# semster-project

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```r
read.csv(file = "../data-raw/IUCN Red List Changes - 2002 to 2022 - Single Measure.csv") -> Single_Meas
read.csv(file = "../data-raw/IUCN Red List Changes - 2002 to 2022 - Multiple Measures.csv") -> Multiple_
```

```r
Single_Measure %>%
  filter(Class == "Amphibians" | Class == "
Birds" | Class == "Fishes" | Class == "Fungi & Protists") %>%
  group_by(Class, Metric)
```

```
## # A tibble: 300 x 4
## # Groups:   Class, Metric [15]
##     Year Class      Metric                 Number.of.Species
##    <int> <chr>      <chr>                  <chr>
##  1  2002 Amphibians Critically Endangered 30
##  2  2003 Amphibians Critically Endangered 30
##  3  2004 Amphibians Critically Endangered 413
##  4  2006 Amphibians Critically Endangered 442
##  5  2007 Amphibians Critically Endangered 441
##  6  2008 Amphibians Critically Endangered 475
##  7  2009 Amphibians Critically Endangered 484
##  8  2010 Amphibians Critically Endangered 486
##  9  2011 Amphibians Critically Endangered 498
## 10  2012 Amphibians Critically Endangered 509
## # ... with 290 more rows
```

```r
#as.integer(Single_Measure$Number.of.Species)
Single_Measure %>%
  group_by(Metric) %>%
  mutate(Species = as.integer(Number.of.Species)) %>%
  filter(!is.na(Species)) %>%
ggplot(mapping = aes(x = Year, y = Species, color = Metric)) +
  geom_point(size = 0.5) +
  facet_wrap(~Class, scales = "free_y")
```

```
## Warning: There was 1 warning in `mutate()`.
## i In argument: `Species = as.integer(Number.of.Species)`.
## i In group 3: `Metric = "Total Assessed"`.
## Caused by warning:
## ! NAs introduced by coercion
```
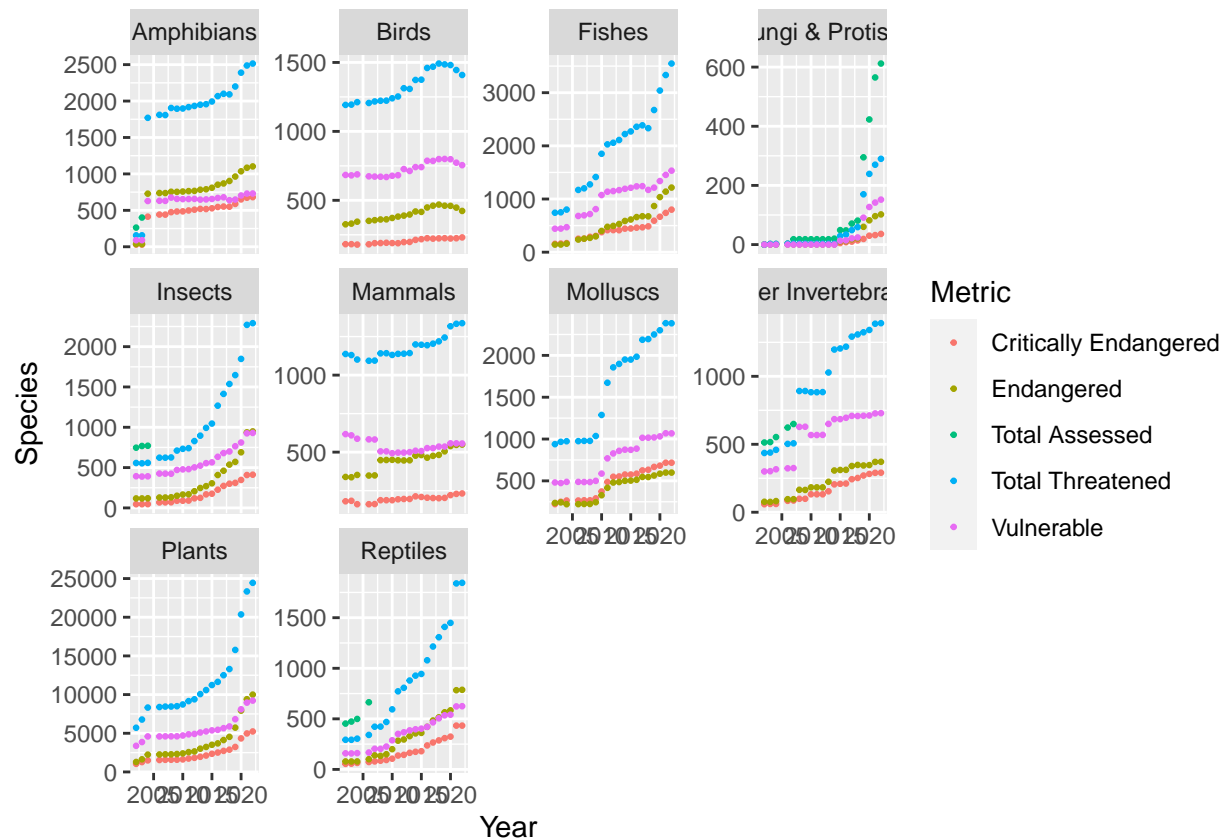
```
str(Single_Measure)
```

