Weippe Prairie Camas Lily Pilot Sampling Project
Summary of Findings

A collaboration between the OMSI Salmon Camp Program**,** NPS Upper Columbia Basin Network Inventory and Monitoring Program, and the Nez Perce National Historic Park

Weippe Prairie, Nez Perce National Historical Park
June 27-30, 2005

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Introduction

Nez Perce National Historical Park (NEPE) and the NPS Upper Columbia Basin Network (UCBN) are in the process of developing a long-term ecological vital signs monitoring program. Because of its ecological and cultural significance, the camas lily (*Camassia quamash*) population at Weippe Prairie has been identified as a high priority vital sign. One of the potential threats to camas at Weippe Prairie is the presence of non-native forbs, including sulphur cinquefoil (*Potentilla recta*).

From June 27-30, the UCBN, NEPE, and the Oregon Museum of Science and Industry (OMSI) Salmon Camp Team worked at Weippe Prairie to conduct 3 days of inventory and monitoring field data collection. The objectives of the program were as follows:

1) To provide pilot data on estimates of camas lily and sulphur cinquefoil frequency (proportion of area occupied), density, and cover at Weippe Prairie.

2) To provide important baseline spatial data on fencelines, irrigation ditches, and other semi-permanent features to NEPE resource management.

3) To establish permanent photomonitoring plots for long-term qualitative change detection in Weippe Prairie.

4) To collect information on the small mammal and bat species present in Weippe Prairie.

5) To gain insight into the cultural significance of camas to the Nez Perce culture and the importance of the Nez Perce/Lewis and Clark Corps of Discovery encounter at Weippe Prairie.

Of the five objectives, the first received the most effort and attention and three half-day work sessions were dedicated to camas and sulphur cinquefoil sampling. This work took longer than expected and required all staff and students to participate. As a result, objectives 2 and 3 were not met. Limited information on bats and small mammals was accumulated during one night of trapping. Objective five was met through participation by the NEPE interpretive staff and through conversations about the cultural history of the site periodically throughout the program. The significance of the site's cultural history was underscored by the ongoing bicentennial commemoration of the Corps of Discovery's journey across the west in 1805. Additional natural history information collected during the program included a list of birds and other vertebrates seen on or near the prairie. The following sections describe the methods, results, and a brief discussion on the significance of results and recommendations for future efforts.

Methods

Vegetation Sampling -

A two-stage sampling design was used for pilot monitoring of camas and sulphur cinquefoil in which quadrats, the secondary sampling units, were placed along transects, the primary sampling units (see Elzinga et al. 2001). Quadrat size and transect length decisions were based on recommendations found in Elzinga et al. (2001) and others in order to achieve a representative sample with good interspersion. A systematic random sample of twenty-eight 200-m long transects were selected from the entire NPS-owned portion of Weippe Prairie (see figure 1). Transects were placed along 200-m intervals with a random starting point. Ten 1 x 0.5-m rectangular quadrat frames were placed along each transect at 20-m intervals and sampling was conducted at each quadrat. A coin toss was used to determine whether quadrat placement began at the transect origin or at the 20-m point. Three measurements of the camas population were taken at each quadrat: frequency, stem density, and cover. Frequency was measured by determining whether camas was present or absent within the quadrat. Stem density was measured by counting each flowering and non-flowering camas stem that originated within the quadrat frame. Plants rooted outside the frame but whose stems bent over the frame boundary were not included. Cover was measured by visually estimating the percent of the quadrat frame covered by camas plant parts. This included plants rooted outside the frame but whose leaves, stems, or inflorescences occupied a portion of the area inside the frame. Cover was the only measure taken for sulphur cinquefoil. Cover estimates were made in the following classes: <5%, 5-25%, 25-50%, >50%. Parameter estimates generated for each measure included means and standard deviations. Confidence intervals and estimates of required sample size were also calculated following procedures outlined in Elzinga et al. (2001) for estimating single population means and proportions from samples that are less than 5% of the target population (i.e. the finite population correction factor was not used). Cover estimates were not included in analysis because of the large number of "0" values encountered in the data. Means and variance estimates were calculated for each transect and again for the overall sampled population, following recommendations from Elzinga et al. (2001).

