Appendix B5- Ecological Inventory and Assessment Summary

The ecological section of the inventory and assessment had several goals including:

- Understanding what biodiversity is currently present in the City and how various sites contribute to that biodiversity
- Determine how different variables (land use, site area, habitat type, etc.) affect wildlife
- Use the findings from the first two goals to inform site design and restoration across the City

Survey Design

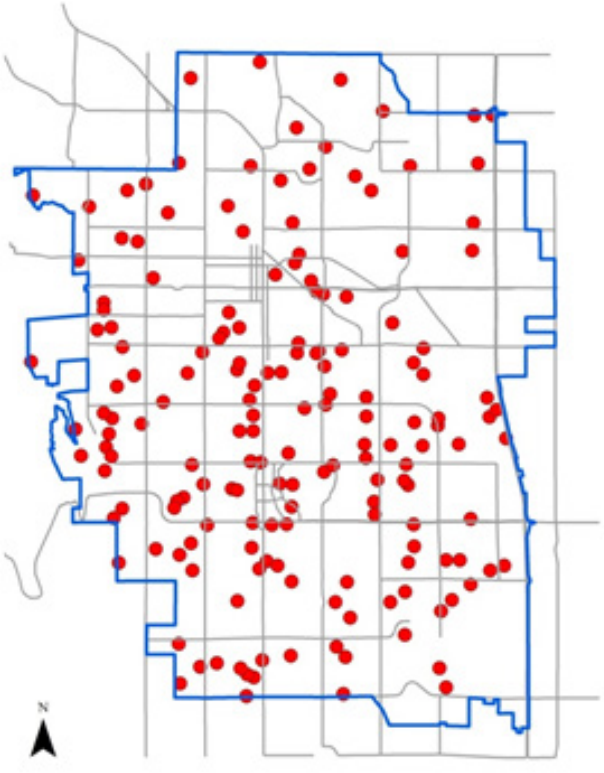
To achieve the goals of the assessment, a survey was designed collaboratively by City staff, Colorado State University and the Wildlife Conservation Society. The survey was designed to be statistically defensible, inclusive of all areas within the City's Growth Management Area (GMA) and repeatable.

Site Selection

Staff surveyed 166 sites throughout the summer (Map A). All sites were randomly selected by an algorithm designed by CSU. Site selection was constructed around four main variables: land use, site size, habitat type and spread between points.

Nine representative land use types were chosen to survey:

- Parks
- Natural Areas
- Trails
- Ditches
- Schools
- Certified Natural Areas and Natural Habitat Buffer Zones (hereafter referred to as CNAs)
- Urban Agriculture
- Residential Open Space
- Institutional Open Space



Map A - 166 survey sites throughout the community were sampled for birds, butterflies and vegetation.

Land Use

Each land use was designed to have an equal number of survey sites (20); however various constraints, such as limited availability or challenges gaining access, did not make this possible for every land use.

Site Area

Many open areas within the City are small parcels (<0.5 acres). To ensure that small parcels were represented in the survey sites, the algorithm was designed so small parcels had an equal likelihood of being selected as larger parcels. Also, when like land use types were adjacent to each other, they were combined together to form one large parcel.

Habitat Type

While Fort Collins contains many habitat types, the dominant habitat types are lawns and non-native grasslands. To make sure all types of habitats were surveyed, the algorithm made areas next to Natural Habitats and Features (wetlands, riparian forests, etc.; see glossary for full list) more likely to be selected.

Spread

The survey was designed to have sites spread across the 77.7 square miles of the Growth Management Area (GMA). The algorithm selected points for each land use to be spread as evenly throughout the GMA as possible.

Survey Protocols

The project consisted of four different surveys: birds, butterflies, vegetation cover and human activity. For each survey a detailed protocol was created by City staff, Colorado State University and the Wildlife Conservation Society. All surveys were performed between May 12 and August 15, 2014 by two technicians.

