# Habitat Use by Forest Owls on the University of Idaho Experimental Forest

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## INTRODUCTION

The purpose of this study was to determine what species are present on the UI Experimental Forest property (figure 1) and what habitat types they are selecting for or against. This is a question that has not yet been answered in any detail by previous research. I have been unable to locate any owl research from the forest, although the manager thinks that some species may have been done presence surveys in the past but never published. Combining field surveys with existing GIS habitat data proved to be an effective strategy for analyzing owl habitat use compared to availability.

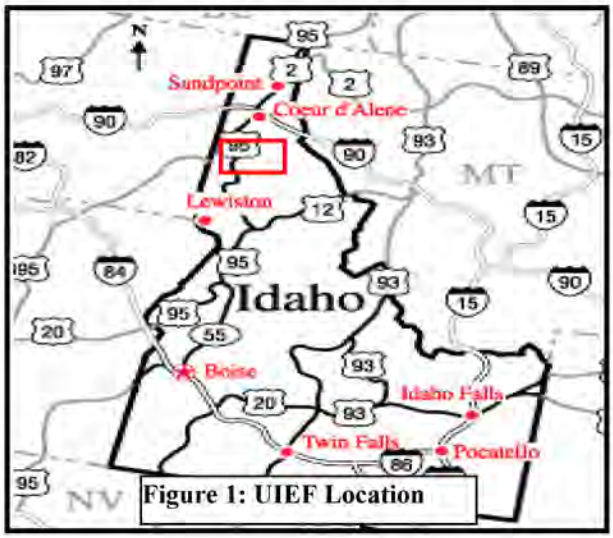


**Figure 1: UIEF Location**

Some great owl work has been done in Idaho that was very helpful in formulating this project. One study from central Idaho dealt with resource partitioning of forest owls (Hayward 1983). The Moscow/Pullman Christmas bird count data for the past several years also provides valuable information regarding at least area wide presence/absence of species (National Audubon Society 2002). A pamphlet published by Idaho Fish and

Game gives detailed description of general habitat requirements and life histories of forest owls (Wilson 1986).

**OBJECTIVES**

The objectives of this study were to: a) Develop a list of owl species that are present on the Experimental Forest property, and b) Determine what habitats each species of owls preferred and avoided, based on successional stage as indicated on GIS stand maps.

This information will serve as one starting point for a complete floral and faunal inventory of the forest that the manager hopes to have completed. It also begins to provide a baseline that future surveys could use to analyze the effects of succession, fire, logging, and grazing on owl populations and distributions. Forest managers have expressed interest in this type of data to incorporate when making management decisions.

**METHODS**

To locate owls in the field, I used transects and recorded calls to complete audio surveys in a variety of habitat types. I stopped the car every 1/4 to 1/2 mile, allowed my disturbance to settle for several minutes, and then played the calls of one to three species of owls for 3 to 5 minutes each using a small megaphone. The species that were played were alternated between stops. Calling locations were marked using a GPS. When owls responded vocally, they were identified and a compass bearing and distance was recorded from the calling point to them. This information was then analyzed using a GIS program. Surveys were completed from February to May in both 2004 and 2005. Transect and call point locations and descriptions are attached, including times and dates (Appendix 1), as are maps of calling points and owl locations (Maps 1-8).

I imported a GIS layer of the Experimental Forest into ArcInfo version 8.3. This layer included the entire forest property broken down into polygons that were classified based on seral stage into 40 different categories. I added a field titled Hab_Class to the table of this layer, and 'selected by attributes' to group these 40 categories into the following habitat categories: Clearcut/Seedlings (1), Brushfields (2), Saplings (3), Pole (4), Small Saw(5), Medium Saw(6), Large Saw(7), Mixed Riparian (8), and (0) other/disturbed/unclassified. The 'calculate field' option was then used to place the correct value in this new column for each polygon based on seral stage. I then displayed the layer using unique values for each of the Hab_Classes (0-8).

I then typed the locations of my survey points into a spreadsheet in Latitude and Longitude Coordinates from the GPS unit I used when sampling. I saved this as a text file and added it to my map. I displayed xy data, projected it according to the same system as the forest stand layer, and exported the table with the UTM coordinates into Excel. I was then able to use trigonometry (Sine and Cosine) to convert my owl distances and bearings from the call locations to new UTM coordinate locations for the owls. I imported these new tables and displayed a layer for the two owls that I chose to focus on.

I overlaid these owl layers with the forest stand layer. This assigned a Hab_Class to each owl based on the polygon that it fell inside. This allowed me to determine owl use of different habitat types. I repeated this for each species. By dividing number of owls of a given species in each Hab_Class by total number of owls of that species detected, I was able to get a use ratio for the owls.

Next, to get availability data, I placed a buffer of 300m on each call point. This distance was chosen because it was the maximum distance at which owls were regularly heard and was therefore considered the maximum average sampling distance. I then broke each of these buffer zones down into quadrants and identified the dominant (by area) Hab_Class within each quadrant visually. This allowed me to divide number of quadrant of each Hab_Class by the total number of quadrants to get an availability ratio for the sampling area.

Finally, I divided the owl use ratio by the availability to get a use/availability (selection) ratio. Values less than one indicate negative selection (avoidance), while values greater than one indicate positive selection (preference). Values that differ from one only in a statistically insignificant amount indicate no preference or avoidance.

