

Data Density of Potential Insect Species

Michael W Belitz

2/1/2020

Data density of potential insects

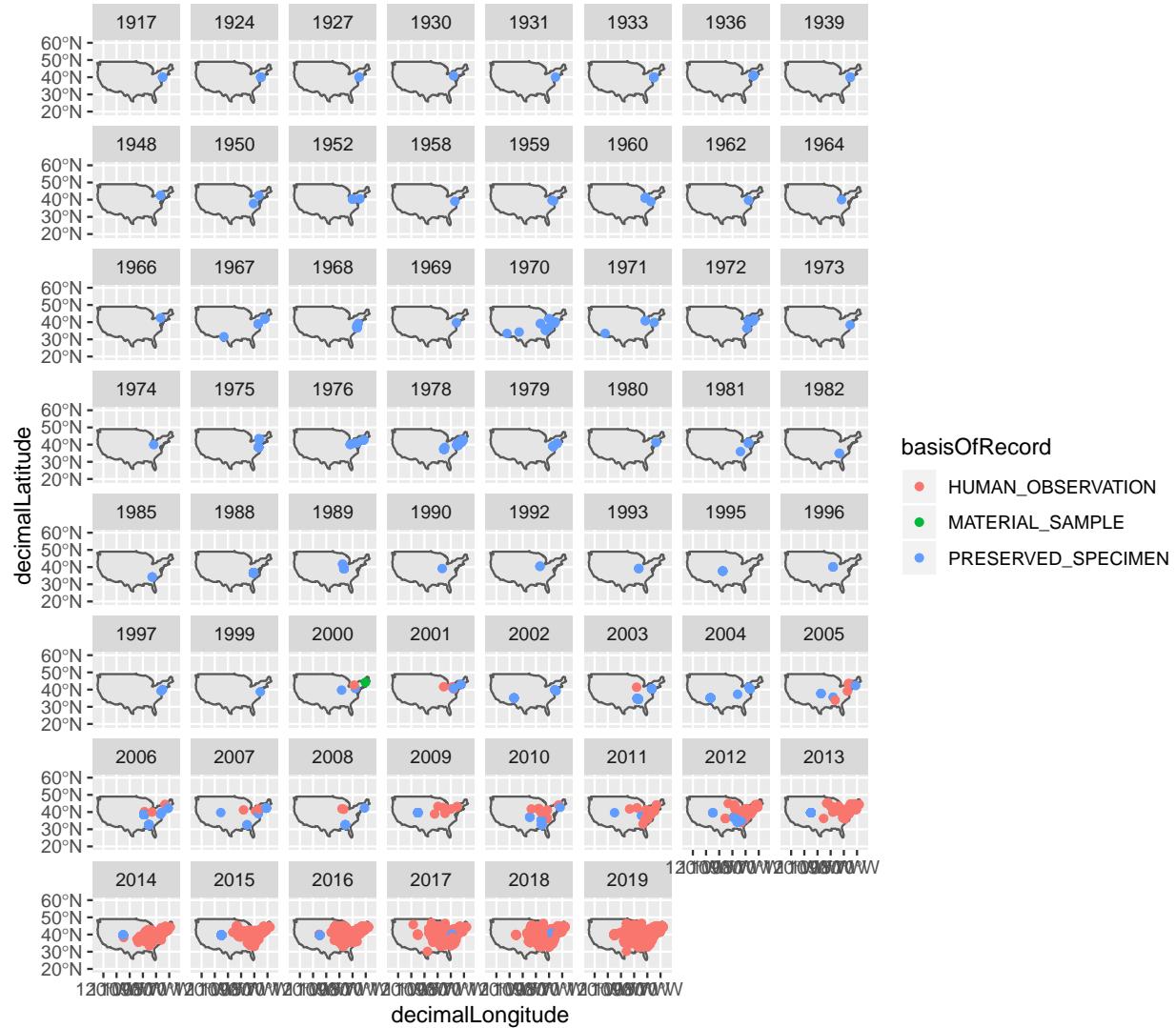
For this initial exploration, I wrote a function that would map the observations and show the basisOfRecord for a species of choice through time. I also summarize the number of obsevations per basisOfRecord for each available year. The summary table only shows years with ≥ 10 observations per basisOfRecord.

Dung Beetles

Top species on iNat: Japanese Beetle - *Popilia japonica*

```
## # A tibble: 30 x 3
## # Groups:   year [24]
##   year basisOfRecord     count
##   <int> <chr>           <int>
## 1 1960 PRESERVED_SPECIMEN    16
## 2 1968 PRESERVED_SPECIMEN    11
## 3 1970 PRESERVED_SPECIMEN    22
## 4 1975 PRESERVED_SPECIMEN    18
## 5 1978 PRESERVED_SPECIMEN    47
## 6 1979 PRESERVED_SPECIMEN    18
## 7 1988 PRESERVED_SPECIMEN    40
## 8 1989 PRESERVED_SPECIMEN    12
## 9 2002 PRESERVED_SPECIMEN    10
## 10 2003 PRESERVED_SPECIMEN    33
## # ... with 20 more rows
```

