Annotated Bibliography

Hunter Everton

Lisboa et al. (2022) Assessing the Impact of Road and Land Use on Species Diversity of Trees, Shrubs, Herbs and Grasses in the Mountain Landscape in Southern Africa

Summary: The researchers studied the diversity of flora in the Moribane Forest Reserve in the Eastern Chimanimani Mountain range, located in central Mozambique. They really wanted to assess how the main National Road (EN 216) affected the species diversity of flora in the mountain region. For assessing the land use of the area the researchers separated the area into four major categories: Agriculture, Fallow, Forest, and Road. For measuring diversity of flora the researchers took the alpha and beta diversity measures across the different land use types. They found that there was greater diversity of flora along the main National Road, particularly invasive species were found more abundantly on the roadside. They conclude that this diversity is likely caused by changes in soil composition due to the creation of the road.

Evaluation: This study is limited for my purposes as they only assess plant diversity in this one mountainous region of Mozambique and so it would be difficult to see a direct connection between it and the areas of Oregon that I will be examining. They also say themselves that they had smaller sample sizes from the non-road land-use types, therefore there may have been some species diversity that they did not see in the other land-use types.

Relevance: This paper provides an example of how to measure land-use in a given area and how I can compare species diversity to land-use

Newbold et al. (2020) Global effects of land use on biodiversity differ among functional groups

Summary: The researchers of this study sought to understand how land-use affects biodiversity among different groups of animals using data gathered from 424 different studies. For land-use the researchers used 6 classes: primary vegetation, secondary vegetation, plantation forest, cropland, pasture, and urban. These land-use areas were also separated by human use-intensity: minimal, light, and intense. To measure biodiversity the researchers took the abundance of different species and measured the difference in abundance of a species between areas with low human use and high human use. They found that species abundance was varied across different groups of animals, for example omnivores reacted differently to land-use than carnivores. They concluded that overall increases in land-use disproportionately affected organisms of higher trophic levels, which in turn have higher body masses, and therefore human land-use does not affect all species evenly.

Evaluation: This seems to me to be a pretty strong paper and I personally cannot find many limitations in their analysis. Their measure of biodiversity is interesting and I don't have the knowledge to know how well it works in comparison to measures like alpha and beta diversity.

Relevance: I will use this paper as another example of measuring land-use and I think using this idea of human use-intensity could be interesting to my project.

Souza, Teixeira, & Ostermann (2015) Assessing biodiversity loss due to land use with Life Cycle Assessment: are we there yet?

Summary: This paper suggests that Life Cycle Assessment does not account for the entirety of complex ecological systems. They provide multiple limitations of the approach and offer solutions that would incorporate the changing landscape and other types of diversity, like functional diversity.

Evaluation: I can't really make many judgments on this paper as I don't personally know enough about the topic presented to understand their critiques. I find it interesting though and this makes me consider how to best approach the topic of biodiversity given the very complex nature of the topic.

Relevance: I don't yet know how this paper will be used as I would have to get more into modelling biodiversity before I understand where LCA does and doesn't work.

Jernakoff, Knowlton, Vásquez-Ávila, Espinosa, & Tinoco (2023) Effects of land use change on the functional diversity and composition of mixed species avian flocks in the high tropical Andes of southern Ecuador

Summary: The goal of this study was to examine the effects of land-use on the diversity of mixed species bird flocks in southern Ecuador. The researchers examined 3 types of land-use: forests with native tree species, forests regenerating from a history of cattle grazing, and forests with non-native tree species. The researchers walked in four 500 meter transects to observe the bird species that made up each type of land. To measure diversity of mixed species flocks the team used functional descriptors like body mass, bill size, hand-wing size, tail size, and tarsus length. The team found little impacts of land-use on the functional structure of the mixed species flocks.

Evaluation: The researchers cite the nature of their mixed species flocks as the main limitation of their study. They describe how they may have counted individuals multiple times due to the open memberships of Andean bird flocks.

Relevance: Given the nature of bee colonies there is less overlap with this paper and what I will be examining, as bee colonies don't experience mixing of species. This paper does provide an example of how physical traits are used to measure species diversity and that could be applied to my own project.

Semenchuk et al. (2022) Relative effects of land conversion and land-use intensity on terrestrial vertebrate diversity

Summary: This study sought to understand the impact that land-use intensity has on vertebrate biodiversity, as they saw land-use intensity as less studied than land-use type. The team used the countryside species-area relationship as their approach for analyzing the effects of land-use on biodiversity. They conclude that land use is responsible for the loss of around 15% of species richness from the average across the world. They say that land-use intensity plays a substantial role in the erosion of species richness, but it's a complex process that cannot be represented by a single indicator in models.

Evaluation: The researchers provide limitations that they face when modelling species loss with different sets of intensity indicators. They describe how they achieve different results between two sets of intensity indicators and that these differences could be due to data uncertainties, conceptual uncertainties, or a lack of knowledge or availability of coherent data products. Besides these uncertainties present this paper still provides a good understanding of how land-use intensity is changing biodiversity.

