far as open water and aquatic organisms are concerned. Accompanying this, and inextricably woven into successional changes, is the accumulation of sediment, reducing both depth and area. So closely are species identities and variety correlated to the condition of a pond, it is possible to classify the general age of a pond (not in years, but in the five categories stated above) by the kinds of organisms it contains, without ever seeing the pond itself. Individual species and assemblages of species typify the particular stage a pond is in, thereby serving as indicator organisms. These may range from microscopic forms of life to large and familiar plants and animals.

When I arrived in Delaware in 1947, I commenced studying Noxontown Pond at once, because of my background and strong interest in aquatic biology. The pond of 1947 and up into the mid-1950's was very different from what it is today. It was clear to me at that time the pond was in its late maturity; healthy, diverse in its populations, not seriously encroached upon by emergent plants, seasonally supporting submerged vegetation (Potamogeton crispus, now gone), and with a clarity approaching 10 feet. The deepest portion of the pond then measured was slightly in excess of 8 feet.

In 1947 the aquatic reptile, amphibian and fish population was far more diversified than it is today. Diving ducks fishing in the main portion of the pond attested to its clarity. Plankton populations were balanced and healthy, with little or no evidence of any blue-green algal presence despite the season. Shoreline spawning of fishes, especially sunfishes and large mouth bass, was abundant off every part of the northern half of the pond. Large beds of three species of fresh water mussels thrived in clean sand and gravel bottoms.

It should be remembered that in those days there was more contribution from the human and domestic animal elements than in recent decades. The old sewage disposal plant at St. Andrew's, prior to 1965, met all state and safety standards, nevertheless was upgraded by a totally new one after that date. There were small cottages and camps along the shoreline, some of which had inadequate waste disposal systems. At least one large farm on the eastern side of the pond watered a sizeable herd of cattle in the pond daily and the area often was cloudy with their feces. These also were days before DDT was banned from farm use and undoubtedly it washed in from neighboring farms. Despite these conditions, the pond was in satisfactorily healthy condition for approximately the first decade of my observations.

On two occasions I had the opportunity to examine the pond bottom when the surface level was purposely drawn down at the causeway sluice gates. In both instances it was seen that the accumulation of sediments was occurring at an ever-increasing rate. When the water level was normal in the late 1950's, a series of transect cores were made and from them, the original (pre-1740) bottom was identified and contours mapped. Sedimentation from 1740 to that date was plotted and future accumulation projected. The latter was well off the mark as later events proved, with the increase much greater than had been anticipated. A decrease in depth of 2 feet in the most open area of the pond in no more than 25 years is an alarming rate. Most coves that could then be entered easily by boats of any kind now have mouths penetrated only with difficulty, and much of their areas so shallow no flotation device of any kind allows entry. One needs only to walk

the shoreline border of any cove to see the progression (it is known as succession to the ecologist) through marsh to young forest. Gullies now forested have been cored and show that in Thomas Noxon's day they were open water. The entire pond is being closed at a rate that spells an earlier oblivion than I had imagined two and three decades ago.

Beginning about 20 years ago, certain species of plants and animals began growing scarce, then disappearing completely. The sequence they did so agreed with every limnological understanding of a pond declining into senescence, or a less productive old age. Some of the best indicators are among the microscopic plankton, but there were also others of somewhat more familiar nature. Four, possibly five, species of aquatic reptiles diminished; at least eleven species of amphibians seem by now to have disappeared; five species of fish have declined markedly; countless species of aquatic insects are gone. At the same time, other species of animals and plants have increased out of proportionate balance, at times even creating a "bloom" or population explosion. Such imbalance is not just an indication of senescence, but a loss of health.

Charges have been levelled against the activities of various property holders: waste disposal; agricultural treatment by fertilizers, pesticides, herbicides; removal of water for irrigation; agitation and mechanical disturbance; chemical additives; and more. From the biological point of view, each of these possessed possible validity and deserved the attention which it received, either by me, by other trained personnel, by State agencies and specialists. In no case was a true causative agent found either for a general condition or a specific event.

During my years here, there have been several major and serious effects upon pond biology for which there had to be a cause and explanation. While each time I initially suspected human causes, it turned out the real culprit was a natural and almost predictable series of interlocking events characteristic of an ageing and declining pond. I will not go into details of the effects upon aquatic vegetation, invertebrates, fishes and other organisms, except to say they were profound. Whole plant communities ceases to exist, giving opportunities for invasion by even more serious plant threats. There were several massive fish kills, in each case the result of suffocation, not poisoning by toxins. The culprit in at least one major instance over 15 years ago was a sudden bloom by a blue-green alga that, after it rose and declined, set the stage for massive levels of bacterial decay, very nearly eliminating oxygen from the water temporarily. Two later instances seem to have been due to the same cause. In some of the kills only the most susceptible species of fish suffocated; in others, young fish of many species were killed. There was no regionality to the kills and no lethal gradients; in other words, there was no single point source. The phenomenon is well known in small old ponds in poor condition and resembles (although the causative organism is different) the notorious Red Tide off our Atlantic shores. A variety of chemical, physical and biological conditions coincided and created the maximum favorable environment for these microscopic algae to explode; all the conditions were greatly amplified by the increasing shallowness of the pond and its enormous increase in organic sediment load.

Two years ago the most alarming phenomenon I have ever witnessed in a fresh water pond occurred; by late summer, normally the most productive time for a pond's biota (plant and animal populations), all plankton completely disappeared from the water. This condition persisted for nearly two months, after which there was a slow recovery. It was at this time that the team from the Academy of Natural Sciences, under Dr. Clyde Goulden, was engaged to look into this serious situation.

There is no question the pond is still a good fishing pond, but it is not as good as it once was, if our repeated haul-seine censuses over 37 years are indications, and if our surveys of the greatly reduced spawning grounds for bass and sunfish are basis for alarm.

The large schools of tiny bass fry seen soon after hatching have not been observed in many areas for years. The ever-increasing rate at which the pond is filling with sediment means these fishes no longer can excavate down to the necessary sand or gravel bottom. Fish populations inevitably must decline and succeeding generations of fishermen will not have the opportunities others have had in the past.

But neither fishing nor other forms of recreation, nor institutional activities, are bases for my argument. I am concerned about a far larger matter. The biotic entity, or ecosystem, that is Noxontown Pond is on its way to oblivion at a very rapid rate. If there is a chance to turn back this successional clock by removal of sediment to a stage where the pond is mature, not senescent, the interests of all will be served. Dredging is a purposeful attempt to restore biological health to this important body of water; in so doing, certain changes from its present condition will become apparent. Shoreline vegetation will diminish in area but not disappear completely. Spawning may be suspended in one area temporarily, yet with the return of favorable spawning substrates, it will greatly increase in the years ahead, not just for sport fish species, but smaller forms as well which are important to the food web of a pond ecosystem. A greatly increased diversity of species of both plants and animals will begin to appear within only a few years. Monitoring such changes is essential for the security of all interested parties. Follow-up studies will confirm the necessity for this corrective procedure which without doubt is distressing to some, expensive to some, an interruption to some but which, if Noxontown Pond is to continue to exist for us and for future generations, will enhance recreation and recreational fishing, biological studies and pure aesthetics.

Finally, I know that neighbors have spent more time living on the pond than I have, but my 37 years have given me a respect and a love for this beautiful place that commit me to urge dredging now take place under the supervision of all concerned parties. Only in this way will Noxontown Pond have a prolonged future.

Respectfully submitted,



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April 26, 1984