Popillia japonica

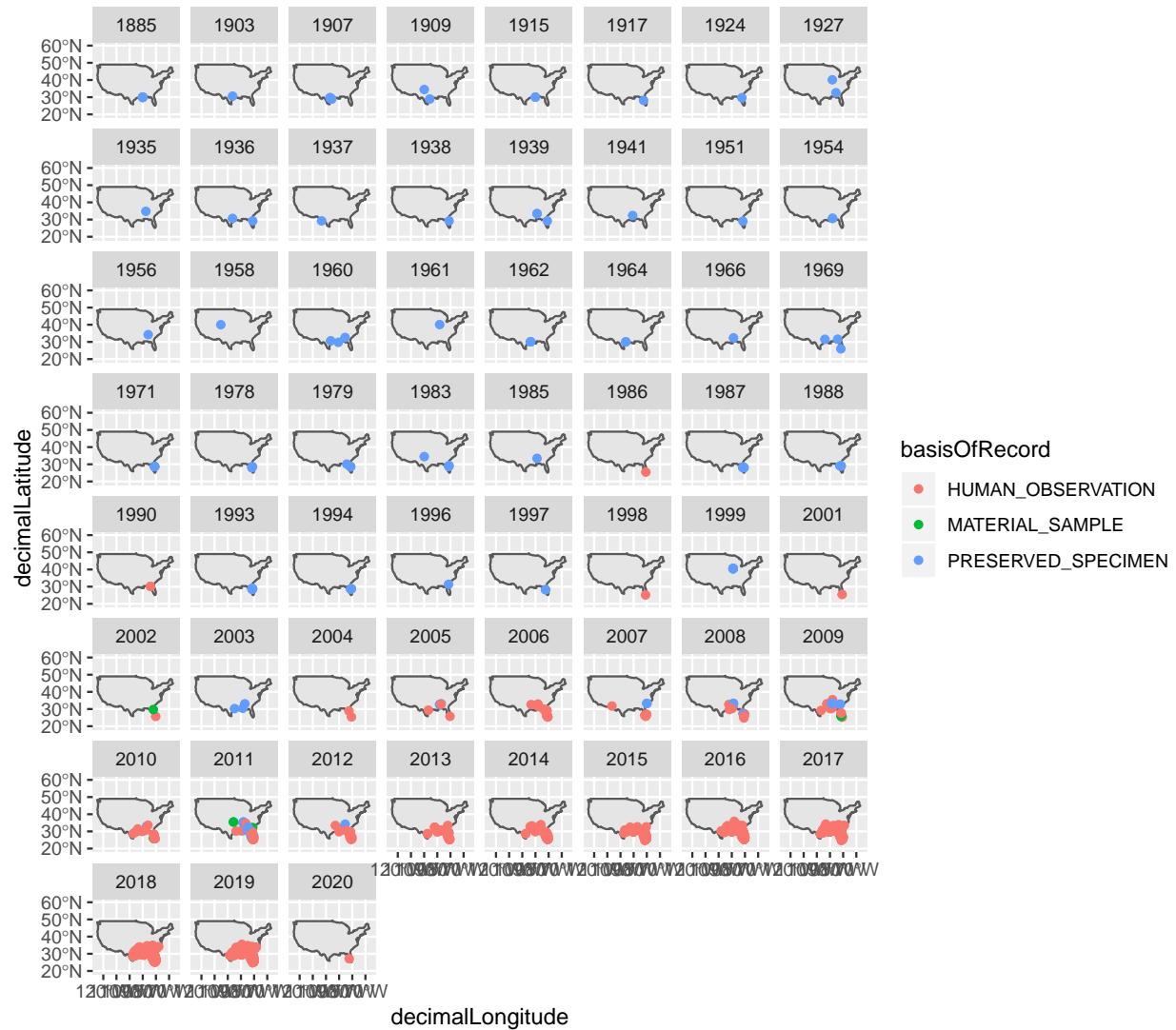


Lubber Grasshoppers - Romaleidae

Romalea microptera (Eastern Lubber Grasshopper)

```
## # A tibble: 14 x 3
## # Groups:   year [13]
##   year basisOfRecord     count
##   <int> <chr>          <int>
## 1 2006 HUMAN_OBSERVATION    15
## 2 2008 HUMAN_OBSERVATION    11
## 3 2009 HUMAN_OBSERVATION    11
## 4 2010 HUMAN_OBSERVATION    14
## 5 2011 HUMAN_OBSERVATION    20
## 6 2011 PRESERVED_SPECIMEN   19
## 7 2012 HUMAN_OBSERVATION    17
## 8 2013 HUMAN_OBSERVATION    29
## 9 2014 HUMAN_OBSERVATION    41
## 10 2015 HUMAN_OBSERVATION    71
## 11 2016 HUMAN_OBSERVATION   131
## 12 2017 HUMAN_OBSERVATION   203
## 13 2018 HUMAN_OBSERVATION   607
## 14 2019 HUMAN_OBSERVATION   968
```

Romalea microptera

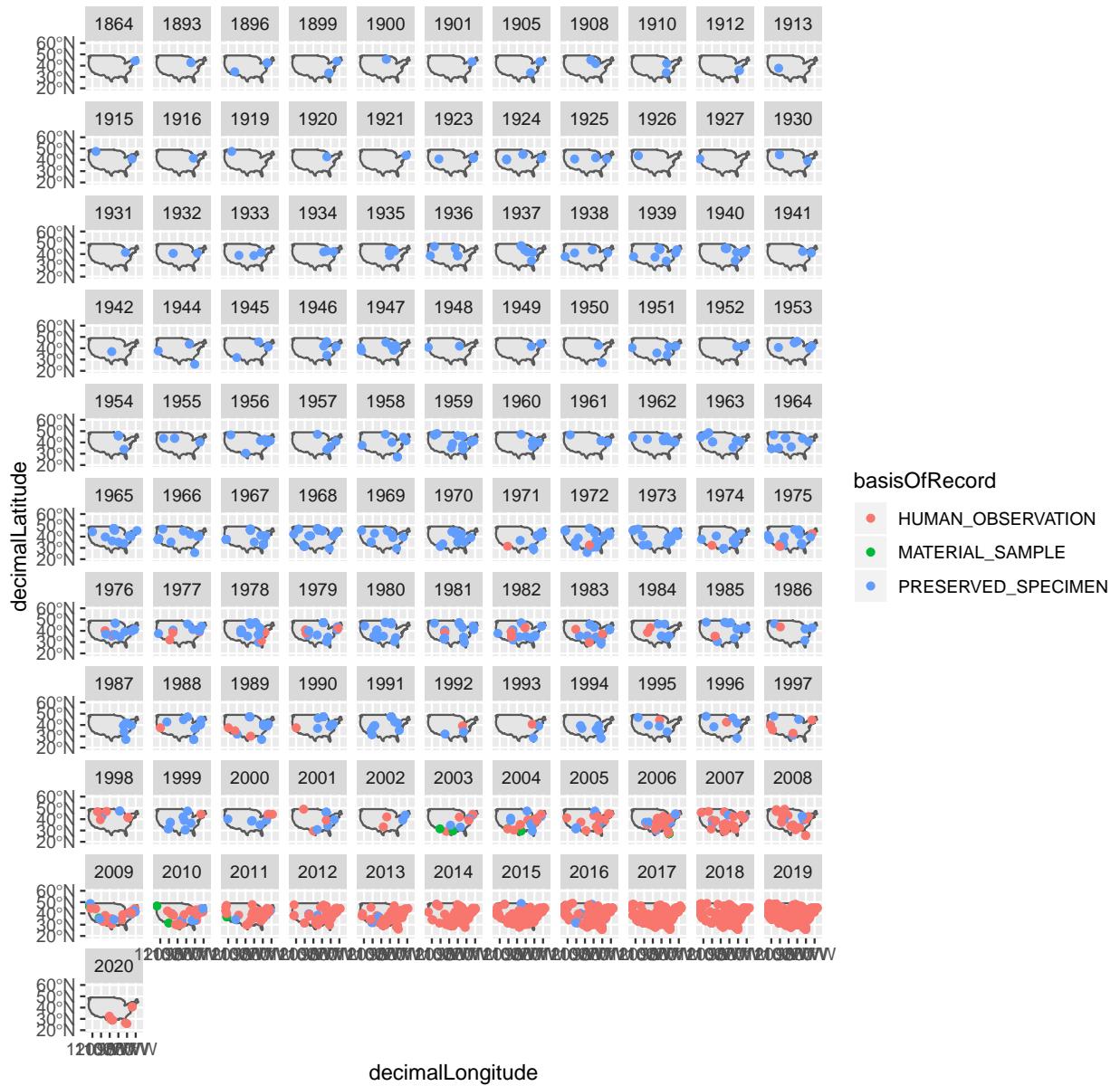


Silk moths - Saturniidae

Antheraea polyphemus (Polyphemus Moth)

```
## # A tibble: 49 x 3
## # Groups:   year [46]
##   year basisOfRecord     count
##   <int> <chr>           <int>
## 1 1935 PRESERVED_SPECIMEN     12
## 2 1959 PRESERVED_SPECIMEN     15
## 3 1962 PRESERVED_SPECIMEN     11
## 4 1963 PRESERVED_SPECIMEN     15
## 5 1964 PRESERVED_SPECIMEN     11
## 6 1965 PRESERVED_SPECIMEN     16
## 7 1966 PRESERVED_SPECIMEN     27
## 8 1967 PRESERVED_SPECIMEN     24
## 9 1968 PRESERVED_SPECIMEN     28
## 10 1970 PRESERVED_SPECIMEN    12
## # ... with 39 more rows
```

