

# The role of avian seed dispersers and large woody debris in plant establishment following dam removal on the Elwha River, WA.



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## Introduction

- Reservoir drawdown following the removal of two hydroelectric dams on the Elwha River, Washington, exposed ~320 hectares of sediments and left a barren landscape in the former reservoirs (Fig 1). The establishment of native vegetation within these areas is critical to meeting restoration objectives.
- Large woody debris (LWD) can play an important role in riparian ecosystems and may assist in the development of early plant communities. LWD helps create favorable microsites for seedlings by creating shade, which decreases temperatures and increases moisture levels in sediments<sup>123</sup>. In sparsely-vegetated landscapes such as those present in the former Mills reservoir, wildlife including birds, can be effective seed dispersers. Logs in the former Mills reservoir provide perch structures upon which birds defecate and deposit seed-rich scat from vegetated areas into these seed-limited habitats<sup>4</sup>.

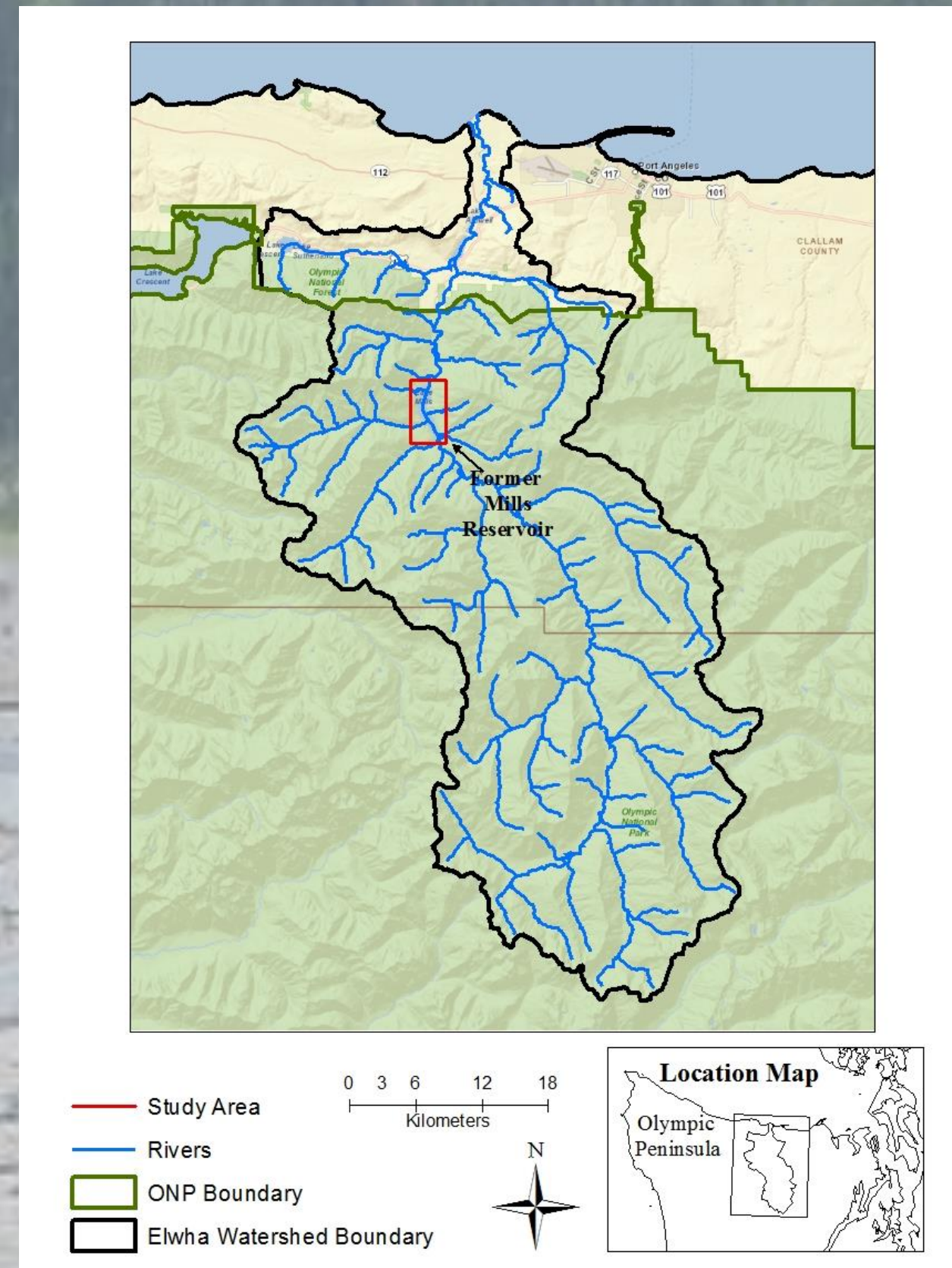


Figure 1. Study site location in the former Mills reservoir located within Olympic National Park.

