Dr. Richard A. Orson
Orson Environmental Consulting
Branford, CT 06405

RE: Bare Hill Pond
Habitat Monitoring Assessment Report

INTRODUCTION

One of the major problems facing wetlands and watercourses is the introduction of invasive plant species (both introduced and native or naturalized invasive species). Often these species begin to crowd out native non-invasive plants and choke waterways. There are a number of ways available for control (i.e., chemical, biological and mechanical) and all with a varying degree of success and danger to the environment. Although, chemical controls (i.e., herbicides) are probably the most successful method for eliminating pest species, they are also the most dangerous with the highest degree of secondary effects. Biological controls (e.g., introduction of herbivorous insects) are, at times, also successful, but they too may have significant impacts on the surrounding environment should the intended control agent begin to behave differently than expected. Mechanical controls (e.g., hydrologic manipulations, harvesting) tend to have the fewest secondary consequences but are also the least effective of the three.

At Bare Hill Pond, the invasive problems are in the Pond itself. Submerged aquatic vegetation (SAV) such as variable Milfoil (Myriophyllum heterophyllum) and Robbin's pondweed (Potamogetan Robbinsii) encompass much of the pond and is interfering with recreational use of the system. A study by ENSR in 1998 found that most of the areas of the pond above 8 ft depth were experiencing significant colonization by SAVs with many areas containing 75% or above cover (Bare Hill Pond Water Quality and Aquatic Plant Evaluation. ENSR 1998).

The reasons for the increases in SAVs have been tied to a number of changes to the landscape including hydrologic manipulations and decreases in water quality, particularly due to

an increase in nutrient loading (phophorus and nitrogen) during the last century. To begin, Bare Hill Pond is not a natural feature to the landscape. The site was a mix of open water and wetland prior to the construction of the dam. So the pond in its present configuration is relatively new to the landscape. Second, nutrient inputs into the systems are primarily from non-point sources. Although the area surrounding the pond is not over developed, nutrient inputs are still coming from lawns and septic systems, and maybe even some natural inputs from the soils. Further, it is just coming to light that a significant portion of nutrient loading (maybe 10 to 20n %) to aquatic habitats may now be coming from the atmosphere. Given the fact that many of the sources of nutrients are non-point in nature, it would be difficult and time consuming to return the landscape to nutrient levels that may have existed centuries ago. Therefore, until such time that we can control nutrient loading in these systems (i.e., switching over to sewer treatment plants, reducing fertilizer use in the farm in the mid-West), active plant control programs will have to be implemented and continued.

The SAV problem in Bare Hill Pond has been ongoing for a number of decades and controls have been attempted since the 1960s (application of herbicides). Today, as we learn more about these systems and the effects chemical herbicides have on the environment, we have begun to shy away from larges scale chemical controls in aquatic ecosystems. Therefore, mechanical methods have become the preferred control mechanism for invasive plant species. In response to the growing SAV problem in Bare Hill Pond, harvesting and draw-downs are being applied to control the SAV problem. Draw-downs manipulate the water levels in the pond with the expectation that freezing will control SAV production. Although this technique may be effective for controlling SAV populations, it also has the secondary effect of interfering with hydrologic cycles on the landscape by changing the rate and timing of water flows through the system. Although wetlands have evolved to include variation in hydrology there are limits to change that any habitat can withstand. Therefore it is important to know if the draw-down may be impacting other habitats besides the SAV community within the Pond.

In 2002, the Town of Harvard Conservation Commission issued a permit to the Bare Hill Pond Committee to conduct an SAV control plan with the conditions that the draw-down be accompanied by an assessment of impacts that such a course of action may include. The

permit required the committee to assess (1) the effectiveness of the program and (2) monitor impacts this procedure may have on the surrounding habitats, particularly the fringe wetlands surrounding the system. Based on a series of previous reports completed by ENSR during the mid 1990s, the Conservation Commission laid out a series of studies that would be required in order to address these conditions. The permit relied on professional studies for assessing the habitat, but did not include a source of funding to carry out the initiative. Therefore, when OEC was contacted to help with the project, it was proposed that the methods of assessment be refined to allow a volunteer force to carry out most of the monitoring. The original permit was amended during the winter of 2003 to simplify the techniques without a significant loss in ability to assess the potential changes to the wetland habitat that may accompany a draw-down.

APPROACH

As is the case in any volunteer effort, there are limitations on what information can be gathered and the time that is available to gather such information. To begin, an assessment of the present conditions at the site needed to be conducted. Relying on the previous ENSOR report and site visits to the area, it was decided that simple plant and animal surveys would go a long way in determining what, if any, impact the hydrologic manipulations associated with SAV control may be having on the surrounding wetland systems. Since plant community structure is a difficult topic to comprehend (changes from year to year may be due to a myriad of factors and almost impossible to relate to any one factor), it was decided that a more simplified approach was needed. The direction taken was to look at the transition area between the upland and the wetland and watch for any changes in boundaries conditions.

If the draw-down was effecting the hydrology of the system, it is anticipated that the wetland will either expand or shrink accordingly. Since the transition area is a marker for natural tolerances of the landscape to flooding, changes should show up here before more interior portions of the wetland. Further, since the downstream hydrology is a function of roads and culverts, drainage in the wetlands is artificially maintained by the lowest elevation of the first culvert. This results in elevated water levels for longer periods of time and helps to insulate the interior portions of the wetland from many of the impacts associated with changes in hydrology. Therefore sampling in the transition area will allow for better analysis of the overall impacts draw-down may be having on the systems beyond the pond itself.

Wetlands

The plant community structure of the wetland fluctuates annually even if there are no anthropogenic hydrologic manipulations associated with it. Even for the scientist, discerning forcing functions are a difficult and time-consuming task. Therefore, since the effort needed to be streamlined for a volunteer force, it was decided that the area best suited for study was the transition area between the wetland and the upland. It is here that the impacts of continued draw-down will first appear in the biologic record either as a permanent shift in water levels or a change in the vegetation that colonizes these areas, particularly the herb layer. This area is also more accessible and easier to sample, something that must be considered when a non-

professional volunteer force is being utilized. In order to achieve these goals, permanent transects were established in the transition zone between the wetland and the upland. Within these transects, the herb, shrub and tree layers were sampled and recorded, bird and amphibian surveys were conducted, and observations on mammal and reptiles were noted (see Methods section for more detail on sampling protocol).

The sampling being conducted here is a "first cut" and on its own will not answer the question of draw-down on the system. Rather this data provides a baseline sample from which future sampling can be compared. Since variation is part of any natural habitat (e.g., uplands, transition zones), this study will need to continue for years to come. One drawback of this data set is that these transects were not established prior to the initial draw-down. Although this will add a layer of uncertainty to the final assessments, over time this data will be able to provide an assessment of the impacts that may occur due to draw-down.

SAV Control

Another aspect of this study is, are these SAV control techniques effective. Although the original ENSR study utilized divers to investigate the SAVs, this is not a practical technique for a volunteer force. So other methods were needed in order to sample the SAV in the pond. Therefore, it was decided that remote sensing using photographs taken from the surface would be a safer approach to sampling (see Methods section for more detail on sampling protocol). Again, establishing permanent transects from the shore and following a repeatable protocol, it will be possible to follow the fate of SAV populations over time. Repeated over time, it should be possible to determine whether the SAV populations are growing, shrinking or staying the same.

METHODS

Transition Area Vegetation Sampling

Since the vegetation is the best indicator of potential change in the system, most efforts were concentrated here. Three transects were established in wetlands surrounding the pond (two downstream of the dam, one above)(Figure 1). All transects were established in the following manner:

1. A metal rod was hammered into the transition area soil within ten meters of the edge of the present day wetland (established by surface hydrology and vegetation). Another rod was inserted into the soil ten meters away from the first rod and parallel to the wetland limit line. These rods mark the transect limits and were sighted using a compass.
2. Starting at the first rod (five meter mark), 15 meter perpendicular transects (using meter tapes) were established at two meter intervals. The perpendicular transects extended ten meters towards the wetland (to insure that the wetland limit line was crossed) and five meters towards the upland (out of the transition zone). Each perpendicular transect was sampled for vegetation and the results recorded.
3. Herbs were sampled using the line intercept method at each meter interval (only those that touched the transect were recorded). Shrubs were recorded by species for canopy cover as a continuous measurement (any shrub cover overhanging the transect) the length of the transect (breaks in the shrub canopy were noted as well). Any tree (greater than 10 cm diameter at breast height (dbh)) that fell within the area encompassed by the outer dimensions of the transect (10 m x 15 m area) were mapped out, identified to species and measured for dbh. Other features such as edge of wetland, surface hydrology characteristics or interesting plants that did not actually touch the transect were noted as well.

Bird Surveys

Since the Audubon Society collects information on bird species throughout the area, the object here was not to repeat that list, but rather attempt to quantify use and activity within the system. To achieve this, bird census were conducted using the following methods:

1. Using the established vegetation transects as a jumping off point, an area defined by trees within the marsh and the surrounding uplands was established as a sampling zone. The bird survey crew led by Susan Hardy, stands at a vantage point on the surrounding hillside (facing east) and observed and recorded all bird activity over the established area for one hour per sampling period.

2. If a bird flew over the sampling area (height was not an issue), it was recorded as to species and direction, as best as possible. If the bird landed or nested within the sampling area it too was noted and designated with an "L" or "NL" respectively. If the bird was heard but not seen it was recorded as well ("H"). Notes were made on birds that may have been interesting but not necessarily found within the confines of the sampling area.

Mammal and Reptile Information

Due to the mobility of mammals and reptiles and time constraints and limits on expertise of the volunteers, no attempt was made to trap and quantify these animal communities. Rather information for these organisms will be gathered as observations on scat, footprints, burrows and other characteristics providing a qualified approach to the data. These data will be collected by the volunteers whenever they are in the vicinity of the Pond and not necessarily within the confines of the transect. If, in the future, it is deemed necessary to quantify these animal communities additional sampling techniques can be added as needed.

Amphibians

Since one of the volunteers has an interest and expertise in amphibians and these animals are more reliant on the hydrology of the system for their existence, amphibian populations were sampled using quantifiable techniques. The information for this sampling will not be submitted as part of this report.

Submerged Aquatic Vegetation (SAV)

In order to facilitate SAV sampling remote sensing techniques are being employed. Since ENSOR already established the foundation for SAV communities in their earlier reports, this information can be utilized (i.e., species identification, density of communities) here as well. Standardized photographs will be use to map and quantify SAV trends along designated transects using the following techniques:

1. Transects were established running perpendicular to the shore with their starting points marked by either a metal rod, a mark on a tree or some other permanent shoreline feature.

Although the location of the transect can be random, attempts will be made to reestablishing the transects utilized in the ENSR study (1998).

2. To sample each transect a marked rope line of established length is attached to the permanent transect marker at one end and a boat or canoe at the other (direction determined as close to perpendicular to the shore as possible). The line is then sampled at regular intervals along the transect.

3. In order to sample the SAVs, a camera rig was designed in the following manner. A pole was fitted with a flattened base. To this a camera attachment was placed at a pre-designated height above the base (height of the camera was based on clarity of the water). The waterproof camera was then attached to the pole and lowered over the side of the boat until the base came to rest on the bottom of the pond. Using a line level the pole was centered upright and a photograph was taken. The area of the photo can be quantified by using the base of the pole or by lowering a secchi disk to the bottom for scale,. Species and densities of the SAV can be established.

