

*Same*



UNIVERSITY OF MASSACHUSETTS  
AT AMHERST

Department of Forestry and Wildlife Manage

Holdsworth Hall  
Amherst, MA 01003

December 31, 1985

Mr. Len Bobinchock  
USDI - NPS, NARO  
15 State St.  
Boston, MA 02109

Dear Len:

Enclosed is John Edman's report on the PULSE mosquito work. I sent the original because it has color photographs and figures. I read through it and it seems reasonable, but mosquitoes are a bit out of my area of expertise so I will rely on you to evaluate the report from the standpoint of ROVA's needs. I have discussed with John the possibility of additional sampling early next spring. That fits with his recommendations and he seems agreeable to a couple of more trips to Hyde Park.

John leaves for two months in the Far East and Southeast Asia on January 10. If you have questions that need immediate answers you should call John before the 10th at 1-413-545-2284. His home phone is 1-413-549-5407, and I imagine that he would not mind taking a call there if you can't get him at work. If you have general comments on the report you can send them to me, and I will see to it that John receives them when he returns to the States.

Sincerely,

*Bill*

William A. Patterson III  
Assoc. Prof. of Forestry

Encl.

## VALKILL MOSQUITO SURVEY

### I. Introduction

The purpose of this study was to identify the species and breeding sources of the pest mosquitoes which annoy visitors to Valkill and provide recommendations relative to the abatement of this problem. According to Park Service personnel, mosquitoes frequently limit the time visitors spend at Valkill and their enjoyment of the grounds. This problem is reportedly most intense during the first half of the summer season.

1985 proved to be an unusually light mosquito year throughout the Northeast and for this reason it was not an ideal year for conducting a one-time survey. Nonetheless, useful data were collected and some tentative recommendations can be made. The low water table, light winter snowfall, and lack of major spring and summer rainstorms, all contributed to the low mosquito populations.

### II. Survey Methods

Mosquitoes were sampled in three ways. Adults were surveyed by operating 2 New Jersey light traps 3 nights per week from mid May until late August and by taking afternoon and evening human biting collections on the day of each monthly larval survey. Larval surveys were carried out by the standard dipping method in all potential breeding sites (i.e. areas with standing water) that were found during each visit. All larvae and adults collected were returned to the University of Massachusetts and identified to species. Pupae were reared to adults and then identified. Park Service personnel operated the NJ light traps and stored the collections until they were picked up each month. One NJ light trap was located at the edge of the wet forest behind the Playhouse and the other was located in the open, on the edge of the flower garden (see Figs. 1, 3 & 4). Because of operational difficulties, the trap by the flower garden did not provide reliable samples during the first part of the summer. All afternoon biting collections were made along the lower part of the forest trail from the Parking lot to where the trail is bisected by the high voltage power line. Mosquitoes attempting to bite that were noticed during the first hour of larval sampling were captured with a mouth suction tube. This procedure probably captured no more than half of the mosquitoes that were encountered. Night time biting collections were made from the exposed legs of the same person seated on a lawn chair next to the woods near the chicken coop (Fig. 5). Collections lasted from sunset until 1 1/2 hours after sunset. A red flashlight was used after it became too dark to see the mosquitoes which also were

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collected with a mouth suction tube. This procedure was about 75 % efficient before dark and about 50 % efficient when the flashlight was used after dark.

### III. Results

#### A. Larval Surveys (Table 1)

At the time of the initial visit to Valkill on April 27, it was anticipated that the spring or snow-melt, univoltine (single generation/year) Aedes would be nearing completion of their development and starting to emerge. These mosquitoes are often extremely dense in the temporary woodland snow-melt pools that are found in northern hardwood and coniferous forests each spring. However, only small numbers of spring Aedes were found at Valkill in April 1985: in the wooded ravine beyond the parking lot (site 2, Fig. 6), the wooded pothole on the South side of the entrance road (site 11, Fig. 14) and the marshy drainage areas West of the road to the caretaker's house (site 15) and on the North side of the entrance road (site 14, Fig. 17). Four different species of spring Aedes were collected: Aedes abstrusus, Aedes canadensis, Aedes cinereus, and Aedes excrucians. Both 3rd and 4th (final) instar larvae and pupae were found but no emerging or flying adults were seen. Adults of these species normally do not bite until a few days after emergence but no evidence (i.e. cast pupal skins) of an earlier emergence was seen. Park personnel indicated they had just started noticing a few mosquitoes in the past few days. The upper and lower ponds in the woods along the trail (sites 5 & 6, Figs. 8 & 9) looked like ideal habitat for spring Aedes but no larvae were found. Perhaps these areas had supported populations that had already emerged.

