

## The Prairie Provinces Butterfly Atlas

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(a September 2017 update of the spring 2017 article in the Alberta Lepidopterists' Guild Newsletter)

This article announces the launch of an online butterfly atlas for the prairie provinces ([www.ontarioinsects.org/prairie](http://www.ontarioinsects.org/prairie)). The initial data consists of 44,000 records -- 10,000 records posted on eButterfly as of January 2017 and 34,000 records from a database initially constructed for Layberry et al. (1998) and updated up to 2011 by Ross Layberry. The latter set of records includes the species, location and holder of the records (e.g., University of Alberta), but not the date and often not the observer. The plan is to consolidate, with full data, all butterfly observation data from various sources for the three provinces.

The Atlas is initially a project of volunteers with the Toronto Entomologists' Association (TEA), using software from the Ontario Butterfly Atlas Online (Macnaughton, 2011; Macnaughton et al., 2017), but it is expected to evolve into a partnership with the Alberta Lepidopterists' Guild.

The Atlas is expected to be of interest to local butterfly observers and may also contribute to scientific research. For example, the flight season data from the TEA's Ontario atlas was a principal source for the azure blues research of Schmidt and Layberry (2016).

### Why a separate atlas?

Websites like eButterfly are great for entering butterfly observations (and uploading the associated photos) and archiving them for future use. However, these sites may not be the best vehicles for retrieving and analyzing the data. Partly this is because different observers prefer different data-entry websites, and so no one site has all of the data for a particular location. But the bigger reason is that since every website project has limited resources (\$60,000 annually for eButterfly; Prudic et al., 2017), website sponsors have to make choices about the features to invest in. For example, eButterfly is currently working on adding a facility in which various observers (not just the observer and the vetter) can add comments on species determinations. Thus, the new Prairie Provinces Butterfly Atlas focuses on data output and analysis, rather than data input.

The Prairie Provinces Atlas shows:

- for each species, maps of butterfly records for the prairie provinces as a whole and, when the user zooms in, maps of butterfly records for any particular area (e.g., Edmonton);
- for each species, and for each area in which the species is found, (i) charts of the flight season for 36 sections of the calendar year, and (ii) a table showing earliest and latest dates, median date, numbers of observations, etc.; and
- for any particular area, a species list and a contributor list

## The Atlas Display

The atlas display, or map screen, consists of the legend (bottom left of the screen), map controls (top and bottom right of the screen), and the map itself (the rest of the screen). When the user changes a setting in the legend or in the map controls, the geographical area shown on the screen will not change.

On visiting the Atlas website, the user's first task is to choose a particular species (or choose "All species"). A total of 233 choices are available (including some subspecies), which is the eButterfly list of 227 plus a few added from the Layberry et al. (1998) data. Currently 229 of these have at least one observation in the Atlas. Common names are drawn from eButterfly but scientific names are from Pohl et al. (2016).

Go to the box displayed in the legend, at the bottom left of the screen. Choose the species by (1) clicking on the downward pointing arrow to display the list of 233 choices (note the scroll bar); or (2) typing all or part of the common name or scientific name (to show species whose names contain that string of letters). Then the Atlas will display, on the same screen, a Google map for that species for the three provinces.

One can change from one species to another in the same two ways. Alternatively, at the line below the species box there are "<" and ">" buttons to move to the species which are respectively one lower and one higher in taxonomic order.

The default map type is squares that are 10 km on each side, for which the required computer files are from Bird Studies Canada. Bird Studies Canada divided the three provinces into about 21,000 such squares for use in its breeding-bird atlases. Only 2,987 of these 10K squares (14%) currently have any butterfly records. The computer code for the Atlas assigns butterfly observations to these squares using the lat-long values provided by the observer (through clicking on the eButterfly map).

The default screen shown when the user first opens the Atlas covers the prairie provinces as a whole (although this can vary with different computer monitors). There are two ways to zoom in (so that the area of interest fills the screen): (1) use the scroll wheel of the mouse, rolling forward to zoom in and rolling backward to zoom out; and (2) going to the bottom right of the screen and clicking on the "+" to zoom in and the "-" to zoom out. When the user zooms in, the colour for the map areas (squares and forest regions) will become more transparent, to allow the user to see the geographical features on the map and determine what locality he or she is looking at.

Users will also want to change the area of the map shown on the screen, e.g., to see the area north of the area currently shown. To do this, click and drag the mouse (i.e., hold down the mouse button, move the mouse in the desired direction, and release).

The map screen contains three other features. First, dragging the stick figure ("peg man") shown in the top right of the screen to the desired location will open Google Street View at that point (which, when applied to a rural road or highway, can be used to find suitable butterfly habitat for a field trip). Second, clicking on the circle at the bottom right of the screen will show a blue circle on the map at the user's current physical location. (However, this generally only works

when accessing the Atlas from a smart phone.) Third, the box shown below “Forest Regions” in the legend displays a URL that stores the information about the map that the user is currently viewing. The text in this box can be copied and pasted in an email or document when one desires to show another person the exact map (species, map type, map centre and map zoom) one has been viewing.

### The Info Window for Squares

Suppose the current map type is the default, 10K squares, and the species chosen is species X. Clicking on some square, say square Y (which may require zooming in first in order to hit it accurately) brings up the info window for that square-species combination. This provides links to additional information, three of which relate to the retrieval of records:

- a link to adult observations ordered by calendar day (which is useful in order to see earliest and latest observations in the calendar year);
- a link to adult observations ordered by date, with the most recent observations appearing at the top; and
- a link to caterpillar and ova observations (including records of ovipositing on particular plants).

A further three links in the info window provide the same choices, but for the prairie provinces as a whole rather than just square Y.

