REPORT

Evaluation of Piscivorous Mammals - Presence/Absence, Distribution, and Abundance in the Housatonic River Floodplain

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June 2003

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1. Introduction and Background

At the request of the General Electric Company (GE), Paul Bernstein[1] and Dr. Michael Chamberlain[2], with the support of ARCADIS G&M, Inc., BBL Sciences, Inc., and Branton Environmental Consulting (BEC), studied the presence of piscivorous mammals in a Survey Area (described below) within the Housatonic River watershed between the spring of 2001 and the spring of 2003. The objective of this survey was to qualitatively determine the presence/absence, abundance, and distribution of free-ranging piscivorous mammals in the Survey Area, including areas adjacent to the mainstem of the river and nearby tributaries. Mink (*Mustela vison*) were the focus of the survey between spring 2001 and spring 2002, and the survey was expanded to include river otter (*Lontra canadensis*, formerly *Lutra canadensis*) in the winter of 2002 – 2003 (referred to herein as 2003). The primary methods used to determine the presence of mink were the monitoring of tracks at scent post stations in the spring, summer and fall (2001 only) and in the snow during the winter. River otter tracks and slides were monitored only in snow in the winter months.

From 1998 to 2000, the U.S. Environmental Protection Agency (EPA) conducted field surveys to characterize the ecology of the Housatonic River and the adjacent floodplain from Fred Garner Park to Woods Pond. The results of these investigations were presented in an ecological characterization of the Housatonic River (Woodlot Alternatives 2002). Incidental observations of mammals or mammal signs were made during the course of these investigations. Surveys of mammal snow tracks were conducted in fresh snow along six 500-meter (m) transects in all habitat types for a minimum of two to three snow events in the winters of 1998-1999 (1999) and 1999-2000 (2000). In the winter of 2000, mink and river otter scents were placed along the transects as attractants. Scent post surveys were also conducted along three transects in the autumns of 1998 and 1999 and concurrent with the winter 2000 snow tracking surveys. River otter scat was collected when possible. Mink tracks and scat were observed at several locations during the 1999 and 2000 snow tracking surveys[3] and river otter tracks were observed during February and March 2000. Three river otter scats were also collected in 2000. Based on these observations, EPA concluded that mink densities within the area surveyed were low and that the tracks observed may have been from transient individuals passing through the area (Woodlot Alternatives, 2002). The ecological characterization states that it is possible that the surveyed area lies within a river otter home range, but that it is not a highly used area (i.e., not a maintained territory within the home range) (Woodlot Alternatives 2002).

GE's survey was designed to assess and document the presence of mink and river otter in the Survey Area (which, as discussed below, covers a large portion of the area surveyed by EPA) by monitoring mink tracks at scent post stations and mink and river otter tracks in the snow over an extended period of time. The spatial and temporal patterns of these observations were then used to determine if there were resident mink and river otter populations using the Survey Area. In addition, in the spring of 2001 we attempted to trap mink for a radio-telemetry study; however, no mink were captured and this portion of the study was discontinued.

[1] Former New York State Department of Environmental Conservation game warden.

[2] Assistant Professor of Wildlife Ecology, Louisiana State University.

[3] The exact number of tracks and scat observed is not specified (Woodlot Alternatives 2002).

A report summarizing the results of GE's 2001/2002 survey, as well as an addendum and errata sheet for that report, were previously provided to EPA (BBL et al. 2001; BBL et al. 2002). The current report is an updated version of the previous report and includes the results from the 2003 season.

2. Materials and Methods

This section details the methods employed in GE's piscivorous mammal population survey, including the definition of the Survey Area and procedures for observations via scent post station monitoring (mink only) and transects for snow tracking. The first session of this survey began in early April 2001 and continued through March of 2002 (2001/2002); the second session began in December of 2002 and continued through April 2003 (2003).

2.1 Survey Area

The Survey Area comprised the mainstem of the Housatonic River and adjacent banks and areas within the ten-year floodplain in Lenox, Berkshire County, between New Lenox Road and Woods Pond, and associated tributaries in the October Mountain State Forest (e.g., Mill Brook, Roaring Brook and Felton Brook) as well as Yokun Brook. The survey focused on land with suitable foraging habitat for mink and river otter (i.e., steep banks, irregular shorelines and backwaters with dense, wooded cover near the water). During the winter snow tracking surveys, portions of the Survey Area were not monitored because access was limited, as discussed further in Section 2.3 below. This Survey Area is roughly comparable to the middle and lower portions of EPA's survey area (discussed above in Section 1; see also Woodlot Alternatives 2002)

2.2 Scent Post Stations (Mink Only)

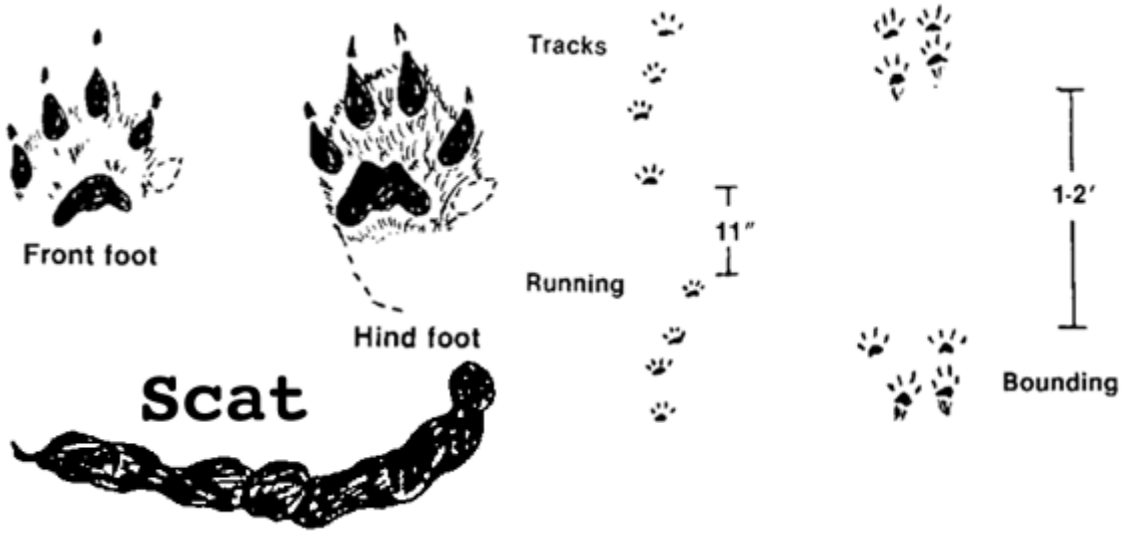
One hundred scent post stations were placed in the Survey Area (from New Lenox Road south toward, and including, the banks of Woods Pond) in 2001. Seventy stations were constructed along the mainstem of the river, while the remaining 30 were constructed on the river's tributaries. The locations of all scent post stations were logged using a hand-held global positioning system (GPS) unit (GARMIN GP-12, GARMIN International Inc., Olathe, K.S.). Scent post stations were located in areas close to a natural entrance/exit to the river from the bank (i.e., beaver slide, visible animal run) to increase the likelihood of animal interest and visitation. These scent post stations were installed in June 2001 and monitored on three days of every month until December 2001. The scent posts consisted of an approximately one-meter-diameter circle prepared by clearing vegetation and other debris and spreading a manufactured, fine-textured soil/sand over the circle as a tracking medium. One of two possible attractants (amino acid disks or lamb's wool soaked with mink urine) was placed in the center of each scent station. The two attractants were placed at alternating scent post stations along the river and tributaries. In the final month of the scent post station survey, mink scat obtained from a nearby mink farm, Berkshire Furs, was used at a subset of stations to replace the other attractants. All observed mink tracks (confirmed and potential) were photographed. Scent post stations were not utilized in the second survey session.

2.3 Snow Tracking/Transects

Between December 2001 and March 2002, site visits were made whenever fresh snow was present to monitor the Survey Area for mink tracks. Incidental observations of otter tracks were documented in 2001/2002 and the survey was expanded to include a focus on river otter as well as mink in 2003. Tracks were also documented when they were observed during other field activities. Field biologists searched for tracks along portions of the east and west sides of the River between New Lenox Road and Woods Pond, and along Roaring Brook and Mill Brook, in areas that appeared likely to support mink (e.g., areas around springs, natural dens) and river otter (e.g., steep banks, fallen trees, abandoned beaver lodges) and that were accessible by foot. In 2001/2002, coverage on the east side of the river

was extensive, whereas, due to poor access, there was no coverage of the west side of the river between the Lenox Sportsmen's Club (just south of New Lenox Road) and Woods Pond. In 2003, there was again no coverage on the west side of the river between the Lenox Sportsmen's Club and Woods Pond, except for a small section of the Willow Creek tributary, and there was also limited access to the middle portion of the east side of the river between New Lenox Road and Woods Pond due to deep snow cover. The primary areas where transects were walked during these site visits are shown in Figures 3-1. – 3-4. When tracks were observed, the location was documented using a GPS and the tracks were photographed.

The positive identification of tracks in this survey relied upon the professional expertise and judgment of the primary field biologists -- Paul Bernstein (former New York State Game Warden) and Thom McClenahan (ARCADIS). Dr. Michael Chamberlain (Louisiana State University) also provided support in some instances by confirming the identification of tracks through photographs or, in one instance, through direct observation. Mr. Bernstein worked for the New York State Department of Environmental Conservation for 40 years and is a highly experienced tracker in the Northeast. These individuals' professional resumes are provided in Attachment A. With only three exceptions (Tr-5, Tr-6 and Tr-9[4]), Mr. Bernstein was present in the field to make positive track identifications. For the three exceptions, Mr. McClenahan, who has an extensive wildlife biology background and had been trained by Mr. Bernstein, was present for all three identifications and Dr. Chamberlain was present for one of these (Tr-5). When multiple tracks were found in one area on the same day, they were counted only once unless they could definitely be identified as belonging to two different animals. Additional tracks had to be at least 500 m away and obviously not from the same animal to be counted as a unique set of tracks.



Mink Tracks, Gait and Sign
Source: http://www.inhs.uiuc.edu/dnr/fur/tracks/tracks.html

[4] Track 9 was documented with a high quality photograph that includes both tracks and mink scat.

In searching for tracks, field staff focused their efforts on areas with habitat likely to support mink and river otter, including islands of trees and brush in fields, marshes, dense brush and cover surrounding the floodplain or shoreline, weed clumps, and muskrat houses and beaver lodges. In addition, tributaries descending from October Mountain to the mainstem, especially Felton Brook, were surveyed. Several key indicators were used to make positive identifications. Paired or indexed footprints were evaluated for signature (pattern), size (although in the snow an accurate foot measurement sometimes was not possible), and straddle size, which is an indicator of the body size or width of the animal (see below). In addition, where possible, the stride of the tracks was considered. Using these parameters and the process of elimination, mink and river otter tracks were distinguished from those of other similarly sized animals. Where possible, the sex of the mink that left the tracks was determined by Mr. Bernstein. A determination of the sex of the mink that left the tracks was primarily based on the tracks' size (width and depth) and the length of the stride indicated by the tracks. Males generally leave wider and deeper tracks and take longer strides, due to their larger size. Other factors that were considered when determining the sex of the mink that left the tracks include the time of year, weather conditions, and the amount and freshness of snow, when winter tracking (as snow melts, tracks can expand in size). In addition, river otter slides and sprainting sites (i.e., latrines) were documented. When tracks and river otter sprainting sites were identified, a GPS reading was taken to document their location and, with a few exceptions (when a camera was not available), they were photographed.

River Otter Tracks
Source: http://www.inhs.uiuc.edu/dnr/fur/tracks/tracks.html

3. Results

3.1 Mink

A total of 35 sets of mink tracks was observed in the Survey Area in 2001/2002 and 33 sets of tracks were observed in 2003. Of the 35 sets of tracks observed in the Survey Area in 2001/2002, one set was observed in May 2001 during other field activities and four sets of tracks were observed at scent post stations during station monitoring – three sets in June 2001 and a fourth set in December 2001. Most of the other tracks – 28 sets – were observed from December 2001 to March 2002. In addition, two sets of mink tracks were observed incidentally in the Survey Area in January 2001 during other field activities prior to the start of the mink survey period, for a total of 35 sets of mink tracks observed in the Survey Area. In addition to the tracks found in the Survey Area during site visits, two additional sets of mink tracks were observed in March 2002 near the confluence of the east and west branches of the Housatonic River, during other field activities. Although these tracks are outside of the Survey Area, they provide additional evidence of the presence of local mink. In 2003, all tracks were observed during snow tracking.

The number of mink tracks observed, date observed, location, and field notes (including identification of sex, where determined) are provided in Tables 3-1 (for 2001/2002) and 2 (for 2003), and the locations of observed tracks are shown in Figures 3-1 and 3-2 for 2001/2002 and 2003, respectively.

Photographs of 18 of the 35 mink tracks observed in 2001/2002 and listed in Table 3-1 are provided in Attachment B. For the remainder of these tracks, photos are not provided for one of two reasons. First, if tracks were observed incidentally to other work being conducted on the river and field staff did not have a camera available, no photos were taken (n=3). Second, in a number of instances, the quality of the photographs was poor due to lighting conditions (e.g., glare) or low definition of the tracks in the snow (n=14), and hence these photos are not included in Attachment B. Photographs of all mink tracks observed in 2003 are provided in Attachment C, along with a photograph of a mink taken along the river by a motion sensing camera.

Upper Right: photograph of mink taken on the mainstem using motion detector camera.
Left: tracks of a mink coming across a field (M-40).

In 2001/2002 more than half (24) of the 35 tracks observed were located on the mainstem of the river (including backwaters and Woods Pond). Eleven sets of tracks were observed along tributaries, including Felton Brook, Mill Brook, and Roaring Brook. Sixteen tracks were identified as belonging to a particular sex. In 2003, all but two of the tracks (31) were observed on the mainstem of the river and one set of tracks each were observed on Mill Brook and Roaring Brook. Eleven sets of tracks were confirmed as belonging to a particular sex.

3.2 River Otter

In 2001/2002, river otter tracks were observed on three occasions; however, these tracks were not photographed. In 2003, 41 river otter tracks were observed in the Survey Area. One set of tracks, likely originating from Felton Pond on October Mountain, was observed on Felton Brook and the remaining 40 sets of tracks were observed on the mainstem of the river. Six sprainting stations were observed during the survey period. One confirmed den site was observed, with two well-used sprainting stations (SS #3 and SS #4) in the immediate vicinity. In addition, a suspected den site was found near otter track O-29-1/20; however, that site was flooded out and the den location was not confirmed.

The number of river otter tracks, date, location, and field notes are listed in Tables 3-3 (for 2002/2002) and 3-4 (for 2003), and the locations of these tracks are shown on Figures 3-3 and 3-4 for the two seasons, respectively. Photographs of all river otter tracks observed in 2003 are provided in Attachment D, along with photographs of river otter taken along the river by motion sensing cameras.

Upper Right: photograph of river otter on the mainstem taken with a motion detector camera.
Left: river otter slide (O-30).

4. Discussion and Conclusions

4.1 Mink

Mink signs were consistently observed in the Survey Area during the winters of 2001/2002 and 2003. The spatial and temporal patterns of these tracks indicate that approximately 6-10 mink in 2001/2002 and approximately 4-7 mink in 2003 likely used the Survey Area as part of their home range over these winter seasons. Given the extensive period that the scent post station survey was carried out and the obvious presence of mink in the area, as indicated by the results of the snow tracking survey, it is unclear why so few tracks were observed at scent post stations. We believe that it may have been due to the attractants used at the stations throughout most of the survey (mink urine and amino acid disks) or the somewhat artificial nature of the scent post itself – a cleared area with manufactured sand spread to record tracks. In the final month of the scent post station study (December 2001), mink scat was used as the attractant at a subset of stations and mink tracks were found at one of those stations. Due to poor winter weather conditions in the following months (early 2002), we were unable to conduct the scent post station monitoring in those months using scat, so we were unable to test the increased efficacy of using scat as an attractant.