In addition to spring Aedes, a few wet tree holes with Aedes triseriatus were noted and Culiseta morsitans (bird feeding species) larvae were found in site 14. Adult black flies were observed flying around our heads near the dam and Simulium tuberosum larvae and pupae were found on rocks and trailing vegetation below the spillway (site 8, Fig. 11).

At the time of the 2nd survey on June 18, few larvae were found anywhere. Culex territans (frog feeding species) were found along the border of Fall Kill Brook (site 4, Fig. 7) and the upper trail pond (site 5, Fig. 8). A water-filled garbage can near the chicken coop had larvae of Culex restuans, another bird feeding species. The only human pest species found were tree hole Aedes triseriatus and pupae of Anopheles punctipennis and larvae of Aedes vexans in the ditch near the culvert under the entrance road (sites 9 & 10, Figs. 12 & 13).

The 3rd survey on July 17, came shortly after a heavy rainfall and large numbers of last instars and pupae of the common reflood species, Aedes vexans were found in the depression on the South side of the main gate (site 9, Fig. 12) and in the ravine running through the hay field on the opposite (North) side of the main entrance gate. Other small, scattered depressions in this large field had Aedes vexans and both flooded areas also had many early instar Culex restuans and pipiens and a few Anopheles punctipennis. Standing water in the roadside ditches along the main entrance road (sites 9 & 10, Figs 12 & 13) had all stages of Anopheles punctipennis and 3 species of Culex (pipiens, salinarius & restuans). A few A. vexans pupae and 4th instar larvae also were found in these ditches. The upper trail pond (site 5, Fig. 8) had a few Culex territans and Uranotaenia sapphirina larvae and the ornamental pool on the patio by the stone cottage had some early instar Culex. A few unidentified Simulium black fly larvae were found below the dam outfall. Adult black flies were not annoying during this visit.

The final larval survey was conducted on August 21. The flood water areas near the main gate had all dried up and only the ditches along the main entrance road (sites 9 & 10, Figs. 12 & 13) were found to be breeding significant numbers of mosquitoes (Anopheles- and Culex). In addition, the swimming pool (site 16, Fig. -18), although covered, was now breeding large numbers of Anopheles in the corners where the cover was folded back and in the water on top of the cover. A few Culex pupae were found in the ornamental patio pool but the stream borders and upper trail pond were negative despite intense sampling.

#### B. Adult Surveys (Tables 2-6)

New Jersey Light Traps. Table 2 presents a monthly total of all female and male mosquitoes collected by the two NJ traps. Of the 20 species (or species groups) taken in these traps, only the Anophelesspp, Aedes spp, and Coquillettidia perturbans are human pests. Culiseta melanura is the enzootic vector of Eastern Equine Encephalomyelitis (EEE) virus but it is mainly a bird feeding species. It is not very attracted to NJ light traps, nor are many of the spring Aedes and the important reflood species, Aedes trivittatus. The weekly means (Williams mean) for each pest and non-pest group are shown in Tables 3 & 4. The permanent water Anopheles, Culex and Coq. perturbans show typical increasing population levels during the summer months. The single generation spring Aedes are short-lived and essentially gone by mid-June while the reflood Aedes (vexans & trivittatus) populations follow heavy seasonal rains. During 1985, the only

major brood of relood mosquitoes was associated with the mid-July storm mentioned earlier.

**Daytime Biting Collections.** Mosquitoes biting along the wooded trail during the afternoon hours (between 1 and 4 pm) were mainly species of spring Aedes and, to a lesser extent, Aedes trivittatus so the numbers declined during each monthly visit (Table 5). Two purely day-active species not taken in light traps, Aedes triseriatus and Psorophora ferox, were minimally represented in these collections. Annoyance from tabanids (deer flies & horse flies) increased during each monthly visit and Hippelates eye gnats also were bothersome along the wooded trail during the August 21 visit.

**Evening Biting Collections.** During the June and August visit to Valkill, almost equal numbers of mosquitoes were biting (i.e. about 1/min). Relood Aedes were common in both collections but the spring Aedes which were common in the June collection were replaced by Anopheles in the August collection. The human biting density in July was only about half that during the June and August visits. It should be noted that Aedes trivittatus was the most common relood species in both daytime and nighttime biting collections whereas A. vexans predominated in NJ light trap collections. This reflects the poorer response of A. trivittatus to light traps. It is also noteworthy that no larvae of this species were ever collected whereas large numbers of A. vexans larvae were collected during the July visit. Aedes trivittatus is a flood plain species that prefers shaded temporary pool whereas A. vexans occur in open sunny pools. The densely vegetated wet woodland along the entrance road and the road to the caretaker's house was less accessible for sampling because of the prolific growth of poison ivy. It is likely that some of the same woodland areas which produce univoltine Aedes in the spring, produce A. trivittatus after heavy rains.