**LIMITATIONS**

The biggest limitation of my field data is that the distances to the owls are rough estimates whose accuracy has been unverified. Also, even if the distances are accurate, the assumption is that the owls are spending a majority of their time in that stand. An improvement may be to also buffer the owl locations with known home range sizes and break these areas down into habitat quadrants as well. This is a question of scale. If my analysis is focused on too fine of an area (i.e. one point) then the accuracy would be reduced. I did not equally sample all successional stages either, causing significant sample size differences between categories. I also chose to limit my analysis to successional stage rather than species composition due to the availability of data. However, species composition may be significant.

There are several significant limitations to my GIS data and analysis as well. The accuracy of the forest stand data is unverified, and is several years old. There is a minimum polygon size as well, and this could cause issues with scale if owls are selecting based on micro-habitat sites (i.e. several large trees near a meadow). The visual breakdown of quadrants into habitat types was somewhat subjective as well. Sample sizes were also small enough that confidence intervals are very large, especially for several under-sampled categories. Since the transects covered much of the forest, the sample ratios probably reflect the actual forest ratios fairly well though.

**RESULTS**

There were 19 saw-whet, 12 great horned, and 7 long eared owls detected on the survey routes on the University of Idaho Experimental Forest. Three barred, 1 western screech, and 2 boreal owls were also detected. Calling points with buffer zones stretched across all major units of the forest (map 1). Maps of great horned (map 2) and saw-whet (map 3) owl locations were made as well. The availability and use of habitat classes varied considerably (table 1).

**Table 1. Habitat Availability and Use**

| | Hab_Class | Availability* | GH Use+ | SW Use+ | BD Use+ | LE Use+ | WS Use+ | BO Use+ |
|---|---|---|---|---|---|---|---|---|
| Other: | 0 | 17 | 1 | 3 | 0 | 0 | 0 | 0 |
| Clearcut/Seedling: | 1 | 1 | 0 | 0 | 0 | 2 | 0 | 0 |
| Brushfield: | 2 | 39 | 2 | 4 | 0 | 0 | 0 | 1 |
| Saplings: | 3 | 12 | 1 | 5 | 0 | 1 | 0 | 1 |
| Pole timber: | 4 | 4 | 0 | 0 | 0 | 0 | 0 | 0 |
| Small sawtimber: | 5 | 5 | 0 | 1 | 2 | 0 | 0 | 0 |
| Medium sawtimber: | 6 | 13 | 1 | 1 | 0 | 1 | 0 | 0 |
| Large Sawtimer: | 7 | 14 | 1 | 1 | 1 | 2 | 0 | 0 |
| Uneven/Riparian: | 8 | 16 | 5 | 1 | 0 | 1 | 0 | 0 |
| unknown | X | 32 | 1 | 3 | 0 | 0 | 1 | 0 |
| | Totals: | 153 | 12 | 19 | 3 | 7 | 1 | 2 |
| | *Quadrants | | | | | | | |
| | +Owls | | | | | | | |

Great horned owls (table 2) selected strongly for only the mixed habitat type. The large sample size for this type indicates that this is significant. They also showed a mild avoidance of disturbed and brushfield areas, as could be expected. Small sample sizes (table 1) in the clear-cut, pole, and small saw categories make use of these figures difficult. Neither preference nor avoidance of the other types was detected.

Saw-whet owls (table 2) selected strongly for saplings and moderately for disturbed areas. The sample size was large for these areas (table 1). The apparent preference for small sawtimber is most likely just an artifact of the small sample size for this vegetation class. Brushfields and medium and large sawtimber was slightly selected against (avoided).

Long eared owls (table 2) seemed to select strongly for Clearcut/seedling and Large Sawtimber stages. It is hard to determine selection for the other stages because of small sample sizes. A larger sample size will be required to gather significant data on the other species that were detected. For all species, it is not possible to determine whether Use/avail. ratios of 0.000 indicate strong avoidance of that stage or are simply due to small sample sizes.

**Table 2: Use/Availability Ratios**

| HabClass | Seral Stage | GH Use/avail. | SW Use/avail. | LE Use/avail. |
|---|---|---|---|---|
| 0 | Disturbed | *0.750* | **1.421** | 0.000 |
| 1 | Clearcut/seedling | 0.000 | 0.000 | **43.714** |
| 2 | Brushfield | *0.654* | *0.826* | 0.000 |
| 3 | Sapling | 1.063 | **3.355** | 1.821 |
| 4 | Pole | 0.000 | 0.000 | 0.000 |
| 5 | Sm. Saw | 0.000 | 1.611 | 0.000 |
| 6 | Med. Saw | 0.981 | *0.619* | 1.681 |
| 7 | Lg. Saw | 0.911 | *0.575* | **3.122** |
| 8 | Mixed | **3.984** | *0.503* | 1.366 |

\+ **Bold** = Positive Selection
\- *Italics* = Negative Selection
N Underline = No Significant Selection

? Normal = Cannot be calculated due to small sample size

The use/availability comparison could be improved by using statistical testing rather than the subjective comparing to determine what level of apparent selection or avoidance was statistically significant. However, with the small sample sizes in this study I'm not sure that any certain conclusions could be drawn.

**CONCLUSIONS**

Great horned owls appear in general to prefer mixed or older habitat types and avoid younger, more open areas. Saw-whet owls prefer sapling and disturbed sites as opposed to older timber. This is in keeping with general knowledge regarding the species (Wilson 1986). It is puzzling why long eared owls seem to prefer both the largest trees and the most open areas over anything in between. I could speculate that this is because they roost and nest in thicker areas but hunt over the more open ground. It would be interesting to see how the other owls that were not included in this analysis compare to these three.