Several lines of evidence indicate that the tracks observed reveal the presence of a mink population residing in or, at least using, the Survey Area. This evidence includes the presence of clusters of tracks in different reaches of the river observed over a several month period as well as the positive identification of tracks belonging to both male and female mink (see Figures 3-1 and 3-2 and Tables 3-1 and 3-2). Based on their knowledge of mink natural history, including home range and territoriality, Dr. Chamberlain and Paul Bernstein estimate that the observed mink tracks in 2001/2002 likely indicate the presence of 6 to 10 mink in the Survey Area. For 2003, they estimate the presence of between 4 and 7 mink. The difference between the number of mink estimated to be in the Survey Area in the two survey periods is likely due to the fact that less time was spent in surveying the middle portion of the east side of the river in 2003 (8 visits in 2001/2002 vs. 3 visits in 2003).

Based on both the temporal and geographic spacing of the tracks observed in 2001/2002, it is likely that at least two males, two females, and two mink of unknown sex maintained home ranges that include portions of the Survey Area. A minimum of two male mink are estimated to have been present because two different sets of male tracks (Tr-36/37 and Tr-33) were recorded within distinctly different stretches of the river in the same sampling period. Based on home range characteristics of mink in riverine systems (Leopold and Chamberlain, 2001; Mitchell, 1961), it is highly unlikely that those tracks were left by the same animal. Similar reasoning dictates that there were at least two females, because female mink tracks (Tr-27 and Tr-29) were detected on nearly opposite ends of the Survey Area, approximately a 1900 m linear distance, within the same sampling period. According to the literature, the probability that those tracks belong to the same female is very low. Linscombe et al. (1982) report that the average distance in stream length for a female home range is 1850 m (stream length, not linear), which is much less than the observed linear distance between the two females in the Survey Area. Finally, based on the findings of other sets of tracks (Tr. 13 and Tr. 22) in separate areas during the same time period (Tr-13-U distant from Tr-14-F/Tr-15-F/Tr-16-U; Tr-22 distant from Tr-18-U/Tr-19-F/Tr-20-F/Tr-21-F), at least two other mink of unknown sex were also likely present in the Survey Area. In order to avoid potential double-counting, when tracks that could not be identified to

sex were located in proximity to tracks identified to sex, the unknown tracks were not assumed to represent different individuals.

In several instances, sets of tracks that were found fairly large distances apart were conservatively estimated as belonging to one individual, but in fact may have been left by two different individuals. Assuming that these tracks belonged to a single mink produces a conservative total estimate of 6 mink in the Survey Area, whereas assuming that such cases may indicate the presence of multiple mink results in a total estimate of 10 mink with home ranges that include the Survey Area.

Using the same logic, a conservative estimate indicates that at least three females and one male were active in the Survey Area in 2003, and the spatial and temporal patterns of the tracks indicate that up to a total of 7 mink may have been active there. Tracks of a male mink (M-3-M-12/10) were observed on the same day and in the same vicinity as tracks of a female mink (M-2-F-12/10), indicating the presence of at least one male using the Survey Area as part of his range. For the females, the clusters of tracks at both the north and the south ends of the Survey Area indicate the presence of at least two females, and the presence of additional female tracks in the middle reach of the Survey Area likely indicates the presence of a third female. Specifically, tracks M-2-F-12/10 and M-5-F-12/10 were observed on the same day at almost opposite ends of the Survey Area (distance of 15.5 km stream length/4.5 linear km). Given the range of female mink (Linscombe et al. 1982, discussed above), this provides strong evidence that two different females made these tracks. On the same day, track M-4-F-12/10 was observed approximately 10 km stream length (2.5 linear km) south of track M-2-F-12/10 and 5.5 km stream length (2.1 linear km) north of M-5-F-12/10, indicating the presence of a third female mink. In addition, based on the professional judgment of the field biologists, it is likely that the large number of "unknown" tracks, as well as tracks found in areas distant from other track clusters (e.g., M-32-F-1/24 and M-33-F-1/24), indicate that up to 3 more mink may have been active in the Survey Area.

Considering the uncertainties inherent in this type of tracking survey (i.e., different substrates, varying weather conditions, observations of tracks up to several days after they were made), we are confident that in 2001/2002 at least 6 mink occupied home ranges that include the Survey Area, and there may have been as many as 10 mink occupying a portion of the Survey Area. In 2003, these numbers are between 4 and 7 mink using the Survey Area as part of their home range. It is important to note, however, that the 2001/2002 estimate of 6 -10 mink essentially excludes the area on the west side of the river between the Lenox Sportsmen's Club and Woods Pond, which was not surveyed in winter due to poor access. In 2003, in addition to the same limited access on the west side of the river (except for a small section of the Willow Creek tributary), the area north of Woods Pond to below New Lenox Road and along October Mountain Road was surveyed infrequently because of poor access due to snow cover. Therefore, the above estimates are likely underestimates of the number of mink active in the Survey Area.

It is not possible to estimate the optimum mink abundance for the Survey Area because such an estimate would need to take into consideration a number of conditions that were not measured, including prey abundance and availability, weather, the presence of conspecific factors, and habitat disturbance. It is worth noting, however, that the estimated number of mink in the Survey Area is within the range of mink densities reported in other riverine systems. Studies in Montana and Michigan (Marshall 1936; Mitchell 1961) have reported mink densities ranging from one mink per 13 hectares to one mink per 31 hectares. These can be compared with approximately one mink per 20 hectares (assuming 6 mink) to one mink per 12 hectares (assuming 10 mink) in this survey in

2001/2002 and between one mink per 30 hectares (assuming 4 mink) and one mink per 17 hectares (assuming 7 mink) in 2003. Thus, even without considering the area on the west side of the Housatonic River that was not surveyed (except for a small section of the Willow Creek tributary in 2003), the estimated density of mink in the Survey Area falls within a range that would be expected based on the literature.

4.2 River Otter

In 2003, 41 river otter tracks were observed in the Survey Area along with six sprainting stations, while only three river otter tracks were observed in 2001/2002 (see Figures 3-3 and 3-4 and Tables 3-3 and 3-4). The difference in the amount of river otter signs observed between the two years may be a function of level of effort spent looking specifically for river otter signs, different weather conditions in the two seasons, different levels of river otter activity in the area, or a combination of all three. Winter temperatures in 2003 were much colder than in the previous winter season and, as a result, the river froze over. Although it is possible that river otter did not spend much time in the Survey Area in 2001/2002, it is also possible that they were simply more visible in 2003 because they were forced to go out on land more frequently due to the freezing of the river, and therefore their tracks were more apparent. In addition, there was much more snowfall in 2003; therefore, monitoring tracks was easier than in the previous winter, which had frequent periods of snowmelt.

The large cluster of observations of river otter signs in the northern half of the Survey Area indicates the presence of two different individuals in that area. A suspected den site was found in the vicinity of track O-29-1/20 (see Figure 3-4), although it was flooded and could not be confirmed. This site was in an area with consistent track observations and repeated use of sprainting stations (#1, #2 and #5). One photograph of a river otter was also taken in this area (Camera #1). In another area, somewhat further south, a den site was documented, with frequent observations of tracks in its immediate vicinity (see Figure 3-4). Two frequently used sprainting stations (#3 and #4) and many tracks were also observed in this area (see Figure 3-4). Multiple photographs of the river otter at the confirmed den site were taken using the motion sensor camera (Camera #2). The tracks observed near each of these den sites were different sizes. In addition, a separate cluster of river otter signs was observed in the area where Felton Brook enters Woods Pond. Frequent river otter slides down October Mountain towards the river were documented in this area along with two sprainting stations (one time use). No den site was observed for this river otter. Based on these observations, it appears that the two northern river otters used the Housatonic River as their core use area, and that the southern otter likely had a core use area elsewhere and made periodic use of this part of the Survey Area. Tracks belonging to a different, smaller individual river otter were also observed (O-37-1/30) in the northern portion of the Survey Area. Based on this evidence, we are confident that two river otters used the Housatonic River Survey Area as their core use area in 2003, that another one used that area regularly, and that at least one other otter passed through the Survey Area.

For the reasons described previously for mink, we were not able to determine the optimum density of river otter in the Survey Area. However, the river otter density in the Survey Area is within the range that would be expected based on the literature, and may be an underestimate based on the limited surveying conducted in the middle portions of both sides of the river. According to the literature, river otter have very large home ranges which vary in size from 1.8 to 57 km^2 (0.7 to 22 square miles) (as summarized by Melquist and Dronkert 1987). The shoreline or waterway linear home range distance estimates range from 1 to 78 km (0.6 to 48.5 miles); in comparison, the Survey Area is approximately 16.6 to 18.5 km in stream length (west and east bank respectively) (10.3 to 11.5 miles) (5.2 linear km).

River otters establish territories, which provide their core use areas, within these home ranges. Literature estimates of river otter density vary from one per 1.18 – 2.1 km (0.73 – 1.3 miles) to one per 10 – 17 km (6.2 – 10.6 miles) of shoreline or waterway (i.e., stream length) (as summarized by Melquist and Dronkert 1987). Actual density is a function of a number of factors including habitat and food availability. The estimated density of river otter in the Survey Area, assuming three individuals were regular users of the Survey Area, is one river otter per 5.5 to 6.2 km of shoreline (west and east bank respectively) (3.4 to 3.9 miles), well within the range reported in the literature.

5. References

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Tables

Table 3-1. Mink Tracks Winter 2001/2002

Track ID	Date Observed	Notes
M-1-U-1/18	1/18/2001	Tracks from river to land
M-5-M-5/11	5/11/2001	Male tracks running on mud shore
M-6-M-6/14	6/14/2001	Male tracks in mud - Felton Brk
M-7-U-6/27	6/27/2001	Tracks on station
M-8-U-6/28	6/28/2001	Tracks on station
M-9-U-12/19	12/19/2001	Tracks on sand- scat
M-10-U-1/9	1/9/2002	Roaring Brook Road Bridge over Mill Brook
M-11-U-1/9	1/9/2002	Roaring Brook Road Bridge over Mill Brook
M-12-U-1/9	1/9/2002	Along log on main river (Box 899)
M-13-U-1/17	1/17/2002	Roaring Brook Road Bridge over Mill Brook
M-14-F-1/17	1/17/2002	Female - tracks into river
M-15-F-1/17	1/17/2002	Female - possible den
M-16-U-1/17	1/17/2002	Passes through open spring area
M-18-U-1/23	1/23/2002	Roaring Brook Road Bridge over Mill Brook
M-19-F-1/23	1/23/2002	Female, in and out of holes
M-20-F-1/23	1/23/2002	Female, in between MS-42/44
M-21-F-1/23	1/23/2002	Female, same possible den site as M-15-F-1/17
M-22-U-1/23	1/23/2002	Mink trail from river to hole ~20'
M-23-M-2/19	2/19/2002	Male, in and out of water and holes
M-24-M-2/19	2/19/2002	Male, in between MS-42/44
M-25-U-1/18	1/18/2001	East side of Woods Pond
M-26-M-2/28	2/28/2002	Male, by mail box #37
M-27-F-2/28	2/28/2002	Female, running under bridge
M-28-M-2/28	2/28/2002	Male, walkway S of MS-43
M-29-F-2/28	2/28/2002	Female, same possible den site as M-15-F-1/17
M-31-U-3/18	3/18/2002	MS-52 Walkway, visiting animal carcass
M-32-U-3/19	3/19/2002	Lope along shore, in/out water
M-33-M-L-3/19	3/19/2002	Large male, in/out water
M-34-U-3/19	3/19/2002	Around tree/water by box #899
M-35-U-3/19	3/19/2002	In mud, on west bank, b/w MS8 and MS9.
M-36-M-L-3/19	3/19/2002	Large male, in/out water, south of Box #711
M-37-M-L-3/19	3/19/2002	Large male, 100 yards south of Box #711.
M-38-M-L-3/21	3/21/2002	Large male, in and out small of stream/culvert
M-39-U-3/21	3/21/2002	30 yards west of Box #899, in/out marsh
M-41-F-3/21	3/21/2002	Female, on MS-16, 10' off river bank

Table 3-2. Mink Tracks Winter 2003

Track ID	Date Observed	Notes
M-1-F-12/10	12/10/02	Female tracks near Bird Box #887
M-2-F-12/10	12/10/02	Female tracks near Bird Box #896
M-3-M-12/10	12/10/02	Male tracks on edge of marsh near Bird Box #713
M-4-F-12/10	12/10/02	Female tracks near an abandoned beaver lodge
M-5-F-12/10	12/10/02	Female tracks - west shore area at footbridge at Woods Pond
M-9-U-12/17	12/17/02	Tracks across field, down log and brush pile, in and out of weed pile
M-10-U-12/17	12/17/02	Tracks across field/marsh area
M-14-U-1/10	1/10/03	Near Bird Box #900
M-22-F-1/14	1/14/03	Loping track in snow - in and out of holes around fallen tree
M-28-U-1/20	1/20/03	Small tracks - in and out of holes, logs, beaver lodge; gait approx. 6-8"
M-32-F-1/24	1/24/03	Fairly small tracks - in and out of holes; stride 2" , gait 18 - 22"
M-33-F-1/24	1/24/03	In and out of holes through weed piles; 28" gait
M-35-U-1/30	1/30/03	Fairly small animal - in and out of weed mounds, under limbs
M-36-U-1/30	1/30/03	In and out and between 2 holes in snow; straddle 3", stride 22"
M-40-U-1/30	1/30/03	Loping through field area, into and out of weed piles; straddle 3.5", stride 18"
M-42-U-2/5	2/5/03	Tracks of into osier cover; stride 15.5", straddle 3 3/4"
M-45-U-2/5	2/5/03	Tracks loping on ice shelf close to shore - investigating holes and bank
M-49-U-2/10	2/10/03	Throughout osier/brush - under logs, stride 17", straddle 2"
M-50-U-2/10	2/10/03	In and out of hole in clump of weeds; stride: 30-34", straddle: 2 1/4"
M-55-U-2/20	2/20/03	Loping tracks from brush, through weed clumps, to downed trees
M-62-U-2/21	2/21/03	Tracks loping through dense red Osier; straddle 2 3/4"; stride:22"
M-65-F-2/25	2/25/03	Tracks running through thick brush (lopes) into river edge area.
M-66-U-2/25	2/25/03	Runs through thick osier brush - top of beaver lodge and across field area.
M-67-U-2/25	2/25/03	Across open area - lopes through brush, into small holes at base of trees
M-69-F-2/25	2/25/03	Loping tracks up the brook from mainstem direction - fairly small tracks
M-73-U-2/27	2/27/03	Loping in and out of shrubs and holes at the base of the shrubs
M-75-F-3/4	3/4/03	Loping tracks through brush and across field area
M-84-U-3/7	3/7/03	In and out of water, up steep bank, across field into/through brush
M-98-U-3/26	03/26/03	Scat left on a natural run way up and along a large uproot
M-103-U-4/8	04/08/03	Mink tracks and slide into river; path seen under ice; wet tail drag
M-107-U-2/3	02/03/03	Around and into an uproot along shore line and open water spot
M-108-U-2/3	02/03/03	From backwater area to mainstem area, through a marsh and thick osier.
M-109-U-2/3	02/03/03	Out of weed pile and into and through small brush/marsh area
M-112-U-2/3	02/03/03	Tracks are old - but pairing of feet is still obvious

Table 3-3. Otter Tracks Winter 2001/2002

Track ID	Date Observed	Notes
O-2-4/24	4/24/01	Tracks in and out of beaver holes
O-3-4/25	4/25/01	Tracks running along shore to beaver lodge
O-4-5/7	5/7/01	Tracks run on shore in and out of water