#### IV. Conclusions and Recommendations.

The main pond and Fall Kill brook waterway at Valkill do not constitute an important source of pest mosquitoes. Some nuisance black flies are produced below the dam (pond outfall) and they could easily be eliminated by splitting the dam into two halves and alternating the half over which the water is allowed to flow by adding retaining boards to one side and taking them away from the other every two weeks.

Spring and relood Aedes are the major human pests which annoy visitors and Park Service personnel at Valkill during the

daytime and early evening hours. Anopheles are abundant but they do not start biting until about 30 min after sunset. Aedes vexans and some Anopheles are produced in the poorly drained roadside ditches along the main entrance road and in the depressions in the hay field north of the main gate. These breeding areas could be permanently eliminated at a reasonable cost by some well designed drainage work (i.e. grading and filling). Alternatively, they could be hand treated with brickettes of Bacillus thuringiensis israelensis (BTI) after each major summer rain or every 10 days when water is permanently standing in these ditches during the summer. BTI is a new biological control agent that is extremely specific against mosquito larvae, is non-toxic to vertebrates, and has little adverse effect on other aquatic organisms.

The woodland pools which produce the spring hatch species and later, A. trivittatus, are less well defined. If these pools were identified and well mapped it would be feasible to also hand treat them with BTI brickettes once in early April to eliminate the spring hatch and again during the summer 2-3 days after major rains occur. The amount of BTI brickettes needed for a season should cost less than \$1000. It is recommended that another visit to Valkill take place between late March and early April in order to better document the location of all woodland pools, and a second visit after the first heavy rains to document which of these woodland pools also produce reflood A. trivittatus.

Tabanids and eye gnats are at time extremely annoying along the woodland trail but control of these pests is simply not feasible. They are not a significant problem anywhere else at Valkill.

If mosquito densities at Valkill never exceeded the levels witnessed during 1985 (no more than 1 bite per minute), the problem would be marginal in terms of instituting control procedures. However, conversations with Park Service personnel indicate that this was not a normal year and that densities frequently exceed those tolerated by visitors. It is on this basis that the control suggestions included here have been made.

TABLE 1. SUMMARY OF MOSQUITO LARVAL SURVEYS AT VALKILL - 1985

| Code | Location                                         | Apr 27 | Jun 18 | Jul 17 | Aug 21 |
|------|--------------------------------------------------|--------|--------|--------|--------|
| 1.   | Meandering stream West Side of Service Rd        | -      | -      | -      | -      |
| 2.   | Drainage Ravine SE of Parking Lot                | +      | -      | -      | -      |
| 3.   | Tributary of Fall Kill Brook on W. Side of Trail | -      | -      | -      | -      |
| 4.   | Quiet Borders of Fall Kill Brook So. of Pond     | -      | +      | +      | -      |
| 5.   | Pond So. Side of Trail                           | -      | +      | +      | -      |
| 6.   | Pond W. Side of Trail                            | -      | -      | dry    | dry    |
| 7.   | Marshy edge of Pond                              | -      | +      | -      | -      |
| 8.   | Pond Dam Outfall                                 | +      | +      | +      | +      |
| 9.   | Rd Ditch So. Side of Entrance Rd.(by culvert)    |        | +      | +      | +      |
| 10.  | Rd Ditch No. Side of Entrance Rd.(by culvert)    |        | +      | +      | +      |
| 11.  | Tree-Lined Pothole So. Side of Entrance Rd.      | +      | -      | dry    |        |
| 12.  | Depression So. Side of Main Gate                 |        | dry    | +      | dry    |
| 13.  | Hay Field Ravine No. Side of Main Gate           |        | dry    | +      | dry    |
| 14.  | Wooded Marsh No. Side of Entrance Rd.            | +      | -      | -      |        |
| 15.  | Marshy Drainage in Woods W. Side of Caretaker Rd | +      | -      |        |        |
| 16.  | Swimming Pool                                    | -      | -      | -      | +      |
| 17.  | Cottage Patio Fish Pool                          |        |        | +      | +      |
| 18.  | Garbage Can by Chick. Coop                       |        | +      | gone   |        |
| 19.  | Misc. Wet Tree Holes                             | +      | +      | +      |        |