4. Where time and ability exist, stakes can be driven into the edge of an SAV area along the transects and followed through time. This would provide a qualified view of the changes in the SAV beds in response to control techniques and aid in our ability to assess whether these techniques are having the desired effect.

Fish

Fish census will be conducted by surveying local fishermen as to catch and size. If additional information is deemed necessary, additional fish surveys can be conducted with more traditional techniques (e.g., seine nets).

RESULTS

The results of the sampling are presented below. Assessments are based on a single sample year (2003) and will become the baseline data for future assessments. The field data are found in figures 2-11.

Transition Area Vegetation Sampling

Transect #1

Transect #1 is located just downstream of the dam. It is a grid of 10 m by 15 m. The area is dense with shrubs (Fig. 3) and consequently, there are few herbs within the grid (Fig. 2). The most frequent shrub is sweet pepperbush occurring in 67% (frequency) of the sampling area (Table 1). Most of the herbs are found down towards the wetland limit line and a few scattered trees occupy area as well (Fig 4).

Table 1. Frequecy of shrubs along transects expressed as percent. Frequency calculated by taking the number of meter intervals crossed by each species divided by the total number of possible meter intervals for each transect (96). Less than 1% denotes its presence on the transect but not crossing at any individual meter interval.

Transect	1	2	3
Sweet Pepperbush (*Clethra alnifolia*)	67	34	31
High bush Blueberry (*Vaccinium corymbosum*)	9	9	16
Witch Hazel (*Hamamelis virginiana*)	7	45	
Swamp Azalea (*Rhododendron viscosum*)		1	<1
Arrowwood (*Viburnum dentatum*)			<1
Winterberry (*Ilex montana*)			6
Buttonbush (*Cephalanthus occidentalis*)			2
TOTAL COVER	78	83	49

Transect #2

Transect #2 is located just downstream (north) of Transect #1. Like Transect#1, it is a 10 m by 15 m grid dominated by shrub cover. Here the shrubs are dominated by witch hazel toward the upland and sweet pepperbush towards the wetland (Fig. 6; Table 1)). The wetland limit line is well demarcated with the end of shrub cover and the beginning of herbs such as

tussock sedge (*Carex stricta*) and royal fern (*Osmunda regalis*) (Fig. 5). Trees are few and are dominated by red maple (*Acer rubrum*) and eastern white pine (*Pinus strobus*)(Fig 7).

Transect #3

Transect #3 is located above the dam at Barba's Point. Like the Transect#1 & #2, it is a 10 m by 15 m grid. Unlike Transects #1 & #2, there is less shrub cover (Table 1; Fig. 9) and subsequently more herbs (Fig. 8). Although shrub cover is dominated by sweet pepperbush and high bush blueberry the transect also includes a wider variety of plants such as winterberry, arrowwood, buttonbush and swamp azalea. The wetland limit line is well demarcated by the presence of water and plants such as cattail (*Typha* spp.). Some purple loosetrife (*Lythrum salicaria*) has made its way into the system as well (Fig. 8). Trees are few but include some oaks (*Quercus* spp.), hemlock (*Tsuga canadensis*) red maple and eastern white pine (Fig 10).

Bird Surveys

Bird surveys were conducted four times (6/14/03, 6/26/03, 7/3/03, 7/10/03) over the last few months under the direction of Ms. Susan Hardy. The results of the survey are shown on Figure11, a-d.

Bird surveys are based on activity within the plot only. Data includes species, number of occurrences, direction and general usage (e.g., flyover, landing nesting)(Table 2). The most common birds within the survey period are tree swallows (78 total sightings) and red-wing blackbirds (45) followed by common grackles, flycatchers and goldfinches. A single bird may fly in and out of the sample area and be counted multiple times for each sighting category. This probably accounts for the relatively high occurrences of swallows and red-wing blackbirds, two species that are both active and relatively territorial.

Table 2. Bird survey analyses. Sightings are based on individual occurrences of birds. A single bird could be responsible for multiple sightings as it moves into and out of the survey area. All data is the result of one-hour sampling periods. Data collected under the direction of Susan Hardy.

Date	6/14/03	6/26/03	7/3/03	7/10/03

# of identified species	18	28	43	13
# of sightings	55	114	129	72
# of unidentified sightings (%)	9(16)	13(11)	28(21)	18(25)
% Landings within Study Site	32	20	43	43

Mammal and Reptile Information

Evidence of **mammals** is limited. Deer scat, and deer and rabbit browsing were observed in the area of Transects #1 & #2. Vole and mouse runs were noted and residents have indicated that muskrats are present in and around the pond. Beaver cuts were noted in the vicinity of Transect #3. Of all of the mammals noted, beaver and muskrats would the most impacted mammals in a draw-down such as this. However, since there is no indication that beaver are inhabiting the pond, it is the muskrat that becomes the unknown in the equation. Their burrows are dug into the sides of the banks and are dependent upon water levels for protection, particularly during the late fall to early spring. In the future it may become necessary to conduct a more thorough investigation of muskrat populations around the pond.

Evidence of **reptiles** was also limited within the study area. Snake movements were evident in the mud and at least one turtle track was noted. It is too soon to assess the reptile populations and more observations will be required during the coming years.

A more inclusive species list is included in the 2002 ENSR report (Appendix C, Wildlife, habitat and vegetative assessment of Bare Hill Pond, with Management Implications, ENSR Report To Town of Harvard, 2002). This list includes both observed and expected wildlife (only 2 of the 57 species listed were actually observed on-site). Mammal and reptile sampling is too time consuming and the results are too ambiguous to use for determining draw-down impacts. Therefore, this study will continue to collect information on these organisms through secondary observation and will not attempt to quantify the results.

Amphibians

Data and analysis of amphibians are to be compiled by the Amphibian group under the direction of Mr. Jack Whelan.

Fish

Fish populations were to be surveyed using catch records as a collection method. To date, no surveys have been distributed and no direct information is available for this report.

Submerged Aquatic Vegetation (SAV)

SAVs will be sampled and reported by the SAV committee headed up by Christopher Ashley. Assessments of sampling and techniques will be determined upon completion of their report. Modifications may be required in future samplings to accommodate field conditions.

DISCUSSION AND CONCLUSIONS

In order to attempt to satisfy the conditions of approval for the draw-down permits, this first monitoring session has been conducted. Since this is the first year of monitoring, conclusions are limited. Impacts to any ecosystem are diverse and difficult to explain. Climate, human impacts and many other considerations interact to create the conditions for the continued development of an ecosystem. Separating any one forcing function is difficult. That is why ecologists are now stressing long-term studies to separate cycles in nature from trends due to individual activities. The draw-down of the pond is a single activity that does have the potential to have a major impact on the system, but that does not guarantee that it will occur. If the activity is done at the proper time of year and does not interfere with the spring growing season then its impacts may be minimal. The only way to know this is to monitor that situation and watch for changes in the environment over time.

The monitoring of transition areas in the environment will be the first step in discerning if the draw-down is having any impacts on the environment and what those impacts may be. The location of transects within the transition area were chosen because they exhibit a well-defined break between upland, transition and wetland habitats. These well-defined breaks will enable the Bare Hill Pond Committee to more precisely follow changes to the environment through time and limit the confusion associated with changes in plant community structure from year to year (following changes in an individual plant community is extremely difficult to do and even more difficult to assess). A change in the boundaries between wetland and upland plant communities may signal an impact due to draw-down; however, here too we need to be cautious about

cause and effect (i.e., changes in weather patterns can also claim responsibility. So one of the places we will be looking in the future is the weather data available from the U.S. Weather Service). Therefore, the key to this monitoring program will be data collection and assessment.

The hydrology of the system is now controlled at all levels. Source (input) of water to the downstream wetlands are maintained through the dam and sluiceway that helped create the pond in its present configuration. Drainage is controlled downstream by a series of roads and culverts that drain the landscape. In this case the road and culverts at the northern portion of the system are controlling flood stage and groundwater hydrology (the road dams water flow and the lowest elevation of the culvert controls drainage and wetland water levels). The culvert may actually be offsetting some of the impacts of pond management. The bottom of the culvert is the lowest limit of drainage for the wetland system located between the dam and the road. By dampening the natural hydrologic cycle associated with drainage, artificially maintaining water levels can support these areas even when the pond is in the process of refilling and outflow is limited (or even in drought years). Indeed, this culvert may be the reason why the wetlands in the area are still flourishing. Either way we must accept that Bare Hill Pond and its surrounding wetland systems are disturbed systems and may require active management well into the future.

Managing our natural resources is a difficult job. Not only do we not have a complete understanding of natural processes, we also have competing interests. Because of this, SAV control in Bare Hill Pond requires multiple management techniques and approaches. Controlling SAVs is not an easy task. The options that are available include mechanical, biological and chemical controls. The community is responsible for deciding on which controls they are willing to use and what price they are willing to pay to be most effective. Since the alternative to hydrological controls (draw-down) and harvesting (the techniques presently being employed) are applications of chemical growth inhibitors (members of the community have stated some reservation to this approach), the Conservation Commission may want to give the draw-down approach more time to be investigated. Now that the monitoring is being conducted using a scientific approach with repeatable sampling techniques, the impacts of draw-down can be assessed more properly in the future.

Upon completion of sampling for the season, techniques and data will be reassessed. In the future, modifications to these techniques may be required to accommodate data collection and expertise.

FIGURE LEGENDS

Figure 2. Results of herbaceous plant surveys along Transect #1. Transect runs from upland (0 meters) to wetland (15 meters) and crossed at 5 meters (horizontal line) by the permanent markers (metal rods inserted into the ground). Key to species is located at bottom of figure. Data collected June 14, 2003

Figure 3. Results of shrub sampling along Transect #1. Only shrub canopy located directly over the transect was included. Key to the species is located at bottom of figure.

Figure 4. Location, size and species of trees located within the sampling area of Transect #2.

Figure 5. Results of herbaceous plant surveys along Transect #2. Transect runs from upland (0 meters) to wetland (15 meters) and crossed at 5 meters (horizontal line) by the permanent markers (metal rods inserted into the ground). Key to species is located at bottom of figure. Data collected June 14, 2003.

Figure 6. Results of shrub sampling along Transect #2. Only shrub canopy located directly over the transect was included. Key to the species is located at bottom of figure.

Figure 7. Location, size and species of trees located within the sampling area of Transect #2.

Figure 8. Results of herbaceous plant surveys along Transect #3. Transect runs from upland (0 meters) to wetland (15 meters) and crossed at 5 meters (horizontal line) by the permanent markers (metal rods inserted into the ground). Key to species is located at bottom of figure. Data collected July 25, 2003

Figure 9. Results of shrub sampling along Transect #3. Only shrub canopy located directly over the transect was included. Key to the species is located at bottom of figure.

Figure 10. Location, size and species of trees located within the sampling area of Transect #3.