Small Mammal and Bat Survey -

Standard capture methods as described in Jones et al. (1996), Cooperrider et al. (1986), and Kunz (1988) were followed. Capture and handling procedures were consistent with those outlined by the American Society of Mammalogist Animal Care and Use Committee (1998) and those previously approved by the University of Idaho Institutional Animal Care and Use Committee for inventory work conducted in NEPE by Strobl et al. (2003). For small mammals, 60 sherman traps were placed in 10-m intervals along six 100-m transects originating along Jim Ford Creek and running northward into a large Douglas hawthorne (*Cretaegus douglasii*) copse. Traps were supplied with polyester batting and a bait mixture of peanut butter and seed. For bats, two 9-m mist nets (standard construction for bats; Avinet, Inc.) and one 6-m net were placed across an open pool in Jim Ford Creek. The Anabat bat echolocation recording and analysis system was also

used to survey free-flying bats in the vicinity of the nets. Both trapping sessions occurred simultaneously during the night of June 29. Two additional nights of bat capture and recording efforts were conducted by UCBN staff immediately preceding and following the Salmon Camp Program. Those results are also included in this report.

Results

Vegetation Sampling –

The group completed sampling of 177 quadrats in 16 transects, including two partially completed transects. The number of quadrats per transect ranged from 7 to 11. Figure 1 shows the sampled and unsampled transects. Tables 1 and 2 show the results for camas stem density counts and camas and sulphur cinquefoil frequency. Camas stem density was measured in 0.5 m^2 quadrats but estimates of transect and population means were calculated for stems per 1 m^2 as a standard unit for analysis. Figure 2 shows the distribution of quadrats containing camas, with graduated symbols scaled to stem count classes. Figure 3 shows graduated symbols for both camas stem density and sulphur cinquefoil estimated cover classes. Both within transect variances (not reported here) and between transect variances were high for camas stem density, due to the large number of empty quadrats encountered during sampling and the wide range of stems per quadrat (1-114 stems) encountered in occupied quadrats. The standard deviation of mean stem density was 23.7, considerably higher than the estimated mean of 18.5. Less variability was encountered in frequency, where the estimated camas frequency was 0.44 but the standard deviation was only 0.27. Estimated mean cinquefoil frequency was lower, at 0.29, and the standard deviation of the mean was 0.25. The 95% confidence interval for camas frequency was also much narrower than was estimated for camas stem density. The estimated sample size requirement to achieve 90% confidence and a 20% precision level ($\pm$ 4 plants) for estimating mean camas stem density based on observed data was 83 transects. For mean frequency, with 90% confidence and a 15% precision level ($\pm$ .066), estimated required sample size was only 29 transects for camas and 25 transects for cinquefoil. No attempt was made to estimate the sample requirement for estimating change between two years of paired permanent transects because of uncertainty in year-to-year correlation.

Small Mammals –

60 sherman traps were placed along six 100-m transects running northward from Jim Ford Creek. No captures occurred over the course of one night. Relatively scant evidence of small mammal activity was noted, and the absence of vole runways was particularly noteworthy.

Bats –

One male hoary bat (*Lasiurus cinereus*) was captured early in the evening of June 29. Anabat recordings were also made of an unidentified *Myotis* species flying in the vicinity of the mist nets. The nature of the recordings make it difficult to determine the species. The most likely species, based on habitat and call characteristics, is the California myotis (*Myotis californicus*), although the long-legged myotis (*Myotis volans*) is also a possibility. Overall bat activity was low, possibly due to the preceding rainy weather and the heavy mist that was present during sampling. Figures 4 and 5 show recordings made of these species at Weippe Prairie. Capture and recording efforts were also made on June