Antherea polyphemus

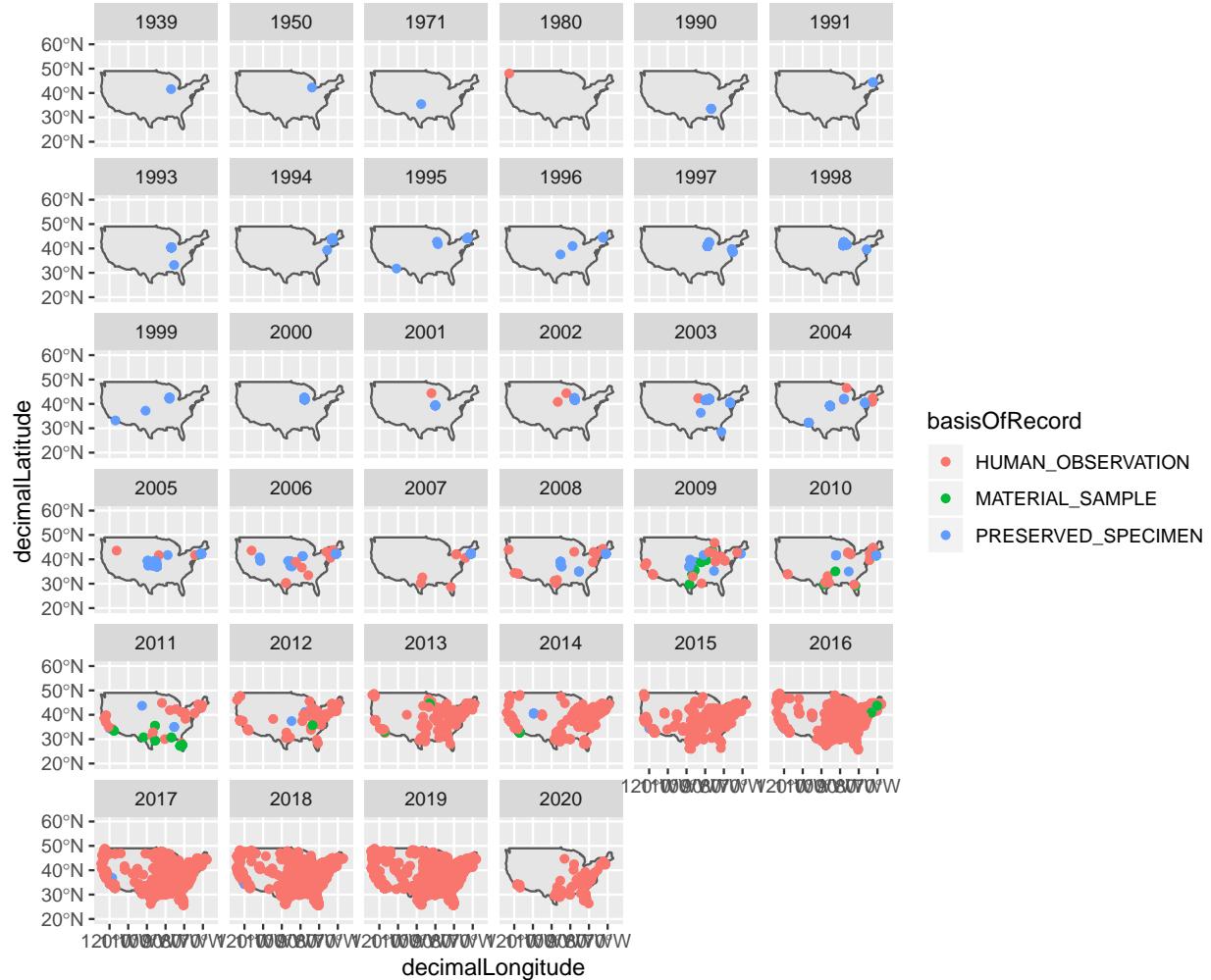


Lady Beetles - Coccinellidae

Harmonia axyridis (Asian Lady Beetle)

```
## # A tibble: 33 x 3
## # Groups:   year [25]
##       year basisOfRecord     count
##       <int> <chr>           <int>
## 1 1993 PRESERVED_SPECIMEN     22
## 2 1994 PRESERVED_SPECIMEN     23
## 3 1997 PRESERVED_SPECIMEN    59
## 4 1998 PRESERVED_SPECIMEN    42
## 5 1999 PRESERVED_SPECIMEN    11
## 6 2000 PRESERVED_SPECIMEN    68
## 7 2002 PRESERVED_SPECIMEN    16
## 8 2003 PRESERVED_SPECIMEN   293
## 9 2004 PRESERVED_SPECIMEN    43
## 10 2005 PRESERVED_SPECIMEN   166
## # ... with 23 more rows
```

Harmonia axyridis



Carrion Beetles - Silphidae

Necrophila americana American Carrion Beetle

```
## # A tibble: 31 x 3
## # Groups:   year [27]
##   year basisOfRecord     count
##   <int> <chr>           <int>
## 1 1965 PRESERVED_SPECIMEN     10
## 2 1966 PRESERVED_SPECIMEN     14
## 3 1967 PRESERVED_SPECIMEN     12
## 4 1968 PRESERVED_SPECIMEN     52
## 5 1969 PRESERVED_SPECIMEN     10
## 6 1972 PRESERVED_SPECIMEN     23
## 7 1992 PRESERVED_SPECIMEN     49
## 8 1995 PRESERVED_SPECIMEN     10
## 9 1996 PRESERVED_SPECIMEN    174
## 10 1997 PRESERVED_SPECIMEN    122
## # ... with 21 more rows
```

Necrophila americana

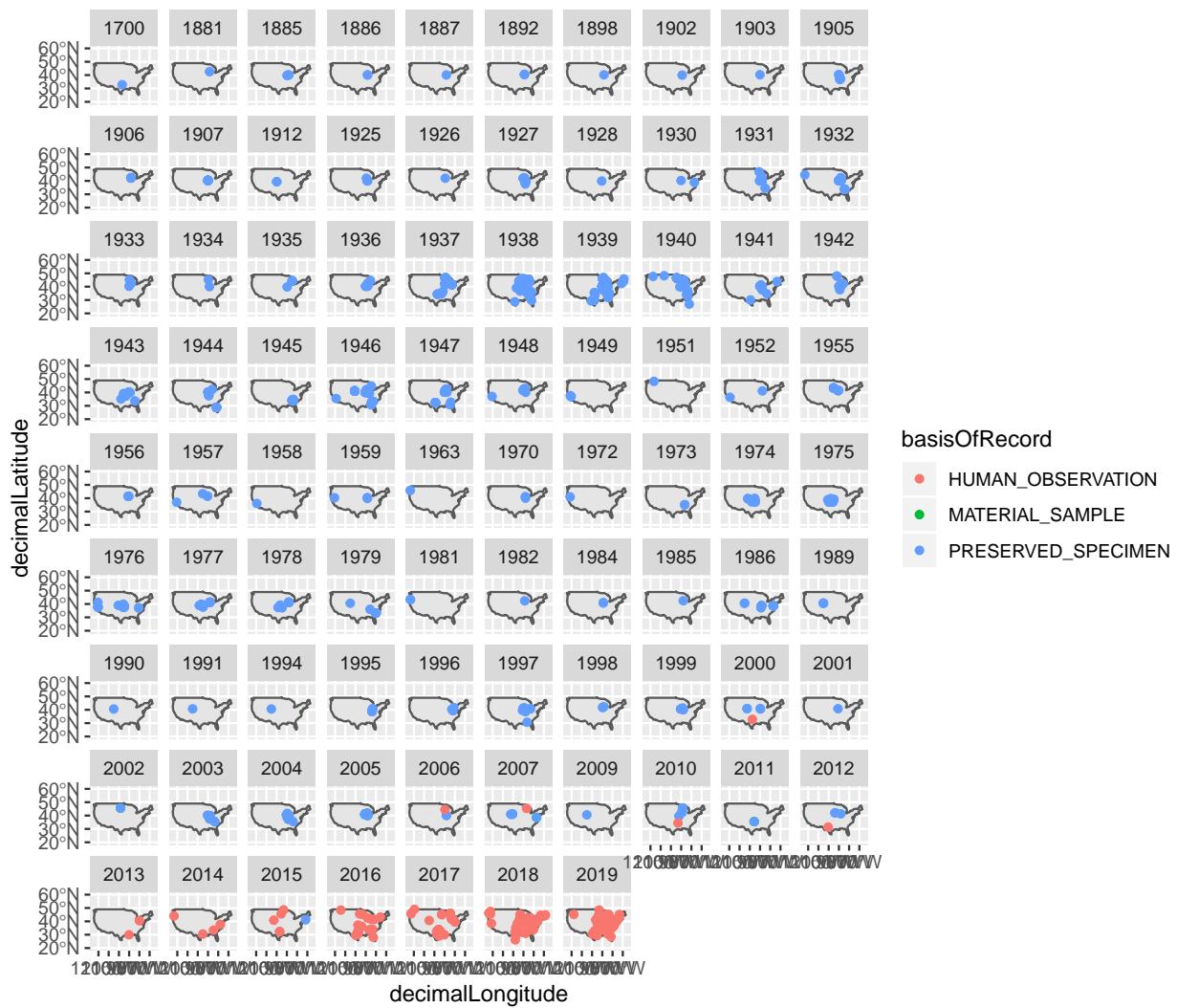


Mayflies - Ephemeroptera

Hexagenia limbata (Giant Mayfly)

```
## # A tibble: 31 x 3
## # Groups:   year [31]
##   year basisOfRecord     count
##   <int> <chr>           <int>
## 1 1905 PRESERVED_SPECIMEN    26
## 2 1907 PRESERVED_SPECIMEN    18
## 3 1927 PRESERVED_SPECIMEN    42
## 4 1931 PRESERVED_SPECIMEN    13
## 5 1932 PRESERVED_SPECIMEN    23
## 6 1936 PRESERVED_SPECIMEN    10
## 7 1937 PRESERVED_SPECIMEN    53
## 8 1938 PRESERVED_SPECIMEN   233
## 9 1939 PRESERVED_SPECIMEN   176
## 10 1940 PRESERVED_SPECIMEN    47
## # ... with 21 more rows
```