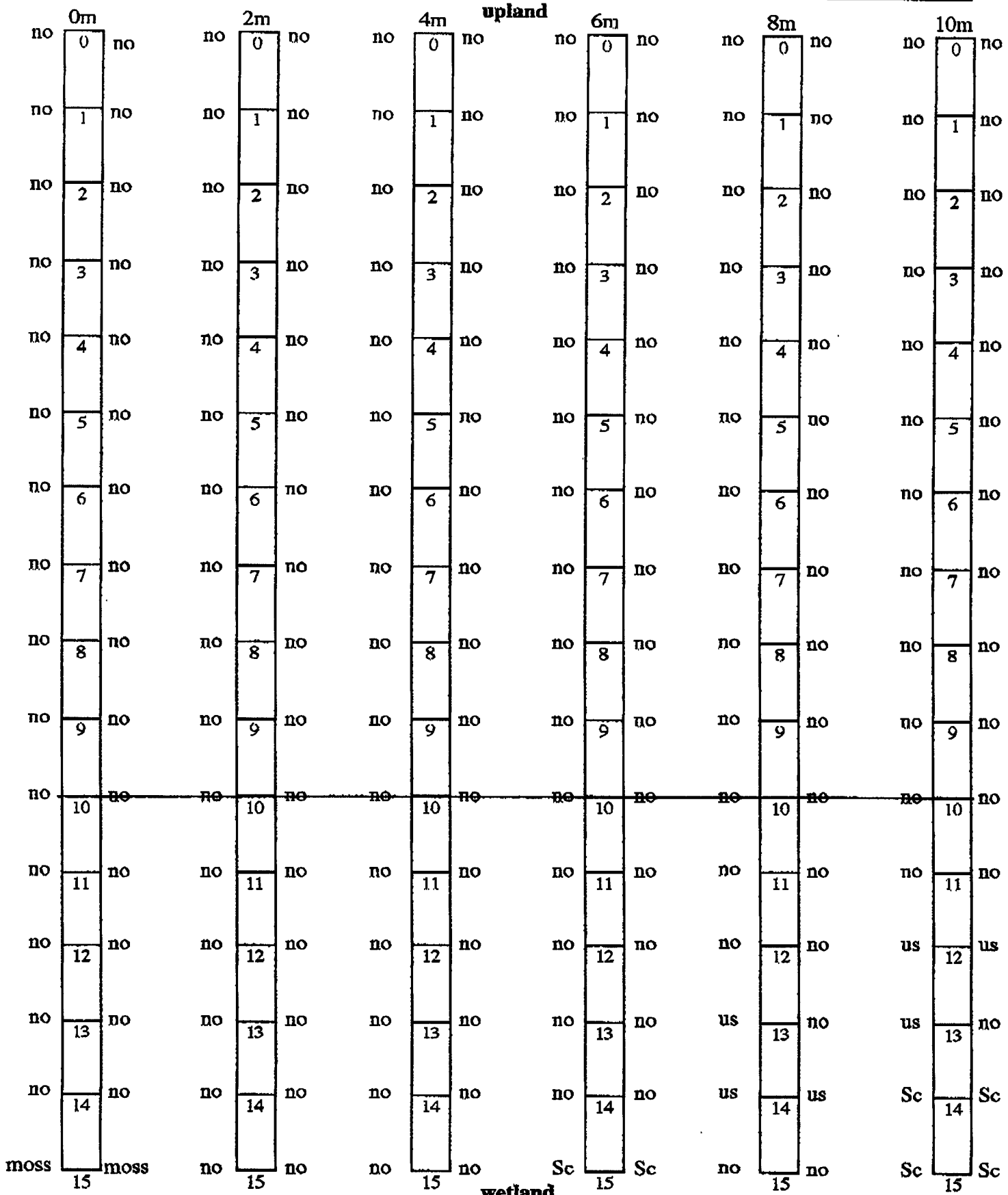
Figure 11, a-d. Bird survey data sheets for survey area between Transects #1 & #2. All observations were conducted over the marsh facing in an easterly direction for one hour periods. Only those birds that entered the plot were recorded. Due to the speed and movement of the birds, some species could not be identified and were noted as such. Fig. 11a – June 14, 2003; 11b – June 26, 2003; 11c – July 3, 2003; 11d – July 10, 2003. All data collected under the direction of Ms. Susan Hardy. Key to the notations is as follows:

- "arrow" denotes a flyover and direction (all directions relative to facing east)
- "L" denotes a landing within the plot
- "N" denotes a nest within the plot
- "LN" denotes a landing at the nest within the plot

- “H” denotes bird heard but not seen within the plot
- number before a notation denotes number of occurrences

HERBACEOUS PLANTS

LOCATION below dam TRANSECT #1 DATE June 14, 2003

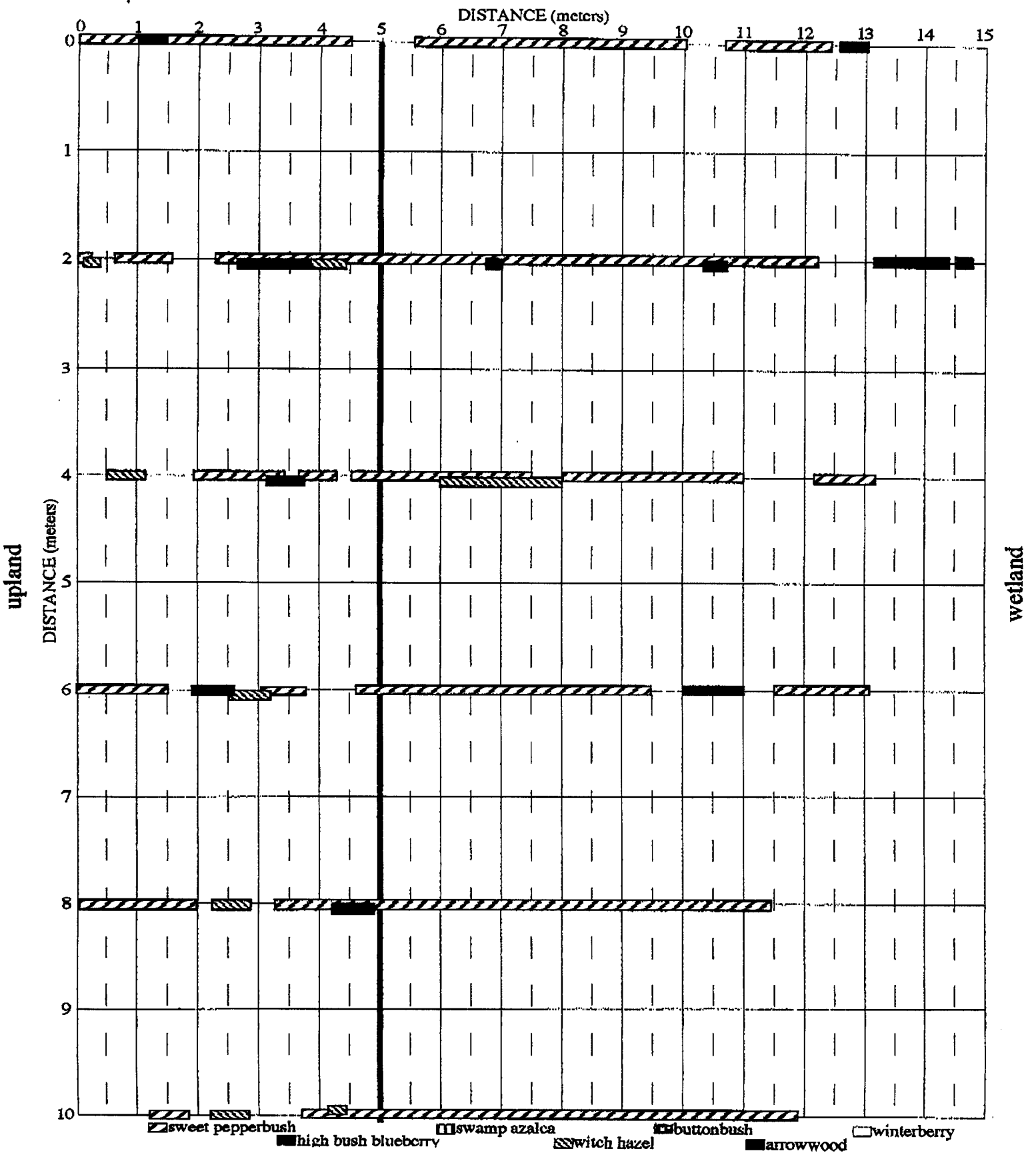


us - unidentified seedling Cs - Carex stricta Sc - Scirpus cyperinus Mc - Maianthemum canadense
no - no herb Iv - Iris versicolor Or - Osmunda regalis Oc - Osmunda cinnamomea

