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Grassland Ecosystem Mapping and Loss Assessment: Final Report

The Grassland Conservation Council

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Background

Grasslands are a vitally important part of British Columbia's ecosystem, yet are for the most part unprotected under provincial or federal law. Consequently, they are being rapidly lost due to human development. The Grassland Conservation Council of British Columbia (GCC) was formed upon recognition of this issue with the mandate of protecting what little grasslands remain in our province.

The GCC has been involved in education and outreach programs, and are also leading the way on the identification and classification of grassland ecosystems using Geographic Information Systems (GIS) technology. The council is also very interested in quantifying the loss of grasslands over time. These two goals – identification and quantifying loss – provide the basis for this project.

Specifically, the goals of this project are: to consolidate existing grassland data into a single comprehensive dataset, and to update this dataset to remove losses that have occurred due to human development. Completing these objectives will provide insight into where and why grasslands are being lost. This will give the GCC a powerful tool to lobby for increased protection, while at the same time allowing policy makers to come to informed decisions over the future of grasslands in British Columbia.

Methods

The project goals were completed successfully using the following general methodology:

Built library of orthophotos covering grassland areas across province.

Created custom editor interface to allow disturbances to be efficiently identified and digitized.

Used editor interface to digitize all disturbances within grassland areas and store as Loss Polygons.

Updated orthophoto library with most recent available imagery.

Used editor interface to digitize all new disturbances.

Removed disturbed areas from Grassland dataset.

Produced set of statistics summarizing losses to grasslands.

Results

All grassland areas in BC (Appendix 1, Figure 1 shows coverage) were examined at a scale of 1:10000 or greater and human developments resulting in permanent and irreversible loss to grassland ecosystems were identified and removed from grassland coverage (Appendix 1, Figure 2 shows losses). This process was repeated with updated orthophotos in many areas to add additional recent losses and give an idea of how developments are occurring temporally in different areas across the province (Appendix 1, Figure 3 shows the currency of final orthophotos used in analysis). Approximately 12,000 separate disturbances were identified, resulting in the removal of over 15,000 hectares of grasslands from the grassland ecosystem dataset.

The nature of lost grassland areas is summarized in two ways: by type of disturbance, and by BC Regional District. Table 1 (Appendix 1) gives the areas lost to each development type for each regional district, while Table 2 (Appendix 1) shows the original area of grasslands and the percent lost for the same areas. Figure 4 (Appendix 1) provides a visual representation of this, with the size of the pie graph representing the percent of total grasslands lost for each regional district, and the chart subdivisions corresponding to the disturbance type.

Discussion

General Impressions

Specific results and statistics will be discussed in depth in the following section; however the general nature of losses to grasslands is equally important. During the course of this project, about three weeks were spent examining the entire grassland ecosystem in BC at large scales. This process gave several insights into trends and the nature of grassland loss in the province. These insights and their implications are described in detail below.

First, losses seem to occur primarily at the edges of grassland ecosystems, especially along major river or lake valleys. This makes sense, as land must be accessible for developments to take place, and – due to the mountainous topography of BC – most major transportation corridors and settlements are located along valleys. This has implications on grassland protection strategies: clearly proximity to highways and roads or valley bottoms increases the risk of a grassland ecosystem being lost, and protection measures should be adjusted accordingly.

Second, the main types of disturbance vary greatly in different regions of BC. For example, the Central and North Okanagan Regional Districts account for over three quarters of the total losses due to suburb development in the province, while the Okanagan-Similkameen has lost far more than any other region due to golf course development. Although it is out of the scope of this project, there are definitely trends within the disturbance type data that should be examined more closely. Understanding these trends could lead to more effective, focused protection strategies in the future, and should be a priority for further work.

Third, due to the larger scale used when working with orthophotos compared to the original 1:20000 VRI derived grassland polygons, many 'new' developments identified likely existed when the original VRI data were collected. This is especially apparent when looking the 'minor road' development type. The majority of these features are one or two lane backcountry access roads that, although individually small, add up to considerable losses in sum. However, considering these areas 'lost' is misleading, as it implies that they were built in the time period of interest for this project (1995 to 2014), when in reality they likely already existed. It is important these areas be removed from the grassland ecosystem coverage, however the date they were lost cannot be determined, and therefore 'minor roads' disturbances should not be considered if using these results to model grassland loss over time.

Fourth, many 'grassland' areas were found to be heavily forested upon orthophoto examination – so much so that they were commercially viable for logging companies to harvest. It is apparent that forest regrowth over the 20 years since the original data were collected has allowed many grasslands to transition into forests. These areas were not considered lost grasslands, as this project focused solely on human developments; however forested 'grassland' areas that were subsequently logged were flagged under the 'Logged' disturbance type. These areas are identified but were not removed from the grassland coverage, as it is questionable whether logging is removing grassland areas, or actually allowing for their regrowth in the future.