These varied results suggest that a larger sample size is needed, and also that owl habitat varies considerably based on the species. The number of owls of each species that were heard should not be used to compare densities between species because of possible differences in willingness to respond to calls. I did not differentiate in my analysis between owls heard before and after I played calls using the megaphone because this would have further reduced my sample size. However, it would be interesting to compare these differences in the future. My results give managers a definite (although probably not comprehensive) list of owl species that use the forest, establish a baseline of

data for future study, and should provide a starting point for evaluating how forest harvest practices will affect various owl species.

**ACKNOWLEDGEMENTS**

I want to thank Ross Appelgren, Brian Austin, and the Experimental Forest for access, maps, equipment, helpful advice for vegetation classification, and some funding. Thanks also to my advisor Dr. Oz Garton for his input and support along the way and for the use of his survey equipment. Joel Sauders with the Idaho Department of Fish and Game provided the caller and some advice as well. Brad Bickford and Erik Lewis assisted with sampling. Thanks!

**LITERATURE CITED**

Hayward, Gregory D. 1983. Resource Partitioning Among Six Forest Owls in the River of No Return Wilderness, Idaho. M.S. Thesis. University of Idaho.

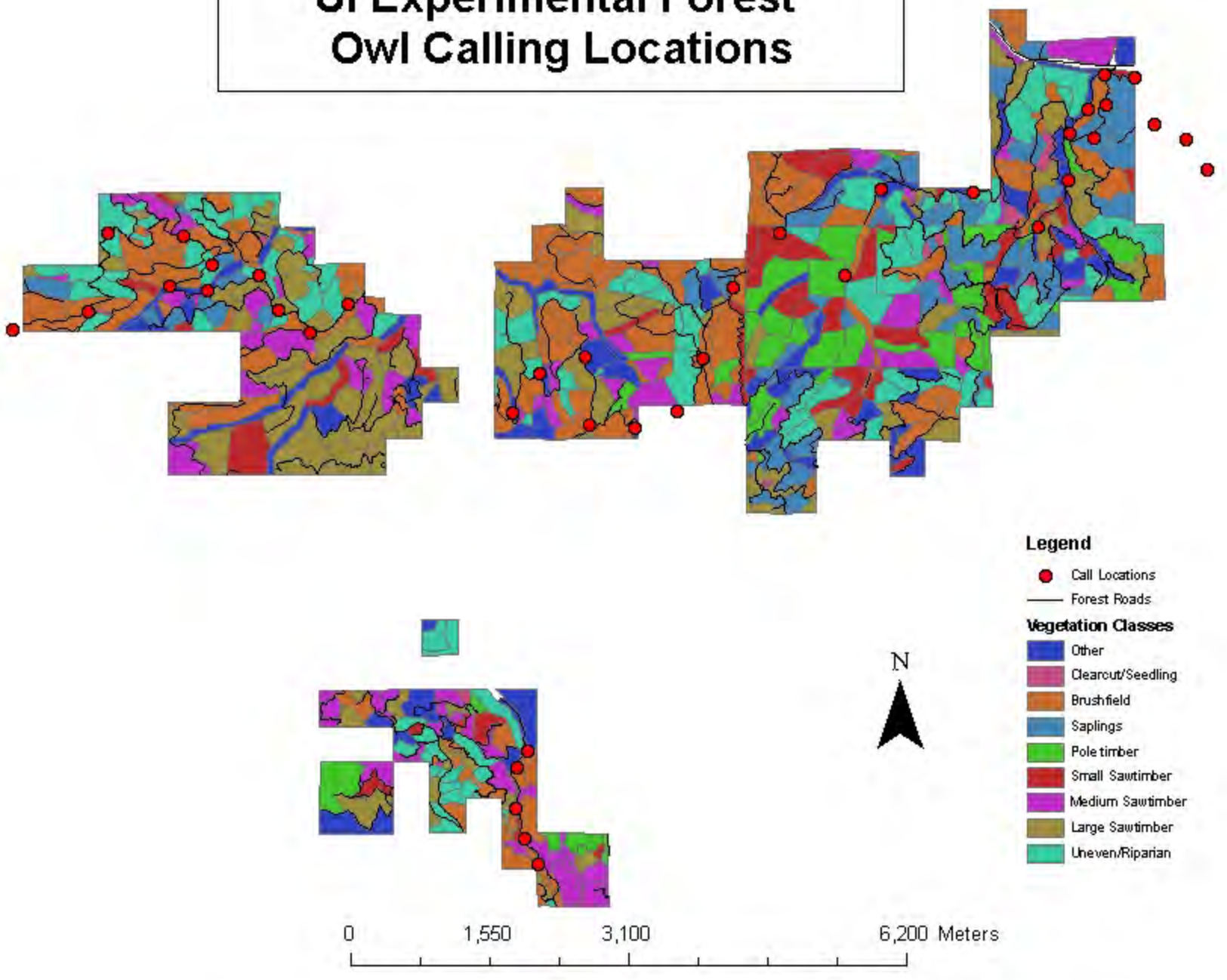
National Audubon Society (2002). The Christmas Bird Count Historical Results [Online]. Available "http://www.audubon.org/bird/cbc" [2000-2003]