LOCATION below dam TRANSECT #1 DATE June 14, 2003

To POND

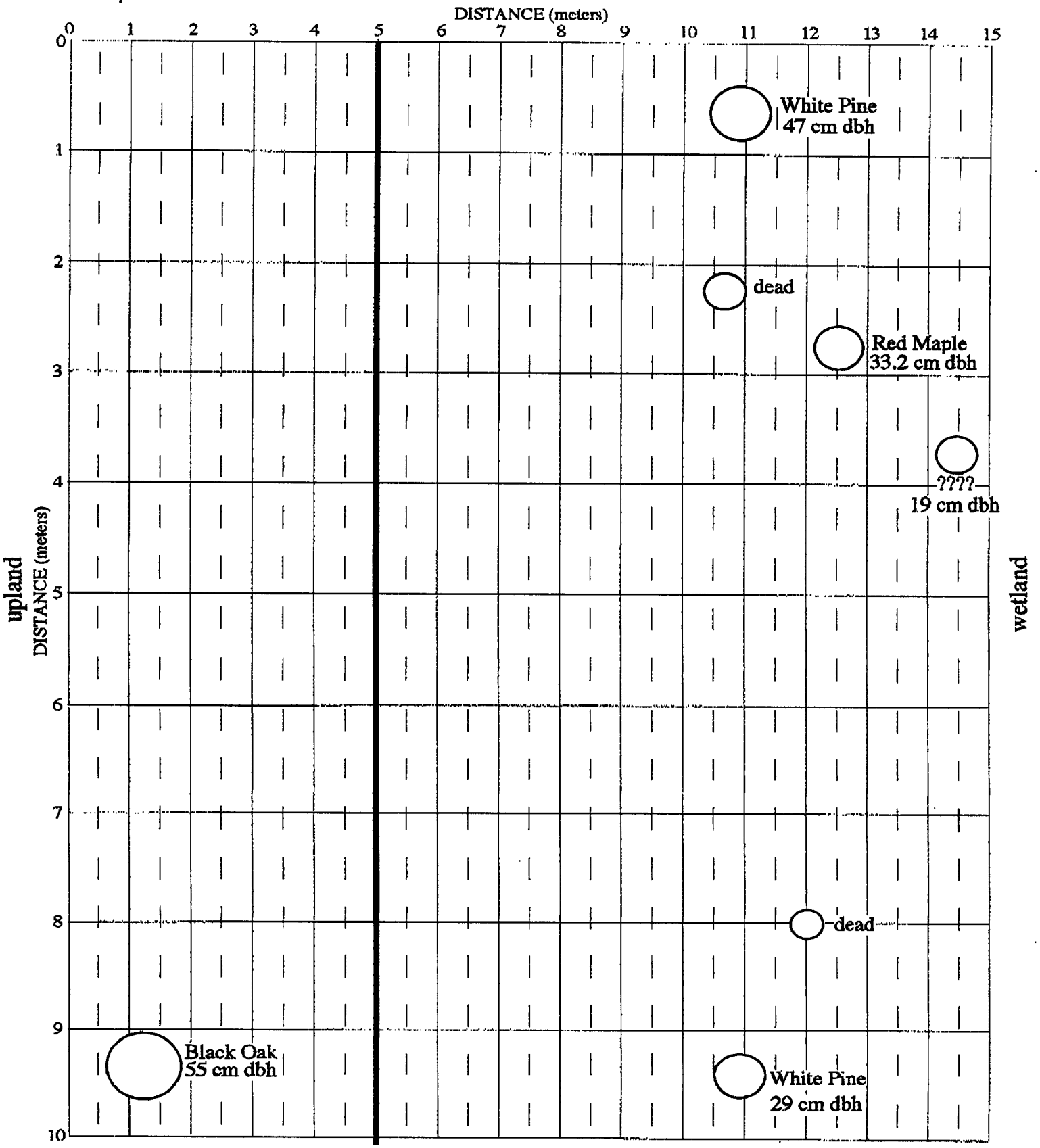
SHRUBS



LOCATION below dam TRANSECT #1 DATE June 14, 2003

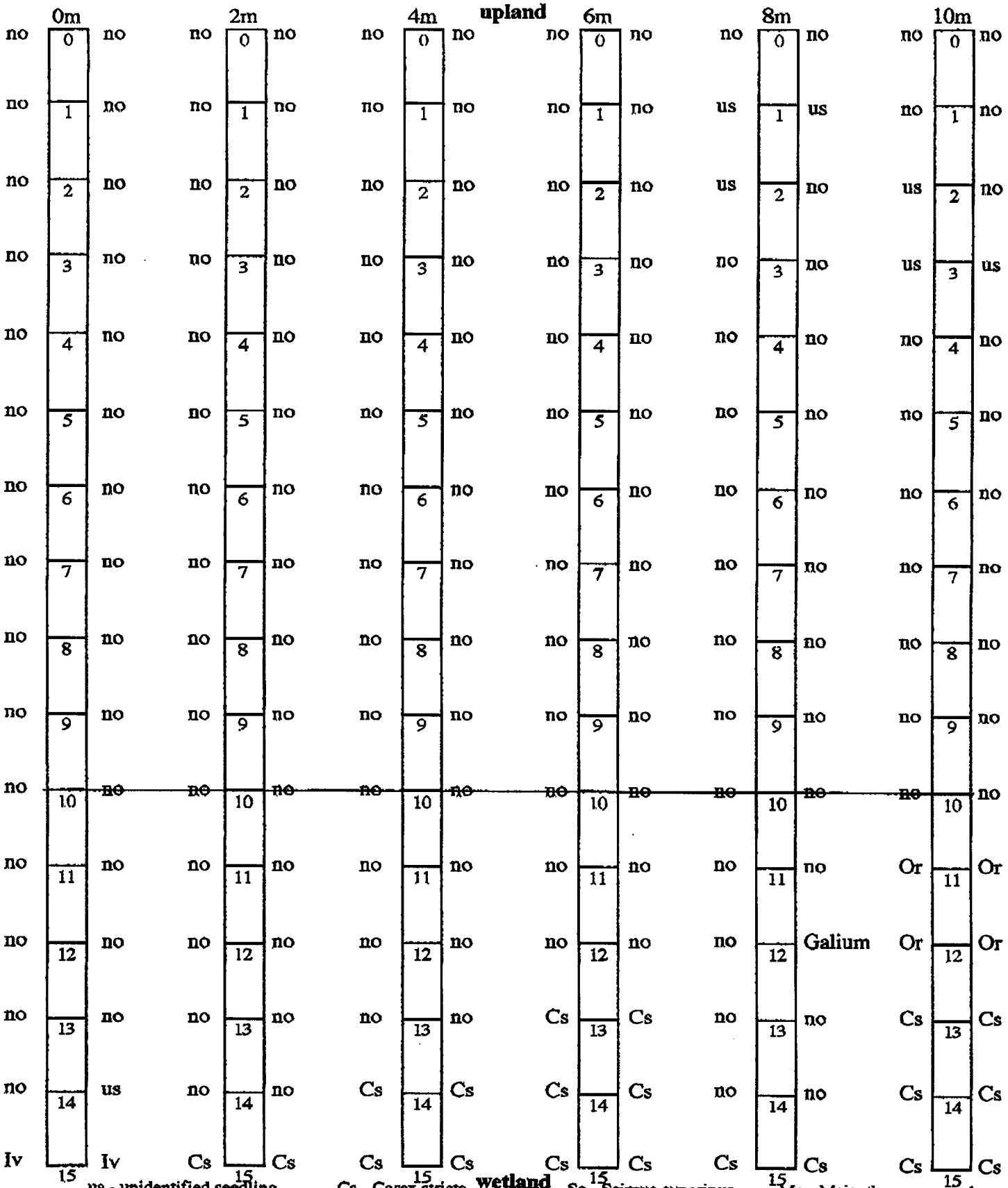
To POND

TREES



HERBACEOUS PLANTS

LOCATION below dam TRANSECT # 2 DATE June 14, 2003

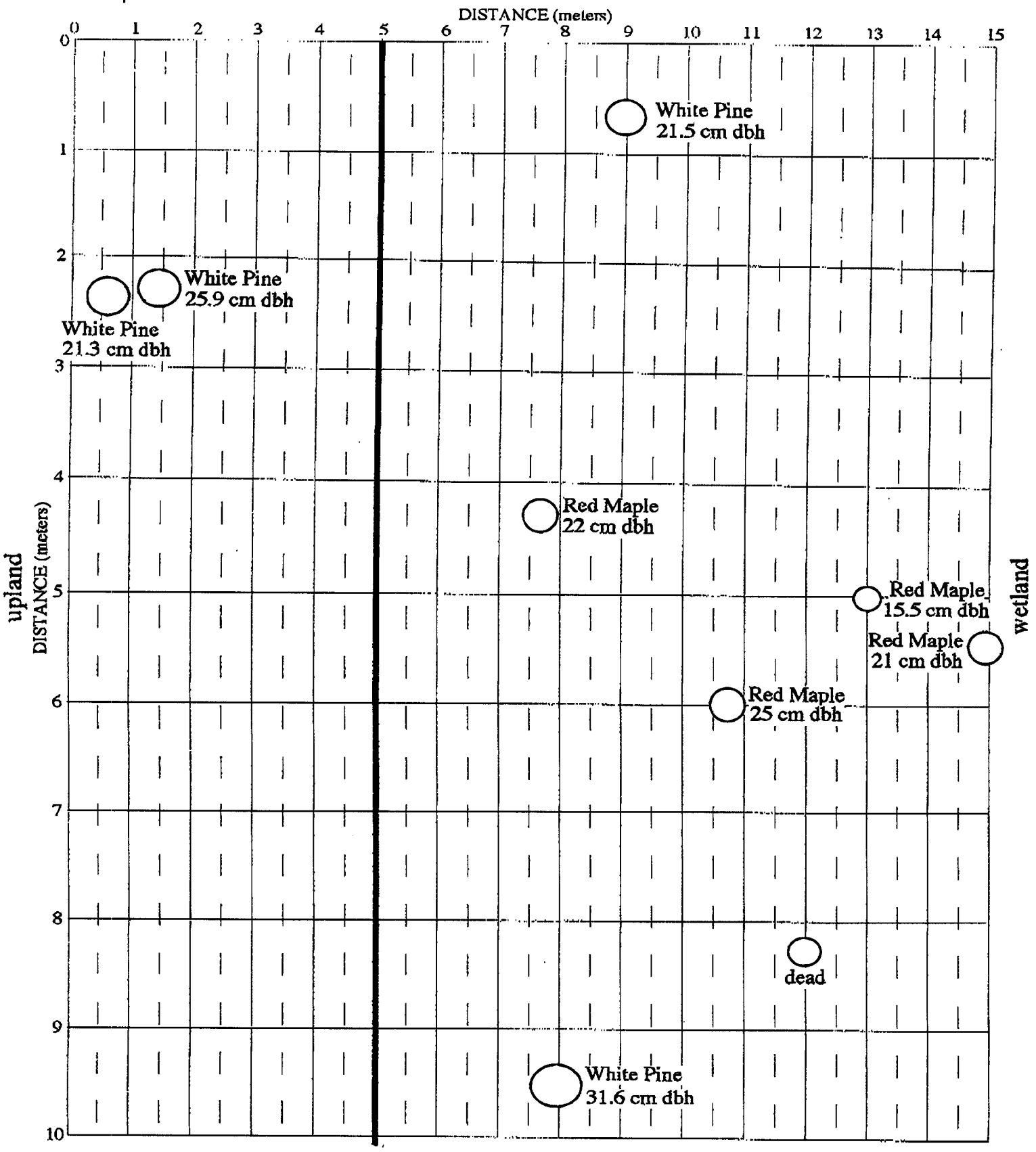


us - unidentified seedling Cs - Carex stricta Sc - Scirpus cyperinus Mc - Maianthemum canadense
no - no herb Iv - Iris versicolor Or - Osmunda regalis Oc - Osmunda cinnamomca