```
## 'data.frame':    1000 obs. of  4 variables:
##  $ Year             : int  2002 2003 2004 2006 2007 2008 2009 2010 2011 2012 ...
##  $ Class            : chr  "Amphibians" "Amphibians" "Amphibians" "Amphibians" ...
##  $ Metric           : chr  "Critically Endangered" "Critically Endangered" "Critically Endangered" "C
##  $ Number.of.Species: chr  "30" "30" "413" "442" ...
```

```
Single_Measure %>%
  filter(Class == "amphibians" | Class == "Mammals" | Class == "Fungi & Protists" | Class == "Mollus" |
  group_by(Metric) %>%
  mutate(Species = as.integer(Number.of.Species)) %>%
  filter(!is.na(Species)) %>%
  ggplot(mapping = aes(x = Year, y = Species, color = Metric)) +
  geom_point(size = 1) +
  facet_wrap(~Class, scales = "free_y")
```

```
## Warning: There was 1 warning in `mutate()`.
## i In argument: `Species = as.integer(Number.of.Species)`.
## i In group 3: `Metric = "Total Assessed"`.
## Caused by warning:
## ! NAs introduced by coercion
```
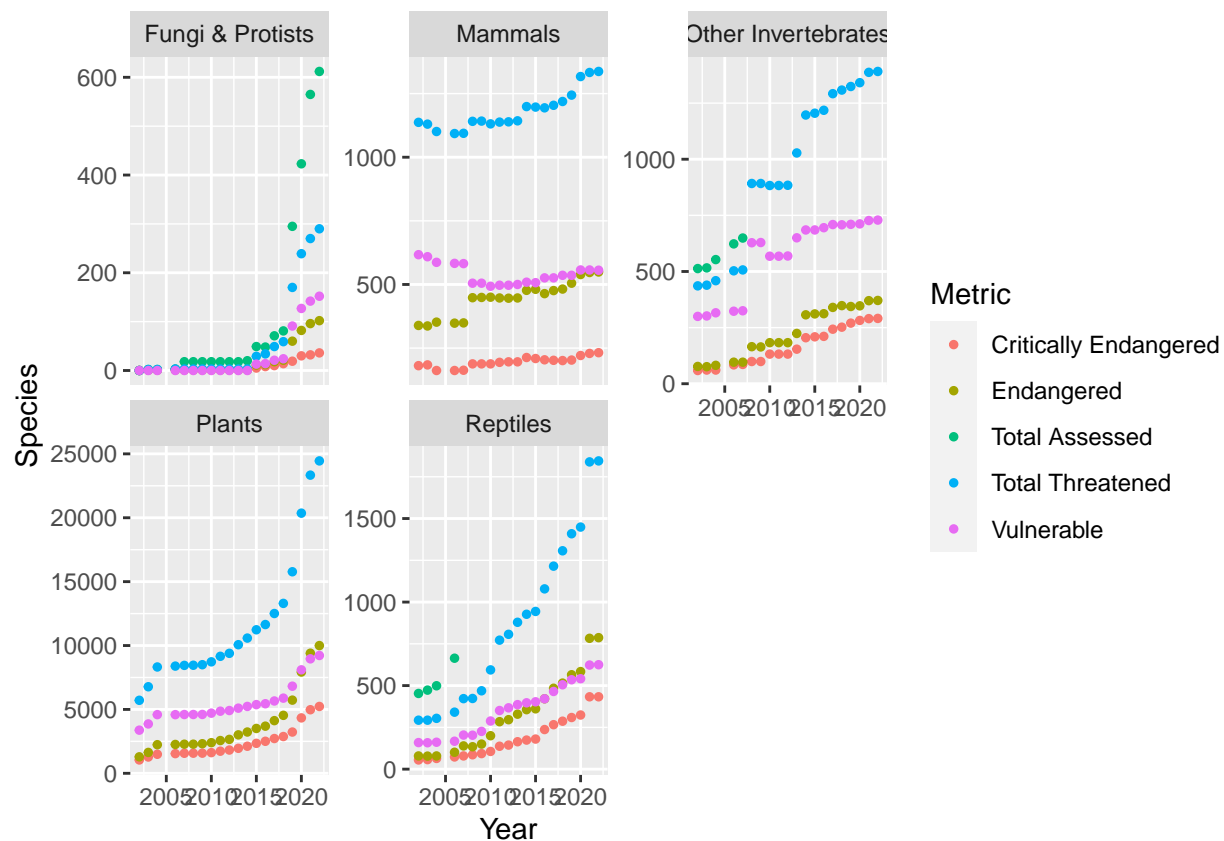
```r
intersect(colnames(Single_Measure), colnames(Multiple_Measure))
```

```
## [1] "Year"
```

```r
inner_join(Single_Measure, Multiple_Measure, by = "Year") %>%
  filter(Year == "2018")
```

```
##    Year            Class             Metric Number.of.Species
## 1  2018       Amphibians Critically Endangered               550
## 2  2018       Amphibians            Endangered               903
## 3  2018       Amphibians        Total Assessed             6,722
## 4  2018       Amphibians       Total Threatened             2092
## 5  2018       Amphibians            Vulnerable               639
## 6  2018            Birds Critically Endangered               224
## 7  2018            Birds            Endangered               469
## 8  2018            Birds        Total Assessed            11,126
## 9  2018            Birds       Total Threatened             1492
## 10 2018            Birds            Vulnerable               799
## 11 2018           Fishes Critically Endangered               486
## 12 2018           Fishes            Endangered               674
## 13 2018           Fishes        Total Assessed            16,803
## 14 2018           Fishes       Total Threatened             2332
## 15 2018           Fishes            Vulnerable              1172
## 16 2018  Fungi & Protists Critically Endangered                14
## 17 2018  Fungi & Protists            Endangered                21
```