26 at Lapwai Creek in Spalding Mission and recording was conducted at Schwartz Pond at White Bird Battlefield on June 30. At Lapwai Creek, 9 bats were captured and included male and pregnant female silver-haired bats (*Lasionycteris noctivagans*), pregnant female big brown bats, and one male Yuma myotis. No additional species were recorded there. Considerable bat activity was encountered at Schwartz Pond and good recordings were made of the western pipistrelle (*Pipistrellus hesperus*), big brown bat, western small-footed myotis (*Myotis ciliolabrum*), hoary bat, little brown bat (*Myotis lucifugus*), and Yuma myotis. Tentative identification from calls and visual observation was also made for the silver-haired bat and the pallid bat (*Antrozous pallidus*).

Other Vertebrates-

Table 3 list some of the bird, reptile, and amphibian species noted while conducting field work at Weippe Prairie during June 28-30, 2005.

Discussion

Vegetation Sampling–

Based on these results, the 0.5 m^2 rectangular quadrat performed relatively well for frequency, but is apparently much less efficient for determining density and abundance based on stem counts and cover estimates. The large number of "0" values and the large range of values resulted in a highly skewed distribution that indicates a need to either consider different quadrat sizes, shorter transect lengths and intervals (and a corresponding increase in sample size), or to focus data collection on frequency. Mean frequency, as a measure of overall abundance and distribution, is a very useful parameter and is promising for long-term monitoring because of its simplicity and efficiency in data collection and analysis (Elzinga et al. 2001). It will also work well for invasive species, as was demonstrated here when applied to sulphur cinquefoil. Because frequency, as a field measurement, requires relatively little training, change and trend detection of camas and invasive plant frequency could probably be conducted almost entirely by citizen scientists and NEPE interpretive staff as an environmental education program. Recommended future actions include organizing a second season of data collection, perhaps with more focus on frequency plots and nested quadrats to explore the effect of quadrat size on parameter estimation. A second season of frequency data will provide an estimate of year-to-year correlation between permanent sampling units (transects) and would greatly assist estimation of required sample size necessary to adequately detect change at specified levels of confidence and minimum detectable change.

Small Mammals-

The lack of small mammal captures at Weippe Prairie was surprising and unexpected. The prairie habitat is a highly productive environment supporting dense grass and forb cover that should support a large population of voles (*Microtus spp.*) and other rodents. Factors that may have influenced this apparent lack of activity (and presence?) include the cold and rainy weather during the week prior to trapping, no "pre-bait" period, and only a single night of trapping. Typical trapping schemes include several days of pre-baiting, in which traps are locked open with bait prior to setting trap triggers, as well as several days of repeat trapping. This can greatly enhance capture success. However, it may also be that anthropogenic factors, such as heavy pesticide application or cyclical rodent population fluctuations inherent in most vole species may have contributed to an unusually low rodent population. Future small mammal inventory efforts should include pre-baiting and more than one night of trapping.

Bats-

All three water sites visited during the program (Jim Ford Cr. At Weippe Prairie; Scwartz Pond at White Bird Battlefield; Lapwai Creel at Spalding Mission) appear to be important foraging and commuting areas for bats. Tremendous nightly variability in bat activity and species presence is typical in our region but the species diversity encountered during sampling as well as observed behavior of individual bats suggests the importance

of these sites. Idaho currently lists six bat species as rare and possibly threatened (S1 or S2 rank), including the western pipistrelle and pallid bat, both of which are probably breeding residents of the White Bird area. These rock-roosting species may roost in the cliff band located in the center of the battlefield area.

Other Vertebrates-

Noteworthy observations were made during the program. Several grassland-associated bird species were observed within the NPS portion of the prairie, including the bobolink, savannah sparrow, and western meadowlark. Nesting Wilson's phalaropes were observed in an open water wetland area east of the NPS portion of the prairie. Also, the bullfrog, a non-native species that negatively impacts native amphibians, is present in Jim Ford Creek.