Specific Results

In total, 11623 separate disturbances were identified, resulting in the loss of 15330.5 ha of grasslands in British Columbia from 1995 – 2014. The development types causing the most loss were agriculture (4473 ha), minor roads (3297 ha), and acreage developments (2166 ha). Interestingly, although they resulted in large total losses, the average size of minor roads and acreage developments were the smallest at about 0.8 ha and 0.6 ha respectively. Suburb developments, and suburbs under construction were on average the largest, at 5.6 ha and 4.0 ha respectively.

Breaking the results down by BC Regional District, the Thompson-Nicola and the Okanagan-Similkameen lost the greatest area of grasslands (5110 ha and 3386 ha respectively). However, the Thompson-Nicola originally had a very large area of grassland ecosystems, and thus the relative loss is

small. In terms of percent of original grasslands lost, the three Okanagan Regional Districts are by far the hardest hit: the Central Okanagan lost 8.0% of its total, the North Okanagan lost 6.4%, and the Okanagan-Similkameen lost 4.2%. Most of the other districts experienced losses of less than 2%.

Conclusion

The losses to grasslands identified in this project seem large; however amount to only about 2.3% of the total grassland area. That being said, developments are definitely occurring more rapidly in certain areas, and the danger of losing grasslands completely in specific regions exists. As the population in the province rises, developments will continue at an increased rate, putting yet more pressure on fragile grasslands ecosystems. Projects such as this provide a means to alleviate some of this pressure, and hopefully will allow for the continued existence of grasslands in British Columbia in the future.

