Species Occupancy of Native Western Gray Squirrels and Invasive Eastern Gray Squirrels on Joint Base Lewis-McChord in Washington State

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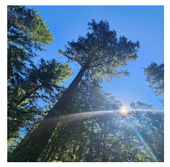
Introduction

- Native to Washington state Western Gray Squirrel (*Sciurus griseus)* listed threatened by the state has a particular habitat that it prefers when compared to that of the invasive Eastern Gray Squirrel (*Sciurus carolinensis).*
- Causes of species loss where biological invasions have occurred may be attributed to factors other than competition because subtle differences in niches can allow for coexistence of similar species (Johnston et al. 2019).
- Invasions by introduced species often coincide with other environmental changes, such as habitat loss, that may obscure the negative effects of introduced species and complicate recovery strategies for imperiled species (Johnston et al. 2019).
- It is important to understand potential threats of introduced species so that conservation efforts to maintain biological diversity or recovering rare species are efficient and effective (Johnston et al. 2019).
- Diet studies of potential competitors may reveal shared dependence on limited resources and other important information about interspecies interactions (e.g., when and where interactions may occur) (Johnston et al. 2019).
- Eastern and western gray squirrels had low spatial overlap in their areas of use on the Base and exhibited significant differences in habitat use possibly reducing the consequences of overlap in diets (Johnston et al. 2019).
- Habitat use by eastern gray squirrels strongly favored riparian areas dominated by deciduous trees and with high diversity of shrubs that included mast producing species like beaked hazelnut, rather than conifer-dominated uplands (Johnston et al. 2019).
- Western gray squirrels, in contrast, used primarily uplands dominated by fir and pine (Johnston et al. 2019).



Western Grey Squirrel (*Sciurus griseus)*

https://wdfw.wa.gov/species-habitats/species/sciurus-griseus

Eastern Grey Squirrel (*Sciurus carolinensis)*

https://freerangestock.com/photos/172845/squirrel-on-a-mossy-stump-in-forest.html

- Although eastern gray squirrels had ample access to Douglas-fir trees, our foraging observations suggest they failed to use this food resource, instead focusing their efforts on hardwood trees and shrubs (Johnston et al. 2019).
- Lacking oak trees that provide cavities used as natal dens in more southerly populations, most western gray squirrels in our North Cascades study area reared young in drays (Gregory et al. 2010).
- Squirrels in Washington's Southeastern Cascades and southern Puget Trough primarily use cavities in oaks but also Douglas-fir and big leaf maple (Acer macrophyllum) as natal dens (Gregory et al. 2010).
- For Eastern squirrels Den cavities may be more common where a mixture of trees is present, especially if oak species are in the mixture (Williamson, 1983).
- Acorns are among the main food items for squirrels, and squirrel populations tend to fluctuate in response to acorn availability (Williamson, 1983).
- EGS and WGS populations do prefer similar nesting sites but have some differences in food preferences and topography, but this should still have cause for concern that they could move into the WGS territory.
- Preponderance of forests dominated by Douglas-fir or other conifers in Washington may inhibit spread of eastern gray squirrels beyond areas with human-cultivated food resources or limit them to riparian areas (Johnston et al. 2019).
- Causes for WGS high mortality rate and decline in the Puget Trough JBLM population likely include habitat loss, habitat alteration, and increased mortality related to vehicle traffic (WDFW, 2022).
- Within this study squirrel occupancy studied by collection of hair samples in different areas on JBLM to see whether there is still not any overlap between species, whether they reside in the same areas as in previous studies and to see if the counts on WGS have changed since 2022 when a translocation from Oregon had taken place for population diversity/increase.
- Hypothesis being tested is that there will be little overlap between Western Gray and Eastern Gray squirrels.

METHODS

Plastic pipes were made into squirrel hair capturing devices by addition of metal plating screwed inside with tape on each inside end of tube with a nut securely glued in center and 3 nuts spread 1 ft apart leading to the tubes on either side with logs securing tubes in place

Some sites were chosen with squirrel nests directly above the area, or in stands of 2-3 Douglas-firs potential nesting areas with open space and Oregon White Oak nearby and game cameras at three locations. Sites were monitored in 2024 from July to October.

Map coordinate points were put into Avenza with JBLM Atlas map 0.5 mile away from roadways with description if nest was present or near oak, stands of Douglas fir.

After two weeks wait the tubes were checked for squirrel hair and if it was not found it was left on site or nuts were replaced

If the squirrel hair had red-orange present it was determined to be Eastern Gray Squirrel hair if the hair was only black and white mix it was determined to be Western Gray Squirrel hair

Frequency of encounter was calculated by WGS and EGS encountered at least once at each site of the 95 sites. total found was then divided by total sites by 100 for percentage.