Another part of the info window for 10K squares for a particular species are two links under the heading “Time of Year”, which provide data on flight seasons (phenograms). Clicking on the first of these links – the link for “square, forest region, etc.” -- brings up a webpage containing four charts, each of which shows the distribution of adult butterfly observations on that species across 36 sections of the calendar year. These sections are the 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> month-third (i.e., days 1-10, days 11-20, and day 21 to the end of the month) for each of 12 months.

The first of these four charts is for the square itself, while the other three are for larger areas that the square is a part of. The latter charts are useful where there are not enough records in the square to provide reliable data on the flight season in that square. The larger areas used are: the census division, as defined by Statistics Canada; the census division together with other census divisions adjoining it; and the forest region (Rowe, 1972). In addition to these charts, this webpage provides a table summarizing key data on the flight season – earliest record, latest record, median record, number of observations, etc.

Finally, the second link under “Time of Year” produces a similar webpage, except that it provides charts which compare the flight season of that species in different areas of the prairie provinces (as measured by the four forest regions with the most records).

The final part of the info window for 10K squares for a particular species are two links under the heading of “Time Trend”. These links relate to charts showing numbers of records for each year of the past 36 years, 1982-2017. They are similar to the “Time of Year” charts except that they relate to years rather than month-thirds.

The “Time of Year” and “Time Trend” analysis uses only the 10,000 eButterfly records, as the 34,000 Layberry et al. (1998) records currently do not contain a date.

If the species chosen is not a particular species, but is instead “All Species”, there are two sets of additional links: species lists for adult observations, provided in two different formats – in taxonomic order and with the species with the fewest records shown first; and contributor lists, either alphabetic or in decreasing order of number of records. Soon, the species will display, for each species on the list, (1) the earliest and latest adult observation for that species, and (2) the first and last years in which the species has been recorded. Similarly, the contributor list will soon display for each contributor the first and last year in which he or she has provided data.

### Map Types Other than Squares

In the legend, just below the butterfly photo, the user can change the map type from 10K squares to something else by clicking on any of the radio buttons. Besides squares, map type choices are: (1) points (currently 11,000) – the dot on the map for each butterfly record; (2) Statistics Canada’s census divisions, of which there are currently butterfly records for 52 of the 60; (3) forest regions, for which there are currently butterfly records for all eight. The points map type is useful in that it shows the exact location of each butterfly record. By zooming in, the user can find suitable locations to visit to look for butterflies. On the other hand, the main use of the other map types is to facilitate retrieval of records. For example, clicking on the “Grasslands” forest region brings up the info window, which provides links to retrieve records for that region in all three provinces (and to obtain a species list for that forest region).

If the map type for a particular species is not 10K squares, the “Time of Year” and “Time Trend” links are not available in the Atlas. However, the links for retrieval of records and for species lists and contributor lists are present. They are the same as described above for 10K squares.

### Help!

Currently there are 139 contributors to the Atlas from eButterfly. Each contributor can make a tremendous difference to the knowledge of the butterflies found in his or her own square, as each square currently contains an average of only 18 eButterfly observations on all species combined (10,000 records over 585 squares). So, “own” a square and build up its records. Record not just the rare and surprising stuff but also the more routine things; if you can, record every species seen every day you go out. The full set of records helps to fill out flight season charts, and serves as a baseline against which future changes in species distribution and abundance can be measured.

And there are so many squares for which there is no data at all, even in populated areas. If you have time, fill in those empty squares.

So, even though data is skimpy now in many respects, I hope this will be a case of “if you build it, they will come.” As one example of what might be possible, the TEA’s atlas of silkmoths and sphinx moths had just 2,500 records at launch this spring -- but in just three months it has more than doubled to 5,500 records. Contribute records using [eButterfly](#) in the usual way or, if that

doesn't suit, use [iNaturalist](#) or [BAMONA](#) (both of which have facilities to download data to the Atlas) or email the TEA (address above).

Also, more volunteer help in constructing the Atlas is needed if it is to grow and prosper.

- The goal is that the Atlas will consolidate data currently contained in eButterfly, iNaturalist, BAMONA, BugGuide, museum databases and private observers' own historical records. The task would be to identify suitable data, make arrangements with its owner, and convert all of the data to a standard format. Eliminating duplicate observations would be an issue. Some familiarity with Excel spreadsheets would be helpful.
- Another task, which would be suitable for someone with local butterfly knowledge, would be to work on the quality of the data by identifying questionable observations (unusual species, unusual time of year for a species, unusual habitat for a species, etc.). Often this is simply an error in entering the data in eButterfly or in the Atlas, and contacting the observer can sort it out.
- A person with photo-editing software is needed to resize photos and to add captions identifying the photographer. I have no photos for many species, and for others I have only Ontario photos.
- Help from a person familiar with GIS software (any one of ArcGIS, QGIS, etc.) would be useful. Parks (national, provincial and maybe local) would be nice to add as a map type, but some GIS mapping work is required as there is no readily available computer file for this.

Finally, input is welcome—let me know about things that do not work, are unintuitive, or could be improved. For example, should forest regions be replaced with ecozones (Pohl et al., 2014) as a map type?

Thanks are due to John Acorn (my principal contact in the ALG) for encouraging this work. Thanks are also due to Bev Edwards and Ross Layberry, my collaborators in the TEA who worked on the GIS and butterfly database aspects of the Atlas respectively. Ontario Nature, and in particular Brad McGinn, also deserves thanks; the current single-page Angular GIS, Google Fusion Tables and MySQL code was developed in partnership and is used in both the TEA atlases and Ontario Nature's reptile and amphibian atlas.

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