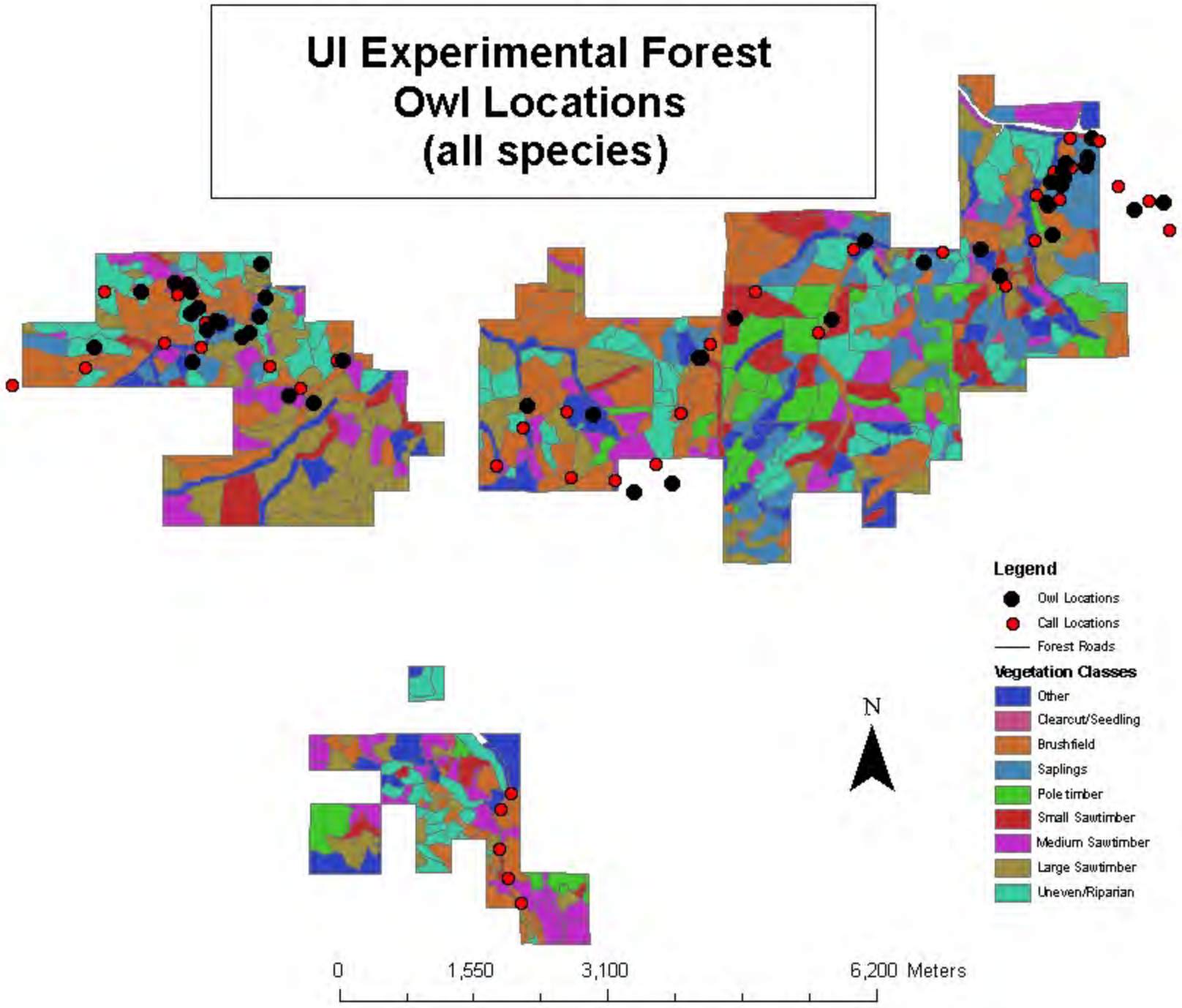
Wilson, Alison. Idaho's birds or prey: Part 2, Owls. Boise: Idaho Dept. Fish and Game, 1986.

**GIS DATA**

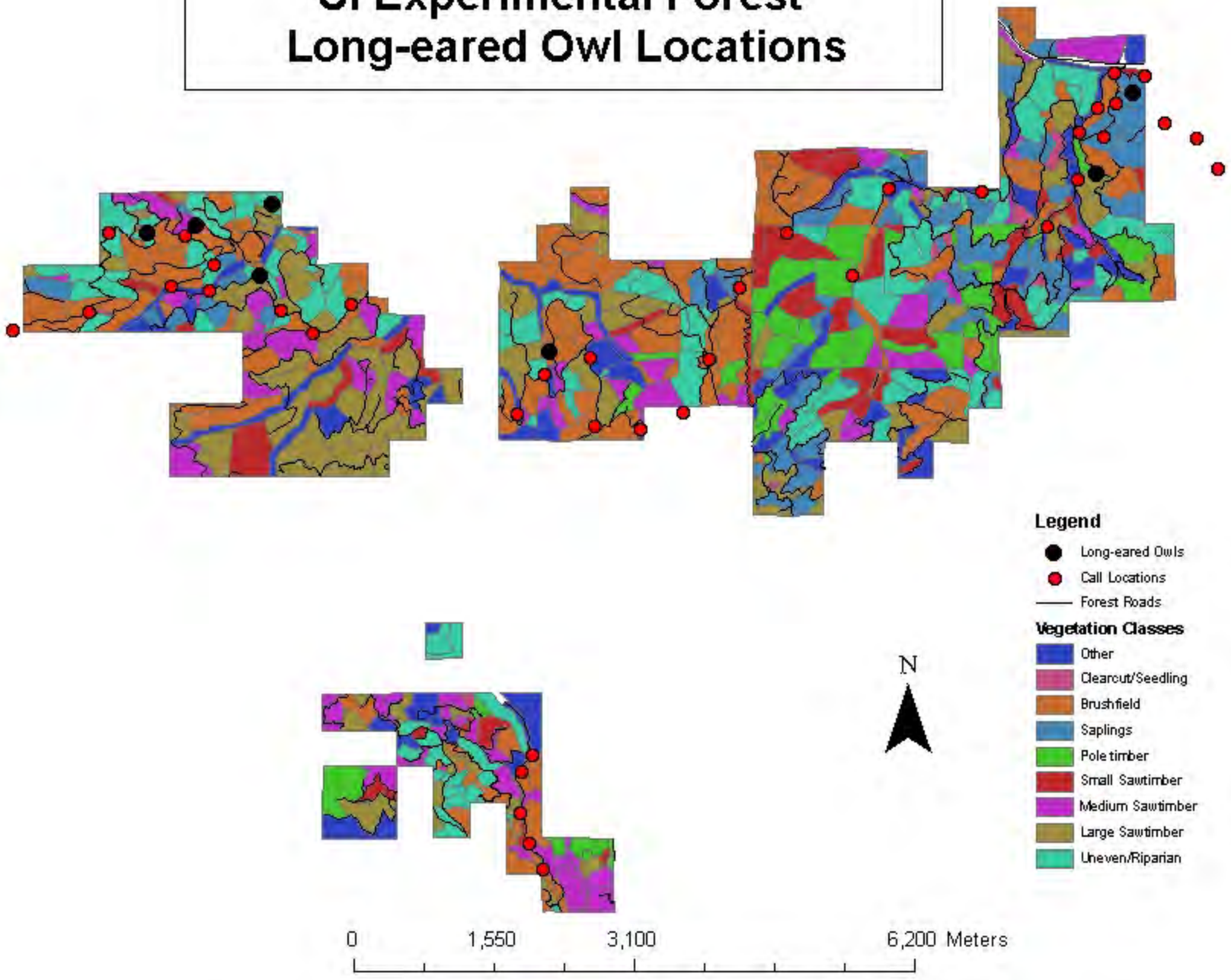
Harold Osborne, Ross Apelgren, University of Idaho College of Natural Resources, Experimental Forest Staff. 2001. Forest_Stands Layer. Unpublished Material. University of Idaho, Moscow, Idaho.

