Paper 3: Ecological decay distance assesses ecosystem dissimilarity in matched high-and-low integrity forest stands.

**Intro**: High integrity forests are rare, and becoming rarer. They are hard to find and identify, but some datasources make efforts (last of the wild; ecological reserves; protected areas; intact forest landscapes). We propose a method to assess the similarity of forests across a large region to these high integrity data sources across a range of ecosystems, and assess their spatial patterning across a range of protected statuses.

**Methods:** Decide between single ecosystem (CWH), or entirety of bc

Single ecosystem lets the 4th paper be about spatial extension in addition to cumulative impacts

Delineate “highly intact” zones. Intersect intact forest landscapes w/ protected areas (bonus if it’s an ecological reserve) and wilderness areas. Filter out all human footprint pixels so paper 4 analysis can look at impact

Subsample approach: Take subsample of this, stratify by age (or time since disturbance; only fires since ‘natural’), bootstrap mean value and generate confidence interval for each variable (forest structure + DHIs). Compare all pixels to these ranges using mahalanobis distances.

Counterfactual approach: **I am concerned with computation time associated with this when done at 30m resolution**. Basically, it would match any “highly intact” pixel with other pixels using exact and other matching methods (mahalanobis, propensity score, etc) on covariates. The real innovation here is that we are comparing multiple attributes (multiple forest structure and DHI) at once to get a more holistic view, advancing beyond Liang 2022 and Duncanson 2023. We then condense the distances from each attribute into a single distance score, and can compute the mahalanobis distance from the treatment (where treatment is being highly intact) to the counterfactual. We can then compare this across BEC zones. This allows us to find locations of highly intact forests across the province, by BEC zone.

These matching algorithms generally include some indicator of human presence: distance to city, distance to roads, travel time to city, population count, and population density. I think we can argue this is different enough to the Canadian human footprint (which includes many industrial activities) to be able to assess those impacts

**Results**: plot counterfactual distance across study area

Prevalence of high integrity areas in iucn categories / ecological reserves

Plot iucn categories spatial patterning as boxplots w/ significance

**Discussion:**

Location of high integrity forests

Remote sensing

Ecological structure and function as methods for identify high integrity

Use of matching methods as a preprocessing step for RS studies of conservation