Hexagenia limbata

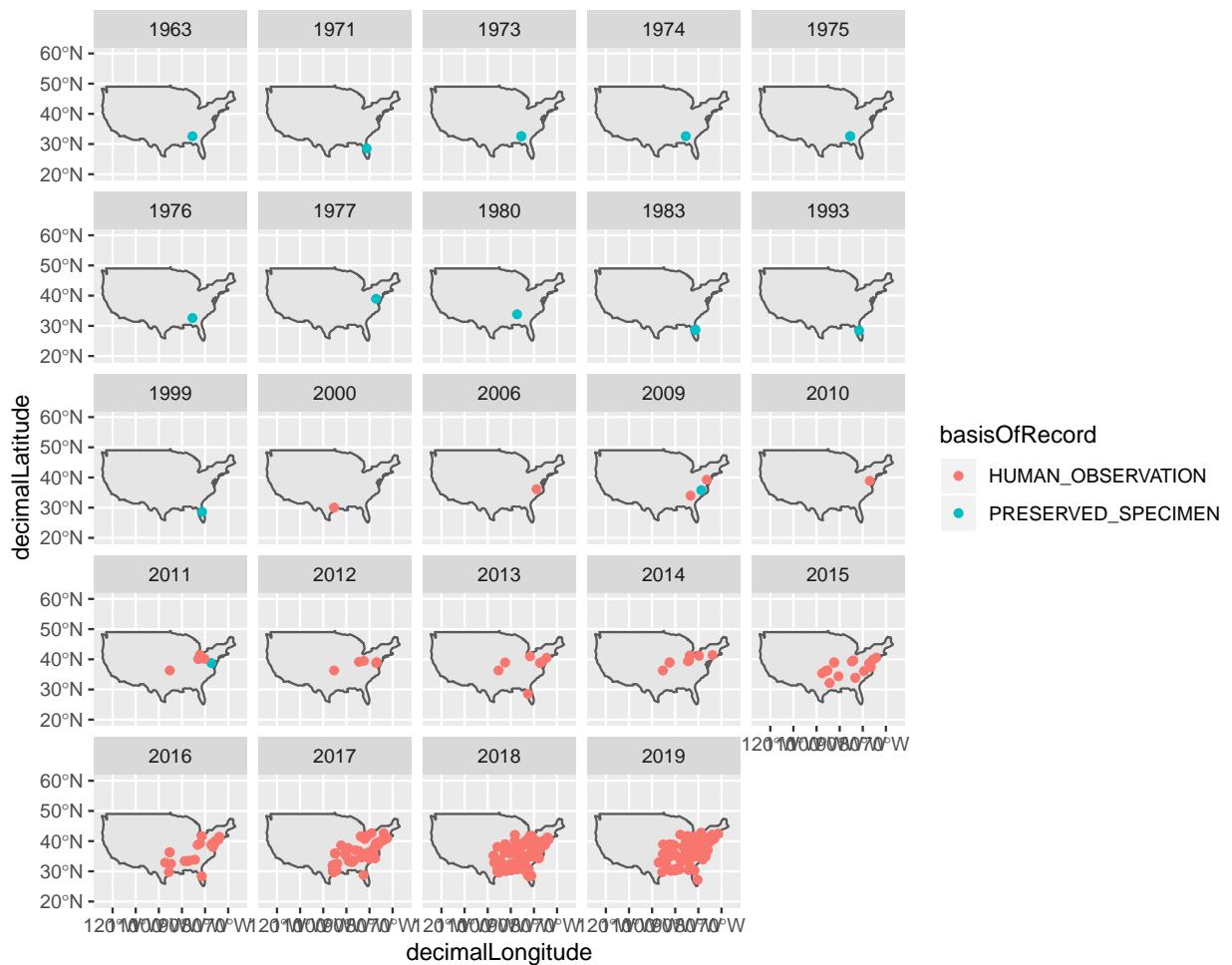


Cicadas (Cicadidae)

Neotibicen tibicen (Swamp Cicada)

```
## # A tibble: 5 x 3
## # Groups:   year [5]
##   year basisOfRecord   count
##   <int> <chr>           <int>
## 1 2015 HUMAN_OBSERVATION    17
## 2 2016 HUMAN_OBSERVATION    25
## 3 2017 HUMAN_OBSERVATION    75
## 4 2018 HUMAN_OBSERVATION   124
## 5 2019 HUMAN_OBSERVATION   222
```

Neotibicen tibicen

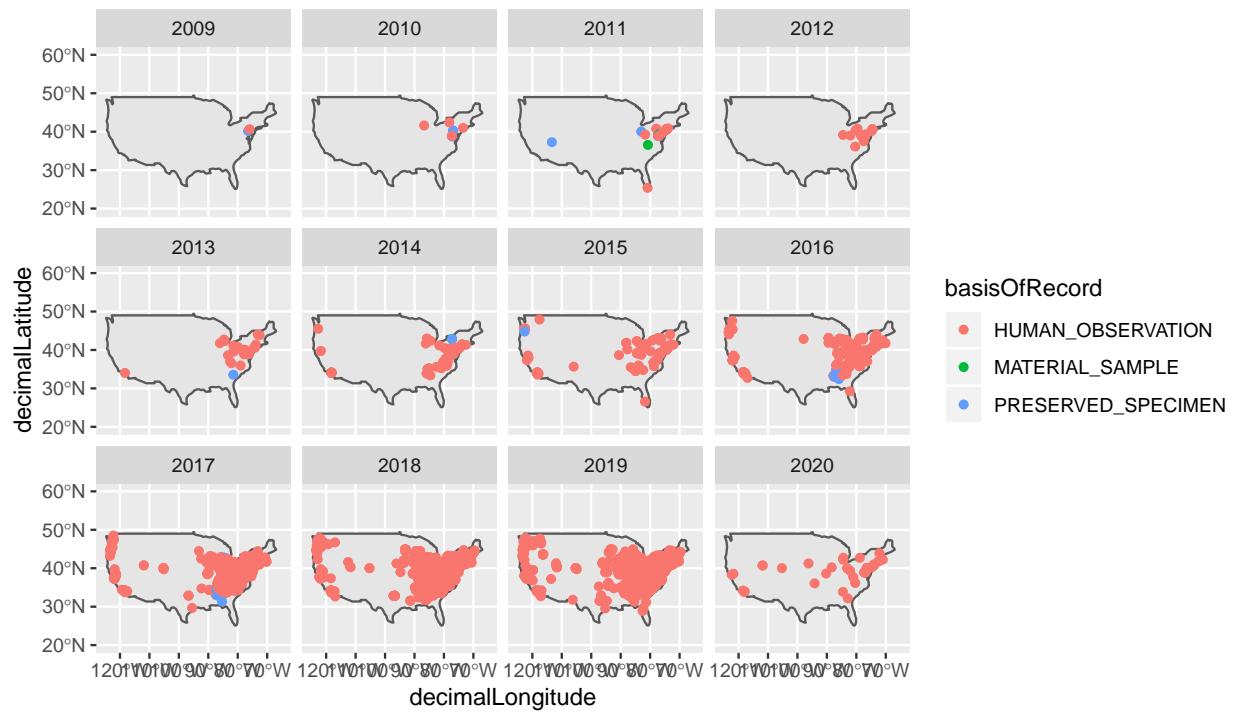


Stink Bugs (Pentatomidae)

First I'll do the brown marmorated, but it is a recent invasive. *Halyomorpha halys* (Brown Marmorated Stink Bug)