Table 3-4. Otter Tracks Winter 2003

Track ID	Date Observed	Notes
O-13-1/10	1/10/03	Otter tracks and slide to and from river near Bird Box #897
O-15-1/10	1/10/03	Tracks and slide in snow; scat sample noted
O-16-1/10	1/10/03	Tracks and slide in snow; on old beaver lodge
O-17-1/10	1/10/03	Tracks and slide in snow, to and from river
O-21-1/14	1/14/03	Sliding tracks in snow out of water, turn around, back in water
O-23-1/14	1/14/03	In and out of water and ice in 2 locations, up a narrow gully
O-27-1/20	1/20/03	Otter slide on the ice, through dusting of snow
O-29-1/20	1/20/03	Trail and possible den location, trail from river
O-30-1/20	1/20/03	Otter tracks and multiple slides to and from river, sprainting station
O-37-1/30	1/30/03	Width between leaps 40", otter was in gray/brown color phase
O-39-1/30	1/30/03	Slide on shore, tracks lead from ice and up bank
O-44-2/5	2/5/03	Loping along ice shelf on rivers edge, can see paired tracks
O-46-2/5	2/5/03	Otter running and playing on ice around an exposed metal drum
O-51-2/10	2/10/03	Tracks within the slide, good imprinted tracks - webbing seen
O-52-2/10	2/10/03	Up and out of river, onto sprainting station
O-54-2/10	2/10/03	Heavy use area, spent a lot of time on land here all throughout pond
O-56-2/20	2/20/03	Tracks from river, lope, leap and run through snow
O-59-2/21	2/21/03	In and out of several spring/running water spots, walking tracks
O-61-2/21	2/21/03	Walking tracks from backwater area to mainstrem
O-64-2/25	2/25/03	Walks/lopes to roling station where rolled repeatedly - fishy odor
O-68-2/25	2/25/03	Fresh (within 1 week), scat in same exact location as 2 previous events
O-72-2/27	2/27/03	Heavily used area - slides, tracks, multiple use for sprainting station, den site
O-74-2/27	2/27/03	Walking tracks from Fenton Pond and slide, down hill, crossing the road
O-76-3/4	3/4/03	Out of river, up bank, loping through snow and back into river
O-77-3/4	3/4/03	Some uncovered scat in same exact location
O-78-3/4	3/4/03	Tracks up and on ice, turns around, defecates and returns to river, sprainting station
O-80-3/4	3/4/03	Tracks fresh since Sat./Sun. rain (3/2,3/3) in/out of den to river, den site
O-81-3/4	3/4/03	In and out of spring/open water area, scat at sprainting station, den site
O-85-3/7	3/7/03	New slide and tracks from river to sprainting station, urine and scat, den site
O-86-3/11	3/11/03	Otter tracks out of water, onto ice shelf, up and across land
O-87-3/11	3/11/03	Heavy use in natural river inlet, slide up/down bank to sparinting station
O-88-3/11	3/11/03	Heavy activity out of water and onto stop, possible feeding stop
O-89-3/11	3/11/03	Otter tracks on land, across beaver lodge, onto ice, runs and slides
O-90-3/11	3/11/03	New/fresh tracks out of water and around den opening, den site
O-91-3/11	3/11/03	Tracks on shore and in and out of spring, backwater to den area, den site
O-97-3/19	3/19/03	New (since 3/14/04) partial slide with tracks inside of slide, den site
O-104-4/8	04/08/03	Tracks and slide from backwater to river, tracks inside slide
O-105-4/10	04/10/03	1 hind and 1 fore in mud, scat (fresh - within 2 weeks due to flooding)
O-106-4/10	04/10/03	Scat left on shore on a good run from MS-73, sprainting station
O-110-2/3	02/03/03	Tracks and slide, both loping and running
O-114-2/3	02/03/03	Running from on shore onto the ice and along ice to open water

Figures

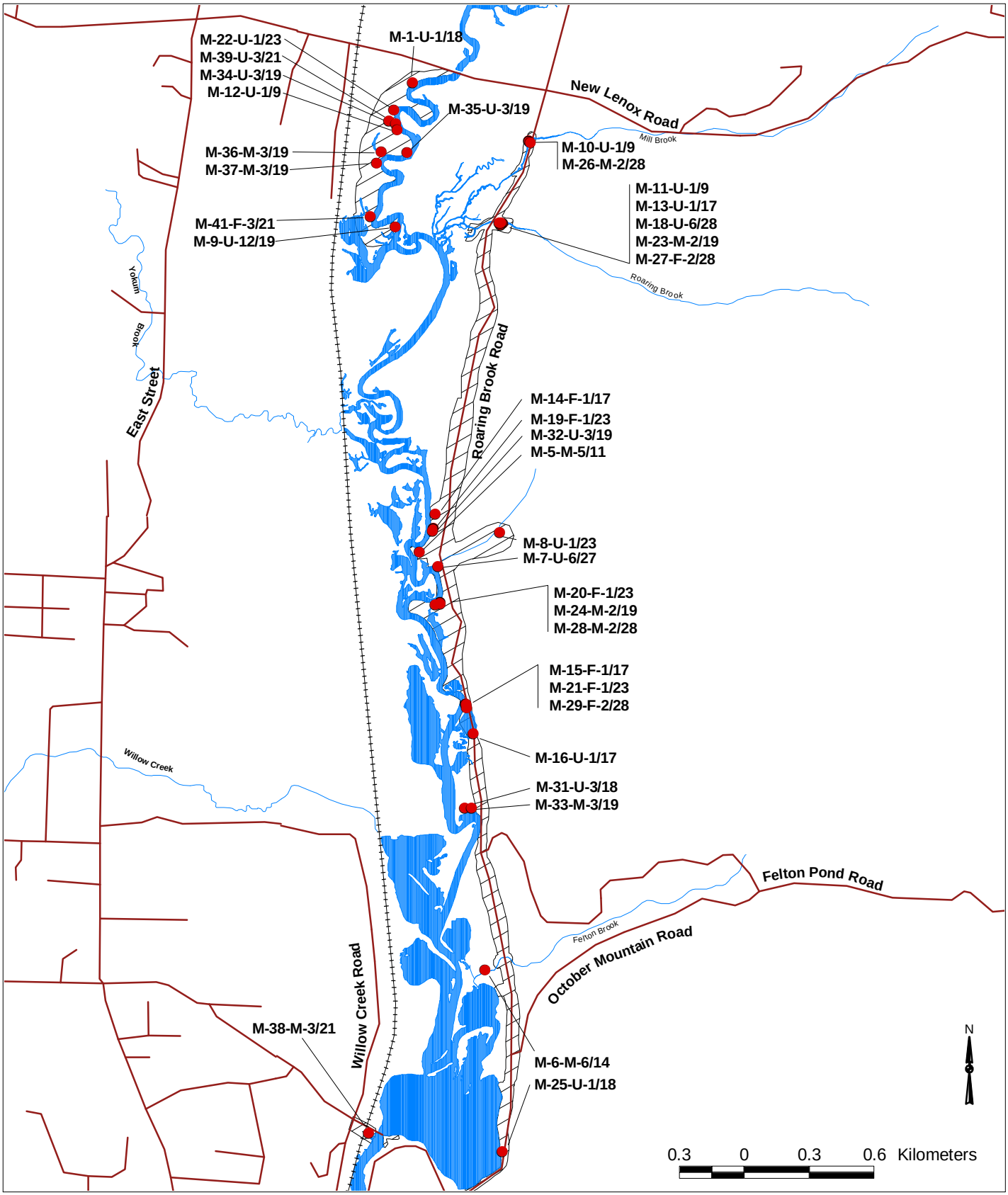

Figure 3-1.

Mink Track Locations Winter 2001/2002

Housatonic River
Massachusetts

Legend

- Mink track location

Labels

M-xx: Mink
-M: M = male, F = female,
U = unknown
-1/14: month/day (e.g. Jan. 14)

Searching transects

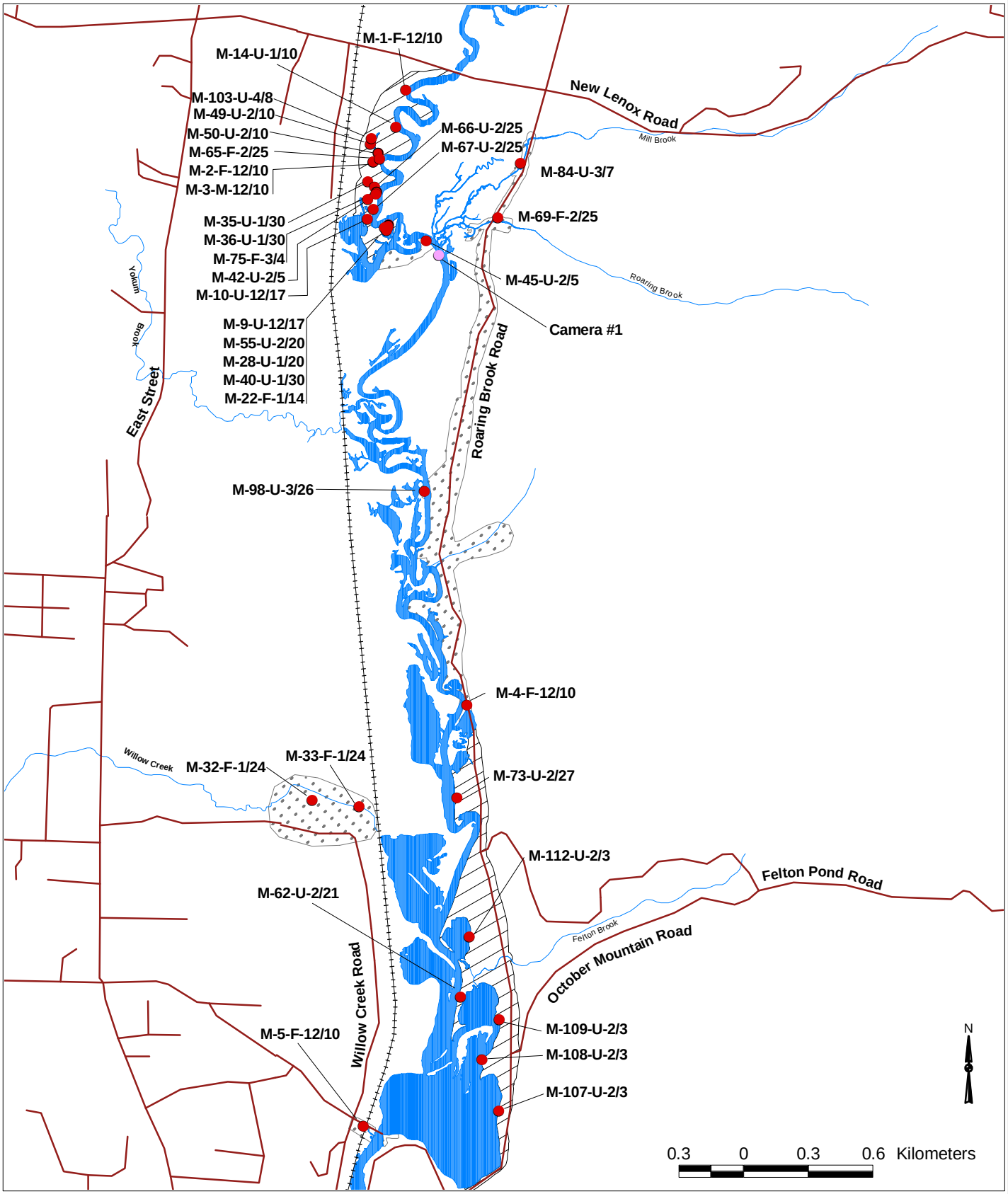

Figure 3-2.

Mink Track Locations Winter 2003

Housatonic River
Massachusetts

Legend

- Mink track location
- Camera location

Labels

M-xx: Mink
-M: M = male, F = female, U = unknown
-1/14: month/day (e.g. Jan. 14)

- Searching transects (frequent)
- Searching transects (infrequent)

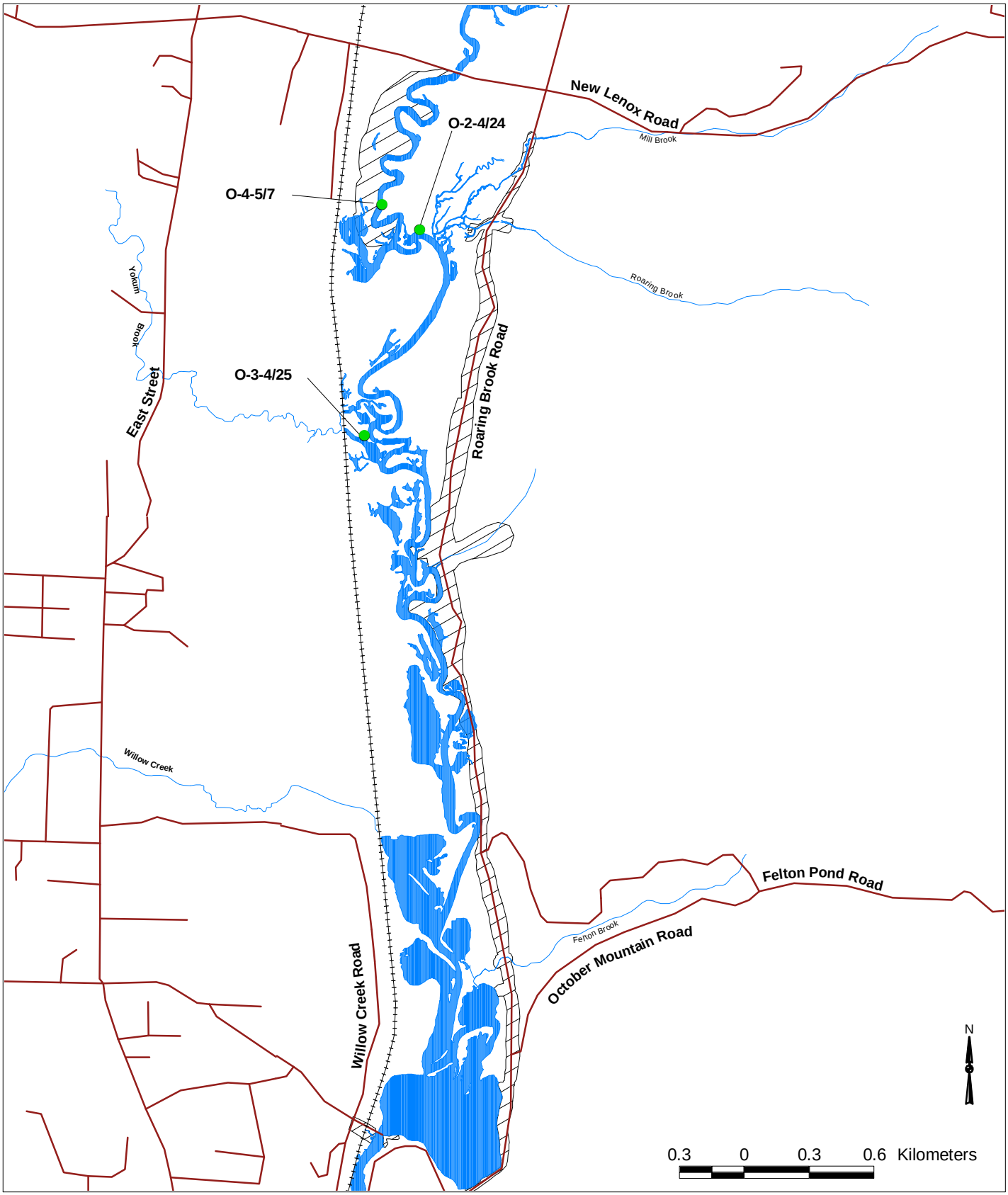

Figure 3-3.