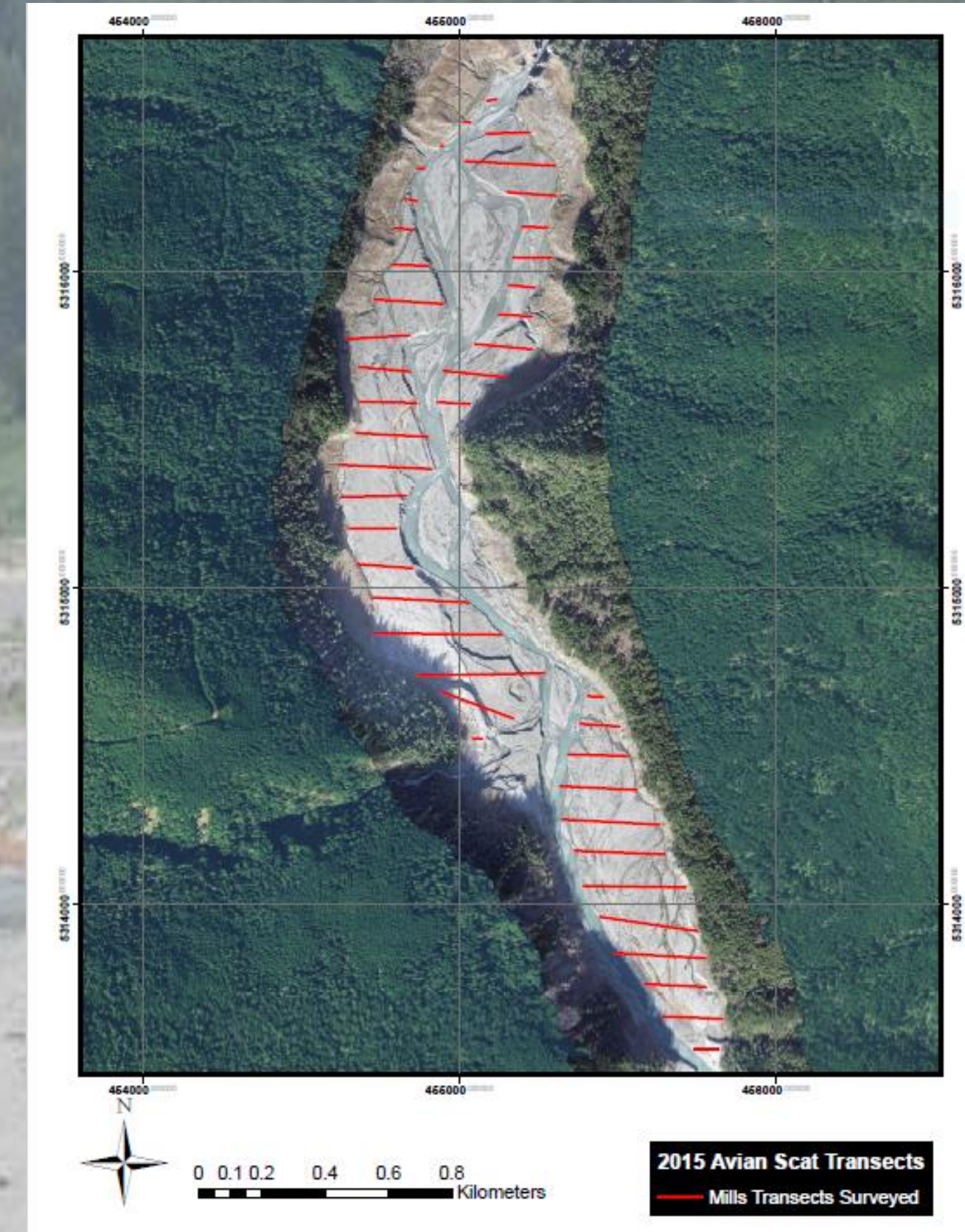


Figure 2. Avian scat transects extending east/west from the former dam south to the former delta on Lake Mills.

