A Limnological Survey of Woodchuck Pond, Greenwoods Conservancy

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ABSTRACT

During the summer of 1995, a preliminary biological survey of Woodchuck Pond, at Greenwoods Conservancy, Burlington, NY, was conducted to characterize this water body. In addition an assessment was made for its capability of sustaining a population of *Salmo gairdneri* (rainbow trout). Water quality analysis was conducted using a Hydrolab (model SVR2-SU), a portable water monitoring device. Floral and faunal specimens were collected to characterize the Woodchuck Pond ecosystem. This work, facilitated by the Biological Field Station, SUNY Oneonta, was done in connection with similar studies to gain a greater understanding of Greenwoods Conservancy. After further investigation it was found that the eutrophic nature of this pond is not conducive to the long-term survival of *Salmo gairdneri*.

INTRODUCTION

Greenwoods Conservancy is a thousand-plus acre preserve in Burlington, New York. It is protected under a conservation easement with the Otsego Land Trust, under which most of the Conservancy is designated "forever wild". For research purposes, restrictions on development and maintenance within the Conservancy vary. Regulations for the area around Woodchuck Pond, a 60 meter by 35 meter man-made farm pond within the Conservancy, allow mowing near the pond. In addition to this upkeep, Woodchuck Pond was stocked with trout by the owner of Greenwoods, Dr. Earle Peterson. The fish were introduced in the summer of 1993 and lived for at least a few weeks, but they had died off by the spring of the following year. Dr. Peterson asked the Biological Field Station, which monitors Greenwoods, to investigate possible biological limitations which prohibit the survival of the trout.

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Figure 1. Woodchuck Pond, Greenwoods Conservancy, Otsego County, N.Y.

Max Length: 60 m
Max Width: 40 m
Max Depth: 2.7 m
Surface Area: 225 m$^2$
METHODS and MATERIALS

Hydrolab Readings

On 10 July 95 a Hydrolab (model SVR2-SU) was used to measure temperature, pH, dissolved oxygen content, and conductivity at Woodchuck Pond, Greenwoods Conservancy. Measurements were taken from the bottom and the surface at six sites around the pond. On 12 July 95 and 10 August 95, dissolved oxygen measurements were taken at about every ten feet across the pond's surface at .5 meter intervals. These data were used to create dissolved oxygen profiles (see Figures 2 and 3). At the same time temperature was also measured on the surface and the bottom of the pond to establish the extent of thermal stratification.

Benthic Invertebrates

On 21 July 95, specimens were collected from Woodchuck Pond. Collecting was done near the shore using seines, sieves, triangle nets, and forceps. Collectors used a canoe in conjunction with sieves and triangle nets to collect further from shore. The specimens were then brought to the Biological Field Station and immersed in boiling water. The specimens were then placed in labeled vials containing alcohol and classified taxonomically according to Harman (1982).

Vertebrates

On 21 July 95, specimens were collected by manually gathering living vertebrates in the water. The samples were placed in 10% Formalin solution which killed and preserved them. Later these specimens were identified using the Vertebrates of the United States, Blair (1968), and the Handbook of Frogs and Toads, Wright and Wright (1949). An attempt was also made to collect fish using seines.

Zooplankton

On 19 July 95, zooplankton were collected at Woodchuck Pond by manually dragging a plankton net with a #20 cup through the pond. In an attempt to collect plankton from different depths in the pond the net was pulled at different speeds. The sides of the plankton cup were washed with tap water in order to rinse all of the plankton into a jar. The strained plankton were placed into a labeled specimen jar and Lugol's iodine was added to preserve and stain it. When the plankton settled to the bottom of the specimen
Figure 2. Dissolved oxygen concentration (mg/l) in a transect from N to S through the deepest parts of Woodchuck Pond, Greenwoods Conservancy, Otsego County, N.Y. 12 July 95.