Otter Track Locations Winter 2001/2002

Housatonic River
Massachusetts

Legend

Otter track location

Labels

O-xx: Otter
-1/14: month/day (e.g. Jan. 14)

Searching transects

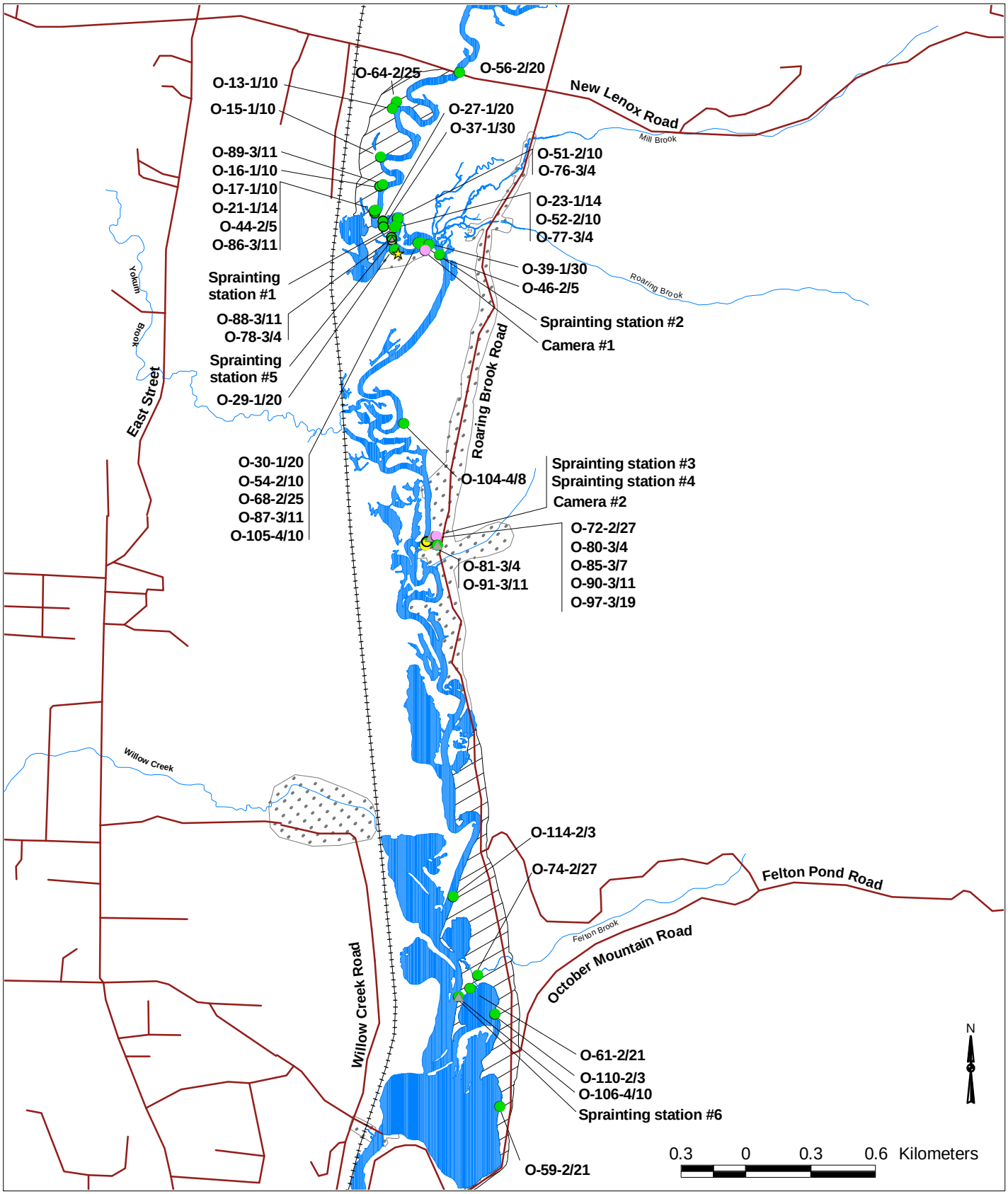

Figure 3-4.

Otter Track Locations
Winter 2003

Housatonic River
Massachusetts

Legend

- Otter track location
- Camera location
- Sprainting station
- Den
- Den (possible site)

Labels

O-xx: Otter
-1/14: month/day (e.g. Jan. 14)

- Searching transects (frequent)
- Searching transects (infrequent)

Attachment A

Professional Resumes

Paul Bernstein - Curriculum Vitae

PAUL BERNSTEIN

133 FIREHILL ROAD, BOX 91 • SPENCERTOWN, NEW YORK 12165
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Paul Bernstein worked for the New York State Department of Environmental Conservation for forty years. He spent six years as a Fish and Wildlife Field Supervisor and thirty-four years as an Environmental Conservation Officer. At retirement he held the rank of Lieutenant. As a Lieutenant, Mr. Bernstein supervised Environmental Conservation Officers in Columbia and Rensselaer counties. He also served as a Senior Training Officer for the New York State Department of Environmental Conservation and lectured to state and local police agencies as well as the environmental police force, specializing in fish and wildlife identification.

Since his retirement, Mr. Bernstein has worked as a consulting naturalist on the upper Hudson River and on the Housatonic River cataloging, identifying and tracking the many species of fish, wildlife and fauna that live in this unique area.

EXPERIENCE

1999–Present Private Consulting New York

Consulting Naturalist

- Providing consulting services in wildlife trapping and tracking.
- Cataloguing species of fish, wildlife, and fauna in New York and Massachusetts.

1977–1994 New York State Department of Environmental Conservation New York

Police Training Officer, 1985-1994

- Served as instructor for classes teaching how to track both wildlife and people.
- Lectured classes in trial testimony and courtroom seminars, police ethics and ethnic awareness, and fish and wildlife identification.

Hazardous Materials Lieutenant, 1983-1994

- Served as New York State Region 4 Hazardous Materials Lieutenant.

Enforcement Officer, 1977-1983

- Officer in Charge of second basic training school for New York State Environmental Conservation Officers in 1977. School held at the New York State Police Academy. Spent one year getting the school up and running. In the first year, the school graduated 45 officers.

1959–1977 New York State Conservation Department New York

Enforcement Officer, 1966-1977

- Transferred to Putnam County in 1966 and promoted to Enforcement Officer.
- Enforced wildlife-related hunting, fishing and trapping laws.
- Founded the first edition of the New York State Conservation Officer Newsletter in 1972.

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Conservation Officer, 1966

- Placed first in the promotion test for New York State Conservation Officer. Appointed in September 1966.
- Assigned to Westchester County, New York.
- Patrolled the Long Island Sound, enforcing marine and shellfish laws.

Field Supervisor, 1959-1966

- In charge of field crews in building wildlife marshes under the Federal Pittman Robertson Program.
- In charge of crews building the 1000-acre Birch Kill Game Management Area in Putnam County, New York.
- Worked as a nuisance Beaver Trapper conducting live trapping and transfer of beavers.
- Supervised field team in live trapping, collaring, and monitoring of white tail deer.
- Certified as a deer ager [was taught by Jack Tanck and Bill Leverinhaus, the inventor of the technique].
- Supervised wildlife census teams for pheasant, quail, mourning dove and waterfowl.
- Supervised teams in the acquisition of the 8000-acre Public Hunting Area in Putnam County, New York.
- Worked privately as a trapper of furbearers, including mink.

TRAINING

1972 Service School Training New York State Police Academy

- Attended month-long Service School training in 1972 at the New York State Police Academy. Training specialized in enforcement aspects of environmental quality.

1980 Hazardous Materials and the Law New York

- Attended week-long training course by the U.S. Environmental Protection Agency.

1982 Defensive Tactics Instructor School New York

- Attended Federal Bureau of Investigation defensive tactics instructor school. Training conducted by a certified defensive tactics instructor.

1983 Hazardous Materials Transportation Law New York

- Attended U.S. Department of Transportation course in Hazardous Materials Transportation Law and Compliance.

1985 Police Supervision New York

- Attended Monroe County Community College course in Police Supervision.

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CERTIFICATIONS

N.R.A. Certified Hunting and Trapping Training Instructor.
Certified Deer Ager.

INTERESTS

Outdoor activities, including hunting, fishing and hiking.

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Michael J. Chamberlain - Curriculum Vitae

Curriculum Vitae - Michael J. Chamberlain

Work Address
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mchamb2@lsu.edu

Home address
1026 Brookhollow Drive
Baton Rouge, LA 70810
(225) 753-9216

Education

Ph.D., Forest Resources with major in Wildlife Ecology; Mississippi State University, Mississippi State, MS. GPA - 3.84. December 1999

M. S. Wildlife Ecology; GPA - 3.54; Mississippi State University, Mississippi State, MS. December 1995

B. S. Wildlife Science; Minor - Biology; GPA - 3.3; Virginia Polytechnic Institute and State University, Blacksburg, VA

A. S. Biological Sciences; GPA - 3.4; Danville Community College, Danville, VA

Work Experience

March 2000-present
Assistant Professor - School of Renewable Natural Resources, Louisiana State University Design, implement, and coordinate applied and basic research examining wildlife communities throughout the United States. Research foci include ecology and management of mammalian carnivores, upland game bird ecology and management, wildlife/habitat relationships, and applications of Geographic Information System (GIS) technology to natural resource management. Also serve as instructor for graduate-level courses detailing the ecology, population dynamics, and management of upland game birds and large mammals inhabiting North America (RNR 7011, 7015), as well as a graduate seminar series (RNR 7070). Undergraduate teaching responsibilities include Principles of Wildlife Management (RNR 2031) and Wildlife Habitat Management (RNR 4045).

September 1998 - February 2000
Wildlife Research Assistant I - Mississippi State University - maintain hardware, software, and operating systems on UNIX and PC-based workstations in the Department of Wildlife and Fisheries GIS laboratory. Also provide GIS-related technical assistance to graduate students, faculty, and staff of the Department of Wildlife and Fisheries, Mississippi State University and the Mississippi Department of Wildlife, Fisheries and Parks. Develop multi-layered GIS systems of study areas used by graduate research projects. Maintain GIS systems for several state-owned wildlife management areas and

data associated with Global Positioning System (GPS) base station. Use Trimble hand-held GPS units to gather field locations associated with various research projects. Provide GPS technical assistance to graduate students, faculty, and staff. Assist with capture/tagging of Northern bobwhite and analyze data from field research and surveys. Assist with design of graduate research projects. Conducted winter and summer bobwhite calling surveys.

January 1996 - August 1998
Doctoral Graduate Research Assistant, Mississippi State University - conducted research on bobcats, coyotes, gray foxes, raccoons, opossums, and wild turkeys to examine and model the process of predation involving turkeys. Develop habitat use models to predict selection patterns of carnivores and turkey hens. Field research included capture of listed species and extensive radio-tracking. Coordinated efforts of 4 technicians. Additional field work included extensive vegetation sampling using point-center-quarter method, forest densiometer, Daubenmire frame, Nudd's density board, and 10-factor prism to assess microhabitat conditions of macrohabitats selected by carnivores and turkey hens. Also conducted small mammal trapping to assess habitat-specific rodent abundance for medium-sized and larger mammalian carnivores and omnivores on 2 study sites. Performed long-term dietary analysis of bobcats and coyotes. Coordinated and conducted research on Singing River Island, Mississippi assessing influence of introduced bobcats on rabbit and nutria populations.

Assisted in design, coordination, and implementation of 2 graduate research projects designed to supplement information gained directly through my doctoral research. These projects were (1) assess impacts of summer hunting on raccoon population dynamics and (2) assess relationships between carnivore densities and visitation rates using multiple index methods.

Created, coordinated, and assisted in the implementation of web-based completion report for the overall predation project my dissertation detailed. This web site served as a final completion report for the Mississippi Department of Wildlife, Fisheries and Parks, the National Wild Turkey Federation, Georgia-Pacific Corporation, and the USDA Forest Service. Site can be viewed at http://www.cfr.msstate.edu/predator/projecthome.html

July 1993 - December 1995
Graduate Research Assistant, Mississippi State University - coordinated and conducted research on wild turkeys including capture using cannon nets, field marking, radio-telemetry, collection of harvest data, and gobbler call counts. Also coordinated and conducted baseline monitoring system for the U. S. Army Corps of Engineers to determine relative abundance of numerous species including white-tailed deer, wild turkey, small mammals, lagomorphs, tree squirrels, songbirds, reptiles/amphibians and waterfowl. Used multiple census techniques to monitor relative abundance of the aforementioned species, including spotlight counts, track counts, pellet-group counts, time-area counts, flush counts, circular bird plots, and reptile/amphibian call counts.

May - June 1993
Research Technician, Virginia Polytechnic Institute and State University - assisted with collection of vegetation data to implement a GIS-based habitat model. Field sampling techniques included line-intercept sampling and tree density surveys.

May - June 1989, 1990
General Laborer - Bryant Contracting, Inc., Toano, VA; performed various tasks including welding, painting equipment, repairing engines and transmissions, and servicing company vehicles.

Research Interests

Wildlife Population Ecology
Population Dynamics
Population Estimation
Avian Ecology and Management
Wildlife/Habitat Relationships
Predator-prey relationships
GIS applications

Awards and Honors

Ernest A. Gluesing Memorial Award for outstanding graduate student in the Department of Wildlife & Fisheries, Mississippi State University - 1999
David H. Nabi Memorial Award for outstanding service to fellow graduate students and faculty at Mississippi State University - 1998
Hanover-Caroline Soil Conservation Service Scholarship - 1989
Dean's List - Danville Community College (3 times)
Dean's List - Virginia Polytechnic Institute and State University (2 times)
Xi Sigma Pi Honor Society (1992 - present)
Alpha Zeta Honor Fraternity (1992-1993)

Certifications

Associate Wildlife Biologist - The Wildlife Society - 27 March 2000

Committees Chaired

Spatial and Information Technologies in Natural Resources - 2000/2001 - Louisiana State University - committee to review proposed undergraduate course examining spatial and information technologies in the natural resource disciplines.

Committee Assignments

Wildlife Faculty Search Committee - 2000 - Louisiana State University - committee to identify and hire wildlife faculty member specializing in wetland ecology

Technology Committee - 2000-present - School of Renewable Natural Resources - Louisiana State University

Natural Resource Conservation Course Committee - 2001 - committee responsible for designing class to be included in core curriculum of School of Renewable Natural Resources.

Louisiana State University Institutional Animal Care and Use Committee - 2001

Criteria for Endowed Professorship Committee - 2001 - committee responsible for drafting criteria for selecting endowed professors in the School of Renewable Natural Resources.

Web-page Design Committee - 2002-present - School of Renewable Natural Resources - committee responsible for designing website for school

Assessment Committee - 2002-2003 - School of Renewable Natural Resources - committee reviewing and revising guiding principles for assessment of the School

Advising/Mentoring of Undergraduate Students Committee - 2002-2003 - School of Renewable Natural Resources - committee developing guidelines for decentralizing of undergraduate advising

Peer-reviewed publications

Published , or in-press

Chamberlain, M. J., D. A. Miller, B. D. Leopold, and G. A. Hurst. 1996. Predation rates on wild turkey hens in a hardwood bottomland forest and a mixed forest in Mississippi. Proceedings of the Annual Conference of Southeastern Association of Fish and Wildlife Agencies 50:428-435.

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Chamberlain, M. J. and B. D. Leopold. 1998. Microhabitat characteristics of wild turkey hen prenest and nest site selection in central Mississippi. Proceedings of the Annual Conference of Southeastern Association of Fish and Wildlife Agencies 52:274-282.

Chamberlain, M. J., L. M. Conner, B. D. Leopold, and K. J. Sullivan. 1998. Diel

activity patterns of adult bobcats in central Mississippi. Proceedings of the Annual Conference of Southeastern Association of Fish and Wildlife Agencies 52:191-196.

Chamberlain, M. J., B. D. Leopold, L. W. Burger, B. W. Plowman, and L. M. Conner. 1999. Survival and cause-specific mortality rates of adult bobcats in central Mississippi. Journal of Wildlife Management. 63:613-620.

Chamberlain, M. J., K. M. Hodges, B. D. Leopold, and T. S. Wilson. 1999. Survival and cause-specific mortality of adult raccoons in central Mississippi. Journal of Wildlife Management 63:880-888.

Chamberlain, M. J. and B. D. Leopold. 1999. Survival and cause-specific mortality of hardwood seedlings in the Mississippi Alluvial Valley. Ecology and Management of Bottomland Hardwood Systems: The State of Our Understanding. Pages 119-123.

Hodges, K. M., **M. J. Chamberlain**, and B. D. Leopold. 2000. Effects of summer hunting on ranging behavior of adult raccoons in central Mississippi. Journal of Wildlife Management 64:194-198.

Bowman, J. L., B. T. Bond, B. D. Leopold, **M. J. Chamberlain**, and J. M. Ross. 1999. Effect of harvest on previously unexploited populations of fox and gray squirrels. Proceedings of the Annual Conference of Southeastern Association of Fish and Wildlife Agencies 53:282-295.

Chamberlain, M. J. and B. D. Leopold. 1999. Dietary patterns of sympatric bobcats and coyotes in central Mississippi. Proceedings of the Annual Conference of Southeastern Association of Fish and Wildlife Agencies 53:204-219.

Chamberlain, M. J., J. W. Mangrum, B. D. Leopold, and E. P. Hill. 1999. Evaluation of four attractants for indices to monitor relative abundance of carnivores. Proceedings of the Annual Conference of Southeastern Association of Fish and Wildlife Agencies 53:296-304.