Recommendations for Future Work

With regards to the UCBN/NEPE monitoring program, the highest priority for future work conducted in the Weippe Prairie should focus on camas and invasive weed sampling protocol development. At least one additional season of sampling should be completed so that an understanding of interannual variability in target plant germination and flowering can be developed. Other invasive species of concern, especially orange hawkweed (*Hieracium aurantiacum*), should also be included in sampling efforts in order to broaden the scope of the monitoring. Additional vertebrate inventory activities should be conducted whenever possible, although there are currently no high priority UCBN vital signs monitoring objectives involving vertebrates in NEPE. Salmon Camp or other citizen science groups should be encouraged to participate in future work as long as field protocols are established and NEPE and/or UCBN staff are available to provide technical guidance and training.

Acknowledgements

This project provided an extremely unique opportunity to provide hands-on science education to Native American students participating in OMSI's Salmon Camp program, while at the same time generating useful scientific data for the NPS. Bringing the group to the Weippe Prairie was the result of collaboration between OMSI, the UCBN, and NEPE. The use of state-of-the-art digital technology, including ArcPad, was made possible through a grant from the Rocky Mountain Cooperative Ecosystem Studies Unit. Special thanks go to all the NPS and OMSI staff that helped make this collaboration a success. In particular, we wish to thank Jason Lyon and Alyse Cadez of NEPE, Dan Calvert and his staff from OMSI, and Tom Rodhouse, Leona Svancara, and Lisa Garrett of the UCBN. We are also grateful to the students and their families for making Salmon Camp possible.

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Tables and Figures

Table 1. Transect means for camas stem density counts and camas and sulphur cinquefoil frequency.

Transect	Camas Stem # (m^2)	Camas Frequency	Cinquefoil Frequency
6	11.0	0.40	0.20
7	0.4	0.10	0.20
8	0.2	0.10	0.10
9	23.4	0.60	0.00
11	14.8	0.90	0.00
12	29.6	0.60	0.50
13	7.2	0.30	0.40
14	86.4	0.64	0.09
15	11.8	0.36	0.36
16	6.8	0.40	0.30
17	5.2	0.20	0.30
18	6.4	0.50	0.50
19	0.0	0.00	0.40
20	57.8	0.90	0.00
21	51.6	0.90	0.20
25	4.3	0.57	0.57
26	5.4	0.18	0.18
27	10.8	0.43	1.00

Table 2. Sample population parameter estimates for camas stem density and camas and cinquefoil frequency.

n=18	Camas Stem # (m^2)	Camas Frequency	Cinquefoil Frequency
Mean	18.5	0.44	0.29
Range	0.0-86.4	0.0-0.90	0.0-1.0
Std. Deviation	23.7	0.27	0.25
SE Mean	5.6	0.06	0.05
Lower 95% CI Bound	6.7	0.31	0.17
Upper 95% CI Bound	30.3	0.58	0.41

Table 3. A short list of birds other vertebrates observed during field work conducted at Weippe Prairie, June 28-30, 2005. This list is not comprehensive and relatively little effort was directed toward birding.

Bobolink	White-tailed Deer w/fawn	Western Toad
Eastern Kingbird		Common Garter Snake
Cliff Swallow		Western Terrestrial Garter Snake
Great Blue Heron		Bullfrog
Savannah Sparrow		
Western Meadowlark		
Yellowthroat		
Common Snipe		
Willow Flycatcher		
Wilson's Phalarope		
Northern Harrier		

Figure 1. Systematic random sample of 200-m transects spaced at 200-m intervals in Weippe Prairie. The NPS boundary is shown in blue. Sampled transects are highlighted in red and unsampled transects are yellow.