Appendix 1

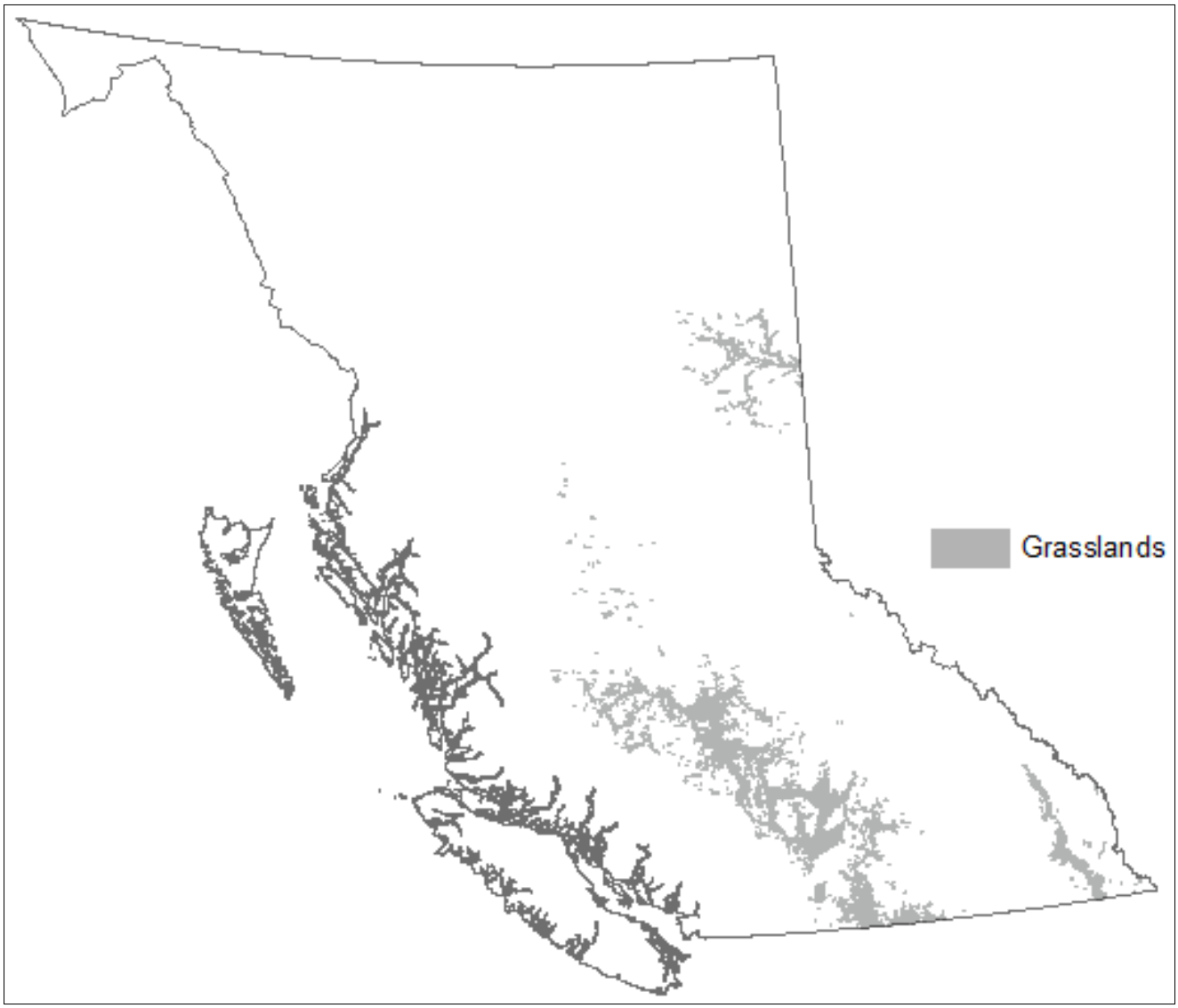

Figure 1: Grassland Ecosystems in BC, as derived by the GCC from Vegetation Resource Inventory polygons