```
## 18 2018     Fungi & Protists        Total Assessed                81
## 19 2018     Fungi & Protists       Total Threatened               59
## 20 2018     Fungi & Protists             Vulnerable               24
## 21 2018              Insects Critically Endangered               300
## 22 2018              Insects             Endangered               537
## 23 2018              Insects         Total Assessed             8,037
## 24 2018              Insects        Total Threatened            1537
## 25 2018              Insects             Vulnerable              700
## 26 2018              Mammals Critically Endangered               201
## 27 2018              Mammals             Endangered               482
## 28 2018              Mammals         Total Assessed             5,692
## 29 2018              Mammals        Total Threatened            1219
## 30 2018              Mammals             Vulnerable              536
## 31 2018             Molluscs Critically Endangered               633
## 32 2018             Molluscs             Endangered               546
## 33 2018             Molluscs         Total Assessed             8,627
## 34 2018             Molluscs        Total Threatened            2195
## 35 2018             Molluscs             Vulnerable             1016
## 36 2018 Other Invertebrates Critically Endangered               252
## 37 2018 Other Invertebrates             Endangered               348
## 38 2018 Other Invertebrates         Total Assessed             5,222
## 39 2018 Other Invertebrates        Total Threatened            1308
## 40 2018 Other Invertebrates             Vulnerable              708
## 41 2018               Plants Critically Endangered              2879
## 42 2018               Plants             Endangered             4537
## 43 2018               Plants         Total Assessed            27,514
## 44 2018               Plants        Total Threatened           13299
## 45 2018               Plants             Vulnerable             5883
## 46 2018             Reptiles Critically Endangered               287
## 47 2018             Reptiles             Endangered              515
## 48 2018             Reptiles         Total Assessed             7,127
## 49 2018             Reptiles        Total Threatened            1307
## 50 2018             Reptiles             Vulnerable              505
##    Mammal.Species.Assessed Bird.Species.Assessed Reptile.Species.Assessed
## 1                    5,692                11,126                    7,127
## 2                    5,692                11,126                    7,127
## 3                    5,692                11,126                    7,127
## 4                    5,692                11,126                    7,127
## 5                    5,692                11,126                    7,127
## 6                    5,692                11,126                    7,127
## 7                    5,692                11,126                    7,127
## 8                    5,692                11,126                    7,127
## 9                    5,692                11,126                    7,127
## 10                   5,692                11,126                    7,127
## 11                   5,692                11,126                    7,127
## 12                   5,692                11,126                    7,127
## 13                   5,692                11,126                    7,127
## 14                   5,692                11,126                    7,127
## 15                   5,692                11,126                    7,127
## 16                   5,692                11,126                    7,127
## 17                   5,692                11,126                    7,127
## 18                   5,692                11,126                    7,127
## 19                   5,692                11,126                    7,127
## 20                   5,692                11,126                    7,127
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## 21                          5,692                  11,126                     7,127
## 22                          5,692                  11,126                     7,127
## 23                          5,692                  11,126                     7,127
## 24                          5,692                  11,126                     7,127
## 25                          5,692                  11,126                     7,127
## 26                          5,692                  11,126                     7,127
## 27                          5,692                  11,126                     7,127
## 28                          5,692                  11,126                     7,127
## 29                          5,692                  11,126                     7,127
## 30                          5,692                  11,126                     7,127
## 31                          5,692                  11,126                     7,127
## 32                          5,692                  11,126                     7,127
## 33                          5,692                  11,126                     7,127
## 34                          5,692                  11,126                     7,127
## 35                          5,692                  11,126                     7,127
## 36                          5,692                  11,126                     7,127
## 37                          5,692                  11,126                     7,127
## 38                          5,692                  11,126                     7,127
## 39                          5,692                  11,126                     7,127
## 40                          5,692                  11,126                     7,127
## 41                          5,692                  11,126                     7,127
## 42                          5,692                  11,126                     7,127
## 43                          5,692                  11,126                     7,127
## 44                          5,692                  11,126                     7,127
## 45                          5,692                  11,126                     7,127
## 46                          5,692                  11,126                     7,127
## 47                          5,692                  11,126                     7,127
## 48                          5,692                  11,126                     7,127
## 49                          5,692                  11,126                     7,127
## 50                          5,692                  11,126                     7,127
##      Amphibian.Species.Assessed Fish.Species.Assessed Insect.Species.Assessed
## 1                        6,722                 16,803                    8,037
## 2                        6,722                 16,803                    8,037
## 3                        6,722                 16,803                    8,037
## 4                        6,722                 16,803                    8,037
## 5                        6,722                 16,803                    8,037
## 6                        6,722                 16,803                    8,037
## 7                        6,722                 16,803                    8,037
## 8                        6,722                 16,803                    8,037
## 9                        6,722                 16,803                    8,037
## 10                       6,722                 16,803                    8,037
## 11                       6,722                 16,803                    8,037
## 12                       6,722                 16,803                    8,037
## 13                       6,722                 16,803                    8,037
## 14                       6,722                 16,803                    8,037
## 15                       6,722                 16,803                    8,037
## 16                       6,722                 16,803                    8,037
## 17                       6,722                 16,803                    8,037
## 18                       6,722                 16,803                    8,037
## 19                       6,722                 16,803                    8,037
## 20                       6,722                 16,803                    8,037
## 21                       6,722                 16,803                    8,037
## 22                       6,722                 16,803                    8,037
## 23                       6,722                 16,803                    8,037
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## 24                           6,722                 16,803                      8,037
## 25                           6,722                 16,803                      8,037
## 26                           6,722                 16,803                      8,037
## 27                           6,722                 16,803                      8,037
## 28                           6,722                 16,803                      8,037
## 29                           6,722                 16,803                      8,037
## 30                           6,722                 16,803                      8,037
## 31                           6,722                 16,803                      8,037
## 32                           6,722                 16,803                      8,037
## 33                           6,722                 16,803                      8,037
## 34                           6,722                 16,803                      8,037
## 35                           6,722                 16,803                      8,037
## 36                           6,722                 16,803                      8,037
## 37                           6,722                 16,803                      8,037
## 38                           6,722                 16,803                      8,037
## 39                           6,722                 16,803                      8,037
## 40                           6,722                 16,803                      8,037
## 41                           6,722                 16,803                      8,037
## 42                           6,722                 16,803                      8,037
## 43                           6,722                 16,803                      8,037
## 44                           6,722                 16,803                      8,037
## 45                           6,722                 16,803                      8,037
## 46                           6,722                 16,803                      8,037
## 47                           6,722                 16,803                      8,037
## 48                           6,722                 16,803                      8,037
## 49                           6,722                 16,803                      8,037
## 50                           6,722                 16,803                      8,037
##     Mollusc.Species.Assessed Other.Invertebrate.Species.Assessed
## 1                      8,627                              5,222
## 2                      8,627                              5,222
## 3                      8,627                              5,222
## 4                      8,627                              5,222
## 5                      8,627                              5,222
## 6                      8,627                              5,222
## 7                      8,627                              5,222
## 8                      8,627                              5,222
## 9                      8,627                              5,222
## 10                     8,627                              5,222
## 11                     8,627                              5,222
## 12                     8,627                              5,222
## 13                     8,627                              5,222
## 14                     8,627                              5,222
## 15                     8,627                              5,222
## 16                     8,627                              5,222
## 17                     8,627                              5,222
## 18                     8,627                              5,222
## 19                     8,627                              5,222
## 20                     8,627                              5,222
## 21                     8,627                              5,222
## 22                     8,627                              5,222
## 23                     8,627                              5,222
## 24                     8,627                              5,222
## 25                     8,627                              5,222
## 26                     8,627                              5,222
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## 27                   8,627                       5,222
## 28                   8,627                       5,222
## 29                   8,627                       5,222
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## 31                   8,627                       5,222
## 32                   8,627                       5,222
## 33                   8,627                       5,222
## 34                   8,627                       5,222
## 35                   8,627                       5,222
## 36                   8,627                       5,222
## 37                   8,627                       5,222
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## 39                   8,627                       5,222