+ Sampled and breeding found

- Sampled but no breeding found

TABLE 2. SUMMARY OF ALL NJ LIGHT TRAP COLLECTIONS AT VALKILL - 1985

| SPECIES                   | May |   | June |    | July |    | August |     | TOTAL |     |
|---------------------------|-----|---|------|----|------|----|--------|-----|-------|-----|
|                           | F   | M | F    | M  | F    | M  | F      | M   | F     | M   |
| <i>Anopheles barberi</i>  | 0   | 0 | 0    | 0  | 1    | 1  | 0      | 0   | 1     | 1   |
| <i>An. punctipennis</i>   | 13  | 1 | 20   | 2  | 45   | 7  | 105    | 17  | 192   | 27  |
| <i>An. quadrimac.</i>     | 4   | 0 | 1    | 0  | 18   | 2  | 19     | 1   | 42    | 3   |
| <i>An. walkeri</i>        | 1   | 0 | 0    | 0  | 1    | 0  | 0      | 0   | 2     | 0   |
| <i>Aedes abser./punc.</i> | 3   | 2 | 0    | 0  | 0    | 0  | 0      | 0   | 3     | 2   |
| <i>Ae. canadensis</i>     | 0   | 0 | 1    | 0  | 0    | 0  | 0      | 0   | 1     | 0   |
| <i>Ae. cinereus</i>       | 1   | 0 | 0    | 0  | 3    | 0  | 2      | 0   | 6     | 0   |
| <i>Ae. excrucians</i>     | 2   | 0 | 1    | 0  | 0    | 0  | 0      | 0   | 3     | 0   |
| <i>Ae. stimu./fitchii</i> | 1   | 0 | 0    | 0  | 1    | 0  | 0      | 0   | 2     | 0   |
| <i>Ae. trivittatus</i>    | 0   | 0 | 7    | 0  | 9    | 0  | 38     | 0   | 54    | 0   |
| <i>Ae. vexans</i>         | 0   | 0 | 12   | 3  | 13   | 2  | 47     | 8   | 64    | 13  |
| <i>Culex pipiens</i>      | 1   | 0 | 0    | 0  | 10   | 0  | 34     | 4   | 45    | 4   |
| <i>Cu. restuans</i>       | 3   | 1 | 21   | 3  | 33   | 1  | 29     | 0   | 86    | 5   |
| <i>Cu. salinarius</i>     | 0   | 0 | 3    | 0  | 5    | 0  | 4      | 0   | 12    | 0   |
| <i>Cu. territans</i>      | 3   | 4 | 4    | 16 | 5    | 11 | 7      | 10  | 19    | 41  |
| <i>Cu. spp</i>            | 1   | 1 | 14   | 6  | 23   | 18 | 79     | 16  | 117   | 41  |
| <i>Culiseta meTanura</i>  | 0   | 0 | 1    | 0  | 0    | 0  | 2      | 0   | 3     | 0   |
| <i>Cs. morsitans</i>      | 0   | 0 | 3    | 0  | 0    | 0  | 1      | 0   | 4     | 0   |
| <i>Cs. spp</i>            | 0   | 0 | 0    | 0  | 0    | 0  | 0      | 1   | 0     | 1   |
| <i>Coq. perturbans</i>    | 0   | 0 | 9    | 4  | 37   | 1  | 33     | 0   | 79    | 5   |
| <i>Psor. ciliata</i>      | 0   | 0 | 0    | 0  | 1    | 0  | 0      | 0   | 1     | 0   |
| <i>Uran. sapphirina</i>   | 4   | 0 | 3    | 0  | 182  | 25 | 98     | 97  | 287   | 122 |
| TOTAL ALL SPECIES         | 37  | 9 | 100  | 34 | 387  | 68 | 498    | 154 | 1022  | 265 |
| TOTAL TRAP NITES          | 5   |   | 11   |    | 13   |    | 18     |     | 47    |     |
| FEMALES/TRAP NIGHT        | 7.4 |   | 9.1  |    | 29.8 |    | 27.7   |     | 21.7  |     |