Figure 3. Dissolved oxygen concentration (mg/l) in a transect from N to S through the deepest parts of Woodchuck Pond, Greenwoods Conservancy, Otsego County, N.Y. 10 August 95.
jar extra water was decanted. The plankton were then placed on a Sedgewick Rafter cell and viewed through a compound microscope. This allowed plankton to be identified using Pennak (1989).

**Aquatic and Terrestrial Plants**

On 21 July 95, a plant survey of Woodchuck Pond and adjacent areas was conducted. Terrestrial plants, within a one meter radius, were placed in vasculums, while aquatic plants from within the pond itself were placed in a tub full of water for transportation. The plants were taken to the Biological Field Station, where they were pressed and dried at 100°F for about 15 hours. The dried plants were then identified with the assistance of field manuals (Brown, 1979; Knobel, 1980; Peterson, 1977; Peterson/McKenny, 1968; Petrides, 1958; Prescott, 1969; Preston, 1980). In most cases, family, genus, and species were recorded, but it was impossible to identify some plants to species, due to a poor sample or the lack of flowers or fruit. Identified specimens were mounted on herbarium paper for preservation.

**RESULTS**

**Hydrolab Readings**

The results of the Hydrolab readings are presented in Figures 2, 3 and Table 1. The dissolved oxygen levels near the bottom of the pond were below 6 mg/l. The temperature at the bottom of the pond, on 10 July 95, was between 18.70°C and 19.60°C. The temperature at the top of the pond was between 19.60°C and 19.75°C. The temperature at the bottom of the pond, on 10 August 95, was between 18.99°C and 19.40°C. The temperature at the top was between 22.43°C and 22.54°C.

**Benthic Invertebrates**

Three phyla, represented by eight orders, were found at Woodchuck Pond. A complete list is given in Table 2.

**Vertebrates**

Three species of vertebrates were found at Woodchuck Pond. All were amphibians. Refer to Table 3 for a complete listing.

**Zooplankton**

Table 4 shows the plankton collected at Woodchuck Pond. In the phylum Rotifera, family Brachionidae, the two genera,
Brachionus and Platlyias were not differentiated, as it was difficult to distinguish between them due to specific characteristics that were unable to be detected by the processes initiated for classification.

Aquatic and Terrestrial Plants

Table 5 is a complete taxonomic list of the plants collected at Woodchuck Pond.

Table 1. Water quality data collected at Woodchuck Pond, Greenwoods Conservancy, summer 1995.

<table>
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<th>HYDROLAB SITE</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
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</table>
Table 2. Macrobenthic invertebrates collected at Woodchuck Pond, Greenwoods Conservancy, summer 1995.

Phylum: Annelida
   Class: Hirudinea
      Order: Placobdellida

Phylum: Arthropoda
   Class: Crustacea
      Order: Amphipoda
   Class: Insecta
      Order: Coleoptera
      Order: Hemiptera
      Order: Megaloptera
      Order: Odonata

Phylum: Mollusca
   Class: Bivalvia
      Order: Prosobranchia

   Class: Gastropoda
      Order: Basomattophora

Table 3. Vertebrates collected at Woodchuck Pond, Greenwoods Conservancy, Summer 1995.

Phylum: Vertebrata
   Class: Amphibia
      Superorder: Lepospondyli
         Order: Urodela
            Suborder: Salamandroidea
               Family: Plethodontidae
                  Notophthalmus viridescens
                     Eastern newt

   Class: Amphibia
      Order: Salienta
         Family: Ranidae
            *Rana catesbeiana*  Bullfrog
            *Rana clamitans melanota*  Green frog
Table 4. Zooplankton collected at Woodchuck Pond, Greenwoods Conservancy, Summer 1995.