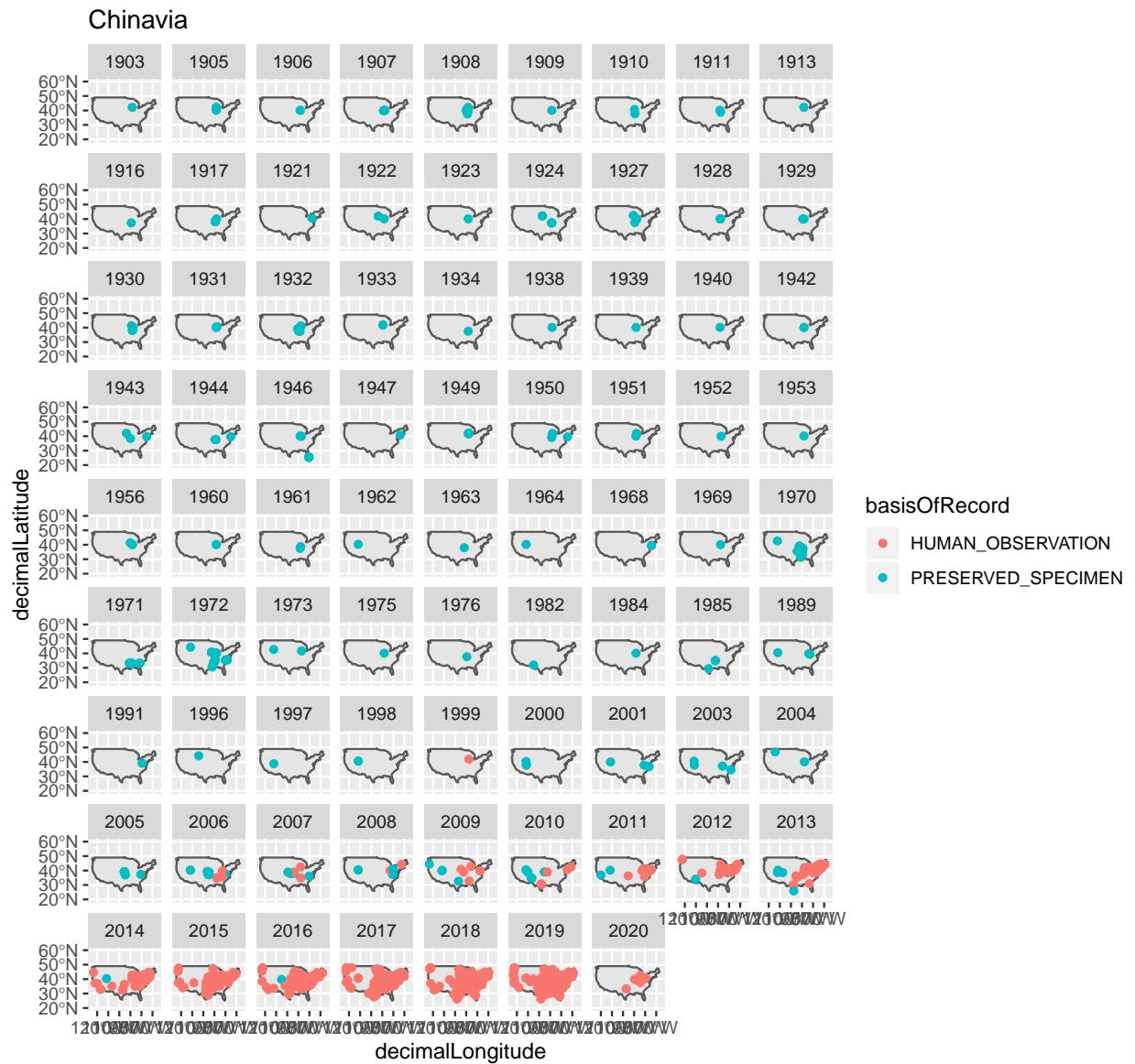
```
## # A tibble: 11 x 3
## # Groups:   year [10]
##   year basisOfRecord     count
##   <int> <chr>           <int>
## 1 2011 HUMAN_OBSERVATION    23
## 2 2012 HUMAN_OBSERVATION    19
## 3 2013 HUMAN_OBSERVATION    31
## 4 2014 HUMAN_OBSERVATION    51
## 5 2015 HUMAN_OBSERVATION    89
## 6 2016 HUMAN_OBSERVATION   269
## 7 2016 PRESERVED_SPECIMEN    17
## 8 2017 HUMAN_OBSERVATION   484
## 9 2018 HUMAN_OBSERVATION   972
## 10 2019 HUMAN_OBSERVATION  1811
## 11 2020 HUMAN_OBSERVATION    39
```

Halyomorpha halys



Here's the second most observed on iNat. *Chinavia hilaris* (Green Stink Bug) *Chinavia halaris* Well tried to do this for *Chinavia hilaris*, but iNat and gbif disagree on taxonomy. So just using *Chinavia* genus.

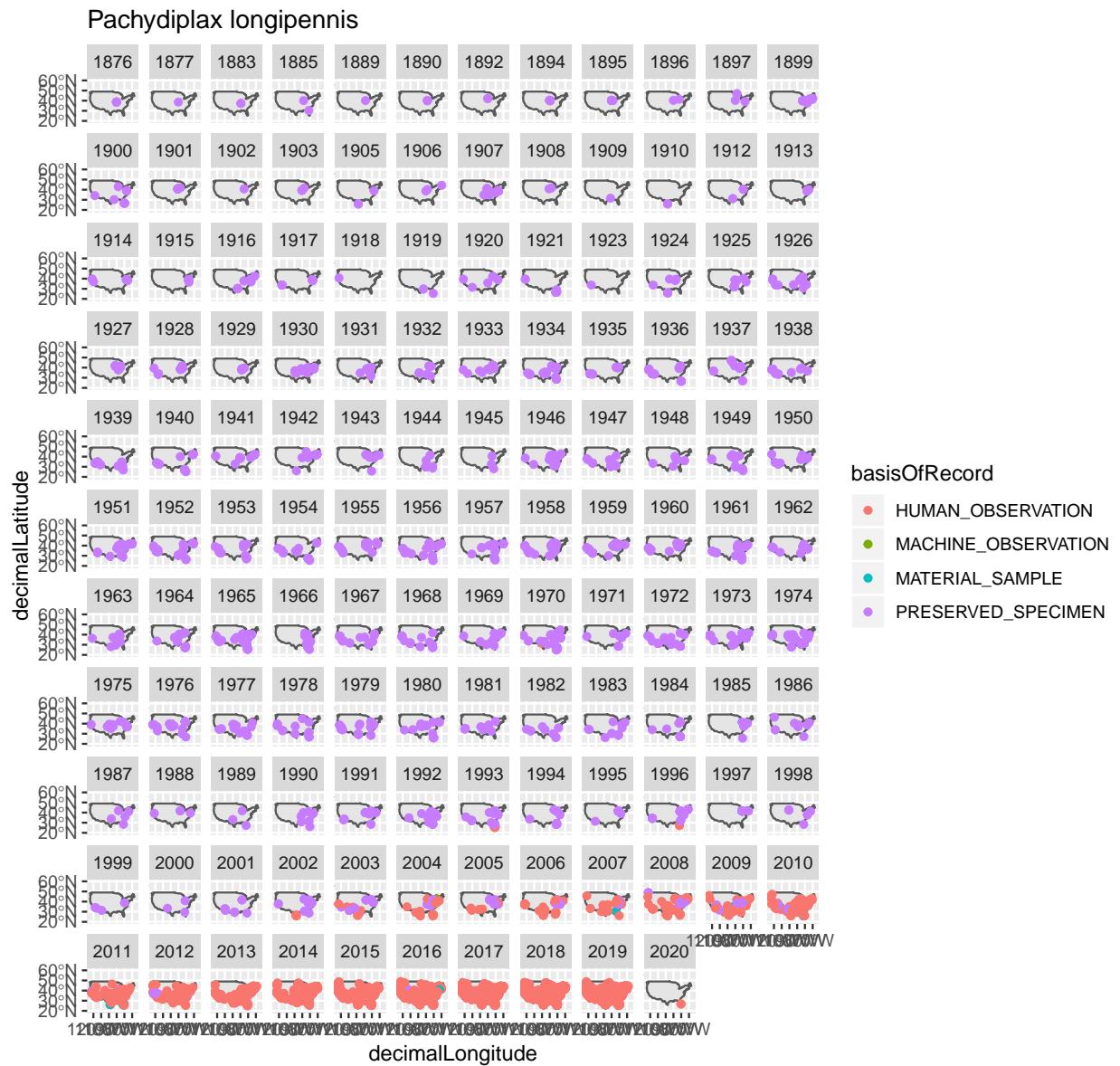
```
## # A tibble: 19 x 3
## # Groups:   year [19]
##   year basisOfRecord    count
##   <int> <chr>          <int>
## 1 1927 PRESERVED_SPECIMEN    10
## 2 1932 PRESERVED_SPECIMEN    11
## 3 1946 PRESERVED_SPECIMEN    11
## 4 1949 PRESERVED_SPECIMEN    11
## 5 1970 PRESERVED_SPECIMEN    25
## 6 1971 PRESERVED_SPECIMEN    10
## 7 1972 PRESERVED_SPECIMEN    50
## 8 2006 PRESERVED_SPECIMEN    16
## 9 2008 PRESERVED_SPECIMEN    10
## 10 2010 PRESERVED_SPECIMEN    10
## 11 2011 HUMAN_OBSERVATION    15
## 12 2012 HUMAN_OBSERVATION    32
## 13 2013 HUMAN_OBSERVATION    44
## 14 2014 HUMAN_OBSERVATION    63
## 15 2015 HUMAN_OBSERVATION    97
## 16 2016 HUMAN_OBSERVATION   154
## 17 2017 HUMAN_OBSERVATION   413
## 18 2018 HUMAN_OBSERVATION   618
## 19 2019 HUMAN_OBSERVATION  1258
```



Dragonflies (Odonata)