## 40                   8,627                       5,222
## 41                   8,627                       5,222
## 42                   8,627                       5,222
## 43                   8,627                       5,222
## 44                   8,627                       5,222
## 45                   8,627                       5,222
## 46                   8,627                       5,222
## 47                   8,627                       5,222
## 48                   8,627                       5,222
## 49                   8,627                       5,222
## 50                   8,627                       5,222
##     Plant.Species.Assessed Fungus...Protist.Species.Assessed
## 1                   27,514                               81
## 2                   27,514                               81
## 3                   27,514                               81
## 4                   27,514                               81
## 5                   27,514                               81
## 6                   27,514                               81
## 7                   27,514                               81
## 8                   27,514                               81
## 9                   27,514                               81
## 10                  27,514                               81
## 11                  27,514                               81
## 12                  27,514                               81
## 13                  27,514                               81
## 14                  27,514                               81
## 15                  27,514                               81
## 16                  27,514                               81
## 17                  27,514                               81
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## 19                  27,514                               81
## 20                  27,514                               81
## 21                  27,514                               81
## 22                  27,514                               81
## 23                  27,514                               81
## 24                  27,514                               81
## 25                  27,514                               81
## 26                  27,514                               81
## 27                  27,514                               81
## 28                  27,514                               81
## 29                  27,514                               81
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## 30                    27,514                            81
## 31                    27,514                            81
## 32                    27,514                            81
## 33                    27,514                            81
## 34                    27,514                            81
## 35                    27,514                            81
## 36                    27,514                            81
## 37                    27,514                            81
## 38                    27,514                            81
## 39                    27,514                            81
## 40                    27,514                            81
## 41                    27,514                            81
## 42                    27,514                            81
## 43                    27,514                            81
## 44                    27,514                            81
## 45                    27,514                            81
## 46                    27,514                            81
## 47                    27,514                            81
## 48                    27,514                            81
## 49                    27,514                            81
## 50                    27,514                            81
##     Mammal.Species.Critically.Endangered Bird.Species.Critically.Endangered
## 1                                     201                                224
## 2                                     201                                224
## 3                                     201                                224
## 4                                     201                                224
## 5                                     201                                224
## 6                                     201                                224
## 7                                     201                                224
## 8                                     201                                224
## 9                                     201                                224
## 10                                    201                                224
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## 19                                    201                                224
## 20                                    201                                224
## 21                                    201                                224
## 22                                    201                                224
## 23                                    201                                224
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## 25                                    201                                224
## 26                                    201                                224
## 27                                    201                                224
## 28                                    201                                224
## 29                                    201                                224
## 30                                    201                                224
## 31                                    201                                224
## 32                                    201                                224
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## 33                                        201                                    224
## 34                                        201                                    224
## 35                                        201                                    224
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## 44                                        201                                    224
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## 46                                        201                                    224
## 47                                        201                                    224
## 48                                        201                                    224
## 49                                        201                                    224
## 50                                        201                                    224
##      Reptile.Species.Critically.Endangered
## 1                                       287
## 2                                       287
## 3                                       287
## 4                                       287
## 5                                       287
## 6                                       287
## 7                                       287
## 8                                       287
## 9                                       287
## 10                                      287
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## 25                                      287
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## 27                                      287
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## 34                                      287
## 35                                      287
```

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## 36                                                        287
## 37                                                        287
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## 42                                                        287
## 43                                                        287
## 44                                                        287
## 45                                                        287
## 46                                                        287
## 47                                                        287
## 48                                                        287
## 49                                                        287
## 50                                                        287
##      Amphibian.Species.Critically.Endangered Fish.Species.Critically.Endangered
## 1                                        550                                486
## 2                                        550                                486
## 3                                        550                                486
## 4                                        550                                486
## 5                                        550                                486
## 6                                        550                                486
## 7                                        550                                486
## 8                                        550                                486
## 9                                        550                                486
## 10                                       550                                486
## 11                                       550                                486
## 12                                       550                                486
## 13                                       550                                486
## 14                                       550                                486
## 15                                       550                                486
## 16                                       550                                486
## 17                                       550                                486
## 18                                       550                                486
## 19                                       550                                486
## 20                                       550                                486
## 21                                       550                                486
## 22                                       550                                486
## 23                                       550                                486
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## 25                                       550                                486
## 26                                       550                                486
## 27                                       550                                486
## 28                                       550                                486
## 29                                       550                                486
## 30                                       550                                486
## 31                                       550                                486
## 32                                       550                                486
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## 34                                       550                                486
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## 36                                       550                                486
## 37                                       550                                486
## 38                                       550                                486
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## 39                                550                       486
## 40                                550                       486
## 41                                550                       486
## 42                                550                       486
## 43                                550                       486
## 44                                550                       486
## 45                                550                       486
## 46                                550                       486
## 47                                550                       486
## 48                                550                       486
## 49                                550                       486
## 50                                550                       486
##    Insect.Species.Critically.Endangered Mollusc.Species.Critically.Endangered
## 1                                   300                                   633
## 2                                   300                                   633
## 3                                   300                                   633
## 4                                   300                                   633
## 5                                   300                                   633
## 6                                   300                                   633
## 7                                   300                                   633
## 8                                   300                                   633
## 9                                   300                                   633
## 10                                  300                                   633
## 11                                  300                                   633
## 12                                  300                                   633
## 13                                  300                                   633
## 14                                  300                                   633
## 15                                  300                                   633
## 16                                  300                                   633
## 17                                  300                                   633
## 18                                  300                                   633
## 19                                  300                                   633
## 20                                  300                                   633
## 21                                  300                                   633
## 22                                  300                                   633
## 23                                  300                                   633
## 24                                  300                                   633
## 25                                  300                                   633
## 26                                  300                                   633
## 27                                  300                                   633
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## 37                                  300                                   633
## 38                                  300                                   633
## 39                                  300                                   633
## 40                                  300                                   633
## 41                                  300                                   633
```