# UI Experimental Forest
# Owl Calling Locations




UI Experimental Forest
Owl Locations
(all species)
Legend
Owl Locations
Call Locations
Forest Roads
Vegetation Classes
Other
Clearcut/Seedling
Brushfield
Saplings
Pole timber
Small Sawtimber
Medium Sawtimber
Large Sawtimber
Uneven/Riparian
N
0
1,550
3,100
6,200 Meters

# UI Experimental Forest
# Long-eared Owl Locations



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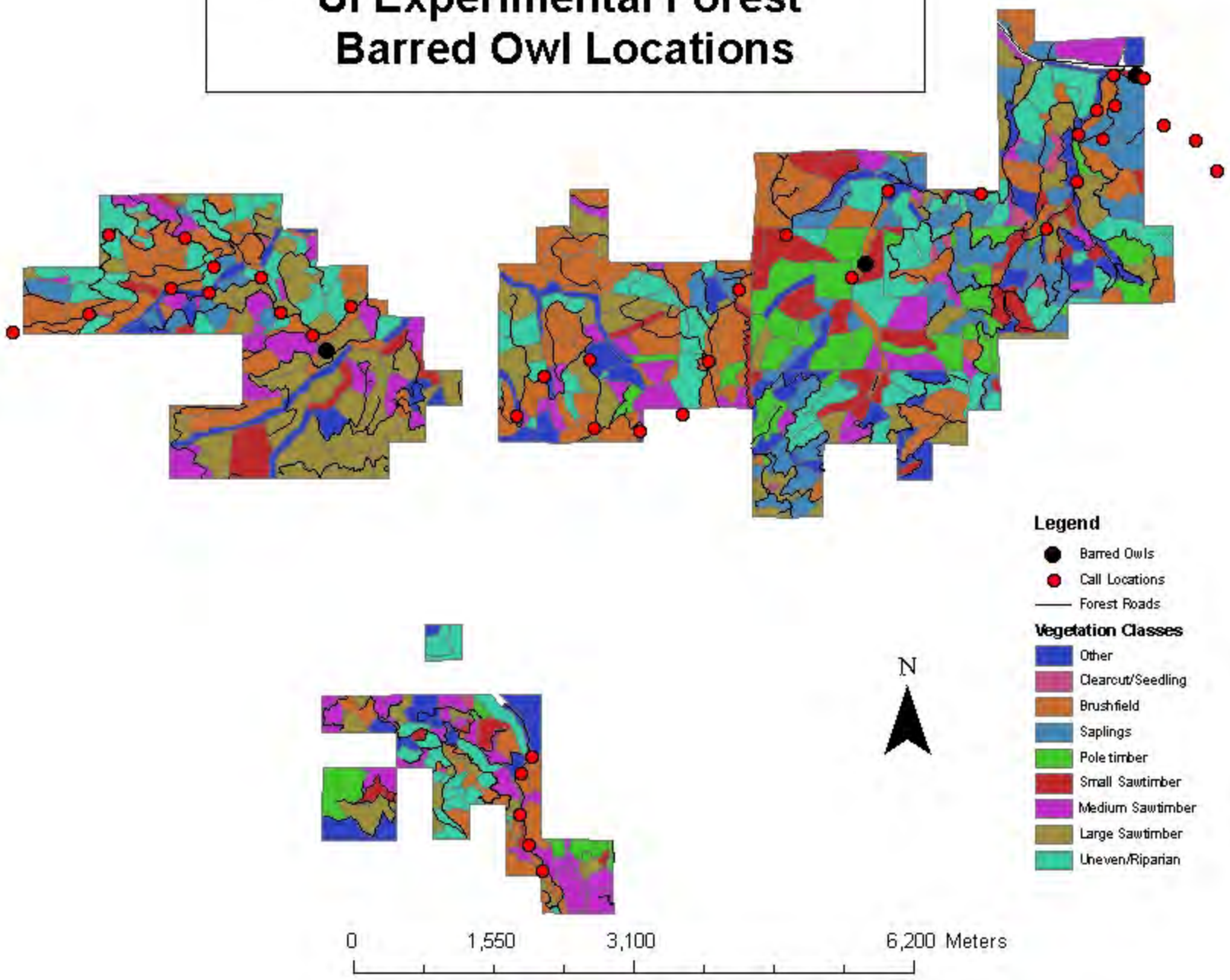
# Barred Owl Locations