Pachydiplax longipennis (Blue Dasher)

```
## # A tibble: 107 x 3
## # Groups:   year [96]
##   year basisOfRecord     count
##   <int> <chr>           <int>
## 1 1895 PRESERVED_SPECIMEN     10
## 2 1899 PRESERVED_SPECIMEN    78
## 3 1900 PRESERVED_SPECIMEN    15
## 4 1901 PRESERVED_SPECIMEN    11
## 5 1907 PRESERVED_SPECIMEN    16
## 6 1914 PRESERVED_SPECIMEN    21
## 7 1915 PRESERVED_SPECIMEN    20
## 8 1916 PRESERVED_SPECIMEN    28
## 9 1917 PRESERVED_SPECIMEN    13
## 10 1920 PRESERVED_SPECIMEN   16
## # ... with 97 more rows
```

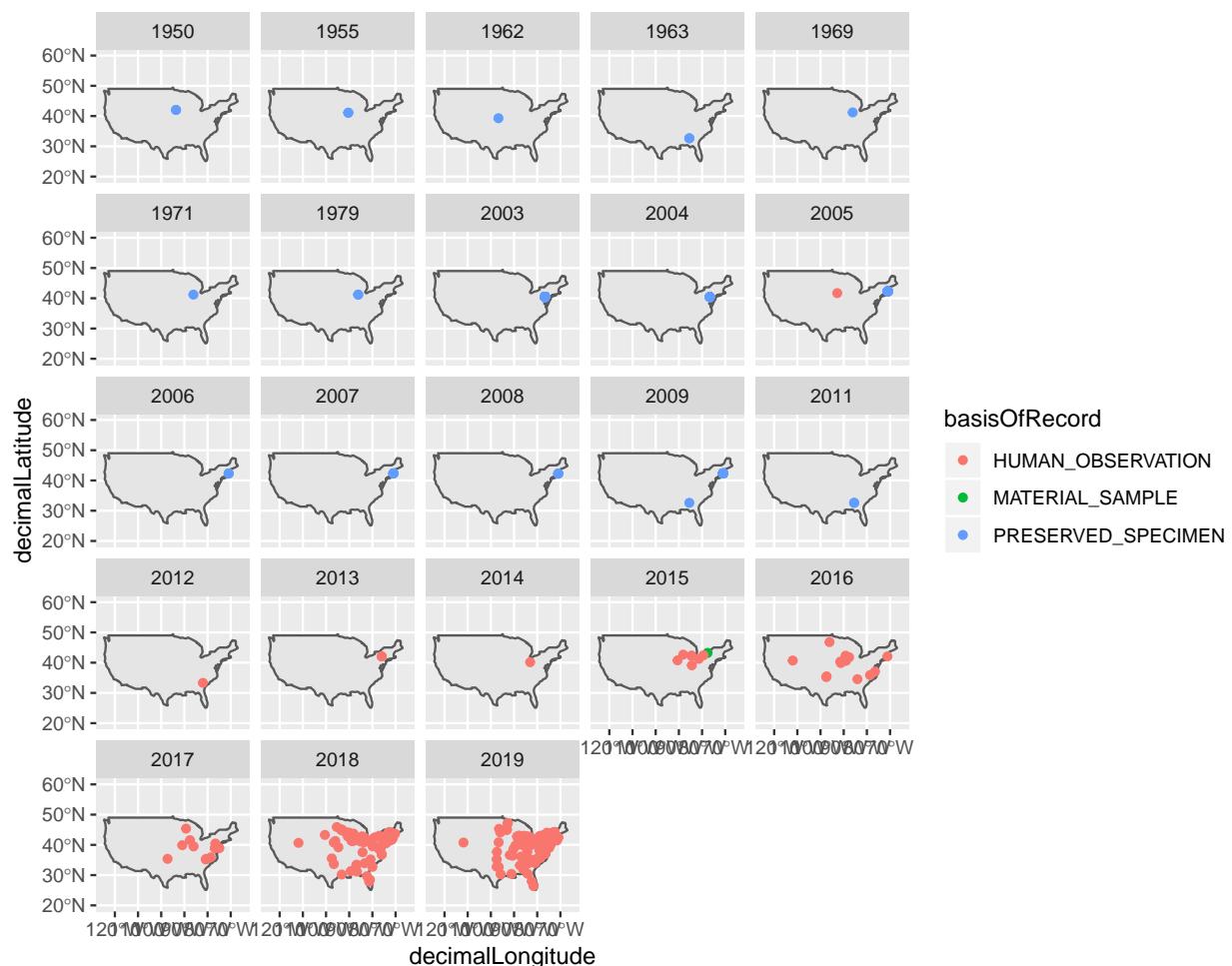


Typical Leaf Hoppers (Cicadellidae)

Graphocephala coccinea (Red-banded Leafhopper)

```
## # A tibble: 8 x 3
## # Groups:   year [8]
##   year basisOfRecord    count
##   <int> <chr>          <int>
## 1 2003 PRESERVED_SPECIMEN    120
## 2 2004 PRESERVED_SPECIMEN     13
## 3 2005 PRESERVED_SPECIMEN    28
## 4 2009 PRESERVED_SPECIMEN    19
## 5 2016 HUMAN_OBSERVATION    13
## 6 2017 HUMAN_OBSERVATION    12
## 7 2018 HUMAN_OBSERVATION    80
## 8 2019 HUMAN_OBSERVATION   173
```

Graphocephala coccinea

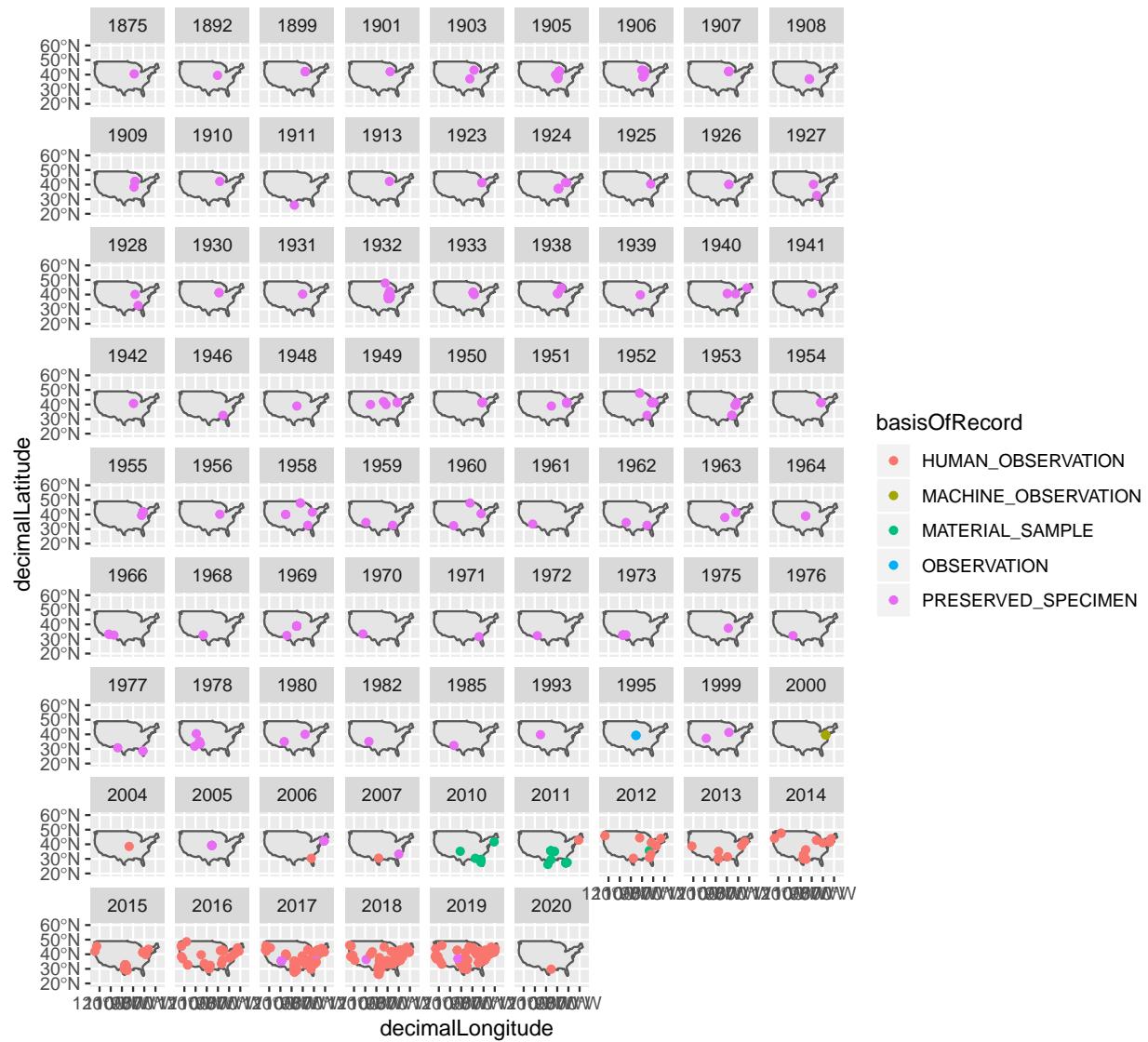


Katydid (Orthoptera)