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## 42                                    300                                    633
## 43                                    300                                    633
## 44                                    300                                    633
## 45                                    300                                    633
## 46                                    300                                    633
## 47                                    300                                    633
## 48                                    300                                    633
## 49                                    300                                    633
## 50                                    300                                    633
##    Other.Invertebrate.Species.Critically.Endangered
## 1                                                252
## 2                                                252
## 3                                                252
## 4                                                252
## 5                                                252
## 6                                                252
## 7                                                252
## 8                                                252
## 9                                                252
## 10                                               252
## 11                                               252
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## 13                                               252
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## 15                                               252
## 16                                               252
## 17                                               252
## 18                                               252
## 19                                               252
## 20                                               252
## 21                                               252
## 22                                               252
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## 30                                               252
## 31                                               252
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## 33                                               252
## 34                                               252
## 35                                               252
## 36                                               252
## 37                                               252
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## 42                                               252
## 43                                               252
## 44                                               252
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## 45                                                    252
## 46                                                    252
## 47                                                    252
## 48                                                    252
## 49                                                    252
## 50                                                    252
##     Plant.Species.Critically.Endangered
## 1                              2879
## 2                              2879
## 3                              2879
## 4                              2879
## 5                              2879
## 6                              2879
## 7                              2879
## 8                              2879
## 9                              2879
## 10                             2879
## 11                             2879
## 12                             2879
## 13                             2879
## 14                             2879
## 15                             2879
## 16                             2879
## 17                             2879
## 18                             2879
## 19                             2879
## 20                             2879
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## 25                             2879
## 26                             2879
## 27                             2879
## 28                             2879
## 29                             2879
## 30                             2879
## 31                             2879
## 32                             2879
## 33                             2879
## 34                             2879
## 35                             2879
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## 37                             2879
## 38                             2879
## 39                             2879
## 40                             2879
## 41                             2879
## 42                             2879
## 43                             2879
## 44                             2879
## 45                             2879
## 46                             2879
## 47                             2879
```