LOCATION below dam TRANSECT #2 DATE June 14, 2003

To POND

TREES



LOCATION below dam TRANSECT #2 DATE June 14, 2003

To POND

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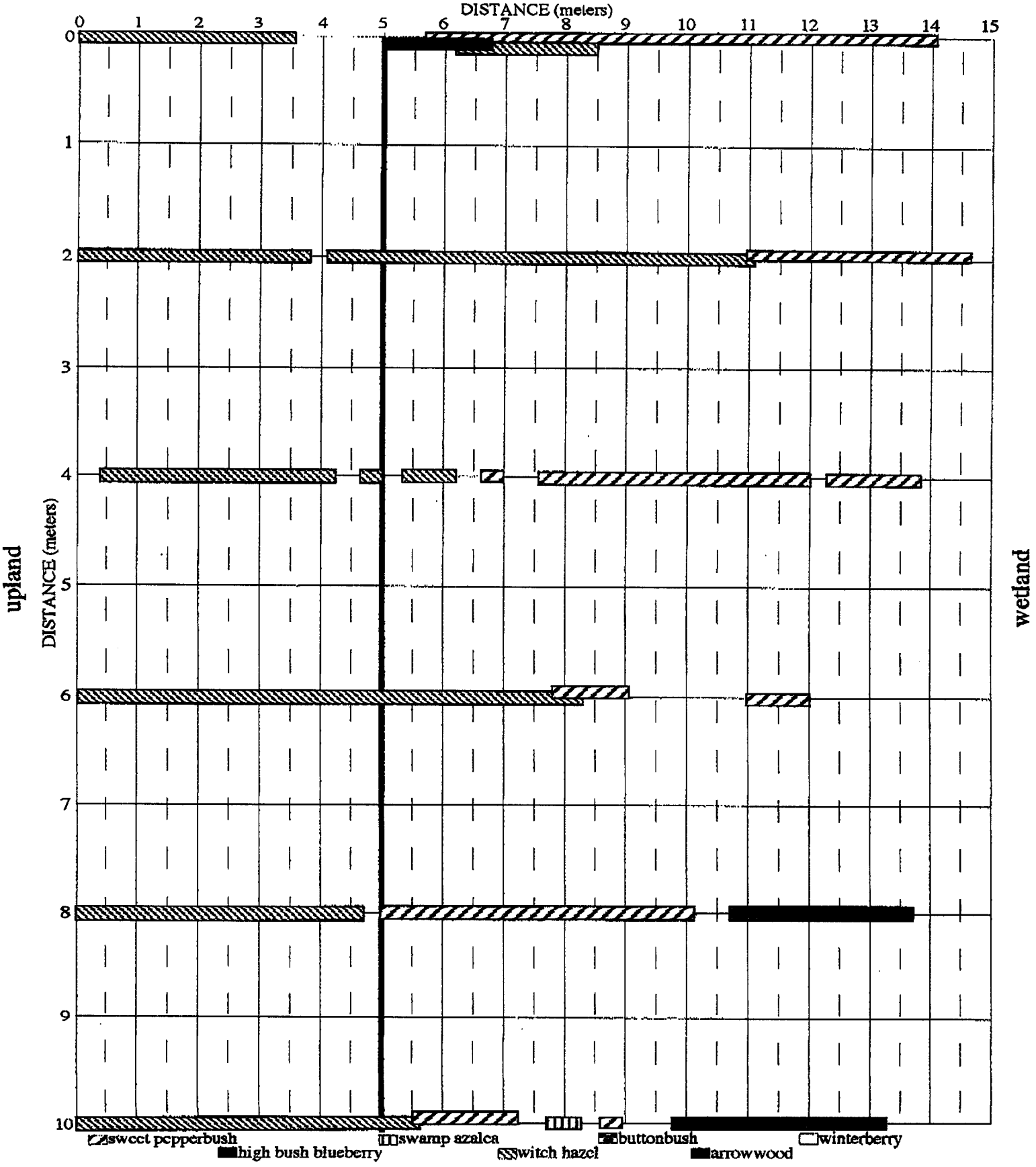
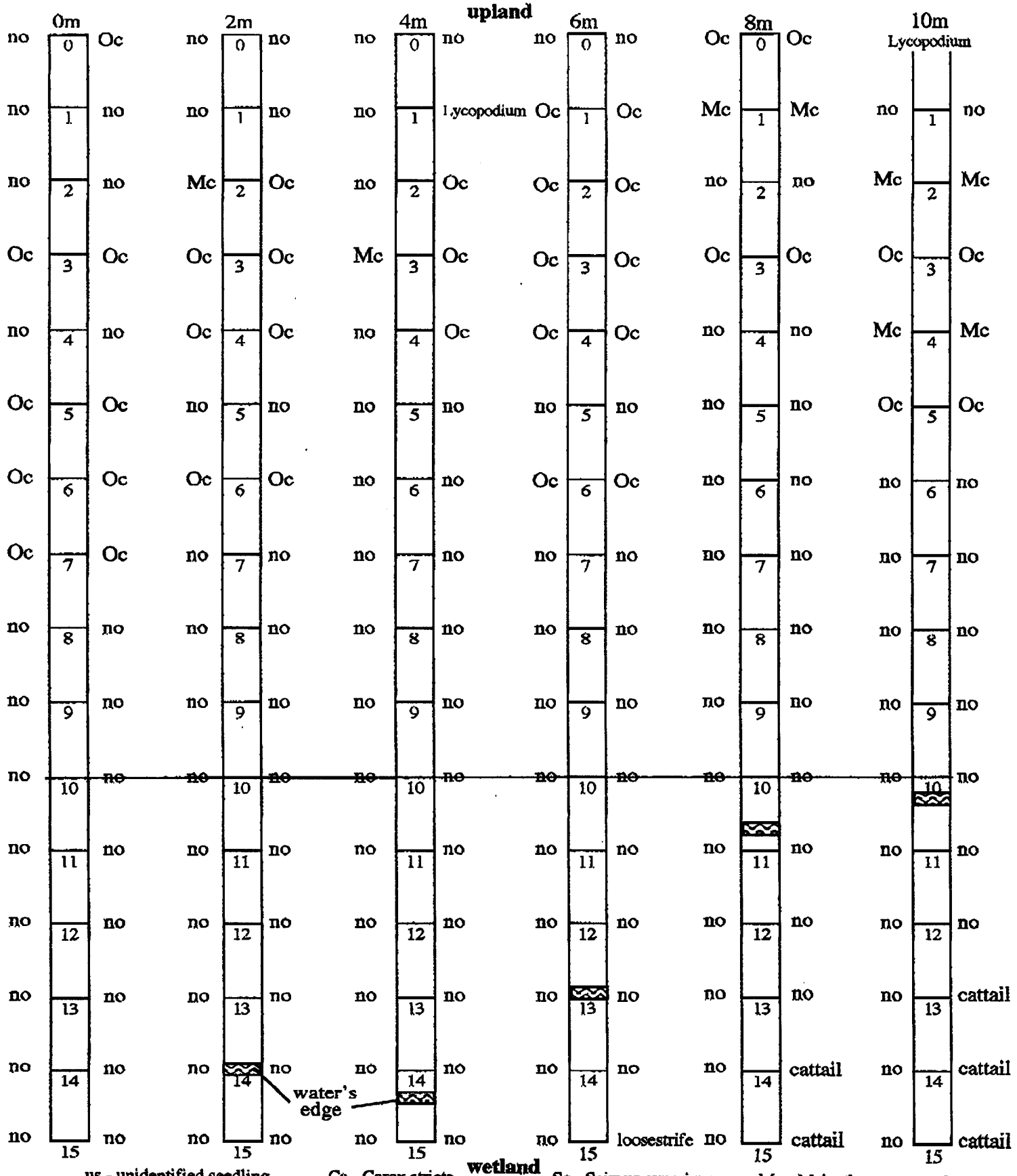


HERBACEOUS PLANTS

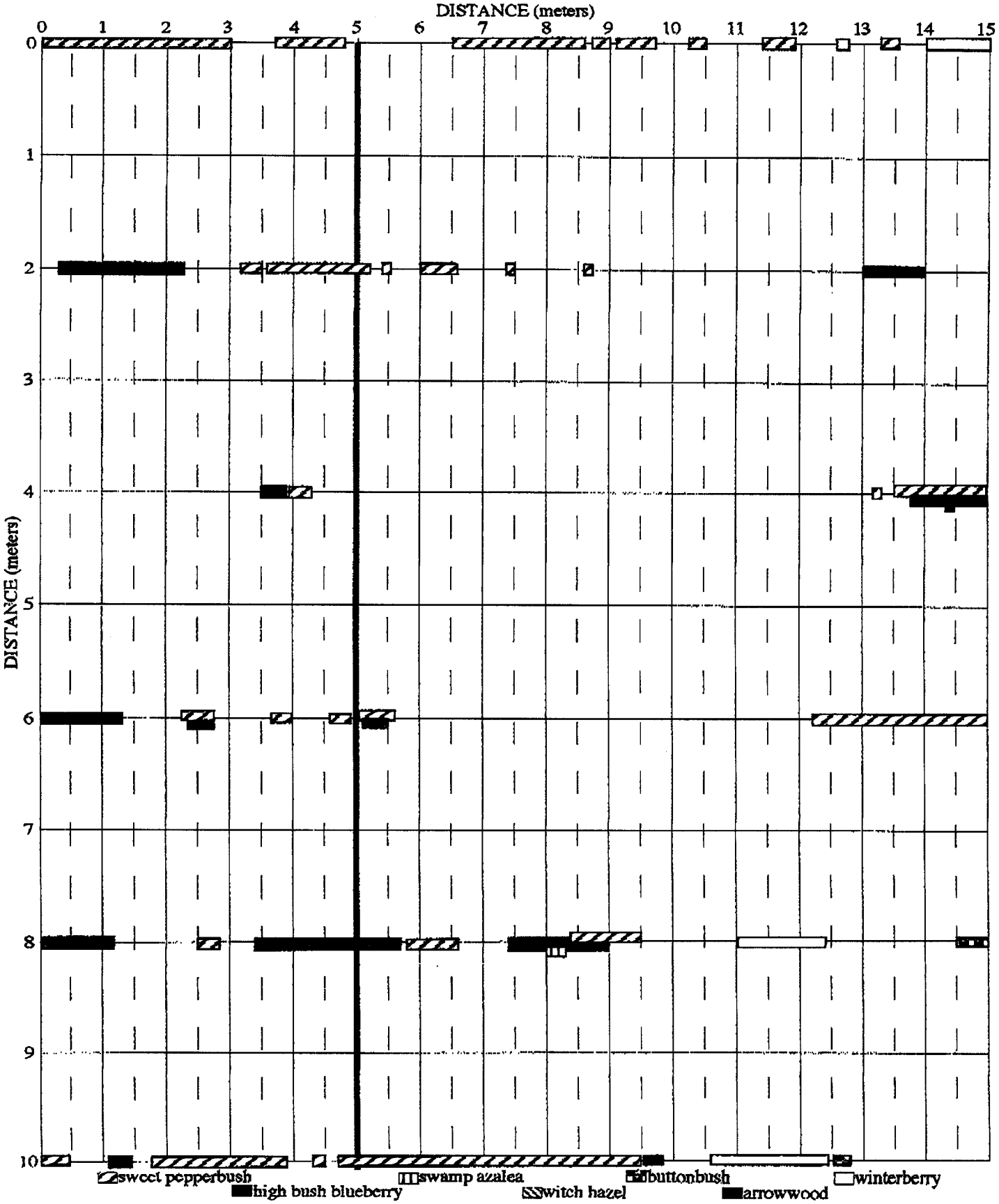
LOCATION Barba's Point TRANSECT #3 DATE July 25, 2003



us - unidentified seedling Cs - Carex stricta Sc - Scirpus cyperinus Mc - Maianthemum canadense
no - no herb Iv - Iris versicolor Or - Osmunda regalis Oc - Osmunda cinnamomea