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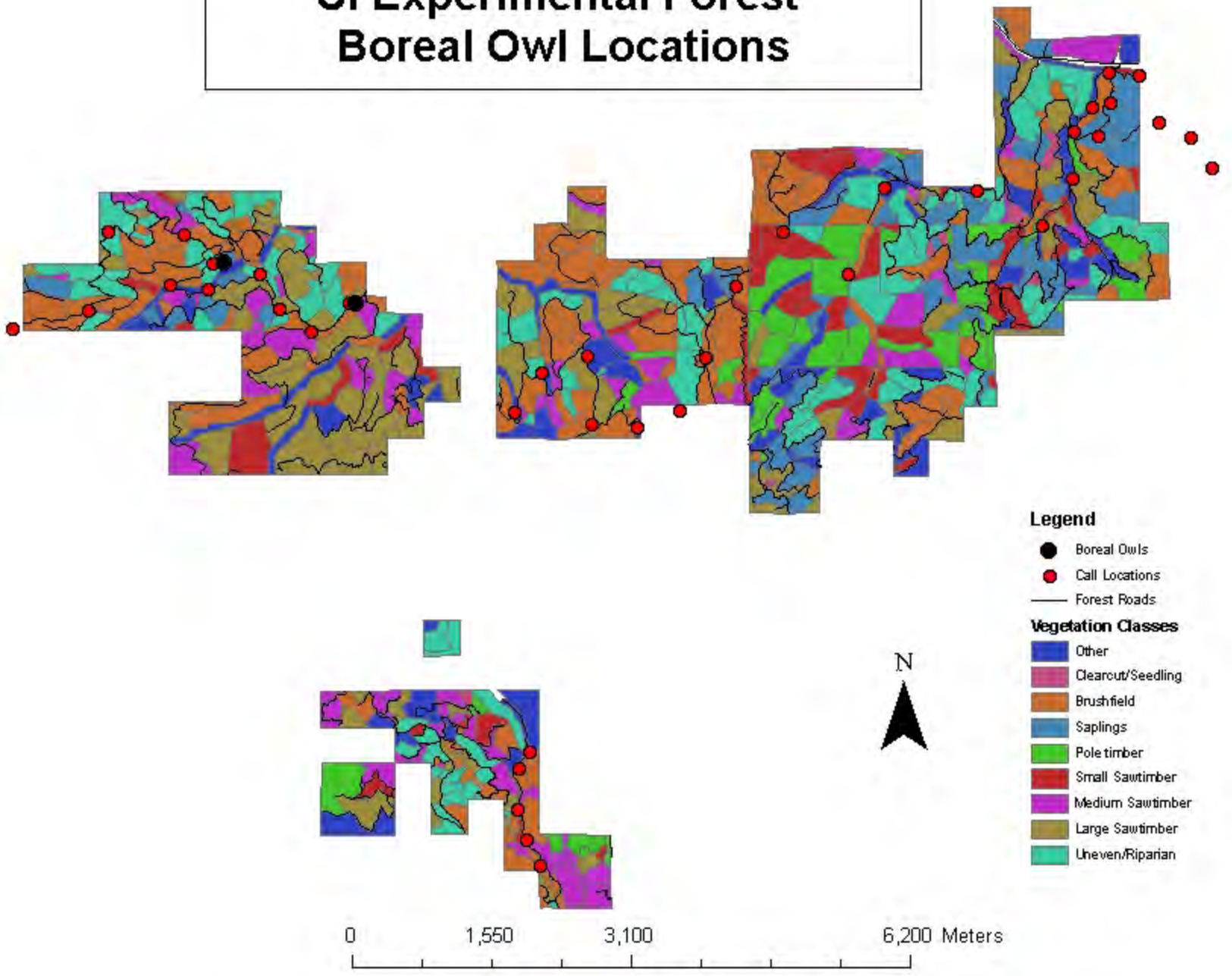
# Boreal Owl Locations