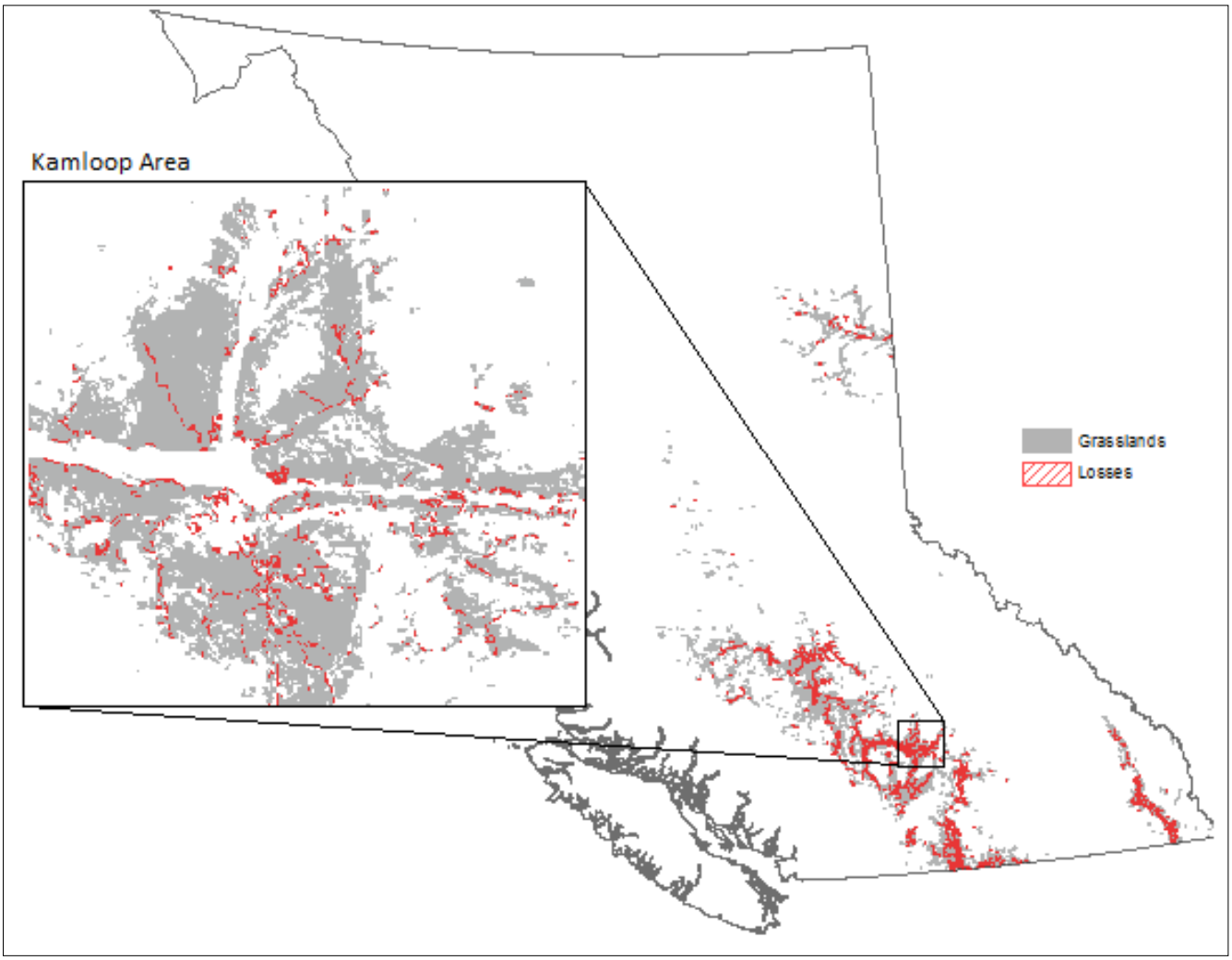

Figure 2: Grasslands with areas lost due to development shown in red. In the small scale portion of this map, the loss areas are exaggerated for visibility. The Kamloops area inset gives a better sense of the proportion of area lost.

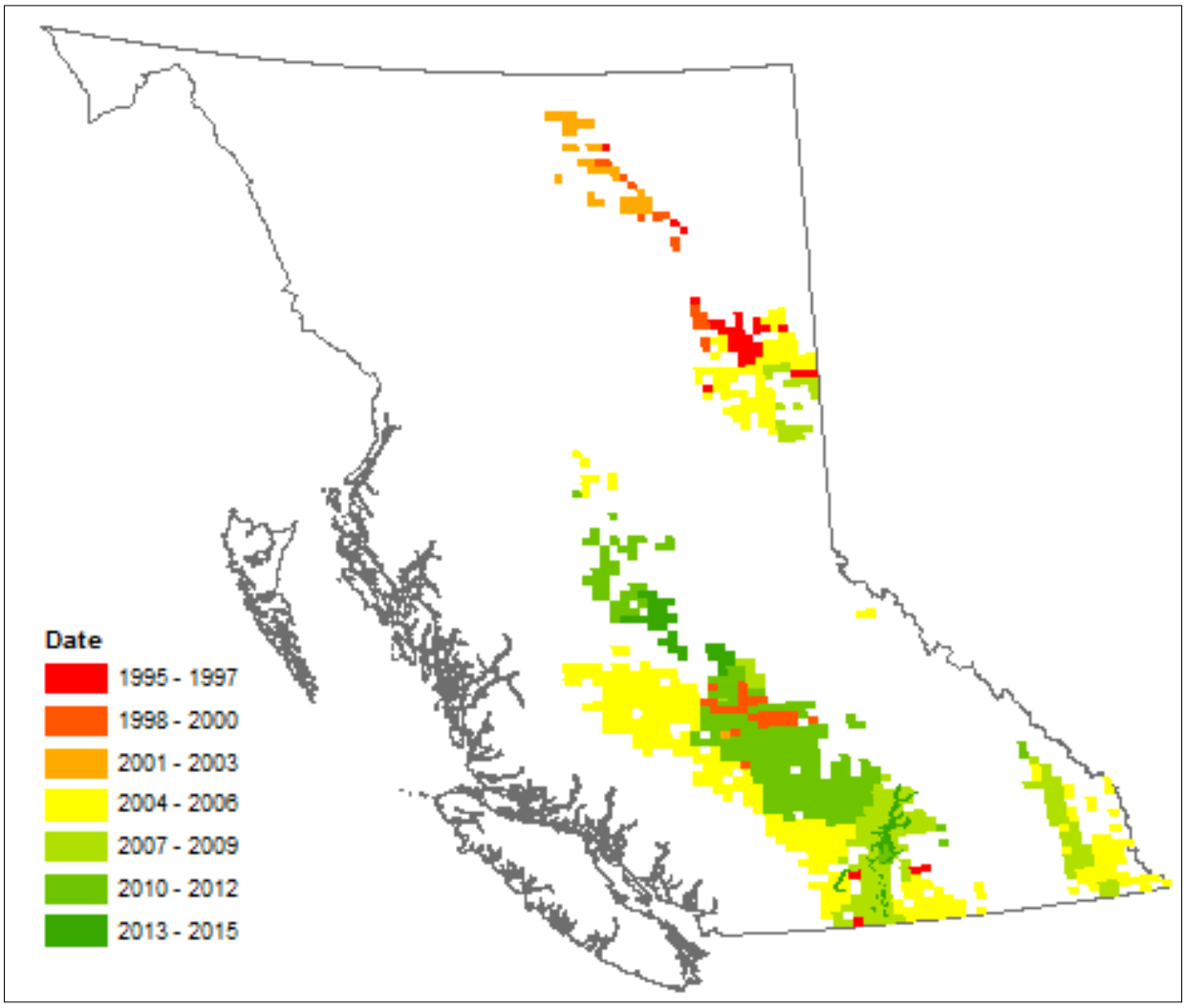

Figure 3: Date of acquisition of orthophotos used to identify disturbances and removed from grasslands. These images were supplemented with 2014 Landsat 8 scenes as well as Bing Map Aerial imagery, mostly from 2012 or more recent. This combination of resources means that all grassland areas have had losses identified up to around 2012.