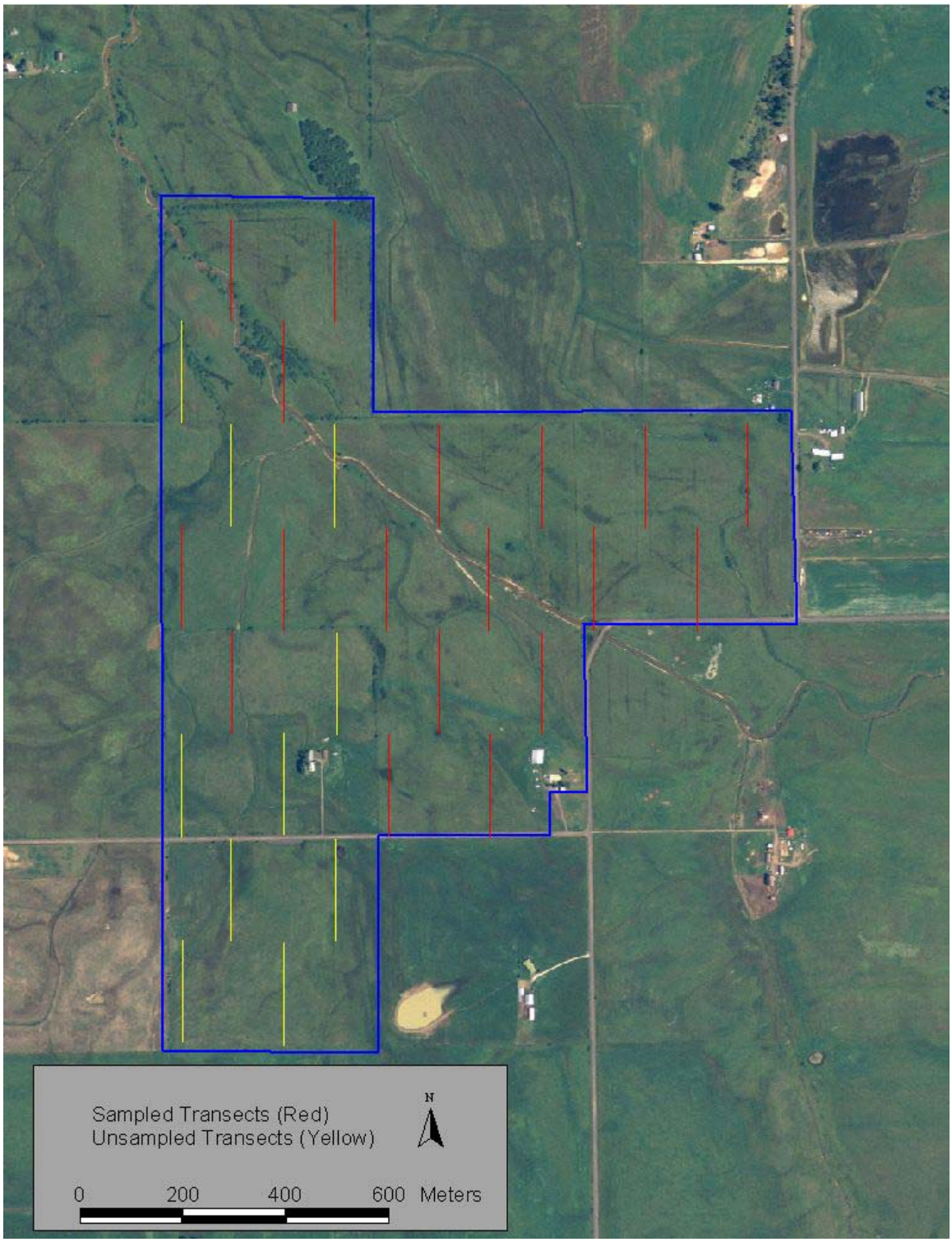

Figure 2. Results of camas stem density counts in 1 x 0.5 m quadrats placed along 200-m transects at Weippe Prairie, June 28-29, 2005. Clustering and gradients of density are evident here.