Birds and butterflies were selected as the two taxonomic groups to survey because they respond to variables at different landscape levels. For example, birds tend to respond to variables at a broad landscape level, whereas butterflies are more affected by site level variables. Both species were also chosen for their ease in identification and the extensive amount of literature and other studies that are available for comparison of results.

Bird Surveys

Bird surveys were conducted from May 12 to June 26, 2014, from approximately 5:30 to 10:30 a.m. in all weather conditions except heavy rain or strong wind. All 166 sites were surveyed on three separate days. The survey location in a site was determined by the algorithm, which placed a specific point in each site. The survey method was a five-minute point count. This consists of standing in a single location recording and identifying all birds seen and heard, as well as the minute and distance at which the observation was made and method of detection.

Butterfly Surveys

Butterfly surveys took place from June 30 to August 15, 2014. Due to time constrains, half of the overall sties were surveyed for butterflies; consistent with the bird surveys, butterflies were surveyed on three separate days. Surveys occurred from 10:00 a.m. to 3:00 p.m. and only on sunny days with cloud cover of less than 50 percent. Two 50-meter (54.7 yards) transects were placed near the location of the bird point count spot. The transects were placed so that they would go through the best habitat for butterflies. The Pollard Walk method was used, consisting of walking the two transects at a slow pace (1 mph) with the field technicians counting and identifying butterflies within 20 feet of the transect line to the front, left, right and above, as well as recording what habitat the butterfly was seen in. Vegetation data was also recorded along the transects which included habitat types, percent cover of flowers, and whether the ground cover had been mowed.

Vegetation Surveys

Vegetation surveys occurred from June 30 to August 15, 2014. All sites were surveyed for vegetation once. All vegetation within a 50-meter (54.7 yards) radius of the point count location was recorded. Vegetation was categorized into ground cover, midstory or overstory. Average height and the three dominant species were recorded for each canopy cover category. Within the 50-meter radius, all habitat types and their percent cover were also recorded. A densitometer (a device used to estimate canopy cover) reading was taken at the point count location, and all noxious weeds were listed as well.

Human Activity

A survey for human activity was performed every time prior to conducting any of the other surveys. For a five-minute period human-related activities within 100 meters (109.4 yards) were recorded. These activities included:

- Moving cars
- Parked cars
- Pedestrians
- Cyclists
- Cats
- Dogs
- Horses
- Other livestock
- Other disturbances (e.g. train)