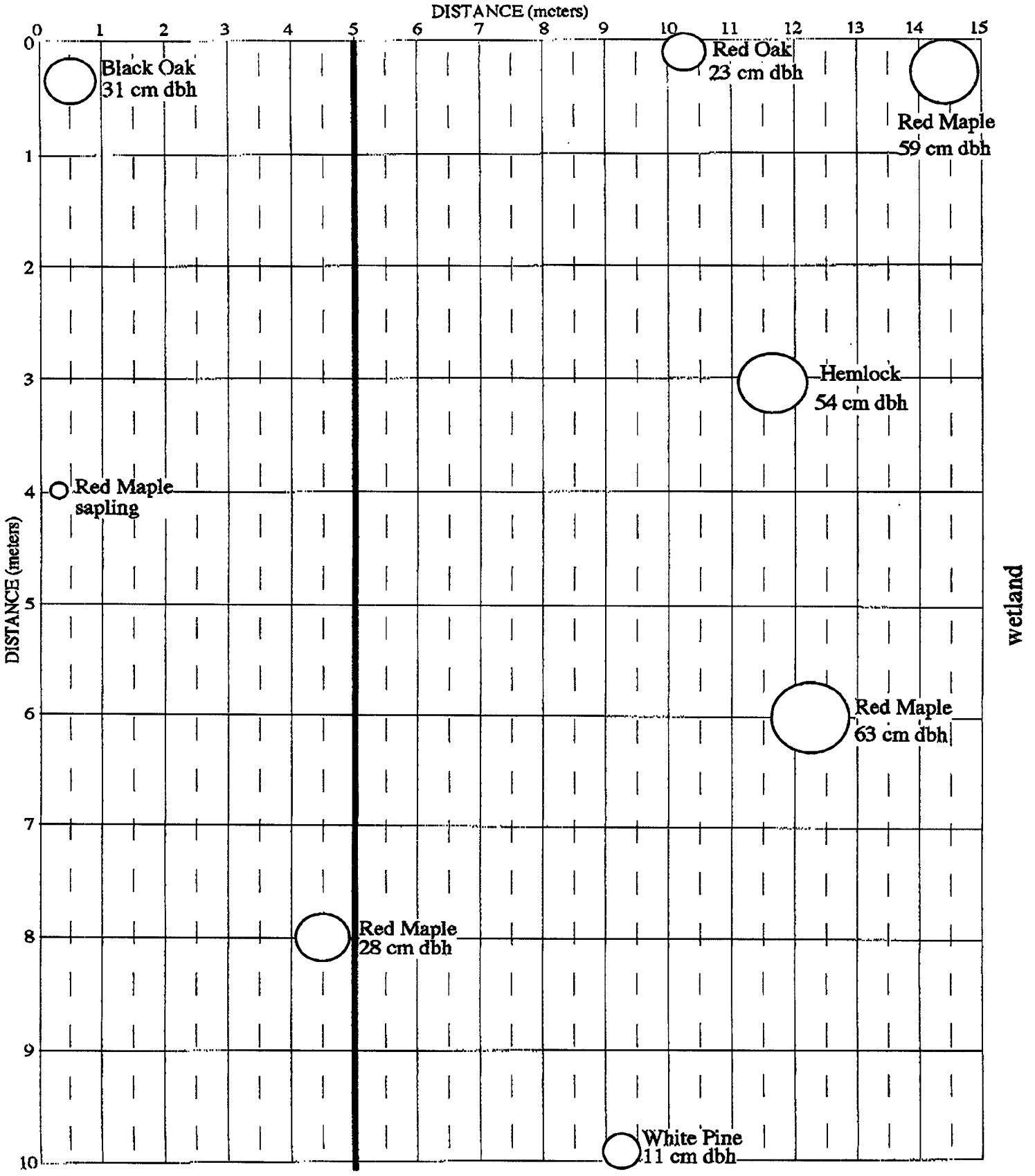
LOCATION below dam TRANSECT #3 DATE July 25, 2003

SHRUBS



LOCATION below dam TRANSECT #3 DATE July 25, 2003

TREES



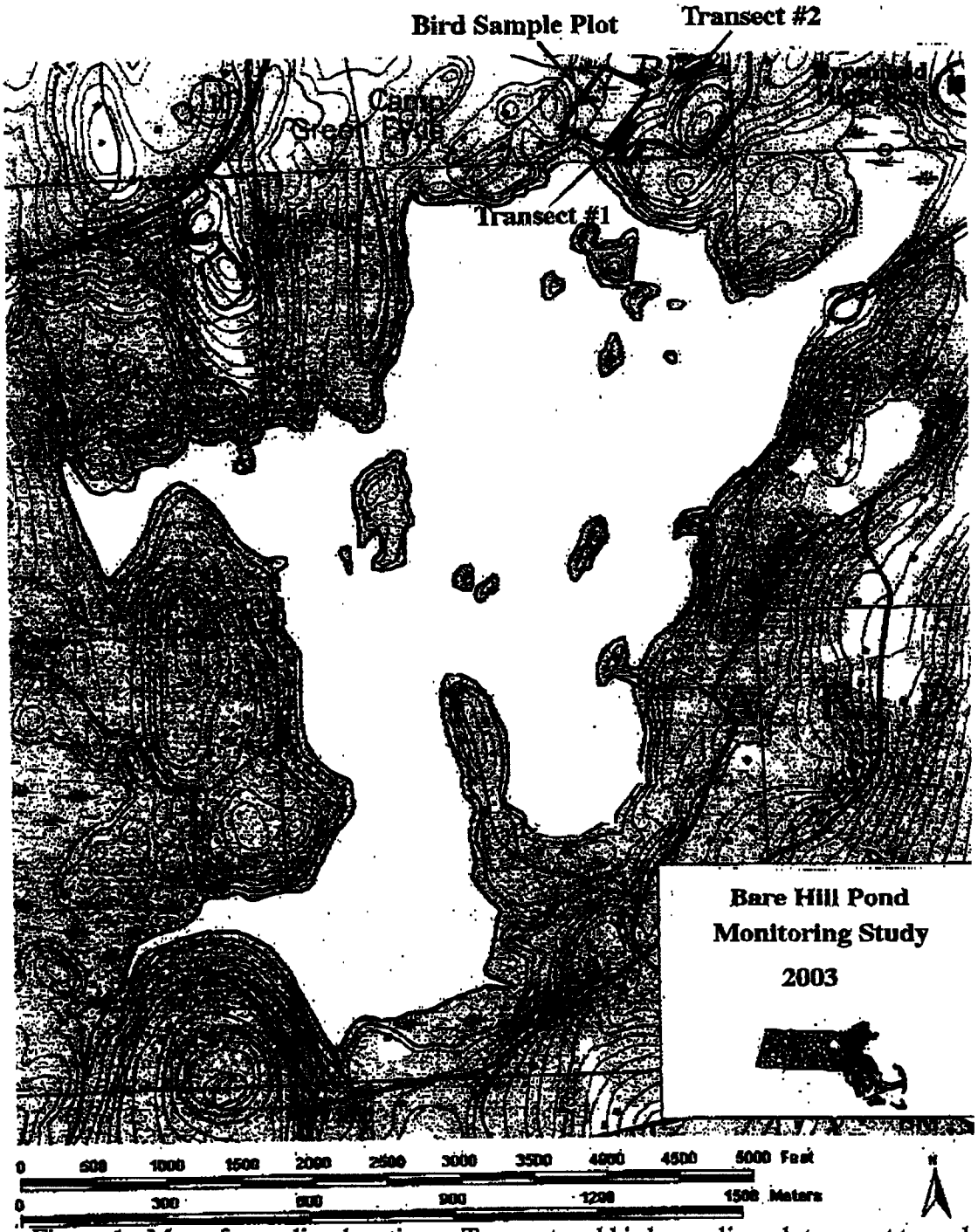


Figure 1. Map of sampling locations. Transect and bird sampling plot are not to scale. (modified from ENSR Report, Wildlife, habitat and vegetative assessment of Bare Hill Pond, Harvard, MA., March 2002)

	1	2	3	4
Yellow-rumped Warbler (B)				
Black-throated Gray Warbler #				
Hermit Warbler #				
Black-throated Green Warbler (B)				
Blackburnian Warbler (B)				
Yellow-throated Warbler *				
Pine Warbler (B)				
Prairie Warbler (B)				
Palm Warbler				
Bay-breasted Warbler				
Blackpoll Warbler				
Cerulean Warbler (B)				
Black-and-white Warbler (B)				
American Redstart (B)				
Prothonotary Warbler *				
Worm-eating Warbler (B)				
Ovenbird (B)				
Northern Waterthrush (B)				
Louisiana Waterthrush (B)				
Kentucky Warbler (B)				
Connecticut Warbler				
Mourning Warbler				
Common Yellowthroat (B)	2H			
Hooded Warbler (B)				
Wilson's Warbler				
Canada Warbler (B)				
Yellow-breasted Chat (B)				
Summer Tanager *				
Scarlet Tanager (B)				
Western Tanager *				
Northern Cardinal (B)	L	→		
Rose-breasted Grosbeak (B)				
Black-headed Grosbeak *				
Blue Grosbeak *				
Indigo Bunting (B)				
Painted Bunting *				
Dickcissel				
Green-tailed Towhee #				
Rufous-sided Towhee (B)				
American Tree Sparrow				
Chipping Sparrow (B)				
Clay-colored Sparrow *				
Field Sparrow (B)				
Vesper Sparrow				
Lark Sparrow *				
Lark Bunting *				
Savannah Sparrow (B)				
Ipswich Sparrow				
Grasshopper Sparrow (B)				
Henslow's Sparrow *				
Le Conte's Sparrow *				
Sharp-tailed Sparrow (B)				
Seaside Sparrow (B)				

	1	2	3	4
Fox Sparrow	3L			
Song Sparrow (B)				
Lincoln's Sparrow				
Swamp Sparrow (B)				
White-throated Sparrow (B)				
White-crowned Sparrow				
Harris' Sparrow *				
Dark-eyed Junco (B)				
Lapland Longspur				
Smith's Longspur *				
Chestnut-collared Longspur *				
Snow Bunting				
Bobolink (B)	→	←	3L	
Red-winged Blackbird (B)				
Eastern Meadowlark (B)				
Yellow-headed Blackbird *				
Rusty Blackbird				
Brewer's Blackbird #				
Boat-tailed Grackle *	→			
Common Grackle (B)				
Brown-headed Cowbird (B)				
Orchard Oriole (B)				
Northern Oriole (B)				
Pine Grosbeak				
Purple Finch (B)				
House Finch (B)				
Red Crossbill				
White-winged Crossbill				
Common Redpoll				
Hoary Redpoll *				
Pine Siskin				
American Goldfinch (B)	H 3L	2→	2←	
Evening Grosbeak				
House Sparrow (B)				
UNIDENTIFIED DUCK	←			
UNIDENTIFIED BIRDS	4←	2↑	2→	

Extinct or extirpated: Labrador Duck #, Gray Partridge, Greater Prairie Chicken (Heath Hen) #, Passenger Pigeon

TRIP NOTES:

Locality, Date, Conditions (weather, tides, etc.), Time, Observers, Habitats covered.

1) June 14 2003 noon - 1 pm 70 partly Sunny
2) TRANSECT #1 Facing West
3) Key ← flying left → flying right
↑ flying away ↓ flying toward
H - heard in area Watching
L - landed
4)

Compiled by Connecticut Rare Records Committee
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September 1989

before Stmb | # times

Observed 6/14/03

CONNECTICUT ORNITHOLOGICAL ASSOCIATION

CONNECTICUT FIELD LIST

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LEGEND

(B) regularly breeds in state.

* species rarely seen in Connecticut. Observers are encouraged to provide written details and photographs for these species.