TABLE 3. WEEKLY MEAN (Williams) NO. FEMALES/ TRAP NIGHT (Play House)

| Week<br>Ending (n) | Spring<br>Aedes | Reflood<br>Aedes | Coq.<br>pert. | Anoph.<br>spp. | Culex<br>spp. | Culis.<br>spp. | Other |
|--------------------|-----------------|------------------|---------------|----------------|---------------|----------------|-------|
| May 25 (2)         | 1.5             | 0                | 0             | 2              | 0             | 0              | 1.5   |
| June 1 (4)         | 2.5             | 0                | 0             | 5              | 3             | 1.5            | 1.75  |
| 8 (4)              | 1.25            | 2.25             | 0             | 2.5            | 3.75          | 1.5            | 0     |
| 15 (2)             | 0               | 2                | 0             | 0              | 2             | 0              | 0     |
| 22 (0)             | -               | -                | -             | -              | -             | -              | -     |
| 29 (3)             | 1.25            | 3                | 5             | 4.3            | 9             | 0              | 1.7   |
| July 6 (2)         | 0               | 5                | 2.5           | 4              | 9             | 0              | 1.5   |
| 13 (2)             | 0               | 0                | 4.5           | 4              | 5.5           | 0              | 5     |
| 20 (1)             | 0               | 2                | 5             | 14             | 27            | 0              | 12    |
| 27 (3)             | 0               | 6                | 7.7           | 14.3           | 13.7          | 0              | 28    |
| Aug 3 (3)          | 0               | 3                | 2.3           | 3.3            | 5             | 0              | 3.7   |
| 10 (3)             | 0               | 7.3              | 5.3           | 12             | 20.3          | 0              | 7.7   |
| 17 (3)             | 0               | 8.3              | 3.7           | 17.7           | 18.7          | 1.7            | 11.7  |
| 24 (2)             | 0               | 6                | 1.5           | 9              | 6.5           | 1.5            | 5     |

TABLE 4. WEEKLY MEAN (Williams) NO. FEMALES/TRAP NIGHT (Garden)

| Week<br>Ending | Spring<br>Aedes | Reflood<br>Aedes | Coq.<br>pert. | Anoph.<br>spp. | Culex<br>spp. | Culis.<br>spp. | Other |
|----------------|-----------------|------------------|---------------|----------------|---------------|----------------|-------|
| Jul 27 (3)     | 0               | 1.3              | 1.3           | 1.7            | 1.3           | 0              | 6.3   |
| Aug 3 (3)      | 1.3             | 2                | 2.3           | 0              | 3.7           | 0              | 5     |
| 10 (3)         | 0               | 3.7              | 2.3           | 2.3            | 6.3           | 0              | 5.7   |
| 17 (3)         | 0               | 5.7              | 1.3           | 2              | 2.7           | 0              | 2.3   |
| 24 (2)         | 0               | 3.5              | 2             | 3              | 3             | 0              | 4     |

TABLE 5. DAYTIME HUMAN BITING COLLECTIONS AT VALKILL (1 hour)

| SPECIES                      | June 18 | July 17 | Aug 21 |
|------------------------------|---------|---------|--------|
| <i>Aedes canadensis</i>      | 1       | 1       | 0      |
| <i>Ae. cinereus</i>          | 0       | 0       | 1      |
| <i>Ae. stimulans/fitchii</i> | 31      | 6       | 0      |
| <i>Ae. triseriatus</i>       | 0       | 0       | 1      |
| <i>Ae. trivittatus</i>       | 7       | 2       | 5      |
| <i>Ae. vexans</i>            | 2       | 0       | 0      |
| <i>Psorophora ferox</i>      | 0       | 0       | 1      |
| TOTAL                        | 41      | 10*     | 8**    |
| BITES/MIN                    | 0.68    | 0.17    | 0.13   |