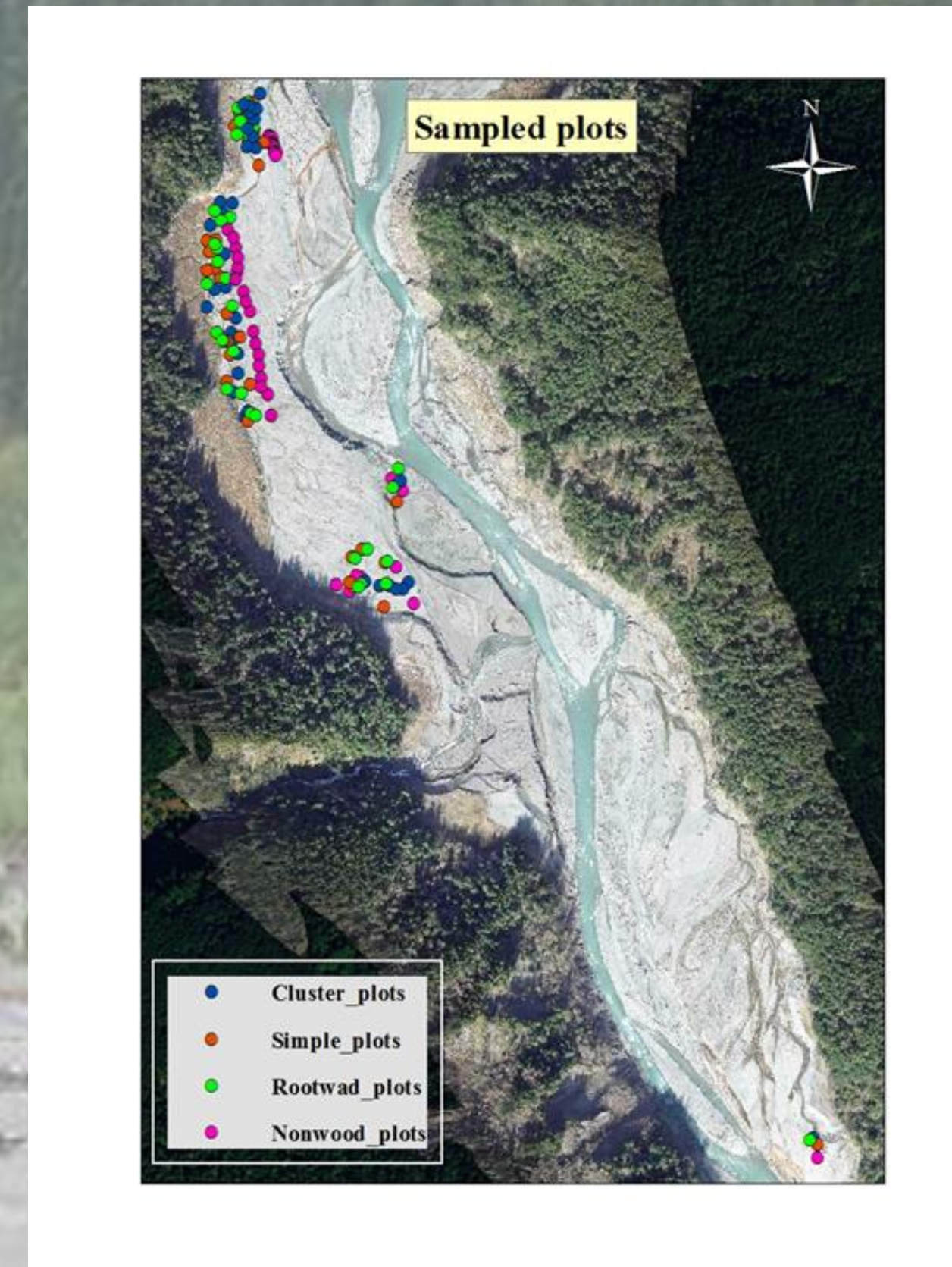


Figure 3. Plant sampling locations at cluster, simple, root-wad, and non-wood plots.

## Analysis

**LWD Component:** I will use generalized linear mixed models (GLMM) and Information theoretic methods (AIC) to determine which variable combinations provide a model with the greatest empirical support for plant establishment around LWD. The following are my explanatory variables:

- Treatment type
- Maximum log height
- Log volume
- Plant distance from wood
- Plot type
- Log orientation
- Distance from forest edge

**Avian Component:** I will use general linear models (GLM) to analyze LWD characteristics (height, area, location) and their effects on the abundance of avian seeds (scat).

I will germinate scats collected in 2015 to determine which seeds are dispersed by birds. I will create density maps (ArcGIS) of avian seed dispersal and plant establishment on LWD across the entire former Mills reservoir.

### Preliminary results:

- Scat abundance on LWD decreases with increasing distance from the forest edge (Fig 4).
- Scat abundance increases with increasing volume of LWD (Fig 5).