Chamberlain, M. J., J. M. Ross, and B. D. Leopold. 1999. Influence of forest management and microhabitat conditions on abundance of southern fox and gray squirrels. Proceedings of the Annual Conference of Southeastern Association of Fish and Wildlife Agencies 53:402-414.

Chamberlain, M. J., and B. D. Leopold. 2000. Spatial use patterns, seasonal habitat selection, and interactions among adult gray foxes in Mississippi. Journal of Wildlife Management 64:742-751.

Miller, D. A., **M. J. Chamberlain**, G. A. Hurst, and B. D. Leopold. 2000. Lessons from Tallahala: What have we learned for turkey management into the 21st century? Proceedings of the National Wild Turkey Symposium 8:in press.

Chamberlain, M. J. and B. D. Leopold. 2000. Habitat sampling and selection by female wild turkeys during preincubation. The Wilson Bulletin. 112:326-331.

Chamberlain, M. J., B. D. Leopold, and L. W. Burger. 2000. Characteristics of roost sites of adult wild turkey females. Journal of Wildlife Management. 64:1025-1032.

Chamberlain, M. J., B. D. Leopold, K. M. Hodges, and J. G. Burton. 2000. Space use and movements of raccoons in two forested ecosystems. Proceedings of the Annual Conference of Southeastern Association of Fish and Wildlife Agencies. 54:391-399.

Chamberlain, M. J., C. D. Lovell, and B. D. Leopold. 2000. Spatial use patterns, habitat selection, and interactions among adult coyotes in central Mississippi. Canadian Journal of Zoology 78:1-9.

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Williamson, S. C., L. W. Burger, S. Demarais, and **M. J. Chamberlain**. 2001. Effects of northern bobwhite habitat management practices on red-imported fire ants. Quail V: Proceedings of the Fifth National Quail Symposium. In press.

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Greenfield, K. C., L. W. Burger, Jr., **M. J. Chamberlain**, and E. W. Kurzejeski. 2002. Vegetation management practices on Conservation Reserve Program fields to improve northern bobwhite habitat quality. Wildlife Society Bulletin 30:527-538.

Chamberlain, M. J., and B. D. Leopold. 2002. Movements and space use of gray foxes (*Urocyon cinereoargenteus*) following mate loss. American Midland Naturalist 147:409-412.

Chamberlain, M. J., and B. D. Leopold. 2003. Effects of flooding on relative abundance and diversity of small mammals in a regenerating bottomland hardwood forest. The Southwestern Naturalist. In press.

Chamberlain, M. J., and B. D. Leopold. 2002. Spatio-temporal relationships among adult raccoons (*Procyon lotor*) in central Mississippi. American Midland Naturalist. 148:297-308.

Chamberlain, M. J., L. M. Conner, B. D. Leopold, and K. M. Hodges. 2003. Space use, movements, and multi-scale habitat selection of adult raccoons in central Mississippi. Journal of Wildlife Management. 67:in press.

Leopold, B. D., and **M. J. Chamberlain**. 2002. Predator management: Here we go again? Proceedings of the Annual Conference of Southeastern Association of Fish and Wildlife Agencies. 56:in press.

Greenfield, K. C., **M. J. Chamberlain**, L. W. Burger, Jr., and E. W. Kurzejeski. 2002. Effects of prescribed burning and discing on Conservation Reserve Program fields and habitat quality for northern bobwhite in Mississippi. American Midland Naturalist. 148:in press.

Chamberlain, M. J., B. D. Leopold, and L. M. Conner. 2002. Space use, movements, and habitat selection of adult bobcats in central Mississippi. American Midland Naturalist. 148:in press.

Richkus, K. J., F. D. Rohwer, and **M. J. Chamberlain**. 2002. Survival and cause-specific mortality of northern pintails in southern Saskatchewan. Journal of Wildlife Management. 67:in press.

Henner, C. M., **M. J. Chamberlain**, B. D. Leopold, and L. W. Burger, Jr. 2003. A multi-resolution assessment of raccoon den site selection. Journal of Wildlife Management. 67:in press.

<u>In Review</u>

Van Why, K. R., and **M. J. Chamberlain**. 2002. Mortality of Louisiana black bears associated with elevated train trestles. Canadian Field-Naturalist.

<u>Books/Book Chapters</u>

Chamberlain, M. J. and B. D. Leopold. 2001. Omnivorous furbearers. Pages 278-292 in J. G. Dickson, editor. Wildlife of Southern Forests: Habitat and Management. Hancok House Publishers, Blaine, Washington, USA.

Leopold, B. D. and **M. J. Chamberlain**. 2001. Carnivorous furbearers. Pages 248-277 in J. G. Dickson, editor. Wildlife of Southern Forests: Habitat and Management. Hancok House Publishers, Blaine, Washington, USA.

Bowman, J. L. and **M. J. Chamberlain**. 2001. Squirrels. Pages 176-185 in J. G. Dickson, editor. Wildlife of Southern Forests: Habitat and Management. Hancok House Publishers, Blaine, Washington, USA.

Leopold, B. D., **M. J. Chamberlain**, and D. Miller. 2002. The Bobcat: Biology, Conservation, and Management. The Hancock Press. In preparation.

Invited papers

Chamberlain, M. J., and B. D. Leopold. 2000. Spatio-temporal relationships among adult bobcats in central Mississippi. Pages 45-50 *in* Woolf, A., C. K. Nielsen, and R. D. Bluett, editors. Proceedings of a symposium on current bobcat research and implications for management. The Wildlife Society 2000 Conference, Nashville, Tennessee, USA..

Peer-edited publications

Chamberlain, M. J., J. W. Mangrum, B. D. Leopold, and E. P. Hill. 2000. Evaluation of four attractants for indices to monitor relative abundance of raccoons. North American Aquatic Furbearer Symposium. 1:in press.

Chamberlain, M. J. and B. D. Leopold. 2000. Movement and activity patterns of adult raccoons in intensively managed pine forests. North American Aquatic Furbearer Symposium. 1:in press.

Conner, L. M., B. D. Leopold, and **M. J. Chamberlain**. 2000. Multivariate habitat models for bobcats in southern forested landscapes. Pages 51-55 *in* Woolf, A., C. K. Nielsen, and R. D. Bluett, editors. Proceedings of a symposium on current bobcat research and implications for management. The Wildlife Society 2000 Conference, Nashville, Tennessee, USA.

Non-peer reviewed publications

Chamberlain, M. J., D. A. Miller, G. A. Hurst, and B. D. Leopold. 1995. Comparison of predation rates on wild turkey hens in two forest ecosystems in Mississippi. Proceedings of the Eastern Damage Management Workshop. 7:abstract only.

Chamberlain, M. J., G. A. Hurst, and B. D. Leopold. 1995. Survival rates of wild turkey hens in bottomland hardwood forests in the Mississippi Alluvial Valley. Mississippi Chapter of the Wildlife Society. Abstract only.

Miller, D. A., M. Weinstein, **M. J. Chamberlain**, W. E. Palmer, G. A. Hurst, and B. D. Leopold. 1995. Ecological importance of southern forested wetlands for the wild turkey. Proceedings of the Southern Forested Wetlands Ecology and Management Conference 1:36-38.

Chamberlain, M. J. and B. D. Leopold. 1996. Preliminary hardwood seedling survival rates in the Mississippi Alluvial Valley. Mississippi Chapter of the Wildlife Society. Abstract only.

Chamberlain, M. J., G. A. Hurst, and B. D. Leopold. 1996. Preliminary survival and habitat use of juvenile wild turkeys in central Mississippi. Midwest Fish and Wildlife Conference. Abstract only.

Chamberlain, M. J., B. D. Leopold, and C. D. Lovell. 1997. Effectiveness of using snap-traps to monitor trends in relative abundance of small mammals in central Mississippi. Mammal Trapping Symposium, Edmonton, Alberta. Abstract only.

Bowman, J. L., **M. J. Chamberlain**, B. D. Leopold, and B. W. Plowman. 1999. Bobcats as biological control agents. National Wildlife Society Conference, Austin, Texas. Abstract only.

Chamberlain, M. J. and B. D. Leopold. 1999. Survival and cause-specific mortality rates of sympatric coyotes and gray fox in central Mississippi. National Wildlife Society Conference, Austin, Texas. Abstract only.

Burger, Jr., L. W., **M. J. Chamberlain,** K. D. Godwin, and B. L. Watkins. 2000. Management of introduced vegetation in restoration of native plant communities on Blackland Prairie soils in Mississippi. Blackland Prairies of the Gulf Coastal Plain: Culture, Nature, and Sustainability.

Jones, B. J., G. A. Hurst, J. E. Inglis, and **M. J. Chamberlain**. 2002. Wild turkey nest site selection on an area managed for red-cockaded woodpecker habitat: potential impacts of spring burning and changes in vegetation structure. 9th Annual Wildlife Society National Conference. Abstract only.

Chamberlain, M. J., and B. D. Leopold. 2002. Spatio-temporal relationships among adult raccoons in central Mississippi. 9th Annual Wildlife Society National Conference. Abstract only.

Van Why, K., and **M. J. Chamberlain**. 2002. Restoration of the Louisiana Black Bear. 9th Annual Wildlife Society National Conference. Abstract only.

Unpublished Documents

Chamberlain, M. J. 1995. Ecology of wild turkeys in bottomland hardwood forests in the Mississippi Alluvial Valley. Thesis. Mississippi State University, Mississippi State, MS, 82pp.

Chamberlain, M. J. and B. D. Leopold. 1995. Vertebrate monitoring of the Mississippi Delta lands: Twin Oaks and Mahannah WMA's. Final Completion Report for U. S. Army Corps of Engineers, Special Contract, 60pp.

Chamberlain, M. J. and B. D. Leopold. 1996. Faunal inventory and permanent monitoring program for the Nutmeg Hickory RNA, Bienville National Forest. Final Completion Report for U.S.D.A. Forest Service, Special Contract 7pp.

Chamberlain, M. J. 1999. Ecological relationships among bobcats, coyotes, gray foxes, and raccoons, and their interactions with wild turkey hens. Dissertation, Mississippi State University, Mississippi State, MS, 446pp.

Leopold, B. D., and **M. J. Chamberlain**. 2000. Ecology of carnivores in pine-dominated systems. Forest and Wildlife Research Center, Annual Performance Report. Mississippi State University, Mississippi State, MS.

Burger, Jr., L. W., and **M. J. Chamberlain**. 2000. Effects of management practices for the red-cockaded woodpecker on relative abundance of northern bobwhite in mixed pine-hardwood ecosystems of southern Mississippi. Final Completion Report for U.S.D.A. Forest Service, Special Contract 14pp.

Publications in Progress

Chamberlain, M. J., J. F. Benson, and B. D. Leopold. 2003. Land tenure and home range replacement in bobcats. Journal of Mammalogy.

Chamberlain, M. J., L. M. Conner, and B. D. Leopold. 2003. Effects of density on space use and habitat selection of adult bobcats. Journal of Wildlife Management.

Chamberlain, M. J., and B. D. Leopold. 2003. Landscape characteristics associated with space use of 4 meso-carnivores in Mississippi. Journal of Wildlife Management.

Chamberlain, M. J., and B. D. Leopold. 2003. Spatio-temporal relationships among sympatric bobcats, coyotes, and gray foxes in central Mississippi. Journal of Wildlife Management.

Chamberlain, M. J., and B. D. Leopold. 2003. The efficacy of radio-marking adult opossums. Wildlife Society Bulletin.

Scognamillo, D. A., **M. J. Chamberlain**, and B. D. Leopold. 2003. Effects of microhabitat conditions on capture probabilities of raccoons in cage traps. American Midland Naturalist.

Chamberlain, M. J., and L. W. Burger, Jr. 2003. Landscape-level effects of red-cockaded woodpecker management on bobwhite abundance and distribution. Journal of Wildlife Management.

Chamberlain, M. J., J. Constible, and L. M. Hooper-Bui. 2003. Effects of using chemical ant repellents during small mammal trapping. The Southwestern Naturalist.

Popular articles

Chamberlain, M. J., G. A. Hurst, and B. D. Leopold. 1997. Wild Turkey and Predator Research. Pages 2-3 in Cycles of Nature, a Georgia-Pacific newsletter. Vol 6 (1).

Chamberlain, M. J., and B. D. Leopold. 1999. Coyotes: Rightfully Maligned or Misunderstood. Mississippi Outdoors.

Chamberlain, M. J., and B. D. Leopold. 2000. Coyote menu: fuzz and roughage. Turkey Call. January/February issue.

Chamberlain, M. J. 2000. Managing Your Forest for Bobwhite Quail: Build and maintain a habitat that works. Forest Landowner. May/June issue.

Chamberlain, M. J. 2002. Restoring the Louisiana Black Bear to Suitable Habitats - The Pilot Study Gains Steam. Louisiana Agriculture.

Chamberlain, M. J. 2002. Renovating Quail Habitat Using Herbicides. Louisiana Agriculture.

Chamberlain, M. J. 2003. Restoration of the Louisiana black bear. The Wildlife Society Restoration Working Group Newsletter.

Local Presentations

Ecology of wild turkeys in bottomland hardwood forests in the Mississippi Alluvial Valley. 1995. Mississippi State, MS.
Wild turkey hen survival rates in bottomland hardwood forests in the Mississippi Alluvial Valley. 1995. Mississippi Chapter of the Wildlife Society, Mississippi State, MS

Vertebrate monitoring of the Mississippi Delta lands: Twin Oaks and Mahannah WMA's. 1995. U. S. Army Corps of Engineers Special Contract, Mississippi State, MS.

Preliminary hardwood seedling survival rates in the Mississippi Alluvial Valley. 1996. Mississippi Chapter of the Wildlife Society, Jackson, MS

Predator Control: Are We Headed in the Right Direction? 1997. The Mississippi State Chapter of the Wildlife Society, Mississippi State, MS.

Effects of Flooding on Relative Abundance and Diversity of Small Mammals in a Regenerating Bottomland Hardwood Forest. 1997. Mississippi Chapter of the Wildlife Society, Mississippi State, MS

Science-based Carnivore Management: A Review of Current Perspectives. 1999. Mississippi Chapter of the Wildlife Society, Vicksburg, MS.

Ecological relationships among bobcats, coyotes, gray fox, and raccoons, and their interactions with wild turkey hens. 1999. Mississippi State, MS.

"Quail, Turkey and Deer: Are They Compatible?". 2000. East Feliciana Parish, LSU Cooperative Extension Service. Jackson, LA.

Relationships among Louisiana's predators. 2000. The Louisiana State University Chapter of the Wildlife Society. Baton Rouge, LA.

Artificial regeneration: Impacts on avian wildlife. 2000. Continuing Education in Natural Resources. Louisiana State University Agricultural Center. Ruston, LA.

Predator Management: Implications for Gamebirds in the Southeast. 2001. Louisiana Wildlife Federation, Cypress Bend, LA.

Spatial Technologies: Improving Inferences or Serving as Aesthetics? 2001. Louisiana State University, Community of Scholars Seminar Series, Baton Rouge, LA.

Managing Native Habitat for White-tailed Deer. 2002. Continuing Education in Natural Resources. Louisiana State University Agricultural Center. DeRidder, LA.

<u>Regional Presentations</u>

Chamberlain, M. J., D. A. Miller, G. A. Hurst, and B. D. Leopold. 1995. Comparison of predation rates on wild turkey hens in two forest ecosystems in Mississippi. Proceedings of the Eastern Damage Management Workshop, Jackson, MS.
Chamberlain, M. J., D. A. Miller, B. D. Leopold, and G. A. Hurst. 1996. Predation rates on wild turkey hens in a hardwood bottomland forest and a mixed forest in Mississippi. Proceedings of the Annual Conference of Southeastern Association of Fish and Wildlife Agencies, Hot Springs AR.

Chamberlain, M. J., and B. D. Leopold. 1998. Impacts of Coyotes on Selected Game

Species Using Dietary Analysis: Should We Re-evaluate Our Ideas? Colloquium on the Conservation of Southeastern Mammals, Hot Springs, AR.

Chamberlain, M. J., and B. D. Leopold. 1998. Microhabitat Characteristics of Wild Turkey Hen Prenest and Nest Site Selection in Central Mississippi. Proceedings of the Annual Conference of Southeastern Association of Fish and Wildlife Agencies, Orlando, FL.