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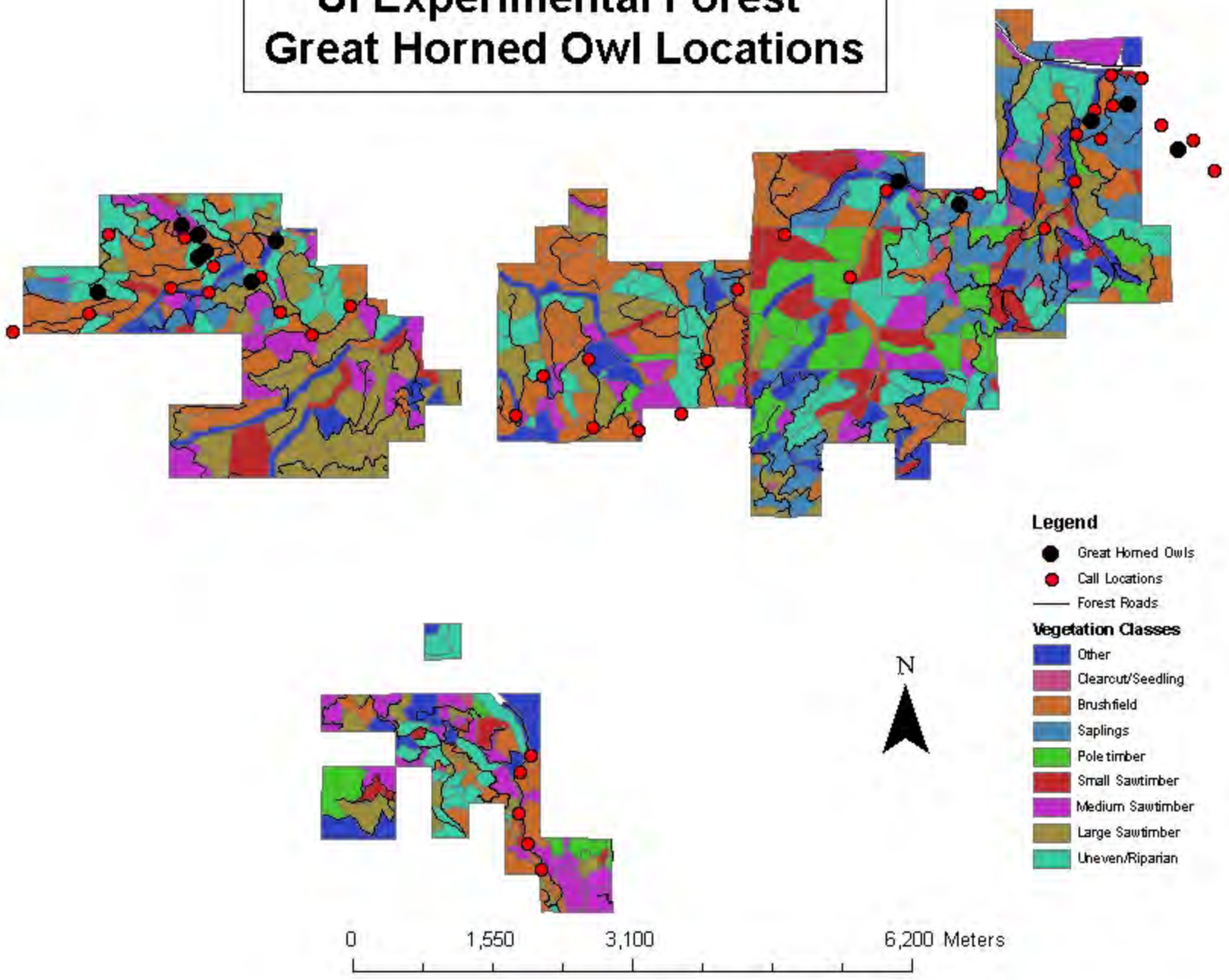
# Great Horned Owl Locations