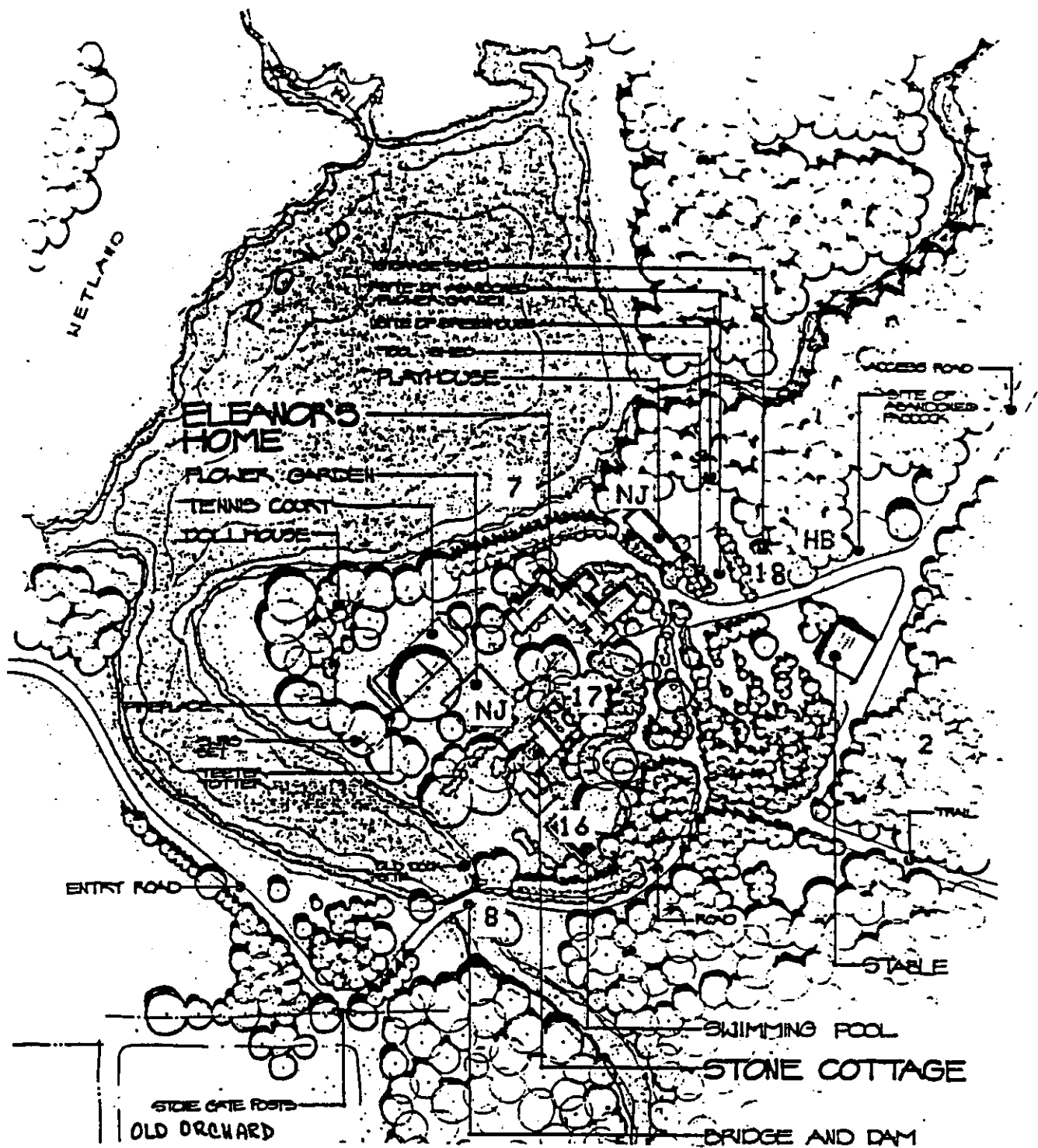
\* 3-4 Tabanids constantly attempting to bite

\*\* Many Tabanids attempting to bite & Hippelates eye gnats around head

TABLE 6. EVENING HUMAN BITING COLLECTIONS AT VALKILL (1.5 hr)

| SPECIES                       | June 18 | July 17 | Aug 21 | Sept 29 |
|-------------------------------|---------|---------|--------|---------|
| <i>Anopheles punctipennis</i> | 13      | 14      | 33     | 2       |
| <i>An. quadrimaculatus</i>    | 0       | 4       | 17     | 2       |
| <i>Aedes canadensis</i>       | 26      | 0       | 1      | 0       |
| <i>Ae. cinereus</i>           | 2       | 1       | 0      | 1       |
| <i>Ae. sticticus</i>          | 0       | 0       | 0      | 1       |
| <i>Ae. stimulans/fitchii</i>  | 17      | 2       | 0      | 0       |
| <i>Ae. triseriatus</i>        | 0       | 0       | 0      | 1       |
| <i>Ae. trivittatus</i>        | 33      | 9       | 24     | 3       |
| <i>Ae. vexans</i>             | 3       | 0       | 12     | 3       |
| <i>Coq. perturbans</i>        | 2       | 6       | 3      | 0       |
| TOTAL                         | 96      | 36      | 90     | 13*     |
| BITES/MIN                     | 1.07    | 0.4     | 1      | 0.14    |

\* Cool night; all mosquitoes captured in first 30 min.