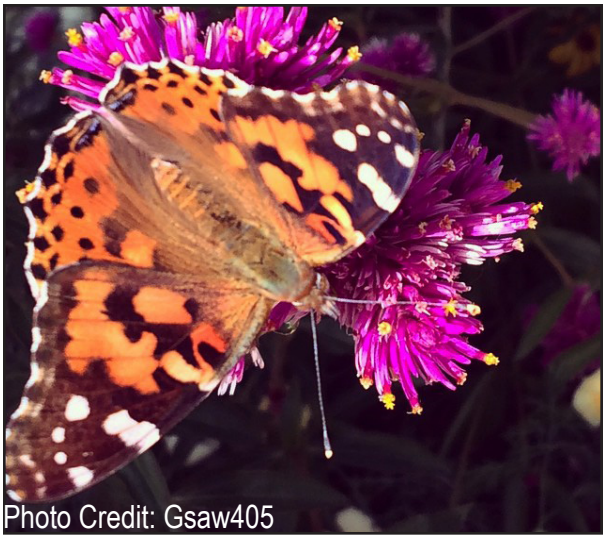


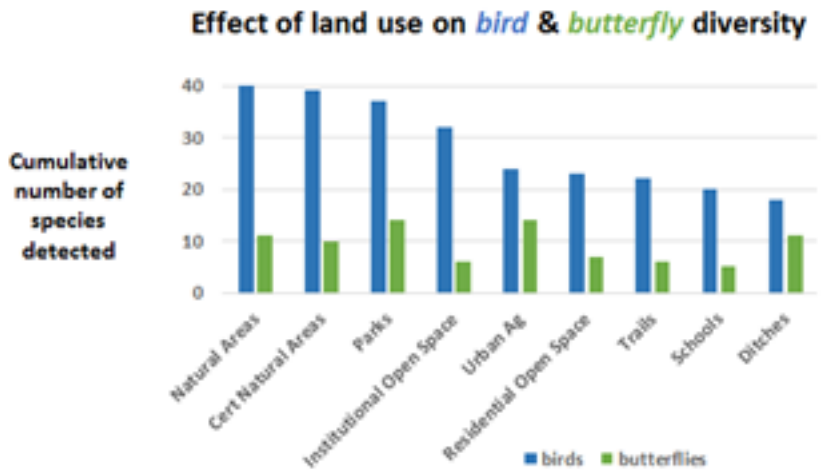
Photo Credit: Gsaw405

Results

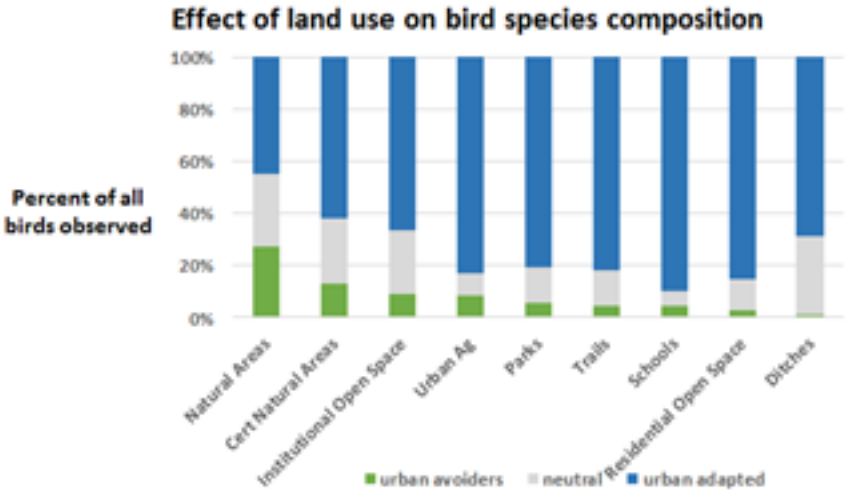
Data analysis was completed by the Wildlife Conservation Society and Colorado State University. Overall, 33 species of butterflies were observed and 88 species of birds. Many various relationships were tested. The following results are a handful of the most relevant to this strategic plan.

Birds

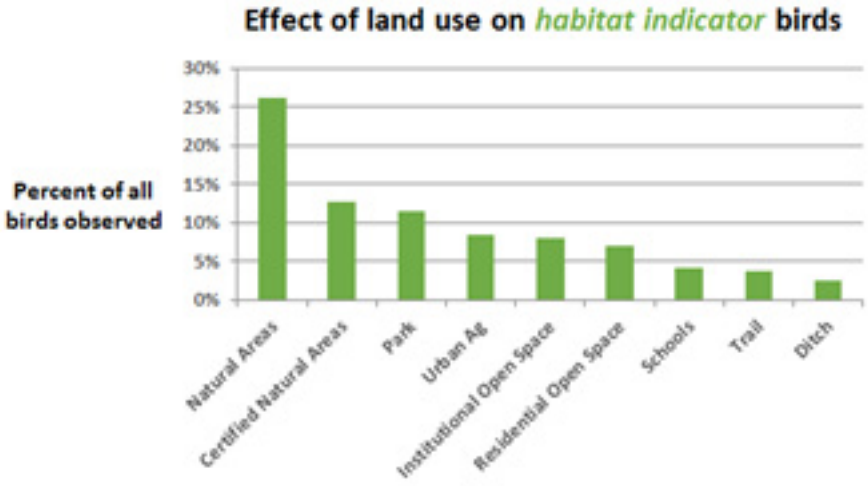
Land Use. The study was designed to compare different land uses. For birds, there were multiple relationships. The first relationship examined how diversity, or number of different species, and land use are related. Natural Areas, CNAs and Parks, respectively, had the most diversity with 37-40 species observed. Ditches, schools and trails had the least diversity with approximately 20 species observed at each site.