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	TRIP 1	2	3	4
Red-throated Loon				
Common Loon				
Pied-billed Grebe				
Horned Grebe				
Red-necked Grebe				
Eared Grebe *				
Western Grebe *				
Northern Fulmar *				
Black-capped Petrel *				
Cory's Shearwater *				
Greater Shearwater *				
Manx Shearwater #				
Wilson's Storm-Petrel *				
White-faced Storm-Petrel *				
Leach's Storm-Petrel *				
Northern Gannet *				
American White Pelican *				
Brown Pelican *				
Great Cormorant				
Double-crested Cormorant (B)				
Anhinga #				
Magnificent Frigatebird *				
American Bittern (B)				
Least Bittern (B)	→	←		
Great Blue Heron (B)				
Great Egret (B)				
Snowy Egret (B)				

	1	2	3	4
Common Raven (B)				
Black-capped Chickadee (B)				
Boreal Chickadee *				
Tufted Titmouse (B)				
Red-breasted Nuthatch (B)	L			
White-breasted Nuthatch (B)				
Brown Creeper (B)				
Carolina Wren (B)				
House Wren (B)				
Winter Wren (B)				
Sedge Wren *				
Marsh Wren (B)				
Golden-crowned Kinglet (B)				
Ruby-crowned Kinglet				
Blue-gray Gnatcatcher (B)				
Northern Wheatear *				
Eastern Bluebird (B)				
Townsend's Solitaire #				
Veery (B)				
Gray-cheeked Thrush				
Swainson's Thrush				
Hermit Thrush (B)				
Wood Thrush (B)				
American Robin (B)	2H			
Varied Thrush *				
Gray Catbird (B)				
Northern Mockingbird (B)				
Brown Thrasher (B)				
American Pipit				
Bohemian Waxwing #				
Cedar Waxwing (B)	5L	3		
Northern Shrike				
Loggerhead Shrike *				
European Starling (B)				
White-eyed Vireo (B)				
Solitary Vireo (B)				
Yellow-throated Vireo (B)				
Warbling Vireo (B)				
Philadelphia Vireo				
Red-eyed Vireo (B)				
Blue-winged Warbler (B)				
Golden-winged Warbler (B)				
Brewster's Warbler				
Lawrence's Warbler				
Tennessee Warbler				
Orange-crowned Warbler				
Nashville Warbler (B)				
Northern Parula	H	L		
Yellow Warbler (B)				
Chestnut-sided Warbler (B)				
Magnolia Warbler (B)				
Cape May Warbler				
Black-throated Blue Warbler (B)				

	1	2	3	4
Yellow-rumped Warbler (B)				
Black-throated Gray Warbler #				
Hermit Warbler #				
Black-throated Green Warbler (B)				
Blackburnian Warbler (B)				
Yellow-throated Warbler *				
Pine Warbler (B)				
Prairie Warbler (B)				
Palm Warbler				
Bay-breasted Warbler				
Blackpoll Warbler				
Cerulean Warbler (B)				
Black-and-white Warbler (B)				
American Redstart (B)				
Prothonotary Warbler *				
Worm-eating Warbler (B)				
Ovenbird (B)				
Northern Waterthrush (B)				
Louisiana Waterthrush (B)				
Kentucky Warbler (B)				
Connecticut Warbler				
Mourning Warbler				
Common Yellowthroat (B)				
Hooded Warbler (B)				
Wilson's Warbler				
Canada Warbler (B)				
Yellow-breasted Chat (B)				
Summer Tanager *				
Scarlet Tanager (B)				
Western Tanager *				
Northern Cardinal (B)				
Rose-breasted Grosbeak (B)				
Black-headed Grosbeak *				
Blue Grosbeak *				
Indigo Bunting (B)				
Painted Bunting *				
Dickcissel				
Green-tailed Towhee #				
Rufous-sided Towhee (B)				
American Tree Sparrow				
Chipping Sparrow (B)				
Clay-colored Sparrow *				
Field Sparrow (B)				
Vesper Sparrow				
Lark Sparrow *				
Lark Bunting *				
Savannah Sparrow (B)				
Ipswich Sparrow				
Grasshopper Sparrow (B)				
Henslow's Sparrow *				
Le Conte's Sparrow *				
Sharp-tailed Sparrow (B)				
Seaside Sparrow (B)				

	1	2	3	4
Fox Sparrow				
Song Sparrow (B)	H			
Lincoln's Sparrow				
Swamp Sparrow (B)				
White-throated Sparrow (B)				
White-crowned Sparrow				
Harris' Sparrow *				
Dark-eyed Junco (B)				
Lapland Longspur				
Smith's Longspur *				
Chestnut-collared Longspur *				
Snow Bunting				
Bobolink (B)	46	5→	5L	
Red-winged Blackbird (B)				
Eastern Meadowlark (B)				
Yellow-headed Blackbird *				
Rusty Blackbird				
Brewer's Blackbird #				
Boat-tailed Grackle *				
Common Grackle (B)	L	←	2→	
Brown-headed Cowbird (B)				
Orchard Oriole (B)				
Northern Oriole (B)				
Pine Grosbeak				
Purple Finch (B)				
House Finch (B)				
Red Crossbill				
White-winged Crossbill				
Common Redpoll				
Hoary Redpoll *				
Pine Siskin				
American Goldfinch (B)	3←			
Evening Grosbeak				
House Sparrow (B)				

Extinct or extirpated: Labrador Duck #, Gray Partridge, Greater Prairie Chicken (Heath Hen) #, Passenger Pigeon

TRIP NOTES:

Locality, Date, Conditions (weather, tides, etc), Time, Observers, Habitats covered. TANGENT #1 facing West

1) June 26/03 8:15-9:15 AM Sunny 75

2) 1 - lands [redacted] H - heard in area

3) LN - lands at NEST

4) ~~#~~ before symbols is number times event occurred.

Compiled by Connecticut Rare Records Committee

September 1989

UNIDENTIFIED 4→ 8← M

OBSERVER: SUSAN MURRAY

6/26/03

CONNECTICUT ORNITHOLOGICAL ASSOCIATION

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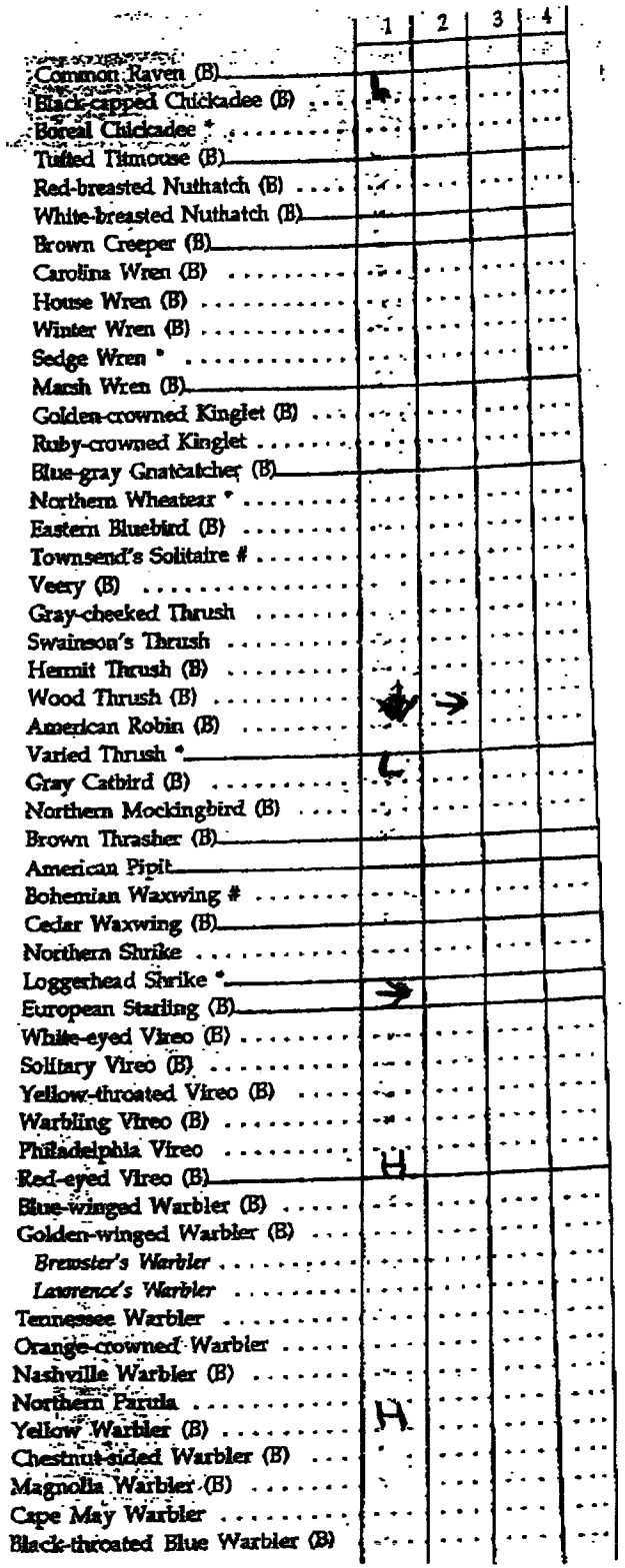
	TRIP 1	2	3	4
Red-throated Loon				
Common Loon				
Pied-billed Grebe				
Horned Grebe				
Red-necked Grebe				
Eared Grebe *				
Western Grebe *				
Northern Fulmar *				
Black-capped Petrel *				
Cory's Shearwater *				
Greater Shearwater *				
Manx Shearwater #				
Wilson's Storm-Petrel *				
White-faced Storm-Petrel *				
Leach's Storm-Petrel *				
Northern Gannet *				
American White Pelican *				
Brown Pelican *				
Great Cormorant				
Double-crested Cormorant (B)				
Anhinga #				
Magnificent Frigatebird *				
American Bittern (B)				
Least Bittern (B)				
Great Blue Heron (B)				
Great Egret (B)				
Snowy Egret (B)				


1
2
3
4
Common Raven (B)
Black-capped Chickadee (B)
Boreal Chickadee *
Tufted Titmouse (B)
Red-breasted Nuthatch (B)
White-breasted Nuthatch (B)
Brown Creeper (B)
Carolina Wren (B)
House Wren (B)
Winter Wren (B)
Sedge Wren *
Marsh Wren (B)
Golden-crowned Kinglet (B)
Ruby-crowned Kinglet
Blue-gray Gnatcatcher (B)
Northern Wheatear *
Eastern Bluebird (B)
Townsend's Solitaire #
Veery (B)
Gray-cheeked Thrush
Swainson's Thrush
Hermit Thrush (B)
Wood Thrush (B)
American Robin (B)
Varied Thrush *
Gray Catbird (B)
Northern Mockingbird (B)
Brown Thrasher (B)
American Pipit
Bohemian Waxwing #
Cedar Waxwing (B)
Northern Shrike
Loggerhead Shrike *
European Starling (B)
White-eyed Vireo (B)
Solitary Vireo (B)
Yellow-throated Vireo (B)
Warbling Vireo (B)
Philadelphia Vireo
Red-eyed Vireo (B)
Blue-winged Warbler (B)
Golden-winged Warbler (B)
Brewster's Warbler
Lawrence's Warbler
Tennessee Warbler
Orange-crowned Warbler
Nashville Warbler (B)
Northern Parula
Yellow Warbler (B)
Chestnut-sided Warbler (B)
Magnolia Warbler (B)
Cape May Warbler
Black-throated Blue Warbler (B)