HB = Human Biting Collection Site

NJ = New Jersey Light Trap Site

Numbers Correspond to Larval Collection Site Code in Table 1

# HISTORICAL CORE

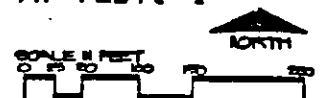
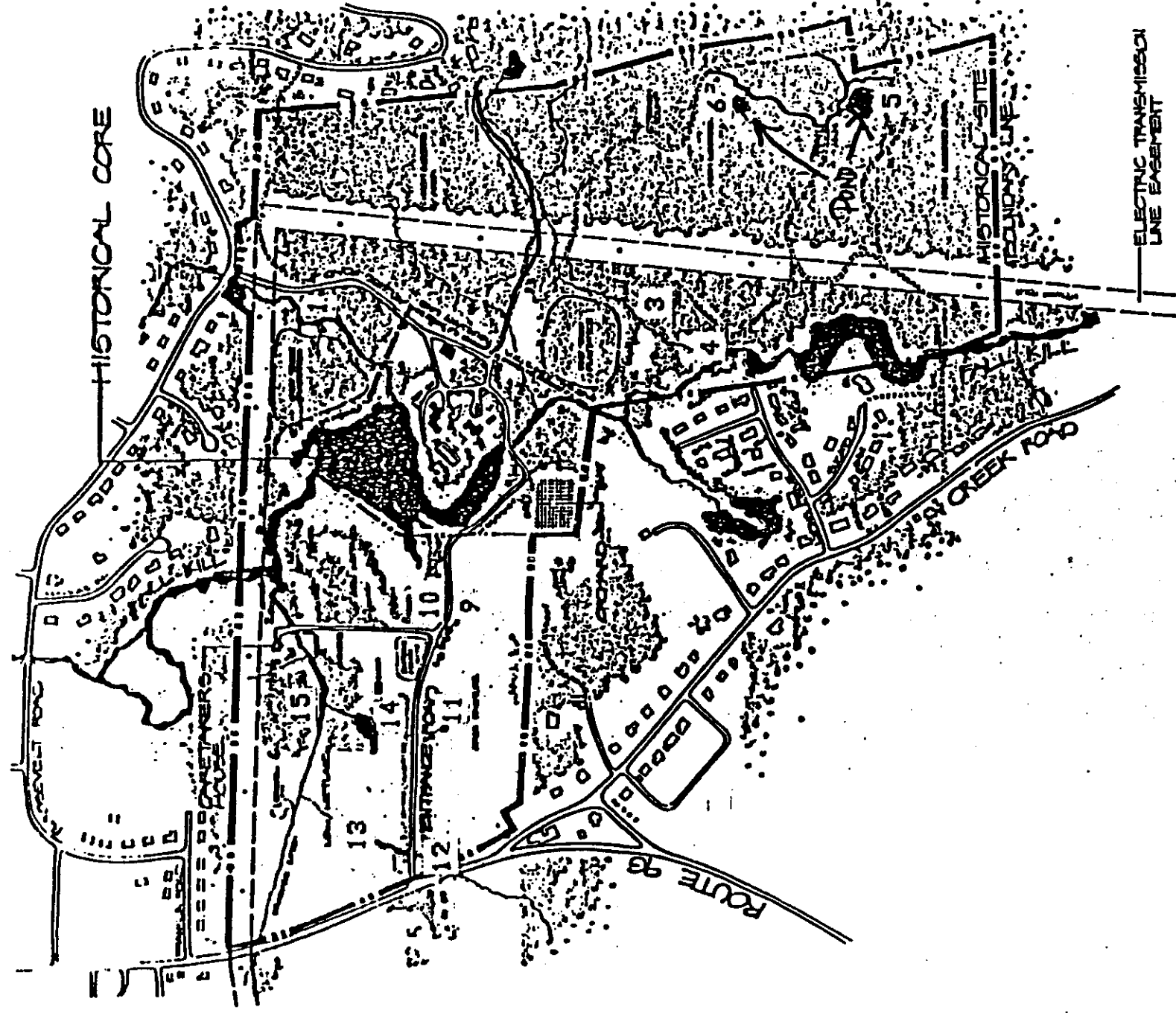


Figure 1. Core Area Map Showing Location of New Jersey Light Traps Human Biting Collection Site and Some Larval Collection Sites (see Code in Table 1 and Figs. 3-19).



# HISTORIC SITE

Figure 2. Area Map Showing Location of Larval Collection Sites (see Code in Table 1 and Figs. 3-19).