Chamberlain, M. J., L. M. Conner, B. D. Leopold, and K. J. Sullivan. 1998. Diel activity patterns of adult bobcats in central Mississippi. Proceedings of the Annual Conference of the Southeastern Association of Fish and Wildlife Agencies, Orlando, FL.

Chamberlain, M. J., and B. D. Leopold. 1999. Survival and cause-specific mortality of hardwood seedlings in the Mississippi Alluvial Valley. Ecology and Management of Bottomland Hardwood Systems: The State of Our Understanding. Memphis, TN.

Chamberlain, M. J., and B. D. Leopold. 1999. Dietary patterns of sympatric bobcats and coyotes in central Mississippi. Proceedings of the Annual Conference of the Southeastern Association of Fish and Wildlife Agencies, Greensboro, NC.

Chamberlain, M. J., J. M. Ross, and B. D. Leopold. 1999. Influence of forest management and microhabitat conditions on abundance of southern fox and gray squirrels. Proceedings of the Annual Conference of the Southeastern Association of Fish and Wildlife Agencies, Greensboro, NC.

Chamberlain, M. J., J. W. Mangrum, B. D. Leopold, and E. P. Hill. 1999. Evaluation of four attractants for indices to monitor relative abundance of bobcats, coyotes, and gray fox. Proceedings of the Annual Conference of Southeastern Association of Fish and Wildlife Agencies, Greensboro, NC.

Chamberlain, M. J., B. D. Leopold, K. M. Hodges, and J. E. G. Burton. 2000. Space use and movements of raccoons in two forested ecosystems. Proceedings of the Annual Conference of Southeastern Association of Fish and Wildlife Agencies, Baton Rouge, LA.

Greenfield, K. C., L. W. Burger, and **M. J. Chamberlain**. 2001. Herbicide and prescribed fire as habitat management tools for northern bobwhite. Proceedings of the Annual Conference of Southeastern Association of Fish and Wildlife Agencies, Louisville, KY.

Conner, L. M., **M. J. Chamberlain**, and B. D. Leopold. 2001. Bobcat home range size relative to habitat quality. Proceedings of the Annual Conference of Southeastern Association of Fish and Wildlife Agencies, Louisville, KY.

Leopold, B. D., and **M. J. Chamberlain**. 2002. Predator management: here we go again? Proceedings of the Annual Conference of Southeastern Association of Fish and Wildlife Agencies, Baltimore, MD.

International and National Presentations

Chamberlain, M.. J., B. D. Leopold, and C. D. Lovell. 1997. Effectiveness of snap-traps for monitoring trends in relative abundance of small mammals. Mammal Trapping Symposium, Edmonton, Alberta, Canada.

Chamberlain, M. J. and B. D. Leopold. 1999. Survival and cause-specific mortality rates of sympatric coyotes and gray fox in central Mississippi. National Wildlife Society Conference, Austin, Texas, USA.

Chamberlain, M. J., and B. D. Leopold. 2000. Spatio-temporal relationships among adult bobcats in central Mississippi. National Wildlife Society Conference, Nashville, Tennessee, USA.

Jones, B. J., G. A. Hurst, J. E. Inglis, and **M. J. Chamberlain**. 2002. Wild turkey nest site selection on an area managed for red-cockaded woodpecker habitat: potential impacts of spring burning and changes in vegetation structure. 9th Annual Wildlife Society National Conference. Bismarck, North Dakota, USA.

Chamberlain, M. J., and B. D. Leopold. 2002. Spatio-temporal relationships among adult raccoons in central Mississippi. 9th Annual Wildlife Society National Conference. Bismarck, North Dakota, USA.

Van Why, K., and **M. J. Chamberlain**. 2002. Restoration of the Louisiana Black Bear. 82nd Annual Meeting of the American Society of Mammalogists. Lake Charles, Louisiana, USA.

Poster Presentations

Using smoked aluminum track plates to assess relative abundance of medium-sized carnivores. 1997. **M. J. Chamberlain** and B. D. Leopold. Proceedings of the Annual Conference of Southeastern Association of Fish and Wildlife Agencies. Oklahoma City, OK.

Comparison of censusing techniques to estimate white-tailed deer populations on mitigation lands in the Mississippi Delta. 1998. **M. J. Chamberlain**, J. L. Bowman, and B. D. Leopold. Proceedings of the Annual Conference of Southeastern Association of Fish and Wildlife Agencies. Orlando, FL.

Effects of flooding on relative abundance and diversity of small mammals in a regenerating bottomland hardwood forest. 1999. **M. J. Chamberlain**, B. D. Leopold, and S. E. Stephens. Proceedings of the Annual Conference of Southeastern Association

of Fish and Wildlife Agencies. Greensboro, NC.

Bobwhite use patterns in relation to cover strips. 1999. **M. J. Chamberlain**, L. W. Burger, and M. D. Smith. Southeast Quail Study Group. Starkville, MS.

Herbicidal renovation of fescue-dominated CRP fields. 1999. **M. J. Chamberlain**, L. W. Burger, and B. L. Watkins. Southeast Quail Study Group. Starkville, MS.

Herbicidal renovation of fescue-dominated CRP fields using individual and combination treatments. 1999. **M. J. Chamberlain**, and L. W. Burger. Southeast Quail Study Group. Starkville, MS.

Renovation of fescue-dominated CRP fields using fire and Roundup. 1999. L. W. Burger, and **M. J. Chamberlain**. Southeast Quail Study Group. Starkville, MS.

Protection of Quail from Red-imported fire ant attack using bait. 2001. J. Rosson, L. M. Hooper-Bui, D. Sanders, and **M. J. Chamberlain**. Entomological Society of America, Annual Meeting. San Diego, CA.

Jones, J. J., **M. J. Chamberlain**, L. M. Hooper-Bui. 2002. Reducing red-imported fire ant activity when live-trapping small mammals. 9th Annual Wildlife Society National Conference. Bismarck, ND.

Van Why, K. R., R. D. Applegate, T. T. Cable, P. S. Gipson, and **M. J. Chamberlain**. 2002. Use of the Internet and Email by Hunters: a potential tool for sportsmen surveys. 9th Annual Wildlife Society National Conference. Bismarck, ND.

Van Why, K. R., and **M. J. Chamberlain**. 2002. Restoration of the Louisiana black bear to portions of its former range. 9th Annual Wildlife Society National Conference. Bismarck, ND.

Chodachek, K. D., and **M. J. Chamberlain**. 2002. Estimating waterfowl nest numbers using pair counts in north-central North Dakota. 9th Annual Wildlife Society National Conference. Bismarck, ND.

Informal presentations

Ecology of wild turkeys in bottomland hardwood forests. 2002. Louisiana Chapter of the National Wild Turkey Federation.

Reproductive ecology of wild turkeys in bottomland hardwood forests of Louisiana. 2002. Wild Turkey Committee meeting - Southeastern Section of the Wildlife Society.

2001 Louisiana High School Science Expo - Louisiana State University - provide

informal seminars to outstanding high school students regarding opportunities in wildlife and natural resources management.

10th Annual Feliciana Forestry Field Day - Idlewild Experiment Station - 2001. Wildlife Habitat Enhancement Using Herbicides

Recruiting students into the School of Renewable Natural Resources - 2000. Avoyelles Parish Teachers Association

Jasper County Annual Forestry Field Day, Newton, MS - 1997

Lee-Davis High School, Hanover County, VA - 1994 - Topic: How to get into the wildlife management field.

Grantsmanship

Grants Awarded

Impacts of Summer Hunting of Raccoons on Selected Game Animals. 1996. Mississippi Raccoon Hunters Association. Co-Investigator with Bruce D. Leopold. Grant Amount: $2,000.00. Starting Date: 8/1/96. Project Duration: 1 year.

Monitoring of impacts of introduced bobcats upon lagomorph populations on Singing River Island, Pascagoula Naval Area Station. 1995-7. Co-Investigator with Bruce D. Leopold and Jacob L. Bowman. United States Department of the Navy. Starting Date: April 1, 1995. Amount: $1,500.00 per investigator. Project Duration: 1 year.

Effects of predation on the wild turkey. 1997. Georgia-Pacific Corporation. Co-Investigator with Bruce D. Leopold. Amount: $12,000.00. Starting date 1/1/97. Project Duration: 1 year.

Faunal inventory and permanent monitoring program for the Nutmeg Hickory Resource Natural Area, Bienville National Forest. 1995. RNA Matching Grants Proposals, U. S. Forest Service, Bienville National Forest. Co-Investigator with Bruce D. Leopold. Grant Amount: $12,000. Starting Date: 8/1/95. Project Duration: 2 years.

Development of a Forest Wildlife Management Plan for Twin Oaks and Mahannah Wildlife Management Areas. 1994. Mississippi Department of Wildlife, Fisheries and Parks through the U.S. Army Corps of Engineers. Co-Investigator with Bruce D. Leopold. Starting Date: August, 1993. Amount: $76,641. Project Duration: 2 years.

Effects of Selective Herbicide Application on Vegetation Structure, Availability and Diversity of Food Plants and Invertebrates for Northern Bobwhite, and Small Mammal

Community Dynamics Within Managed Pine Forests. **2000. McIntire-Stennis program. Amount: $32,250. Project Duration: 2.5 years. Starting Date: August 2000.**

Effects of Herbicide Application on Habitat Quality for Northern Bobwhite in Managed Pine Forests. **2001. McIntire-Stennis program. Amount: $5,000. Project Duration: 1 year. Starting Date: October 2000.**

Evaluating effects of trapping carnivores on 1-square mile sections on waterfowl nest success**. 2001. McIntire-Stennis. Amount: $11,000. Project Duration: 2 years. Starting Date: August 2001.**

Influences of 2 herbicide treatments on habitat quality for Northern bobwhite. 2000. BASF Corporation. Amount: $15,000/year. Project Duration: 2 years. Starting Date: October 2000.

Monitoring Abundance and Distribution of Northern Bobwhite on Kisatchie National Forest, Louisiana. USDA Forest Service. Amount: $12,500. Project Duration: 5 years. Starting Date: June 2001.

Evaluating effects of trapping carnivores on 1-square mile sections on waterfowl nest success and nest density**.** Delta Waterfowl Foundation. Amount: $60,000. Project Duration 2 years. Starting Date: January 2001.

Repatriation of the Louisiana Black Bear into Suitable Habitats. 2000. CoyPu Foundation. Amount: $50,000. Project Duration: 1 year. Starting Date: January 2001.

Monitoring Abundance and Distribution of Northern Bobwhite on Managed Forests in Louisiana. Northwest Louisiana Chapter of Quail Unlimited. Amount: $5,000. Project Duration: 1 year. Starting Date: March 2001.

Ecology of the eastern wild turkey on Sherburne Wildlife Management Area. Louisiana Chapter of the National Wild Turkey Federation. Amount: $6,000. Project Duration: 4 months. Starting Date: February 2001.

Development of a Geographical Information System/Global Positioning System Student Training Center. Louisiana State University College of Agriculture. Amount: $103,179. Co-investigator with G. Breitenbeck, C. F. deHoop, J. Chang, H. Capello, and W. H. Hudnall.

Repatriation of the Louisiana Black Bear into Suitable Habitats in Louisiana. 2001. The Nature Conservancy. Amount: $5,000. Project Duration: 1 year. Starting Date: September 2001.

Restoration of the Louisiana Black Bear to the Red River Wildlife Management Area. 2001. Louisiana Department of Wildlife and Fisheries. Amount: $19,375. Project Duration: 1 year. Starting Date: September 2001.

Producing an Interactive Knowledge Base for Pine Regeneration for the Louisiana Forestry Productivity Program. 2001. Louisiana Department of Agriculture and Forestry. Amount: $370,303. Project Duration: 3 years. Co-investigator with T. Dean and M. Dunn.

Examining Population and Individual-level Response of Northern Bobwhite to Landscape Enhancement Using Selective Herbicides. 2001. Louisiana Department of Wildlife and Fisheries. Amount: $15,000/year. Project Duration: 3 years.

Repatriation of the Louisiana Black Bear into Suitable Habitats. 2001. CoyPu Foundation. Amount: $31,900. Project Duration: 1 year. Starting Date: January 2002.

Ecology of the eastern wild turkey on Sherburne Wildlife Management Area. Louisiana Chapter of the National Wild Turkey Federation. Amount: $8,000. Project Duration: 5 months. Starting Date: February 2002.

Restoration of the Louisiana Black Bear into Suitable Habitats in Louisiana. 2002. The Boone and Crockett Club. Amount: $5,000. Project Duration: 1 year. Starting Date: January 2002.

The Continuing Repatriation of the Louisiana Black Bear. 2002. The United States Fish and Wildlife Service. Amount: $43,200. Project Duration: 1 year. Starting Date: March 2002.

Effects of Forest Management on Herpetile and Bird Communities in Louisiana. 2002. Louisiana Department of Wildlife and Fisheries. Amount: $144,000. Project Duration: 2 years. Starting Date: August 2002.

Restoration of the Louisiana black bear. 2002. The Pope and Young Club. Amount: $2,800. Project Duration: 1 year. Starting Date: September 2002.

Using River Otters as a Bioindicator Species in Louisiana. 2002. J. Bennett Johnston Science Foundation. Amount: $5,000. Project Duration: 1 year. Starting Date: September 2002.

Ecological Variables Related to Distribution of River Otter. 2002. Louisiana Wildlife Federation. Amount: $2,920. Project Duration: 1 year. Starting Date: January 2003.

Repatriation of the Louisiana Black Bear into Suitable Habitats. 2002. CoyPu Foundation. Amount: $16,500. Project Duration: 1 year. Starting Date: January 2003.

Ecology of wild turkeys on Sherburne Wildlife Management Area. 2002. Louisiana Chapter of the National Wild Turkey Federation. Amount: $7,100. Project Duration: 1 year. Starting Date: January 2003.

Effects of selective herbicide application on northern bobwhite. 2003. Weyerhaueser Company. Amount: $3,100. Project Duration: 1 year. Starting Date: January 2003.

Ecological, environmental, and spatial variables in the distribution and abundance of river otter populations in Louisiana. 2003. Louisiana Department of Wildlife and Fisheries. Amount: $96,300. Project Duration: 4 years. Starting Date: July 2003.

Grants Pending

Ecology of Wild Turkeys in Bottomland Hardwood Forest Systems of Louisiana. 2003. U.S. Army Corps of Engineers. Amount: $85,330. Project Duration: 3 years.

Examining Harvest Rate of Male Wild Turkeys on Indian Bayou. 2003. U. S. Army Corps of Engineers. Amount: $27,945. Project Duration: 3 years.

Grants Not Funded

Using Spatial Technologies to Examine Landscape-level Effects of Red-imported Fire Ants on Faunal and Floral Communities. Louisiana Board of Regents Traditional Enhancement. Amount: $50,700.

The Evaluation of the Feasibility and Impact of Landscape-Level Red Imported Fire Ant Control on Floral and Faunal Communities. Co-authored with L. M. Hooper-Bui. Louisiana Board of Regents. Amount: $180,000.

Ecology of the Wild Turkey in a Bottomland Hardwood System of Louisiana. 2001. National Wild Turkey Federation. Amount: $50,000.

Restoration of the Louisiana Black Bear. 2002. International Association of Bear Research. Amount: $13,500.

Interviews

Georgia Department of Natural Resources - Fall 1997 - Diets of coyotes in the southeastern United States

National Wildlife Federation - Gary Turbak - Interactions among bobcats, coyotes, gray fox, and raccoon. Appeared in National Wildlife Federation Magazine June/July 1998 and organization website (http://www.nwf.org/nwf/natlwild/1998/hunted.html).

CNN - Robert Zuill - October 5, 1999 - Coyotes in suburban areas of the Southeast.

Appalachian Voice - Elizabeth Hunter - November 16, 1999 - Eastern coyotes.

National Geographic Society - 2001 - Restoration of the Louisiana black bear.