Scudderia furcata (Fork-tailed Bush Katydid)

```
## # A tibble: 12 x 3
## # Groups:   year [12]
##   year basisOfRecord     count
##   <int> <chr>           <int>
## 1 1905 PRESERVED_SPECIMEN    28
## 2 1932 PRESERVED_SPECIMEN    28
## 3 1952 PRESERVED_SPECIMEN    14
## 4 1955 PRESERVED_SPECIMEN    10
## 5 2011 MATERIAL_SAMPLE     14
## 6 2012 HUMAN_OBSERVATION    10
## 7 2014 HUMAN_OBSERVATION    18
## 8 2015 HUMAN_OBSERVATION    28
## 9 2016 HUMAN_OBSERVATION    26
## 10 2017 HUMAN_OBSERVATION   65
## 11 2018 HUMAN_OBSERVATION   85
## 12 2019 HUMAN_OBSERVATION  175
```

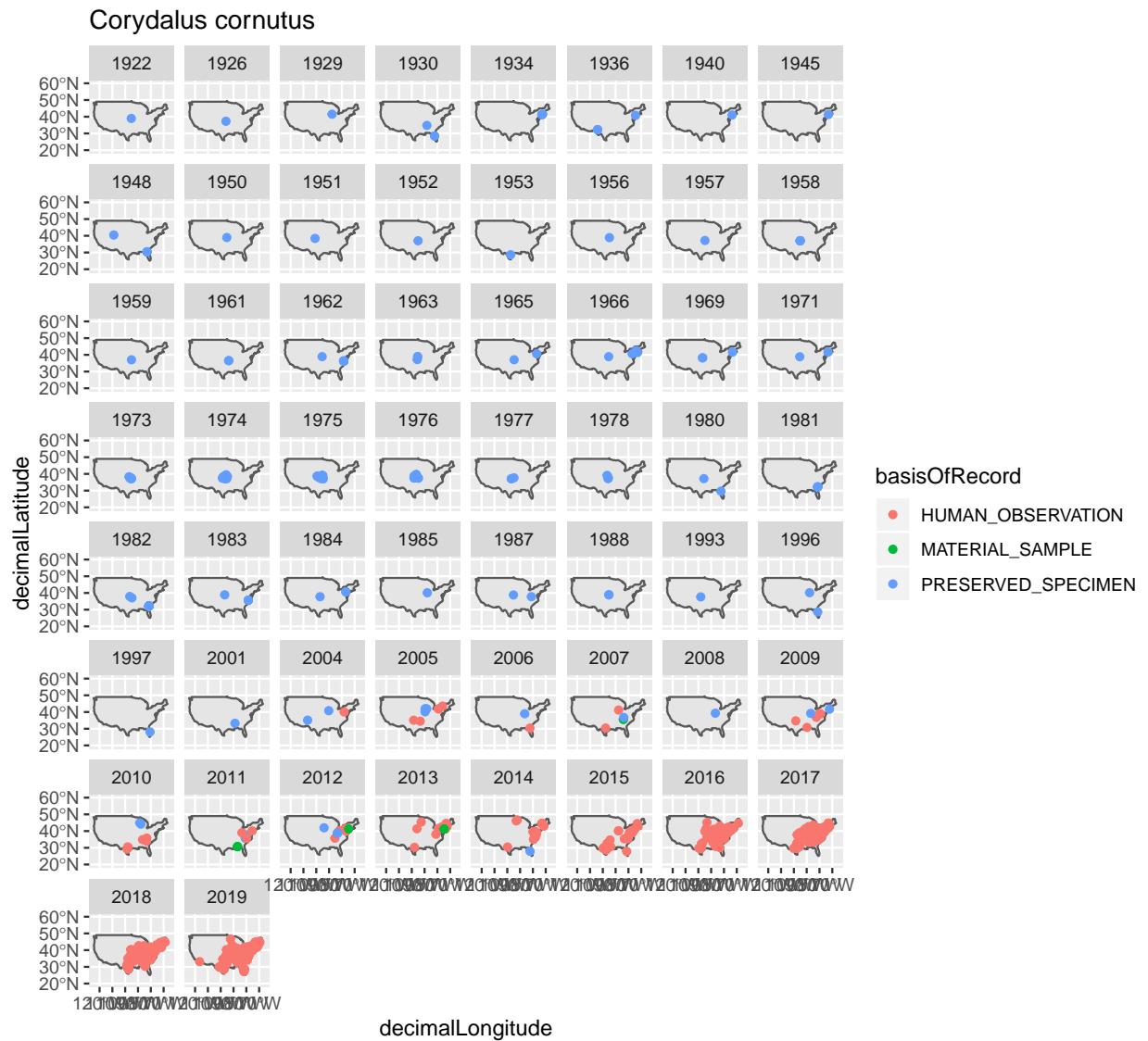
Scudderia furcata



Dobsonflies and fishflies (Megaloptera)

Corydalus cornutus (Eastern Dobsonfly)

```
## # A tibble: 11 x 3
## # Groups:   year [11]
##   year basisOfRecord     count
##   <int> <chr>          <int>
## 1 1974 PRESERVED_SPECIMEN    10
## 2 1975 PRESERVED_SPECIMEN    14
## 3 1976 PRESERVED_SPECIMEN    12
## 4 1982 PRESERVED_SPECIMEN    28
## 5 2013 HUMAN_OBSERVATION    13
## 6 2014 HUMAN_OBSERVATION    17
## 7 2015 HUMAN_OBSERVATION    28
## 8 2016 HUMAN_OBSERVATION    62
## 9 2017 HUMAN_OBSERVATION   109
## 10 2018 HUMAN_OBSERVATION   168
## 11 2019 HUMAN_OBSERVATION   219
```