Phylum: Arthropoda  
   Class: Crustacea  
      Order: Cladocera  
         Family: Bosminidae  
           unknown #1  
         Family: Daphnidae  
           unknown #2  

Phylum: Rotifera  
   Class: Monogononta  
      Order: Ploima  
         Family: Asplanchidae  
            Asplanchna priodonta  
         Family: Brachionidae  
            Keratella cochlearis  
            Keratella quadrata  
            Brachionus*  
            Platyias*  
         Family: Notommatidae  
            Cephalodella sp.  
         Family: Synchaetidae  
            Polyarthra vulgaris  
         Family: Trichocercidae  
            Trichocerca multicrinis  

*either Brachionus or Platyias, see results.

Table 5. Vascular plants collected in and around Woodchuck Pond, Greenwoods Conservancy, Summer 1995.

Order: Campanulatae  
   Family: Compositae  
      Achillea lanulosa  
      Cirsium palustre  
      Solidago sp.  
      Yarrow  
      Marsh thistle  
      Goldenrod  

Order: Eufilicales  
   Family: Polypodiaceae  
      Onoclea sensibilis  
      Sensitive fern
Order: Glumiflorae
   Family: Cyperaceae
      Carex folliculata  sedge
      Carex scoparia  sedge
      Carex vulpinoidea  sedge
      Eleocharis ovata  Spike rush
   Family: Graminae
      Agrostis alba  Red top
      Glyceria grandis  Reed meadow grass
      Leersia oryzoides  Rice cat grass
      Phalaris arundinacea  Reed canary grass
      * Phleum pratense  Timothy

Order: Helobiae
   Family: Naidaceae
      Potamogeton natans  pondweed
      Potamogeton sp.  pondweed

Order: Liliiflorae
   Family: Juncaceae
      Juncus canadecisis  Canada rush
      Juncus effusus  Soft rush

Order: Myrtiflorae
   Family: Haloragaceae
      Myriophyllum exalbescens  Milfoil

Order: Pandanales
   Family: Typhaeae
      Typha latifolia  Cattail

Order: Parietales
   Family: Guttiferae
      Hypericum mutilum  Dwarf St. Johnswort
      Hypericum perforatum  Common St. Johnswort

Order: Polygonales
   Family: Polygonaceae
      Polygonum hydropiper  Common smartweed

Order: Ranales
   Family: Ranunculaceae
      Ranunculus acris  Common buttercup

Order: Rhoeadales
   Family: Cruciferae
      Barbarea vulgaris  Wintercress
Order: Rosales
  Family: Leguminosae
    * Trifolium hybridum  Alsike clover
    Vicia cracca  Cow vetch
  Family: Rosaceae
    Spiraea latifolia  Meadowsweet

Order: Rubiales
  Family: Rubiaceae
    Galium asprellum  Rough bedstraw
    * Galium boreale  Northern bedstraw
    Family: Valerianarceae
      Valeriana officinals  Valerian

Order: Salicales
  Family: Salicaceae
    Salix nigra  Black willow
    Salix sericea  Silky willow
    Salix serissima  Autumn willow

Order: Tubiflorae
  Family: Labiatae
    Galeopsis tetrahit  Hemp nettle
    Lycopus virginicus  Bugleweed
    Mentha piperita  Peppermint
    Satureja vularis  Basil

* Two samples collected

DISCUSSION

The research done on Woodchuck Pond will be used in conjunction with other biological surveys conducted within the conservancy to help gain a greater understanding of the biotope.

Since trout are threatened in dissolved oxygen levels of less than 6 mg/l (Piper, 1982), it can be determined that the oxygen levels in Woodchuck Pond were too low to sustain the introduced rainbow trout. Additionally, temperature may be an important consideration concerning trout survival. Rainbow trout are intolerant of temperatures above 21°C (70°F) (Smith, 1985). Due to the shallowness of this pond, temperature throughout the pond likely exceeds this by late summer.

However, the other data collected represent a reasonable biotope for trout. The predominant limiting factor for the trout in Woodchuck Pond is low dissolved oxygen levels. Though the trout may be able to survive for a short time, this pond seems more suitable for habitation by warm water fish species.
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REFERENCES