Professional Activity

The Wildlife Society

Wildlife Society Bulletin

Referee	1998, 1999
Associate Editor	1999-2002

Faculty Advisor - Louisiana State University Chapter 2000-2002
President-elect - Louisiana Chapter - 2001
President - Louisiana Chapter - 2002
Past-President - Louisiana Chapter - 2003
Member - Mississippi Chapter - 1995 - 1999
Member - Mississippi State University Chapter - 1994-97
Committee Chairman - Mississippi State University Chapter - 1996-97

Journal of Wildlife Management

Referee	1999-2002

Proceedings of the Southeastern Association of Fish and Wildlife Agencies

Referee	1999
Co-Associate Editor (Wildlife Technical Sessions)	2000
Associate Editor (Wildlife Technical Sessions)	2001-2002

Journal of Mammalogy

Referee	2001

American Midland Naturalist

Associate Editor	2002-2003
Referee	2000

Biological Conservation

Referee	2002

Western North American Naturalist

Referee	2002

Southern Journal of Applied Forestry

Referee	2001

Journal of Range Management

Referee	2000

North American Aquatic Furbearer Symposium

Referee	1999-2000

Ecology and Management of Bottomland Hardwood Systems - Symposium

Referee	1999

Forest and Wildlife Research Center, Mississippi State University
Internal Referee 1997-2000

The Virginia Tech Outdoor Sportsman's Society (President/Founder) - 1992-1993.
Virginia Tech Forestry Club - 1992 -1993.
Head Student Senator - College of Agriculture - Virginia Tech.
Academic Affairs Committee - Virginia Tech Student Government - 1992-1993.
Xi Sigma Pi Honors Society - 1994 - present
Active or past member of National Rifle Association, Rocky Mountain Elk Foundation, Ducks Unlimited, National Wild Turkey Federation, Quail Unlimited, and Virginia Deer Hunter's Association
Committee Member - Bulldog Chapter of the National Wild Turkey Federation - 1998
Executive Board Member - Northwest Louisiana Chapter of Quail Unlimited - 2001

Graduate Student Advising

The following students have or are currently conducting research under my supervision as graduate research assistants:

Judy J. Jones - Thesis title: Effects of selective herbicide application on vegetation, invertebrate, and small mammal communities. Expected graduation date: May 2003.

Kristen D. Chodachek - Thesis title: The feasibility and effectiveness of using predator removal on insular prairie habitats to improve waterfowl reproduction. Expected graduation date: May 2003.

Kyle W. Van Why - Thesis title: Feasibility of restoring the Louisiana black bear to suitable habitats in central Louisiana. Expected graduation date: December 2002.

Daniel Scognamillo - Dissertation title: Ecological, environmental, and spatial variables related to distribution and abundance of river otter in Louisiana. Expected graduation date: May 2006.

Keri Landry - Thesis title: Effects of red-imported fire ants on faunal communities in pine-dominated forests of Louisiana. Expected graduation date: May 2004.

Charles Kitts - Thesis title: Effects of landscape-level habitat renovation using selective herbicides on northern bobwhite space and habitat use. Expected graduation date: May 2004.

Walker Wilson - Thesis title: Space use, habitat selection, and nesting ecology of wild turkeys in bottomland hardwood forests. Expected graduation date: December 2004.

John Benson - Thesis title: Space use, movements, and reproductive ecology of relocated Louisiana black bears. Expected graduation date: December 2004.

Holly LeGrand - Thesis title: Relationships between forest management and avian and herpetile communities in 3 forest types of Louisiana. Expected graduation date: May 2005:

I'm currently serving on or have served on graduate committees for the following students:

Kenneth D. Richkus - Dissertation title: Northern pintail nest site selection, nest success, renesting ecology, and survival in the intensively farmed prairies of southern Saskatchewan: an evaluation of the ecological trap hypothesis. Graduation date: May 2002.

Jon Einar Jonsson - Dissertation title: Effects of body size and habitat on goose behavior: Lesser snow goose and Ross's goose. Expected graduation date: May 2004.

Jesse Oetgen - Thesis title: Effects of nonresponse and repeat sampling in the federal waterfowl parts survey. Graduation date: May 2002.

Jeremy Adkins - Thesis title: Effects of predator removal on small mammal abundance. Expected graduation date: December 2002.

Andrea Hoover - Thesis title: Patterns of female nest attendance in northern pintails and mallards. Graduation date: May 2002.

Jason Watton - Thesis title: Designing golf courses to benefit wildlife. Graduation Date: May 2002.

Teaching Experience

Invited lectures -

Upland Game Management - 1993 (Mississippi State University)
Mourning dove ecology and management
Wildlife Techniques - 1996-99 (Mississippi State University)
Capture and marking of wild turkeys,
Relationships between forest management and wild turkey management
Principles of Wildlife Conservation and Management - WF 4153/6153 - Spring 1998 (Mississippi State University)
Mourning dove ecology and management
Wild turkey ecology and population dynamics
Relationships between water and wildlife management
Economics of wildlife management
Wildlife Nutrition and Physiology - WF 5143/7143 - Fall 1997 (Mississippi State University)
Feeding and reproductive strategies of bobcats and coyotes
Mississippi State University lecture series - 1998
Pearl River Community College - Mississippi's carnivores

Mississippi State Continuing Education Short Course - 1999
Ecology and management of Gray and Fox Squirrels
Wildlife Management Techniques - WF 4011 - (Louisiana State University)
Understanding basics of GIS and GPS technologies
Applications of GIS and GPS to natural resource management
Techniques for aging and sexing galliformes
Techniques for trapping and handling mammals
Wildlife diseases
Examining cause-specific mortality in wildlife research
Applied Special Topics in Entomology - ENTM 7008 - Fall 2000 (Louisiana State University)
Using GIS applications in Entomology

Teaching Assistant to Dr. L. Wes Burger - Fall 1998 - Mississippi State University
Principles of Wildlife Conservation and Management (WF 4153/6153)

Full responsibility - *Principles of Wildlife Conservation and Management* (WF 4153/6153; Mississippi State University). Split-level undergraduate/graduate course designed to relate biological concepts and ecological principles to the management of natural resources, habitats, and wildlife populations. Also to encourage professional development including problem solving and critical thinking skills. Design and conduct laboratories emphasizing ecology and management of white-tailed deer, eastern wild turkey, waterfowl, Northern bobwhite, fox and gray squirrel, cottontail and swamp rabbit, feral hogs, and red-cockaded woodpeckers.

Ecology and Management of Upland Game Birds (RNR 7015; Louisiana State University). Graduate course designed to equip graduate students with essential knowledge and skills to understand and better manage a diversity of avian and mammalian species. Selected species covered within course included northern bobwhite, wild turkey, woodcock, northern grouse, and mourning dove. Class structured to provide students with a solid knowledge base of fundamental life history traits, behavioral and physiological adaptations, and habitat requirements of selected avian species common to the United States.

Thoughts Guiding the Evolution of Wildlife Science (RNR 7070; Louisiana State University). This course exposes students to critical thoughts and writings that have advanced the wildlife science profession within the past 15 years. Students are expected to conduct weekly roundtable discussions with instructor regarding selected manuscripts and critical thoughts directed at our evolution as scientists. The course culminates in each student providing a formal seminar that details the student's thoughts and dialogue pertaining to the assigned readings.

Principles of Wildlife Management (RNR 2031; Louisiana State University). Undergraduate course designed to relate biological concepts and ecological principles to the management of natural resources, habitats, and wildlife populations. Also to encourage professional development including problem solving and critical thinking skills. Course emphasizes history of wildlife management, population biology, and current issues facing natural resource professionals.

Mammalian Ecology and Management (RNR 7011; Louisiana State University). Graduate course designed to equip students with fundamental knowledge necessary to understand and manage a diversity of large mammals, including black bear, white-tailed deer, mammalian carnivores, and medium-sized furbearers. Class is structured to provide students with a working knowledge of life history traits, behavioral and physiological adaptations, and habitat requirements of the referenced mammalian species.

Wildlife Habitat Management (RNR 4045; Louisiana State University). Undergraduate course designed to provide students with basic information regarding management of habitats for wildlife and issues facing management and stewardship of habitats. Students are exposed to basic ecological concepts pertaining to managing wildlife habitats, and asked to understand relationships between land use and habitat management. Students also prepare a comprehensive habitat management plan for a particular wildlife species.

Continuing Education - Courses Taken

Spatial Statistics: Analytic Tools for Remote Sensing Research - January 2000

Volunteer Activities

National Wild Turkey Federation, JAKES events, 1995-98
Youth Waterfowl Workshop, Noxubee National Wildlife Refuge - 1996-98
Women in the Outdoors - National Wild Turkey Federation - 2000
Judge - Governor's Award for Excellence in Conservation - sponsored by the Louisiana Wildlife Federation - 2002
Louisiana Black Bear Conflict Resolution Team - 2002-present

Other Skills

Have extensive experience with the following software packages or analytical packages:

Wordperfect 5.0-8.0	Harvard Graphics	HOMER (home range)

SAS	Microsoft Power Point	SURVIV
SPSS	Corel Presentations	CALHOME
Adobe Photoshop	Adobe Acrobat	LOCATE II
Arcview 2.0-3.2	Dbase 3-5	Microsoft Outlook
Quattro Pro	Microsoft Excel	Lotus Notes
Pathfinder Office	ArcInfo (PC and Unix)	Microsoft Word
Kaplan (Stagkam)	MICROMORT	CAPTURE
CONTRAST	Telebase	Asymetrix Compel
ERDAS Imagine		

Have experience trapping furbearers and small mammals with following trap types:

Egg traps	Nos. 1.5, 1.75, and 3.0 Victor soft-catch
110 and 330 Conibear	Tomahawk, New Haven, and Hava-heart live traps
Sherman traps	

Have experience capturing and tranquilizing/restraining various species including:

Bobcat	Coyote	Muskrat
Gray fox	Red fox	Beaver
Raccoon	Opossum	Wild turkey
Striped skunk	Black bear	Northern bobwhite
Fox squirrel	Gray squirrel	

Consultation

Provide technical advice and assistance to private groups regarding research monitoring abundance and ecology of mammalian carnivores.

Provide technical advice and assistance to landowners in Texas, Mississippi, Louisiana and Virginia regarding habitat management programs to benefit wild turkeys, white-tailed deer, and Northern bobwhite

Provided technical assistance to Mississippi Department of Wildlife, Fisheries and Parks concerning GIS applications for wildlife law enforcement and license agents

Provided extensive technical advice and assistance, including statistical techniques and field methods to graduate students, staff, and faculty of the Department of Wildlife and Fisheries, Mississippi State University.

Provided advice and assistance concerning nuisance furbearer damage to personal property for 15-25 households in Starkville, Mississippi.

Interests/hobbies

Enjoy hunting, hunting retriever training, landscaping, and camping.

Thomas W. McClenahan II - Curriculum Vitae

Thomas W. McClenahan II
52 Craven Road
Delanson, New York 12053
Home Phone 518-895-8042

EDUCATION

1995-1999 Bachelor of Science, St. Lawrence University, Canton, New York

EMPLOYMENT

1999-Present *Scientist, ARCADIS*

Responsible for ecological and environmental investigations, data collection, analysis and remediation. Leader and member of field teams implementing protocols designed to study existing conditions and probable solutions.

SPECIAL TRAINING

- Senior study project on amphibian abnormalities occurring in the Adirondack State Park wetlands, ponds, and lakes, examining their possible causes and contributors. Also studied cryogenics and wintering habits of Wood Frogs (Rana sylvatica).
- Apprenticed with former New York State Lieutenant in the Department of Environmental Conservation's Law Enforcement Division for all Mink and Otter work.
- Received direct training alongside licensed instructor to gain certificate and license for small game trapping

WORK EXPERIENCE

Ecological Risk Assessment

Conducted numerous field studies in support of ecological risk assessment investigations. Specific experience associated with these studies is described below.

Semi-Aquatic Mammals

Used several techniques to document the presence of semi-aquatic mammals, including mink (*Mustela vison*) and river otter *(Lutra canadensis)*, in riverine system and wetland systems including:

- Scent post stations
- Snow tracking
- Live trapping

Avian Species

Presence/absence, census and reproductive surveys of several avian species including the American robin *(Turdus migratorius),* the American bittern *(Botaurus lentiginosus*) and the belted kingfisher (*Ceryl alcyon).* Experience includes:

- Used habitat suitability index and habitat surveys to identify suitable nesting and breeding habitat
- Locating kingfisher burrows and defining and monitoring territories throughout the breeding season
- Nest searching and monitoring to determine exposure and nest survival success rates.

Amphibians

Conducted surveys to identify favorable breeding ponds for wood frogs (*Rana sylvatica)*. Call surveys were used to determine the location of the breeding individuals. Participated in reproductive study monitoring larval growth, mortality and metamorphosis.

Small Mammals

Trapping study of short-tailed shrews (*Blarina brevicauda*) (and other incidentally caught species). Activities included routine trap monitoring and providing support for team members marking trapped individuals.

Land/Human Use Survey

Conducted car parking access, canoe surveys, and walking surveys over a six month period to determine the amount of human use in the study area. Coordinated field staff and data processing.

Environmental Remediation

Collection of groundwater, surface water, soil and air samples for investigative and progress monitoring remedial efforts.

- Interpretation and Assessment of hydrological conditions
- Interpretation of faunal assemblages within impacted lake sediments to determine sedimentary depositional environments and depositional history beneath a former MGP plant site.
- Installation of monitoring wells and soil borings.
- Responsible for health and safety monitoring during field activities.
- Responsible for operation and maintenance activities for a number of remedial systems in New York.

Attachment B

Photographs of Mink Tracks
Winter 2001/2003

Photographs of Mink Tracks Winter 2001/2002

Track 5

Male tracks running on mud shore

Track 9

Tracks and scat on sand

Track 10

Roaring Brook Road bridge over Mill Brook,
East Bank

Track 11

Roaring Brook Road bridge over Mill Brook

Track 13

Roaring Brook Road bridge

Track 14

Female – tracks into river

Track 15

Mink tracks and trail at old beaver lodge – main stem; female – possible den

Track 20

Female in between MS-42 and 44 on the mainstem

Track 23

Male, in and out of water and holes, Roaring Brook Road bridge over Mill Brook

Track 24

Male, in between MS – 42/44, East Bank

Track 27

Female running under Roaring Brook Road bridge, trail and tracks

Track 28

Male, walkway south of MS-43, east bank

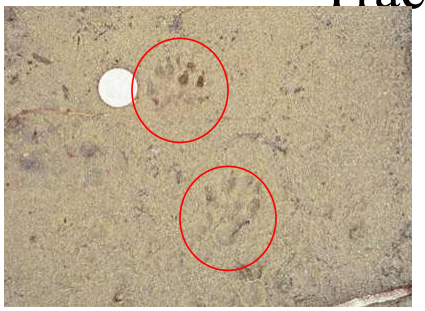
Track 29

Female going into old beaver lodge, mainstem

Track 31

MS-52 walkway, visiting animal carcass

Track 35

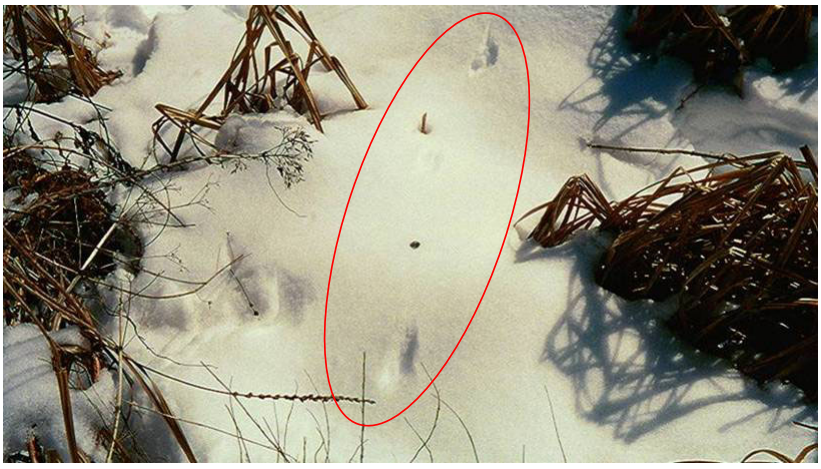


West bank, between MS8 and MS9, 200 yards south of, and running towards. track 34