Figures

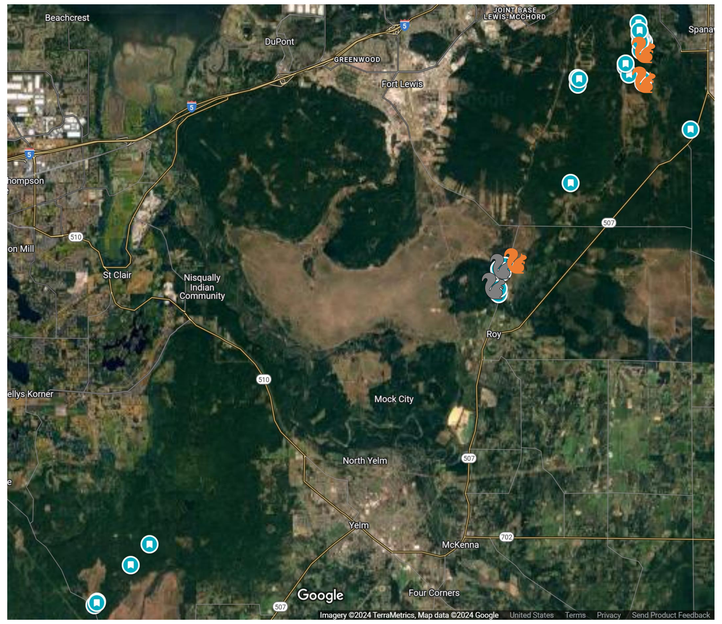


Figure 2. Map of all sites evaluated 3 sites at each blue marker A, B, C with two tubes lost and location distribution within JBLM.

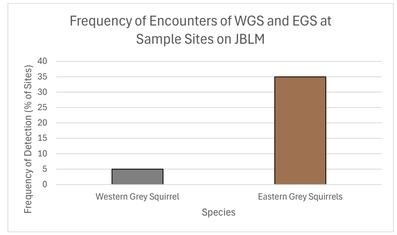


Figure 1. Frequencies of encountering WGS and EGS at sample points. Sites were monitored from July to October 2024. 5 WGS within 95 sites at 5% and 33 EGS within 95 sites at 35%. Lower frequency of WGS than previous studies and the frequency of EGS is 6.6 times higher than WGS at JBLM.

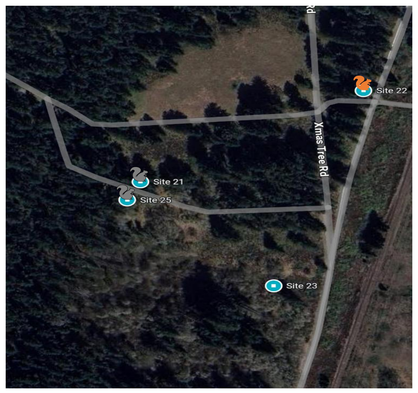


Figure 3. Close up of WGS Habitat and EGS habitat.

RESULTS AND DISCUSSION

- Percentage much lower for western gray squirrels at approx. 5 % and eastern gray squirrels at approx. 35% (Figure 1) suggesting that there is a larger presence of EGS in some areas of JBLM.
- For EGS (Orange) there were three main locations some near urban areas/closer riparian zones and for WGS (Gray) there was only one area out of all 95 sites that had them present (Figure 2) and there is still territory that needs to be explored further.
- WGS were primarily found in Oak, Pine, minimal Scotch Broom, open prairie and isolated small dirt roads habitat Vs. EGS habitat was thick Douglas-Fir, deciduous shrubs, larger paved road, thicker Scotch broom and understory (Figure 3) with not overlap between two species at > 0.5 miles away.
- Unexplored prairie oak woodland territories, translocation sites and other previous siting locations with ideal vegetation preference are already next in the planning phase for further investigation .
- Historical accounts of WGS occurring in the Spanaway marsh area in near previously open prairies with oak woodland but were not discovered there in this study and have been replaced by EGS after overgrowth of Scotch broom nearby urbanization has taken over.
- Forest management activities can affect truffle abundance and composition in forests used by western gray squirrels, but their effects are poorly understood while factors that affect the abundance and distribution of food resources important to arboreal squirrels will aid in their conservation (Johnston et al. 2019).
- Extinction of native species from competition by introduced species is considered uncommon and more often is attributed to mechanisms of predation and disease (Johnston et al. 2019).
- Other considerations would be to use vegetation mapping to get a further understanding of where the WGS occur, food resource abundance, investigations into predation and possible hybridization with EGS.

WORKS CITED and ACKNOWLEDGMENTS

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