```
## 48                                                2879
## 49                                                2879
## 50                                                2879
##    Fungus...Protist.Species.Critically.Endangered Mammal.Species..Endangered
## 1                                               14                        482
## 2                                               14                        482
## 3                                               14                        482
## 4                                               14                        482
## 5                                               14                        482
## 6                                               14                        482
## 7                                               14                        482
## 8                                               14                        482
## 9                                               14                        482
## 10                                              14                        482
## 11                                              14                        482
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## 13                                              14                        482
## 14                                              14                        482
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## 17                                              14                        482
## 18                                              14                        482
## 19                                              14                        482
## 20                                              14                        482
## 21                                              14                        482
## 22                                              14                        482
## 23                                              14                        482
## 24                                              14                        482
## 25                                              14                        482
## 26                                              14                        482
## 27                                              14                        482
## 28                                              14                        482
## 29                                              14                        482
## 30                                              14                        482
## 31                                              14                        482
## 32                                              14                        482
## 33                                              14                        482
## 34                                              14                        482
## 35                                              14                        482
## 36                                              14                        482
## 37                                              14                        482
## 38                                              14                        482
## 39                                              14                        482
## 40                                              14                        482
## 41                                              14                        482
## 42                                              14                        482
## 43                                              14                        482
## 44                                              14                        482
## 45                                              14                        482
## 46                                              14                        482
## 47                                              14                        482
## 48                                              14                        482
## 49                                              14                        482
## 50                                              14                        482
```