UNIVERSITY OF MASSACHUSETTS  
AT AMHERST

Department of Forestry and Wildlife Management

Holdsworth Hall  
Amherst, MA 01003

January 5, 1987

Mr. Len Bobinchock  
USDI-NPS, NARO  
15 State St.  
Boston, MA 02109-3572

Dear Len:

Enclosed is a short addendum to John Edman's report on the ELRO mosquito work. John's initial sampling in 1985 was too late to catch the early spring breeding so he made a trip to Hyde Park on April 11, 1986.

I think the report is self explanatory. Give John a call if you have questions.

Sincerely,

*Bill*

William A. Patterson III  
Associate Professor  
Forestry

WAP/lmb  
Encl.

VALKILL MOSQUITO SURVEY  
(Supplemental Report)

In order to validate certain inferences that were made in my 1985 report concerning the larval development sites of spring *Aedes* mosquitoes at Valkill, a follow up visit was made on April 11, 1986. This date was prior to the earliest emergence of adult snow pool mosquitoes so there was no possibility that certain early populations were missed as in 1985.

There were no major surprises, so the conclusions in our 1985 report remain unchanged. Fairly dense larval populations (i.e. 5-50/dip) were found in most woodland depressions with standing water, especially in the area just beyond the employees parking lot shown in Fig. 1A (site 2, Fig. 6 in our 1985 report). Larval collections are summarized in Table 1A. Both the upper and lower ponds along the woods trail (sites 5 & 6, Figs. 8 & 9 in the 1985 report), supported some breeding pockets of larvae around the edges but few if any larvae were found in the main body of these two ponds. Surprisingly, a few *Aedes canadensis* larvae were found in the small, open (unwooded) pool associated with the culvert under the main entrance road (site 9, Fig. 12 in the 1985 report). Perhaps these larvae hatched in the wooded area on the opposite side of the road and swam through the culvert to the other (=South) side since it is highly unusual for spring *Aedes* to oviposit their eggs in such an open site. Larvae were found in only one site that was not described in the 1985 report. This site was a round woodland pool just over the embankment along the West side of the recently cut trail leading to the new electrical pole in the woods near the caretakers house. This short trail originates along the right (East) side of the road leading from the Main Valkill entrance road to the caretakers house and terminates at the electric pole.

The number of larval development sites of spring-hatch *Aedes* at Valkill and the density of larvae in the sites sampled seem sufficient to produce annoying adult densities of these species in late spring and early summer. Although some movement of adult mosquitoes in Valkill from surrounding areas surely must occur, the terrain at the Valkill property itself is such that a moderate-high resident population of spring-hatch mosquitoes can be produced during any season when climatic conditions are favorable. Some hand ditching and filling work could greatly reduce the number of mosquitoes produced in the large woodland pool just beyond the employees parking lot Fig. 1A. Spring-hatch *Aedes* pose some human health threat as a result of their role as the vectors and transmitters of dangerous human and animal diseases.

Table 1A. Larval collections made at Valkill, April 11, 1986.

| Sites*                  | Brief Description                                                                              | Species Collected                                       |
|-------------------------|------------------------------------------------------------------------------------------------|---------------------------------------------------------|
| Site 2/Fig 6            | Woodland pool in drainage ravine SE of employee's parking lot (see Fig. 1A)                    | Aedes stimulans<br>Aedes excrucians                     |
| Site 5/Fig 8            | Upper pond along main forest trail for visitors                                                | Aedes stimulans<br>Aedes excrucians<br>Aedes fitchi     |
| Site 6/Fig 9            | Lower pond (smaller & temporary) along main forest trail for visitors                          | Aedes excrucians<br>Aedes canadensis<br>Aedes stimulans |
| Site 10/Fig 12          | Open pool in ditch on south side of main entrance road.                                        | Aedes canadensis                                        |
| Site 9/ Figs<br>12 & 13 | Wooded swamp on north side of road from Site 9 to gate to caretaker's road.                    | Aedes canadensis                                        |
| Site 11/Fig 14          | Large wooded pothole surrounded by meadow on so. side of main entrance road                    | Aedes stimulans<br>Aedes excrucians<br>Aedes canadensis |
| New Site                | Round woodland pool on west side of foot trail from the caretaker's road to the electric pole. | Aedes stimulans<br>Aedes canadensis                     |

\* Sites and Figures from 1985 report on the mosquito study at Valkill



FIG. 1A. Section of the elongate woodland pool just beyond the employee's parking lot at Valkill. Third and 4th instar larvae (approx. 30/dip) of spring-hatch Aedes mosquitoes were collected here on April 11, 1986 when this photo was taken.