Relevance: I would like to use this paper as a background piece for synthesizing my hypothesis that land-use negatively affects the species diversity of bees. This paper provides solid evidence of this relationship existing and provides the idea of using some measure of land-use intensity in a potential model.

Cabernard, Pfister, & Hellweg (2024) Biodiversity impacts of recent land-use change driven by increases in agri-food imports

Summary: This paper examined land-use change as a result of increasing agricultural land for the food industry. They found that a major driver of biodiversity loss connected to land-use changes has been driven by an increase in consumption in some countries and the supplying of food for consumption by others. They note that much of the food supply chain have been exported to tropical countries and thus they have experienced drastically increasing biodiversity loss.

Evaluation: The researchers note that their paper does not account for deforestation and the rising forestry industry. They also say that their dataset has some uncertainty given the fact that it extrapolates prior data, from 1995 to 2021,

to 2022. They then discuss how future research should create/include data from more recent years in order to account for the uncertainty in their dataset.

Relevance: This paper gives historical context for certain areas of the world having more biodiversity loss and land-use impacts. This gives context to my project as we would expect Oregon to have less land-use changes than say tropical countries across the world.

Oldham, Herold, Moulton, Gonzalez, & Russo (2025) Contrasting effects of land-use and local disturbance on plant and pollinator communities in wetlands

Summary: This paper examined the effects of land-use on plant and pollinator communities of wetlands in Tennessee. They separated land-use into the types: agricultural, seminatural, urban, and water. The team first measured 6 sites in Eastern Tennessee in 2020 and then 9 sites in the Oak Ridge Reservation in 2021. They found that sites affected more by land-use changes were associated with less diversity, abundance, and species composition of both flowers and pollinators. This was either directly due to the land-use or through other measures affected by land-use like water quality or temperature.

Evaluation: The researchers themselves don't specify any limitations and I myself can't say I see any limits with this study.

Relevance: This study is important for directly addressing the question that I want to answer and it provides evidence of this relationship having a negative correlation.

Tsang et al. (2025) Land Use Change Consistently Reduces α- But Not β- and γ-Diversity of Bees

Summary: This study sought to examine the effects of land-use change on the alpha, beta, and gamma diversity of bees. For land-use types the researchers split them into 3 categories: natural habitat, agricultural habitat, and urban habitat. They found that taxonomic alpha diversity decreased on average by 15.8% in agricultural habitats and 19.6% in urban habitats, both compared to natural habitats. They found that the average taxonomic beta diversity was 1.75 in natural habitats with a 6.4% decline in agricultural habitats and an 8.8% increase in urban habitats. For gamma diversity they found that it was on average 25.2% lower in agricultural habitats and the difference in urban habitats was not statistically significant. They conclude, like the title suggests, that land-use change reduces alpha but not beta and gamma diversity of bees.

Evaluation: The authors present limitations of their dataset in section 1 of the supplemental materials, but offer no limitations of their methods or analysis. I also don't personally see any glaring issues with the paper.

Relevance: Like the paper before, this paper is important for providing an answer to the question of my project and will be used to give evidence towards an argument.

Millard et al. (2021) Global effects of land-use intensity on local pollinator biodiversity

Summary: The researchers of this paper sought to synthesize the results of hundreds of studies related to the effects of land-use intensity on pollinator biodiversity. They found 3974 abstracts that contained 545 genera that they were confident were pollinators. From their synthesis they found that increasing land-use intensity significantly decreased biodiversity of pollinators. For land-use types they found that across almost all land-use types that lower intensity land-use types had greater species diversity compared to their primary vegetation baseline. They concluded with this that land-use intensity had a greater impact on pollinator diversity than land-use type.

Evaluation: The researchers give 8 limitations of their study related to how their dataset was biased towards non-tropical areas, the explanatory power of their analysis was low, and that evidence for one species can't be generalized to the whole species.

Relevance: This provides a very interesting insight into what I was planning to do for my project as the data I have for land-use is exclusively done by land-use type and not intensity. This paper could work with my project by showing what I may miss with my data and analysis.

Grab et al. (2019) Agriculturally dominated landscapes reduce bee phylogenetic diversity and pollination services

Summary: The researchers of this paper looked at the relationship between agricultural land-use change and the phylogenetic diversity of pollinators. They used pollinator community data from 27 apple orchards across 10 years. They found that species loss due to agricultural land-use is not random and that specific branches would go extinct, resulting in branches with very closely related bee species. They also found that with the change in phylogenetic diversity there was an indirect impact on pollination services and crop production. They conclude by arguing that practices which only analyze success through the number of species saved may fail to protect the full diversity of life like phylogenetic diversity.

Evaluation: The authors do not present any limitations and I do not see any glaring issues with the paper.

Relevance: Similarly to the last few papers this paper is directly related to my research question and provides insight into how agricultural land-use specifically impacts bee diversity. This is something that I will be keeping in mind as I go about my analysis.

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