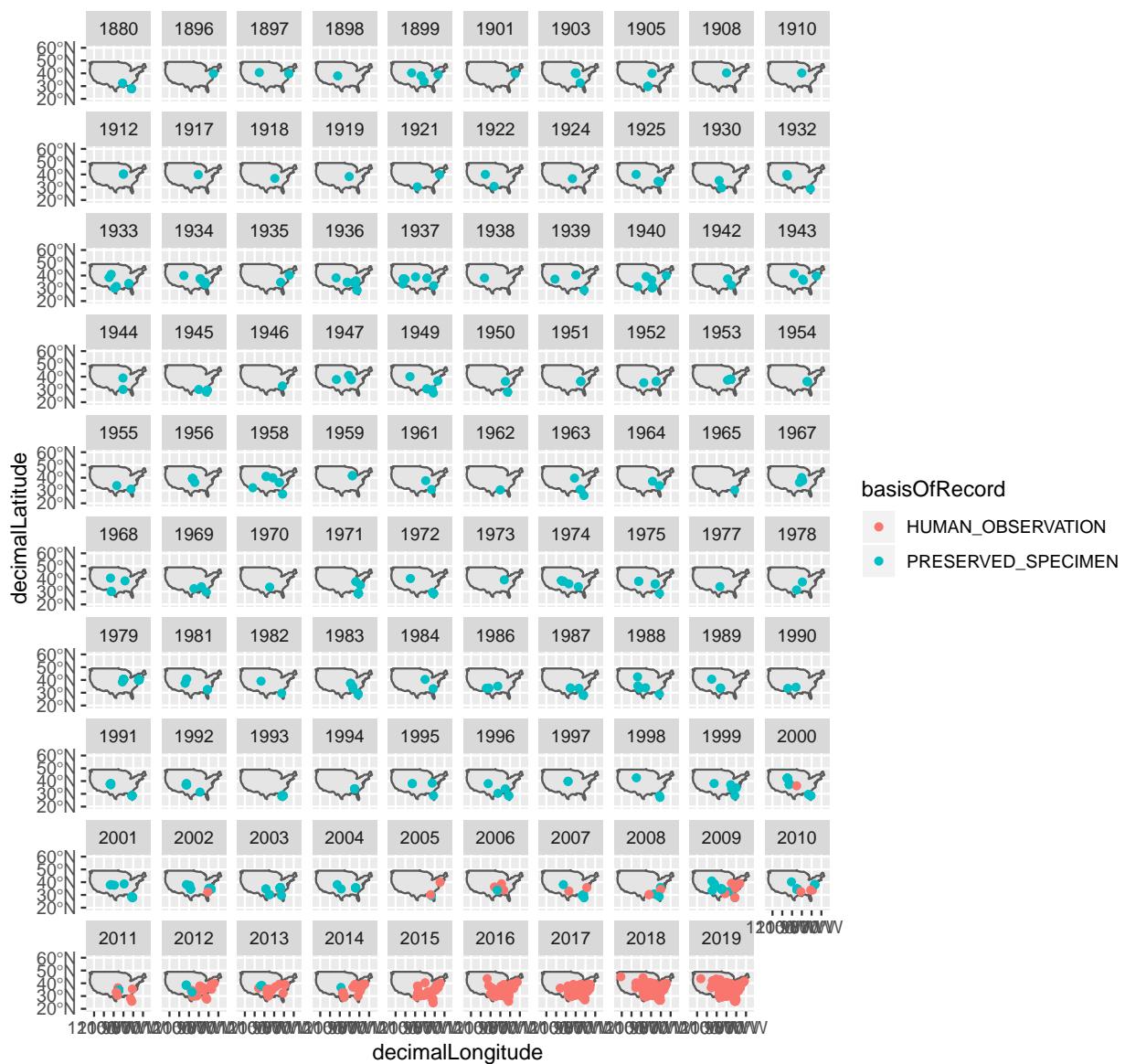


Velvet Ants (Mutillidae)

Dasymutilla occidentalis (Common Eastern Velvet Ant)

```
## # A tibble: 19 x 3
## # Groups:   year [19]
##   year basisOfRecord     count
##   <int> <chr>           <int>
## 1 1937 PRESERVED_SPECIMEN     15
## 2 1953 PRESERVED_SPECIMEN    43
## 3 1974 PRESERVED_SPECIMEN    10
## 4 1979 PRESERVED_SPECIMEN    22
## 5 1991 PRESERVED_SPECIMEN    12
## 6 2000 PRESERVED_SPECIMEN    13
## 7 2002 PRESERVED_SPECIMEN    13
## 8 2003 PRESERVED_SPECIMEN    20
## 9 2009 PRESERVED_SPECIMEN    20
## 10 2010 PRESERVED_SPECIMEN   21
## 11 2011 PRESERVED_SPECIMEN   43
## 12 2012 HUMAN_OBSERVATION   21
## 13 2013 HUMAN_OBSERVATION   18
## 14 2014 HUMAN_OBSERVATION   21
## 15 2015 HUMAN_OBSERVATION   34
## 16 2016 HUMAN_OBSERVATION   93
## 17 2017 HUMAN_OBSERVATION  159
## 18 2018 HUMAN_OBSERVATION  285
## 19 2019 HUMAN_OBSERVATION  517
```

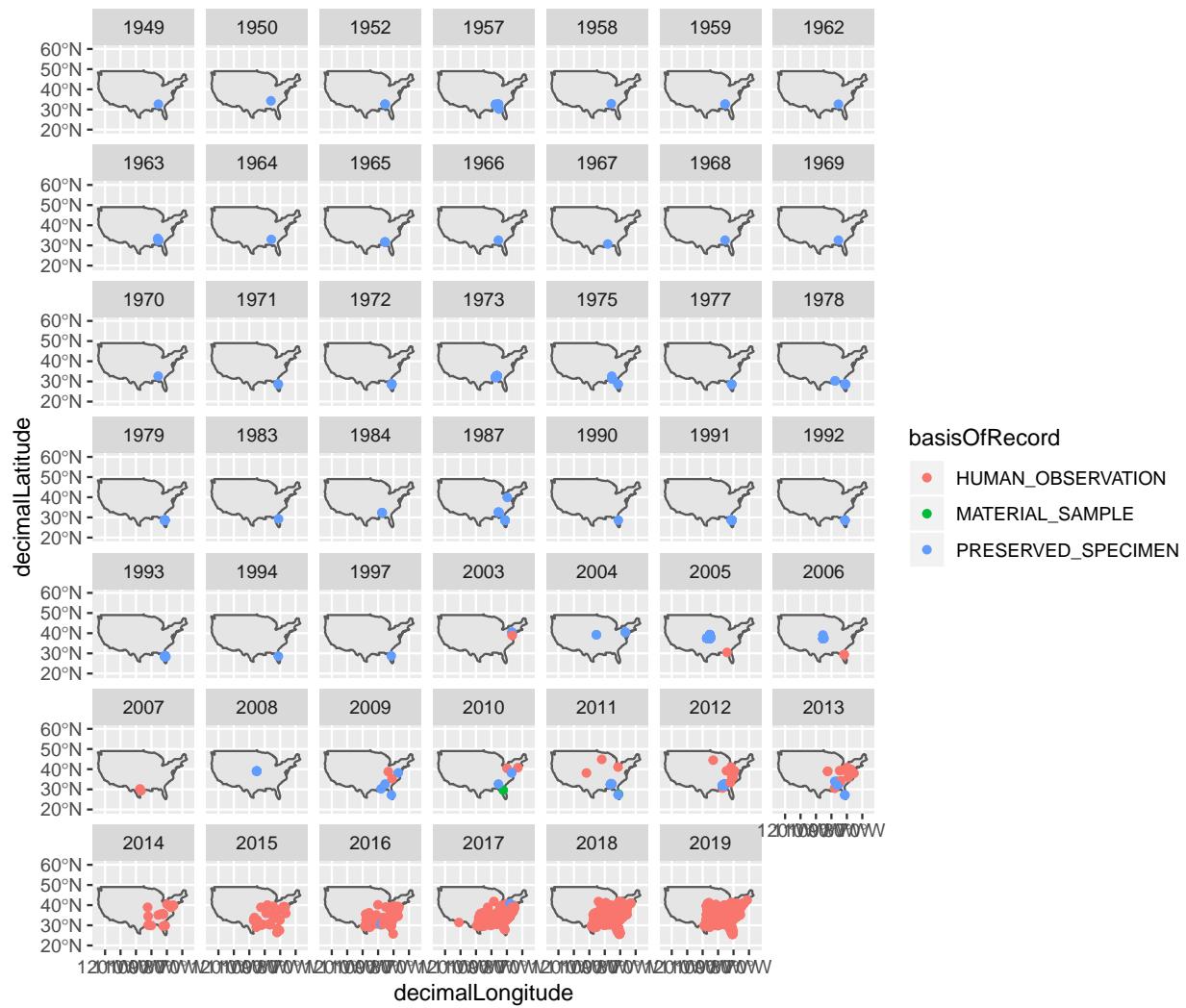
Dasymutilla occidentalis



Prosapia bicincta (Two-lined Spittlebug)

```
## # A tibble: 16 x 3
## # Groups:   year [14]
##   year basisOfRecord      count
##   <int> <chr>            <int>
## 1 1973 PRESERVED_SPECIMEN     35
## 2 1979 PRESERVED_SPECIMEN     13
## 3 1991 PRESERVED_SPECIMEN     30
## 4 1993 PRESERVED_SPECIMEN     23
## 5 2005 PRESERVED_SPECIMEN     33
## 6 2011 PRESERVED_SPECIMEN     14
## 7 2012 PRESERVED_SPECIMEN     21
## 8 2013 HUMAN_OBSERVATION     13
## 9 2013 PRESERVED_SPECIMEN     25
## 10 2014 HUMAN_OBSERVATION     24
## 11 2015 HUMAN_OBSERVATION     49
## 12 2016 HUMAN_OBSERVATION    141
## 13 2016 PRESERVED_SPECIMEN     14
## 14 2017 HUMAN_OBSERVATION    286
## 15 2018 HUMAN_OBSERVATION    392
## 16 2019 HUMAN_OBSERVATION    569
```

Prosapia bicincta



Leaf-footed/squash bugs (Coreidae)

Acanthocephala terminalis (Spine-headed Bug)

```
## # A tibble: 10 x 3
## # Groups:   year [10]
##   year basisOfRecord     count
##   <int> <chr>           <int>
## 1 2005 PRESERVED_SPECIMEN    16
## 2 2006 PRESERVED_SPECIMEN    22
## 3 2012 HUMAN_OBSERVATION    20
## 4 2013 HUMAN_OBSERVATION    31
## 5 2014 HUMAN_OBSERVATION    29
## 6 2015 HUMAN_OBSERVATION    63
## 7 2016 HUMAN_OBSERVATION   120
## 8 2017 HUMAN_OBSERVATION   258
## 9 2018 HUMAN_OBSERVATION   309
## 10 2019 HUMAN_OBSERVATION  401
```

Acanthocephala terminalis