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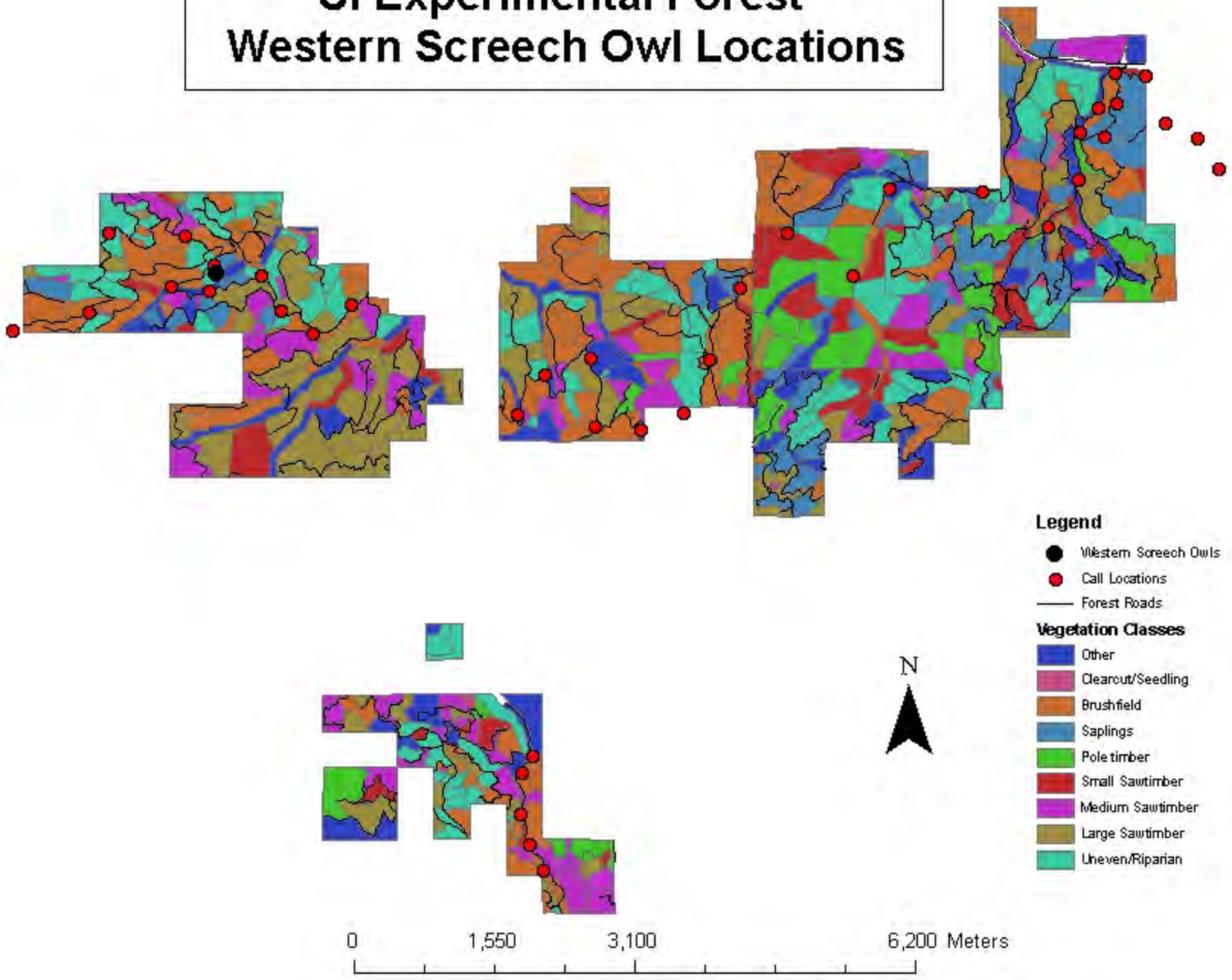
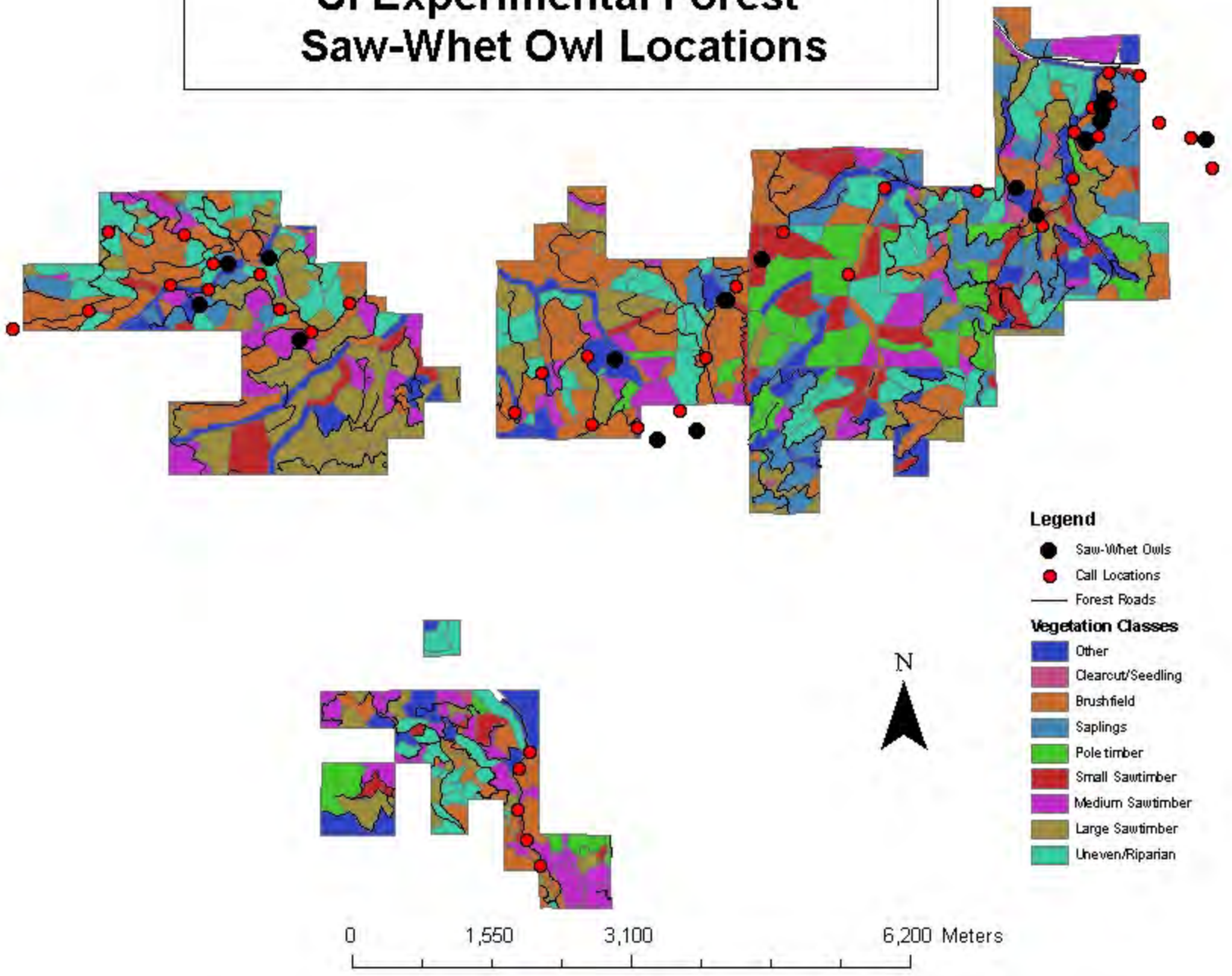
# Western Screech Owl Locations



# UI Experimental Forest
# Saw-Whet Owl Locations



# Location of Complete Research:

Author & Title: Burner, Ryan
Habitat Use by Forest Owls on the University of Idaho Experimental Forest(2005)

University of Idaho Library:

Call Number- none

College of Natural Resources:

Department- Wildlife

Note: This was a directed study under Dr. Oz Garton