Track 36

Large male, in and out of water, south of box #711, west bank

Track 39



30 yards west of Box #899, in and out of marsh

Track 41

Female on MS 16, 10 feet off river bank

Attachment C

Photographs of Mink and Mink Tracks
Winter 2003

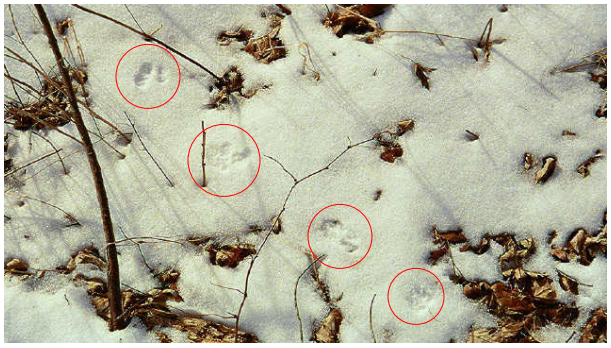
Photograph of Mink
Winter 2003

Mink

Motion Detected Photograph - mainstem

Photograph of Mink Tracks
Winter 2003

M-1-F-12/10



Male mink tracks

M-2-F-12/10

Female tracks

M-3-M-12/10

Male tracks on edge of marsh

M-4-F-12/10

Female tracks near an abandoned beaver lodge

M-5-F-12/10

Female mink tracks

M-9-U-12/17

Tracks across field, down log and brush pile, in and out of weed pile

M-10-U-12/17

Tracks across field/marsh area

M-14-U-1/10

Near tree swallow box #900

M-22-F-1/14

Decker Launch: loping track in snow, rear registering (1st Photo); in and out of holes around fallen tree (2nd Photo)

M-28-U-1/20

New Lenox Road: small tracks - in and out of holes, logs, beaver lodge

M-32-F-1/24

Willow Creek Marsh: fairly small tracks 2" stride, 18 - 22" gait, indexed tracks

M-33-F-1/24

Willow Creek Marsh: showing leaping gait (28" gait), indexed tracks

M-35-U-1/30

New Lenox Launch: indexed tracks through thick brush, stride leading to hole and tunnel

M-36-U-1/30

New Lenox Launch: in and out and between 2 holes in snow and against tree, stride and close up of tracks

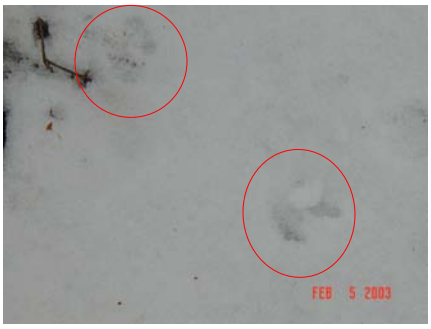
M-40-U-1/30

New Lenox Launch: loping through field area, into and out of weed piles covered with snow

M-42-U-2/5

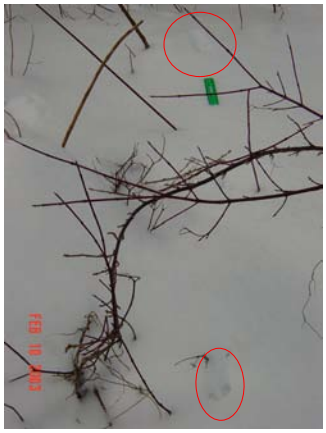
Decker Launch: tracks of mink from weed piled over snow into osier cover

M-45-U-2/5



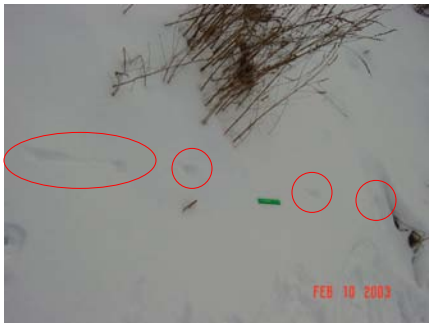
Decker Launch: tracks running/loping on ice shelf close to shore - investigating holes and bank

M-49-U-2/10



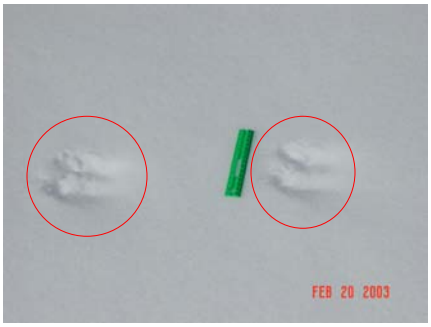
Western boundary of floodplain: throughout osier/brush, - under logs with 4" clearance, small tracks

M-50-U-2/10



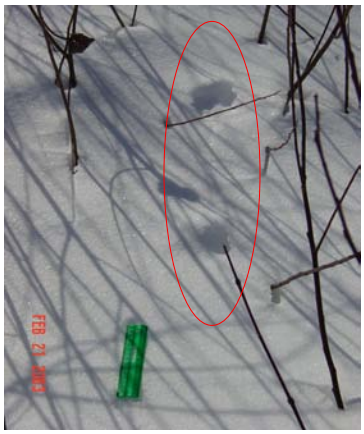
West of MS-10: close up of tracks, loping pattern showing a body drag and leading to hole

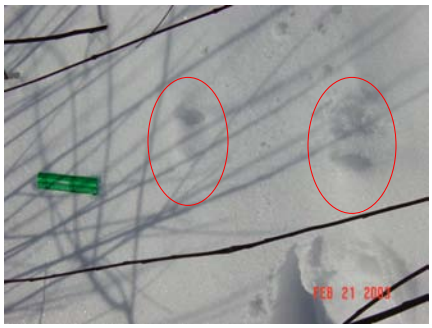
M-55-U-2/20



Loping tracks coming across field, close up of tracks

M-62-U-2/21





Tracks loping through dense red osier, closer shot of paired tracks

M-65-F-2/25

Indexed loping tracks

M-66-U-2/25

Runs through thick osier brush to top of beaver lodge and across field area

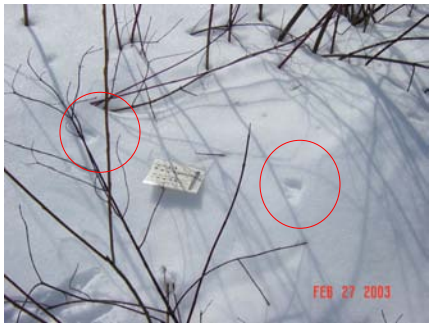
M-67-U-2/25

Across open area - lopes through brush and into small holes at base of trees

M-69-F-2/25

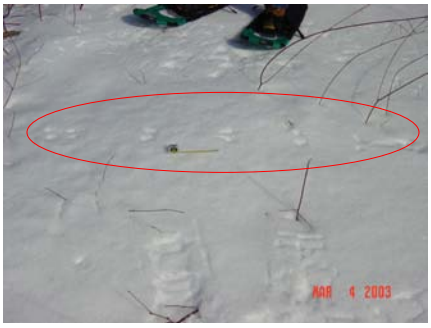
Loping tracks up Roaring Brook from mainstem direction: tracks go into a hole around a root mass - may have gone out in water or under the raised ice shelf

M-73-U-2/27



Loping in and out of shrubs and holes at the base of the shrubs, close up of indexed tracks

M-75-U-3/4



West of MS-14: loping tracks through brush and across field area, 25’ stride

M-84-U-3/7

In and out of water, up steep bank, across field into/thru brush

M-98--3/26

Scat left on a natural run way up and along a large uproot

M-103-U-4/8

Mink path under the ice and onto land, indexed tracks with wet tail drag

M-107-U-2/3

Close up of indexed tracks, loping tracks set with ruler

M-108-U-2/3

Loping set of tracks; close up of indexed tracks

M-109-U-2/3

Loping set of tracks, close up of indexed tracks

M-112-U-2/3

Old blown-in tracks – stride and paired index shown

Attachment D

Photographs of River Otter and River Otter Tracks Winter 2003

Photographs of River Otter
Winter 2003

03/02/03 – Camera #1

03/04/03 – Camera #2

03/05/03 – Camera #2

03/05/03 – Camera #2

03/05/03 – Camera #2

03/05/03 – Camera #2

03/06/03 – Camera #2

03/06/03 – Camera #2

03/11/03 – Camera #2

03/12/03 – Camera #2

03/16/03 – Camera #2

03/16/03 – Camera #2

03/17/03 – Camera #2

Photographs of River Otter Tracks
Winter 2003

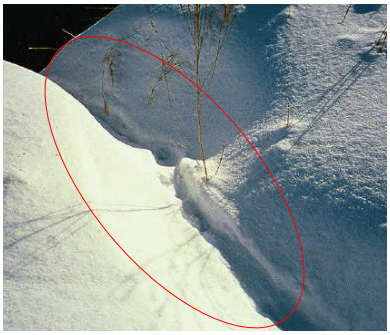
O-13-1/10

Otter tracks and slide to and from river near tree swallow box #897

O-15-1/10

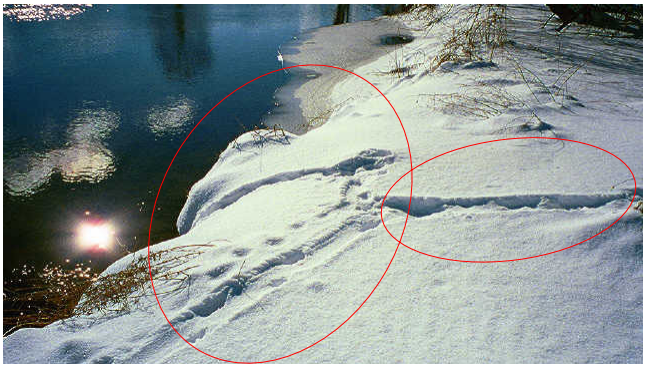
Tracks and slide in snow, scat

O-16-1/10

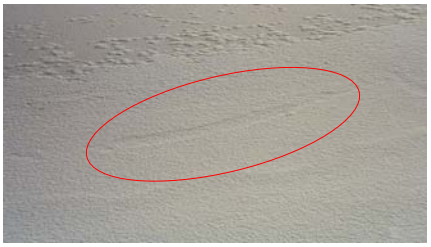
Tracks and slide in snow, on old beaver lodge

O-17-1/10



Tracks and slide in snow, to and from river

O-21-1/14

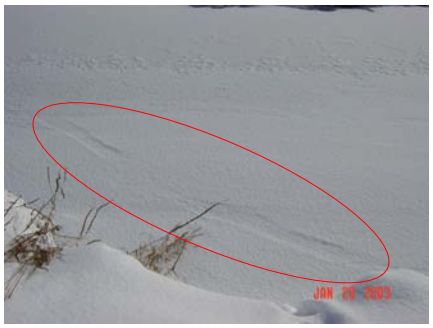


Sliding tracks in snow out of water, turn around, back in water

O-23-1/14

In and out of water and ice in 2 locations: up a narrow gully, urinated (solidified) and tracks on top of ice in dusting of snow; 0 - 4' off river bank

O-27-1/20



Otter slide on the ice, through dusting of snow

O-29-1/20

Trail and possible den location

O-30-1/20

Slides along river, scat laid out to show amount

O-37-1/30

Slide out of water on land and back in water, pair of otter tracks running/loping on ice (two different size tracks)

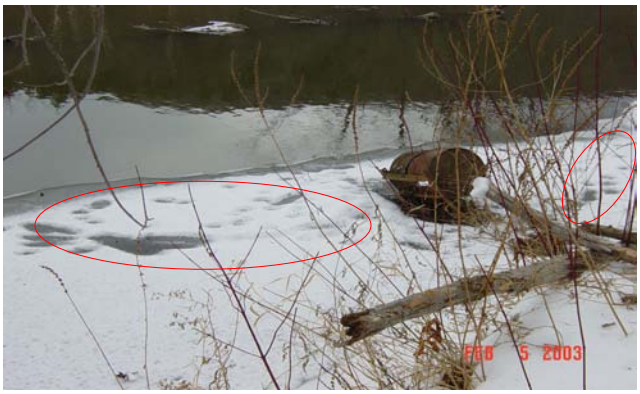
O-39-1/30

Otter slide on land with tracks in slide

O-44-2/5

Otter trail on ice along river

O-46-2/5



Otter tracks coming out of water on to ice to play around barrel, sliding around in snow

O-51-2/10

Slide with tracks in slide, close up of detailed tracks in slide

O-52-2/10

Tracks and scat, close up of tracks and scat

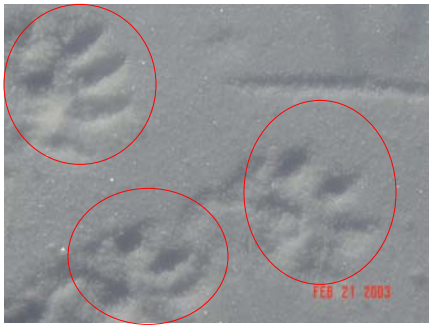
O-54-2/10

Heavily used area with slides, close up of tracks

O-59-2/21

Otter tracks going into open spring, muddy tracks

O-61-2/21



Tracks and tail in loose dusting, close up of tracks

O-64-2/25

Otter tracks across land with tail drag, otter rolling station

O-68-2/25

Scat uncovered with branch and on snow

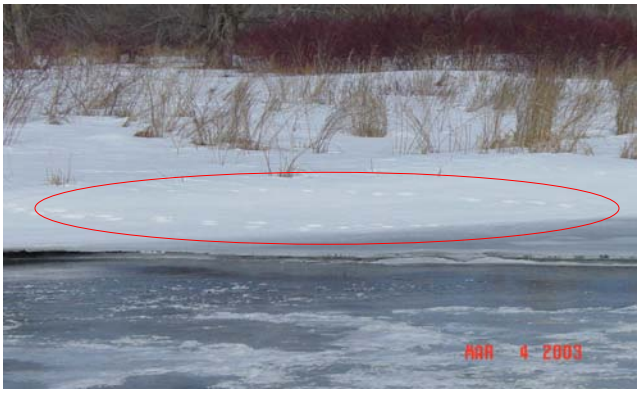
O-72-2/27

Slide and turn around, den entrance with scat outside

O-74-2/27

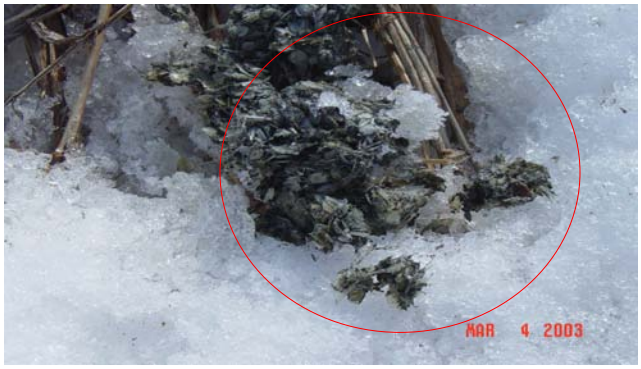
Slide through woods, close up of tracks

O-76-3/4



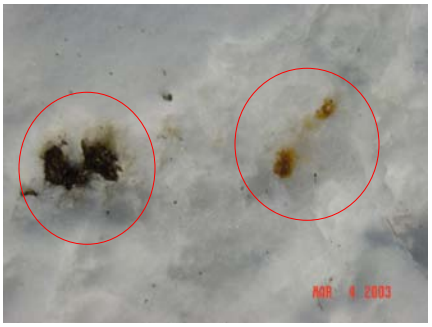
Coming out of water and across land

O-77-3/4



Close up of scat

O-78-3/4



Tracks, slide out of river and scat, close up of scat

O-80-3/4

Den entrance, den and trail to and from river

O-81-3/4

Otter tracks in and around spring

O-85-3/7

Slide with tracks to sprainting station and back to river

O-86-3/11

Tracks on ice up to land

O-87-3/11

Otter tracks around sprainting station, heavy otter use

O-88-3/11

Otter activity on ice edge

O-89-3/11

Otter slide along ice edge

O-90-3/11

Den entrance hole with new/fresh track left of hole

O-91-3/11

Otter track going out of spring across ice, otter activity on sprainting station

O-97-3/19

New slide with tracks, den entrance

O-104-4/8

Otter tracks, tracks and slide

O-105-4/10

Scat on sprainting station, hind and fore foot of otter

O-106-4/10

Three small deposits of scat

O-110-2/3

Tracks and slide, close up of webbed back foot

O-114-2/3

Webbed track with stride, close up of tracks