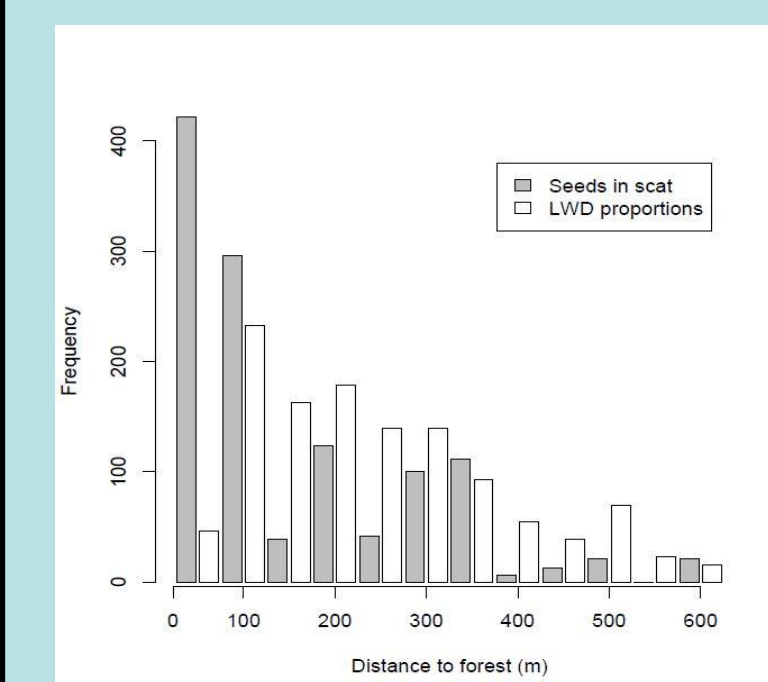


Figure 4. Scat abundances and LWD proportions with distance from forest edge.

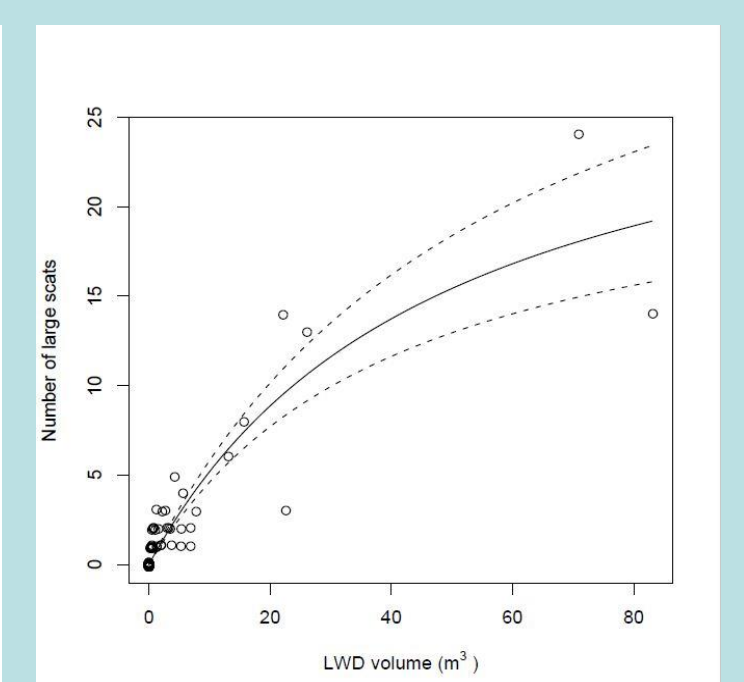


Figure 5. Scat abundances with LWD volume.

## Research Goals

- Examine the synergistic relationship between avian seed dispersal, germination, and plant establishment around LWD.
- Understand how LWD can be used as a tool to assist in the restoration of vegetation following dam removal.

## Research Questions

- LWD Question :** Is plant establishment greater at sites with LWD?
- Avian Question:** How are birds contributing to plant establishment in the former Lake Mills?
  - What is the abundance and distribution of bird-dispersed seeds (scats)?
  - What are the patterns in plant establishment from bird-dispersed seeds?

## Methods



- 2015 Avian Component:** I collected bird scat from the surface of LWD. Sampling occurred along transects extending the length of the former Mills reservoir (Fig 2).

Logs > 50 cm in height were considered LWD. I collected the following measurements from LWD on transects:

- GPS location of each log.
- Log height (max and mean)
- Log length
- Log diameter



- LWD Component** I identified and counted the number of plant species found on 1x1 m<sup>2</sup> plots during summer, 2016.

At each LWD plot, the following dimensions were measured:

- Log diameter
- Log length
- Log height (max and mean).

In total, 34 cluster, 35 simple, 39 non-wood, and 35 root-wad plots (Fig 3) were sampled (N=143).

## References

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