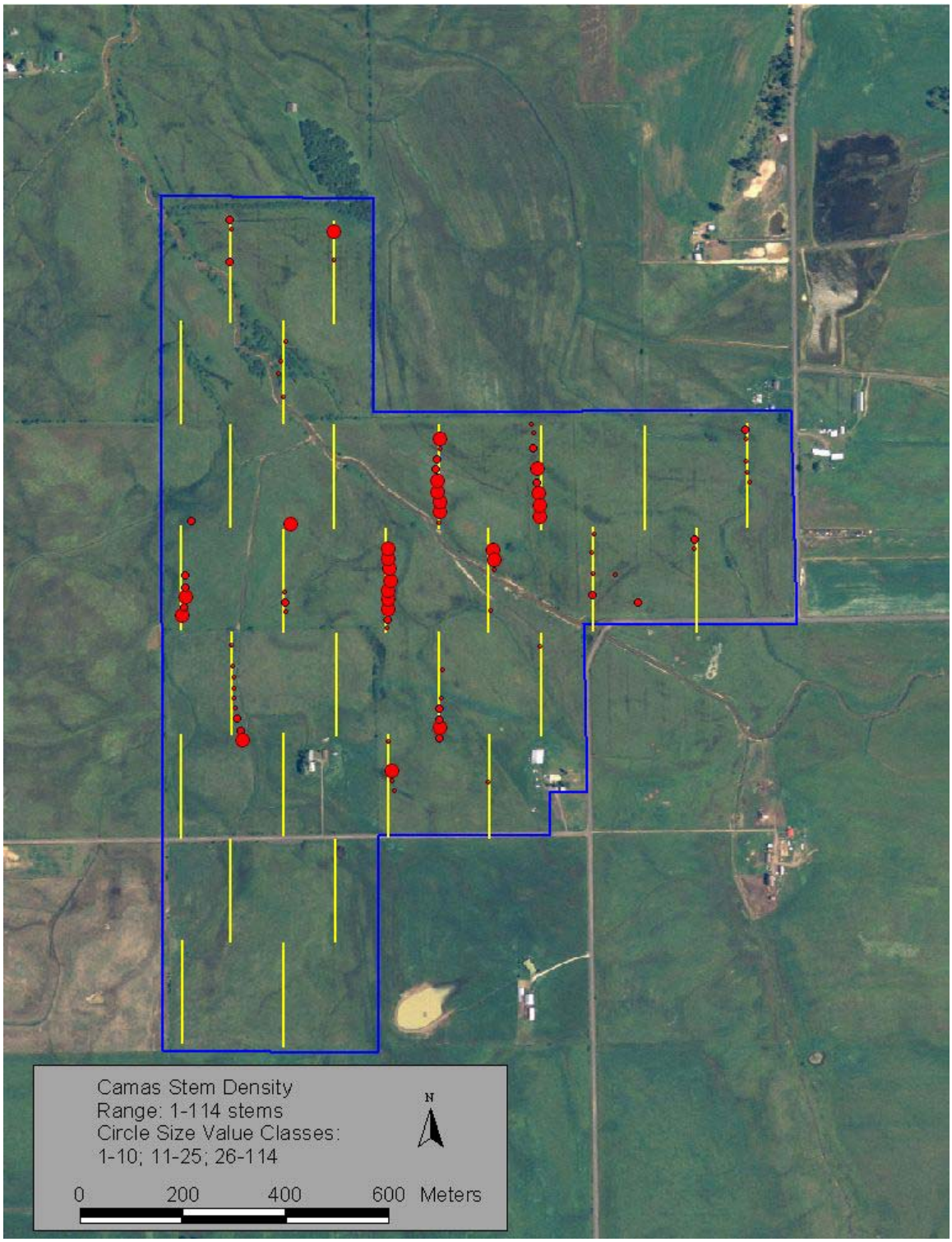

Figure 3. Camas stem density counts (shown in red) and sulphur cinquefoil cover estimates (shown in black). Cinquefoil cover classes ranged from <5%, 5-25%, 25-50%, and >50%. A potential negative correlation between density of these two species may be present in Weippe Prairie.