Table 1: Losses for BC Regional Districts containing grasslands by disturbance type. Total area for each Regional District is read from the bottom row, while the right column gives total area lost for each disturbance type. Approximately 15300 Ha was lost in total (yellow highlighted cell)

Table 2: Total original grasslands, losses, and percent of original grasslands lost for each regional district in BC with grassland ecosystems.

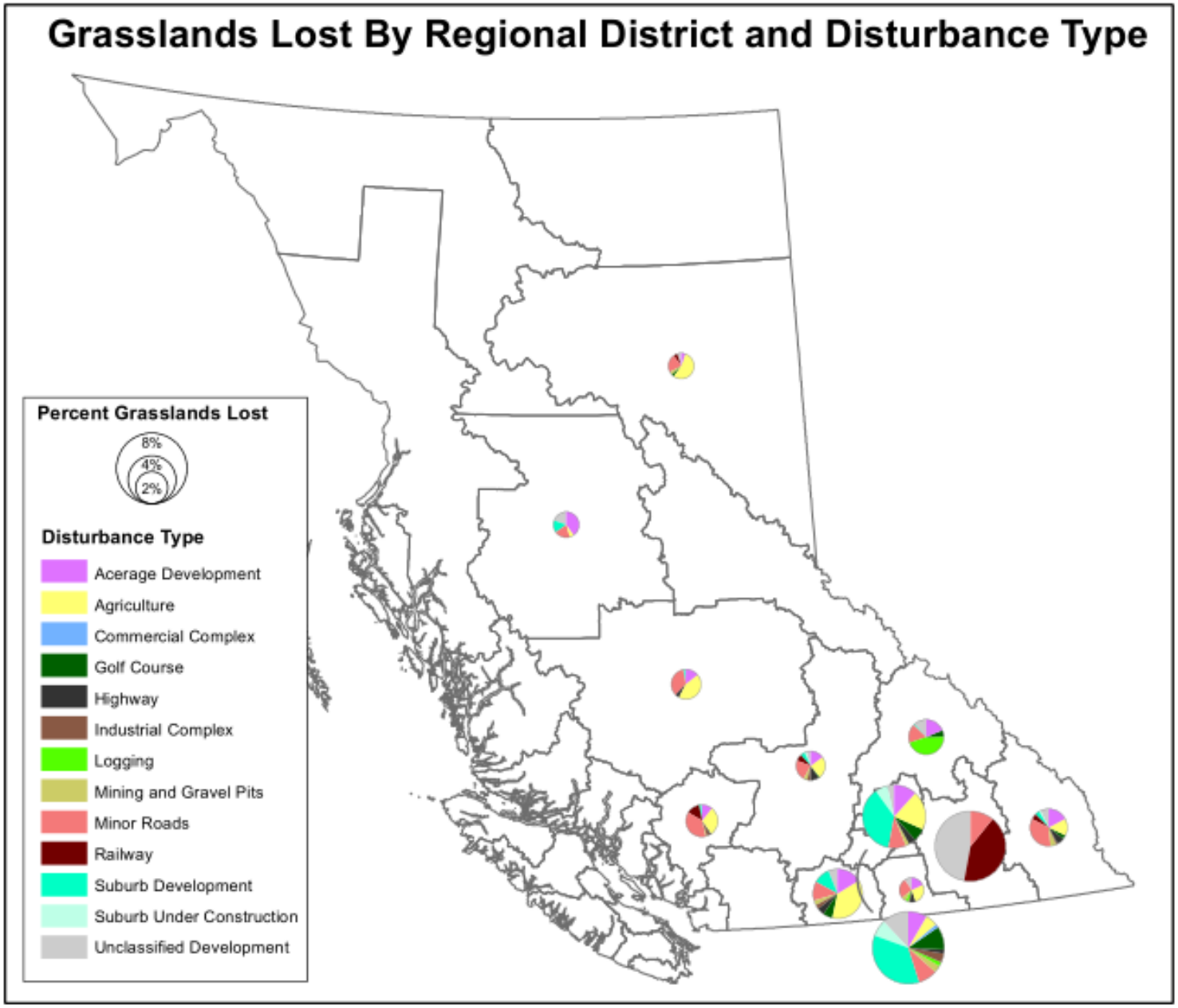

Figure 4: Grasslands lost by BC Regional District and disturbance type.