	1	2	3	4
Common Raven (B)				
Black-capped Chickadee (B)				
Boreal Chickadee *				
Tufted Titmouse (B)	46			
Red-breasted Nuthatch (B)				
White-breasted Nuthatch (B)				
Brown Creeper (B)				
Carolina Wren (B)				
House Wren (B)				
Winter Wren (B)				
Sedge Wren *				
Marsh Wren (B)				
Golden-crowned Kinglet (B)				
Ruby-crowned Kinglet				
Blue-gray Gnatcatcher (B)				
Northern Wheatear *				
Eastern Bluebird (B)				
Townsend's Solitaire #				
Veery (B)				
Gray-cheeked Thrush				
Swainson's Thrush				
Hermit Thrush (B)				
Wood Thrush (B)	←	→	2↑	↓
American Robin (B)				
Varied Thrush *				
Gray Catbird (B)				
Northern Mockingbird (B)				
Brown Thrasher (B)				
American Pipit				
Bohemian Waxwing #				
Cedar Waxwing (B)				
Northern Shrike				
Loggerhead Shrike *				
European Starling (B)				
White-eyed Vireo (B)				
Solitary Vireo (B)				
Yellow-throated Vireo (B)				
Warbling Vireo (B)				
Philadelphia Vireo				
Red-eyed Vireo (B)				
Blue-winged Warbler (B)				
Golden-winged Warbler (B)				
Brewster's Warbler				
Lawrence's Warbler				
Tennessee Warbler				
Orange-crowned Warbler				
Nashville Warbler (B)				
Northern Parula				
Yellow Warbler (B)				
Chestnut-sided Warbler (B)				
Magnolia Warbler (B)				
Cape May Warbler				
Black-throated Blue Warbler (B)				

	1	2	3	4
Yellow-rumped Warbler (B)				
Black-throated Gray Warbler #				
Hermit Warbler #				
Black-throated Green Warbler (B)				
Blackburnian Warbler (B)				
Yellow-throated Warbler *				
Pine Warbler (B)				
Prairie Warbler (B)				
Palm Warbler				
Bay-breasted Warbler				
Blackpoll Warbler				
Cerulean Warbler (B)				
Black-and-white Warbler (B)				
American Redstart (B)				
Prothonotary Warbler *				
Worm-eating Warbler (B)				
Ovenbird (B)				
Northern Waterthrush (B)				
Louisiana Waterthrush (B)				
Kentucky Warbler (B)				
Connecticut Warbler				
Mourning Warbler				
Common Yellowthroat (B)	←	4↓	H	
Hooded Warbler (B)				
Wilson's Warbler				
Canada Warbler (B)				
Yellow-breasted Chat (B)				
Summer Tanager *				
Scarlet Tanager (B)				
Western Tanager *				
Northern Cardinal (B)				
Rose-breasted Grosbeak (B)				
Black-headed Grosbeak *				
Blue Grosbeak *				
Indigo Bunting (B)				
Painted Bunting *				
Dickcissel				
Green-tailed Towhee #				
Rufous-sided Towhee (B)				
American Tree Sparrow				
Chipping Sparrow (B)				
Clay-colored Sparrow *				
Field Sparrow (B)				
Vesper Sparrow				
Lark Sparrow *				
Lark Bunting *				
Savannah Sparrow (B)				
Ipswich Sparrow				
Grasshopper Sparrow (B)				
Henslow's Sparrow *				
Le Conte's Sparrow *				
Sharp-tailed Sparrow (B)				
Seaside Sparrow (B)				

	1	2	3	4
Fox Sparrow				
Song Sparrow (B)	H			
Lincoln's Sparrow				
Swamp Sparrow (B)				
White-throated Sparrow (B)				
White-crowned Sparrow				
Harris' Sparrow *				
Dark-eyed Junco (B)				
Lapland Longspur				
Smith's Longspur *				
Chestnut-collared Longspur *				
Snow Bunting				
Bobolink (B)	2←	→	19↓	
Red-winged Blackbird (B)				
Eastern Meadowlark (B)				
Yellow-headed Blackbird *				
Rusty Blackbird				
Brewer's Blackbird #				
Boat-tailed Grackle *				
Common Grackle (B)	6←	4→	7↓	
Brown-headed Cowbird (B)				
Orchard Oriole (B)				
Northern Oriole (B)	←	2↓	2H	
Pine Grosbeak				
Purple Finch (B)				
House Finch (B)				
Red Crossbill				
White-winged Crossbill				
Common Redpoll				
Hoary Redpoll *				
Pine Siskin				
American Goldfinch (B)	5←			
Evening Grosbeak				
House Sparrow (B)				

SUSAN HARDY + LAURIE UNTHAM

Extinct or extirpated: Labrador Duck #, Gray Partridge, Greater Prairie Chicken (Heath Hen) #, Passenger Pigeon

7/3/03 7:05-8:35AM Sunny 73°

TRIP NOTES: 1st TRANSECT FACING WEST

Locality, Date, Conditions (weather, tides, etc.), Time, Observers, Habitats covered.

1) NL = landed at NEST

2) L - landed in tangut area

3) H - heard in tangut area

4) # before Symbol is # times each occurred

Compiled by Connecticut Rare Records Committee
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September 1989

UNIDENTIFIED: 6← 7→ 4↑ 11L

CONNECTICUT ORNITHOLOGICAL ASSOCIATION

7/3/03

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	TRIP 1	2	3	4
Red-throated Loon				
Common Loon				
Pied-billed Grebe				
Horned Grebe				
Red-necked Grebe				
Eared Grebe *				
Western Grebe *				
Northern Fulmar *				
Black-capped Petrel *				
Cory's Shearwater *				
Greater Shearwater *				
Manx Shearwater #				
Wilson's Storm-Petrel *				
White-faced Storm-Petrel *				
Leach's Storm-Petrel *				
Northern Gannet *				
American White Pelican *				
Brown Pelican *				
Great Cormorant				
Double-crested Cormorant (B)				
Anhinga #				
Magnificent Frigatebird *				
American Bittern (B)				
Least Bittern (B)				
Great Blue Heron (B)				
Great Egret (B)				
Snowy Egret (B)				

	1	2	3	4
Yellow-rumped Warbler (B)				
Black-throated Gray Warbler #				
Hermit Warbler #				
Black-throated Green Warbler (B)				
Blackburnian Warbler (B)				
Yellow-throated Warbler *				
Pine Warbler (B)				
Prairie Warbler (B)				
Palm Warbler				
Bay-breasted Warbler				
Blackpoll Warbler				
Cerulean Warbler (B)				
Black-and-white Warbler (B)				
American Redstart (B)				
Prothonotary Warbler *				
Worm-eating Warbler (B)				
Ovenbird (B)				
Northern Waterthrush (B)				
Louisiana Waterthrush (B)				
Kentucky Warbler (B)				
Connecticut Warbler				
Mourning Warbler				
Common Yellowthroat (B)	3H			
Hooded Warbler (B)				
Wilson's Warbler				
Canada Warbler (B)				
Yellow-breasted Chat (B)				
Summer Tanager *				
Scarlet Tanager (B)				
Western Tanager *				
Northern Cardinal (B)				
Rose-breasted Grosbeak (B)				
Black-headed Grosbeak *				
Blue Grosbeak *				
Indigo Bunting (B)				
Painted Bunting *				
Dickcissel				
Green-tailed Towhee #				
Rufous-sided Towhee (B)				
American Tree Sparrow				
Chipping Sparrow (B)				
Clay-colored Sparrow *				
Field Sparrow (B)				
Vesper Sparrow				
Lark Sparrow *				
Lark Bunting *				
Savannah Sparrow (B)				
Ipswich Sparrow				
Grasshopper Sparrow (B)				
Henslow's Sparrow *				
Le Conte's Sparrow *				
Sharp-tailed Sparrow (B)				
Seaside Sparrow (B)				

	1	2	3	4
Fox Sparrow	L			
Song Sparrow (B)				
Lincoln's Sparrow				
Swamp Sparrow (B)				
White-throated Sparrow (B)				
White-crowned Sparrow				
Harris' Sparrow *				
Dark-eyed Junco (B)				
Lapland Longspur				
Smith's Longspur *				
Chestnut-collared Longspur *				
Snow Bunting				
Bobolink (B)	←	→	6L	H
Red-winged Blackbird (B)				
Eastern Meadowlark (B)				
Yellow-headed Blackbird *				
Rusty Blackbird				
Brewer's Blackbird #				
Boat-tailed Grackle *				
Common Grackle (B)	3→			
Brown-headed Cowbird (B)				
Orchard Oriole (B)				
Northern Oriole (B)				
Pine Grosbeak				
Purple Finch (B)				
House Finch (B)				
Red Crossbill				
White-winged Crossbill				
Common Redpoll				
Hoary Redpoll *				
Pine Siskin	3←	4→	L	
American Goldfinch (B)				
Evening Grosbeak				
House Sparrow (B)				

Unidentified 1→, 2←, ↑, 5L

Extinct or extirpated: Labrador Duck #, Gray Partridge, Greater Prairie Chicken (Heath Hen) #, Passenger Pigeon

Observer: Susan Haeri 7/10/03

TRIP NOTES: 7-8 AM 59°

Locality, Date, Conditions (weather, tides, etc.), Time, Observers, Habitats covered. 1st TRANSECT looking East

1) H - heard in area

2) # B the activity occurred

3) _____

4) _____

Compiled by Connecticut Rare Records Committee

September 1989

CONNECTICUT ORNITHOLOGICAL ASSOCIATION

7/10/03

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	TRIP 1	2	3	4
Red-throated Loon				
Common Loon				
Pied-billed Grebe				
Horned Grebe				
Red-necked Grebe				
Eared Grebe *				
Western Grebe *				
Northern Fulmar *				
Black-capped Petrel *				
Cory's Shearwater *				
Greater Shearwater *				
Manx Shearwater #				
Wilson's Storm-Petrel *				
White-faced Storm-Petrel *				
Leach's Storm-Petrel *				
Northern Gannet *				
American White Pelican *				
Brown Pelican *				
Great Cormorant				
Double-crested Cormorant (B)				
Anhinga #				
Magnificent Frigatebird *				
American Bittern (B)				
Least Bittern (B)				
Great Blue Heron (B)				
Great Egret (B)				
Snowy Egret (B)				

	1	2	3	4
Common Raven (B)				
Black-capped Chickadee (B)	SL	H		
Boreal Chickadee *	L	H		
Tufted Titmouse (B)				
Red-breasted Nuthatch (B)				
White-breasted Nuthatch (B)				
Brown Creeper (B)				
Carolina Wren (B)				
House Wren (B)				
Winter Wren (B)				
Sedge Wren *				
Marsh Wren (B)				
Golden-crowned Kinglet (B)				
Ruby-crowned Kinglet				
Blue-gray Gnatcatcher (B)				
Northern Wheatear *				
Eastern Bluebird (B)				
Townsend's Solitaire #				
Veery (B)				
Gray-cheeked Thrush				
Swainson's Thrush				
Hermit Thrush (B)				
Wood Thrush (B)	4L	→	2L	
American Robin (B)				
Varied Thrush *	9L			
Gray Catbird (B)				
Northern Mockingbird (B)				
Brown Thrasher (B)				
American Pipit				
Bohemian Waxwing #				
Cedar Waxwing (B)				
Northern Shrike				
Loggerhead Shrike *				
European Starling (B)				
White-eyed Vireo (B)				
Solitary Vireo (B)				
Yellow-throated Vireo (B)				
Warbling Vireo (B)	H			
Philadelphia Vireo				
Red-eyed Vireo (B)				
Blue-winged Warbler (B)				
Golden-winged Warbler (B)				
Brewster's Warbler				
Lawrence's Warbler				
Tennessee Warbler				
Orange-crowned Warbler				
Nashville Warbler (B)				
Northern Parula				
Yellow Warbler (B)				
Chestnut-sided Warbler (B)				
Magnolia Warbler (B)				
Cape May Warbler				
Black-throated Blue Warbler (B)				