```
##    Bird.Species..Endangered Reptile.Species..Endangered
## 1                       469                        515
## 2                       469                        515
## 3                       469                        515
## 4                       469                        515
## 5                       469                        515
## 6                       469                        515
## 7                       469                        515
## 8                       469                        515
## 9                       469                        515
## 10                      469                        515
## 11                      469                        515
## 12                      469                        515
## 13                      469                        515
## 14                      469                        515
## 15                      469                        515
## 16                      469                        515
## 17                      469                        515
## 18                      469                        515
## 19                      469                        515
## 20                      469                        515
## 21                      469                        515
## 22                      469                        515
## 23                      469                        515
## 24                      469                        515
## 25                      469                        515
## 26                      469                        515
## 27                      469                        515
## 28                      469                        515
## 29                      469                        515
## 30                      469                        515
## 31                      469                        515
## 32                      469                        515
## 33                      469                        515
## 34                      469                        515
## 35                      469                        515
## 36                      469                        515
## 37                      469                        515
## 38                      469                        515
## 39                      469                        515
## 40                      469                        515
## 41                      469                        515
## 42                      469                        515
## 43                      469                        515
## 44                      469                        515
## 45                      469                        515
## 46                      469                        515
## 47                      469                        515
## 48                      469                        515
## 49                      469                        515
## 50                      469                        515
##    Amphibian.Species..Endangered Fish.Species..Endangered
## 1                            903                      674
## 2                            903                      674
```