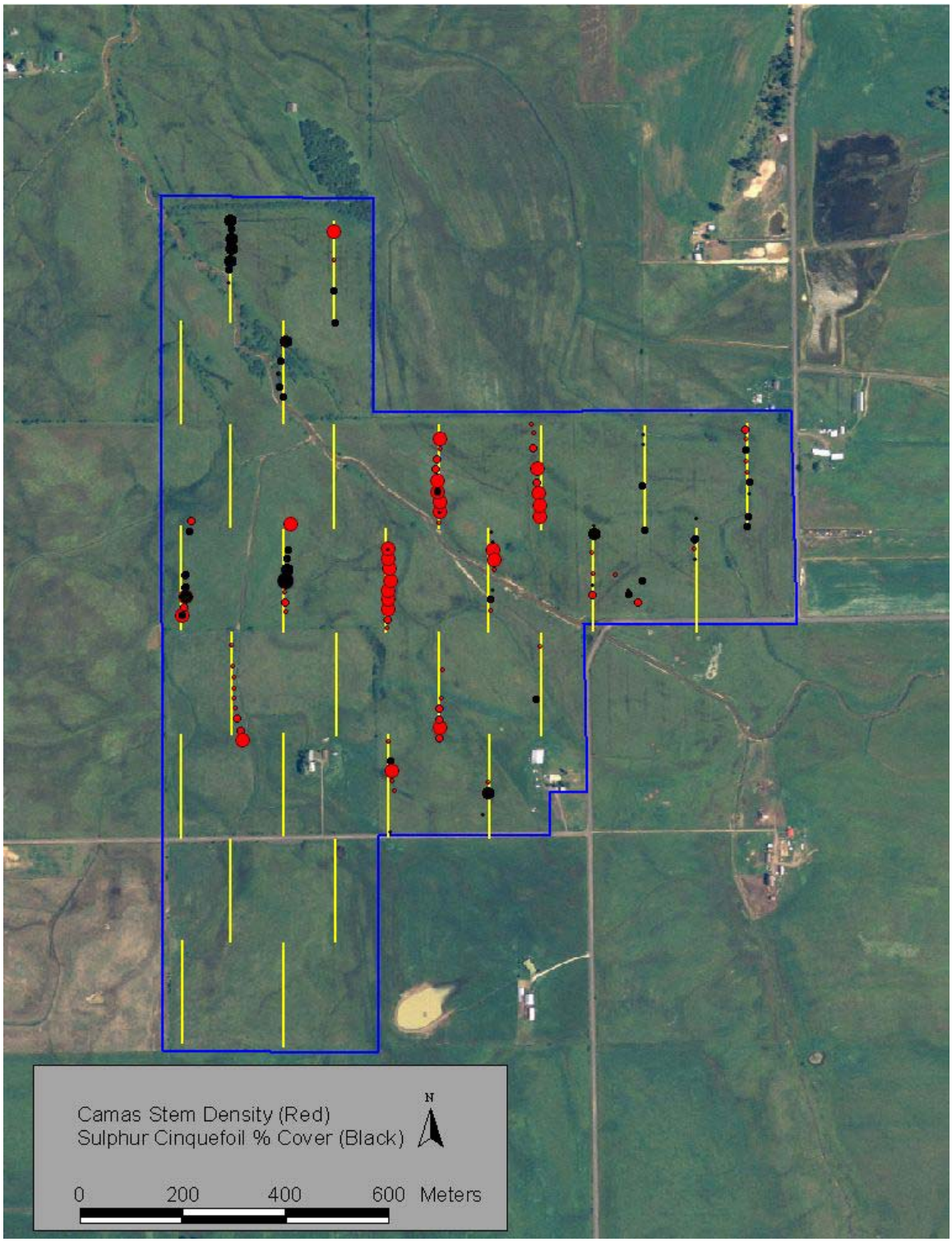

Figure 4. An Anabat recording of a hoary bat along Jim Ford Creek in Weippe Prairie, Idaho.