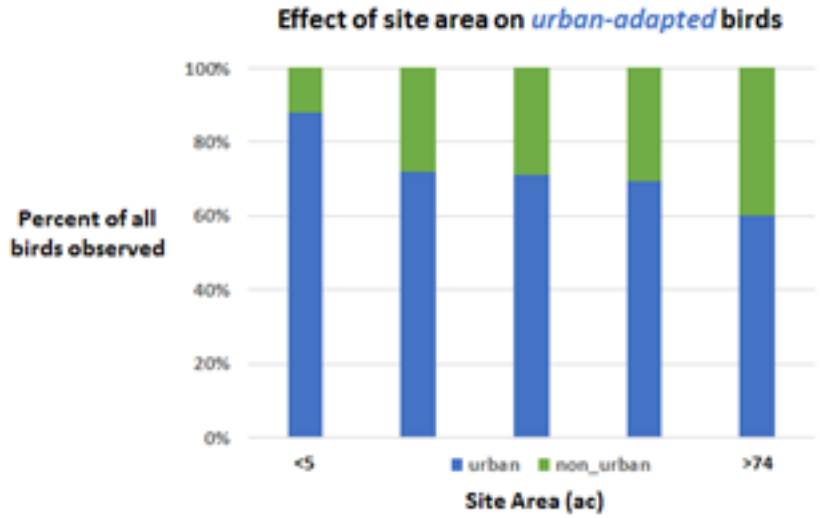
Next, the effect of land use on bird species composition was explored, specifically the proportion of all observations that are classified as urban avoider and urban adapted species for each land use. These two categories represent how a bird species reacts to urbanization – either by adapting or avoiding. Natural Areas had the greatest proportion of urban avoiding species with close to 27 percent, with CNAs following at 13 percent. Trails, Schools, Residential Open Space and Ditches all had less than 5 percent.



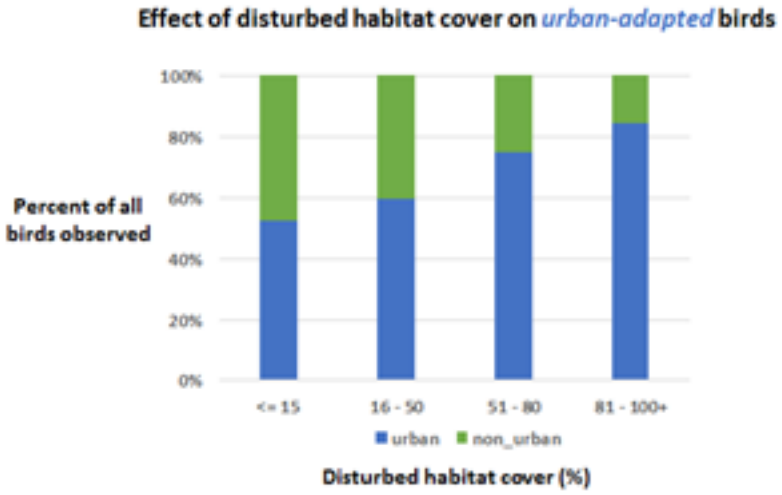
Finally, land use was compared to the proportion of habitat indicator species observed. Habitat indicators are species that are generally tied to a specific habitat and often are used as a measure of quality. Natural Areas had the largest percentage of habitat indicator birds observed with 26 percent. CNAs and Parks came next with both approximately 12 percent. For Schools, Trails and Ditches, less than 5 percent of observations were habitat indicator species.



Site Area. Another variable that the survey was designed to analyze is site area. Site area was compared to the proportion of urban avoiders and urban adaptors observed on each site. On sites that were less than 5 acres, 12 percent of species observed were urban avoider birds. However, sites that ranged from 5 acres to 74 acres saw urban avoiders make up around 30 percent of the birds seen. On sites larger than 74 acres, there was another increase to 40 percent of the total observations.

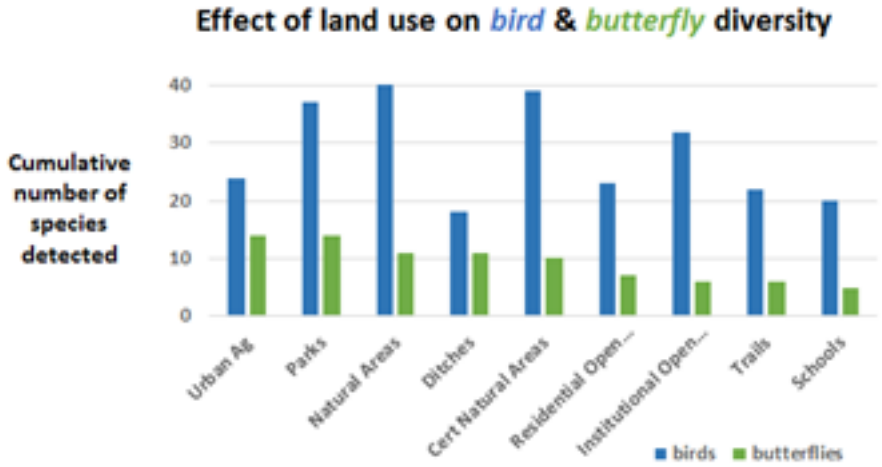


Disturbed Habitat Cover. While on site, field technicians recorded how much of each site was covered by certain habitats. Land covers such as impervious surfaces and lawns were grouped into a disturbed habitat cover category. This category was then compared to the proportion of urban avoiders and urban adaptors observed on each site. At sites with less than 15 percent of their area comprised of disturbed habitat, 48 percent of observations were urban avoiders. On the other end, sites made up of 81-100% disturbed habitat saw 15.5 percent of the observations containing urban avoiders.