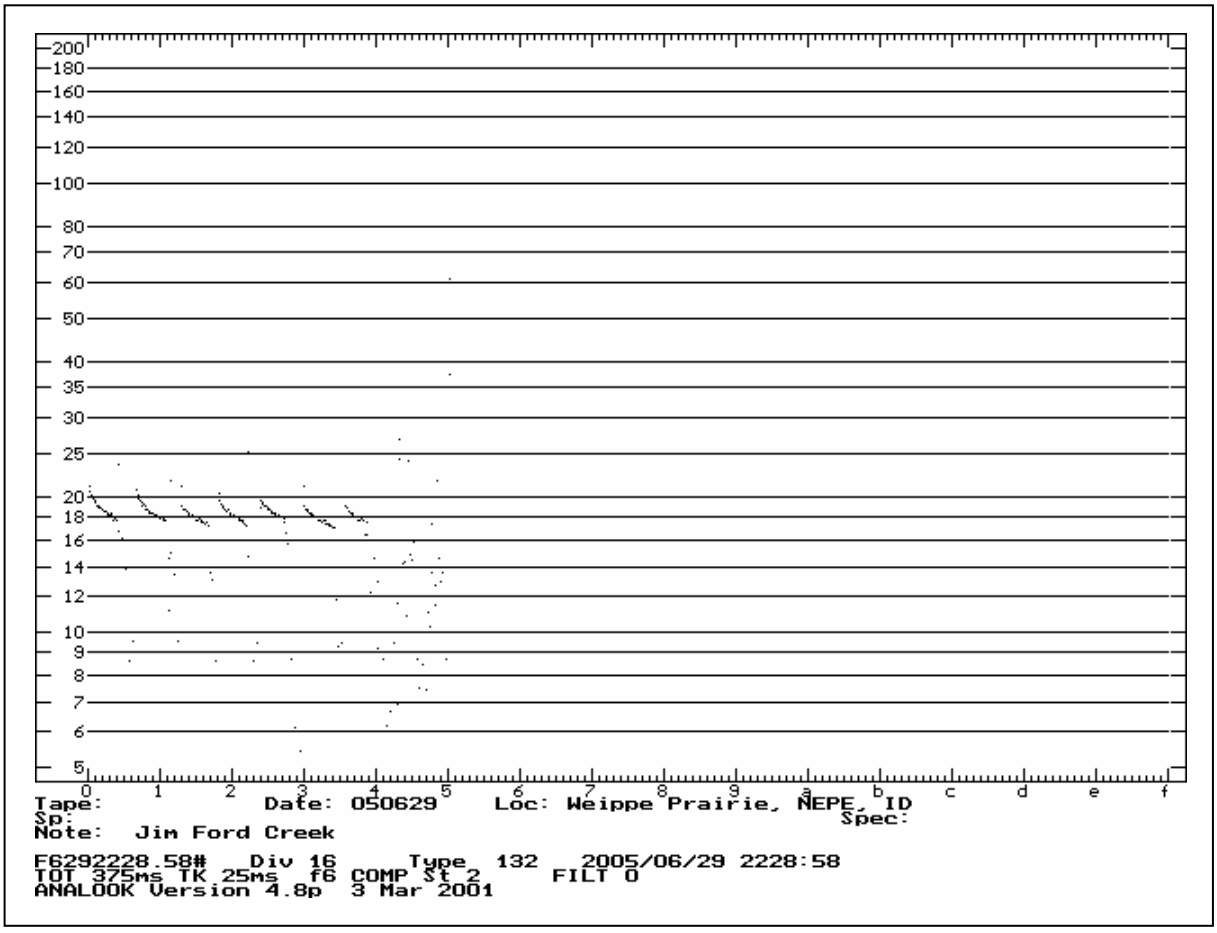

Figure 5. An Anabat recording of an unidentified myotis along Jim Ford Creek in Weippe Prairie. The “45 Khz” quality of the calls, along with the steep slope of the calls, makes the species identification difficult. The most likely species is *Myotis californicus*.