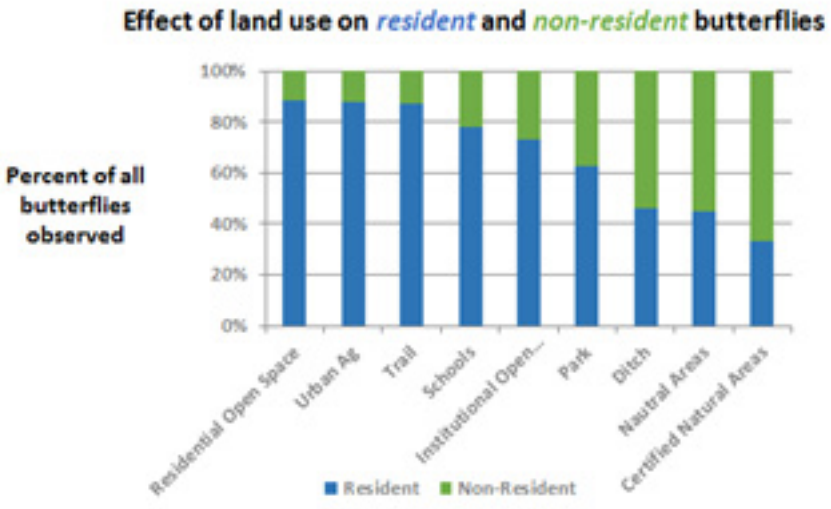


Butterflies

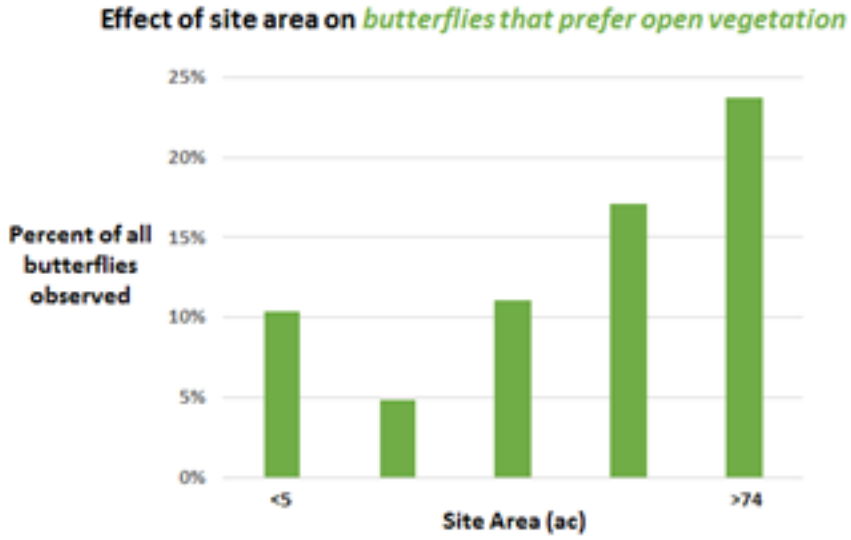
Land Use. An even number of butterfly surveys were performed on each land use (10) so a comparison could be made between the various land uses. One relationship examined for land use is how it affects butterfly diversity. Parks and Urban Agriculture had the most diversity with 14 species seen on each. Natural Areas and Ditches were next, both with 11 species. Institutional Open Space, Trails and Schools had the least diversity with 5-6 species observed.



Land use also had an effect on the composition of species seen, specifically resident vs. non-resident butterflies. These two categories reflect whether the species migrates to the region after undergoing metamorphosis (i.e. from caterpillar to butterfly) – it is not associated with a species' status as native or non-native. Residential Open Space, Urban Agriculture and Trails had the largest proportion of resident butterflies with 88-89 percent. Ditches, Natural Areas and Certified Natural Areas had the smallest proportions with 33-46 percent. Note that the land uses with a more even split between the two categories also tended to have higher biodiversity.



Site Area. Again, site area was an important component of the survey design. Site area had an effect on butterflies that prefer open vegetation. On sites less than 5 acres, about 10 percent of all observations were of these butterflies. On sites larger than 74 acres, around 24 percent of observations were butterflies that prefer open vegetation.



Conclusion

Understanding how different variables affect biodiversity and the health of our local environment is necessary for creating effective management practices and policies. The results derived from this study will guide the ecologically focused policies laid out by this strategic plan.

All of the results increase the collective understanding of how nature reacts in the urban environment. However, two of the findings show great promise for integrating more high quality nature in an urban setting. First is the performance of the Certified Natural Areas and Natural Habitat Buffer Zones (referred to collectively as CNAs) land use. This land use consistently ranks in the top two land uses for both birds and butterflies on variables that signify high quality and diversity. This shows that privately owned lands that are enhanced for native vegetation and wildlife can have a significant impact.

Second is a lack of relationship; neither structure density nor the number of people is important for explaining variation between sites. This is encouraging from an urban development point of view in that density does not necessarily correlate with lower quality and diversity.

Further data analysis is ongoing including creating species-specific models – these will show how particular species are affected by variables. The analysis team is also working on creating connectivity models that show how species move throughout the City.

While the information collected and learned from the monitoring is important for increasing our knowledge about the baseline condition in the City, it is crucial that more than one year of data is collected. Scientific studies are more accurate and useful if performed over a span of time. This allows them to track changes over time and also helps reduce variability from outlier years that may have had unusual weather.


Photo Credit: Dusty Harms