```
## 3                                903                     674
## 4                                903                     674
## 5                                903                     674
## 6                                903                     674
## 7                                903                     674
## 8                                903                     674
## 9                                903                     674
## 10                               903                     674
## 11                               903                     674
## 12                               903                     674
## 13                               903                     674
## 14                               903                     674
## 15                               903                     674
## 16                               903                     674
## 17                               903                     674
## 18                               903                     674
## 19                               903                     674
## 20                               903                     674
## 21                               903                     674
## 22                               903                     674
## 23                               903                     674
## 24                               903                     674
## 25                               903                     674
## 26                               903                     674
## 27                               903                     674
## 28                               903                     674
## 29                               903                     674
## 30                               903                     674
## 31                               903                     674
## 32                               903                     674
## 33                               903                     674
## 34                               903                     674
## 35                               903                     674
## 36                               903                     674
## 37                               903                     674
## 38                               903                     674
## 39                               903                     674
## 40                               903                     674
## 41                               903                     674
## 42                               903                     674
## 43                               903                     674
## 44                               903                     674
## 45                               903                     674
## 46                               903                     674
## 47                               903                     674
## 48                               903                     674
## 49                               903                     674
## 50                               903                     674
##     Insect.Species..Endangered Mollusc.Species..Endangered
## 1                          537                         546
## 2                          537                         546
## 3                          537                         546
## 4                          537                         546
## 5                          537                         546
```

```
## 6                            537                            546
## 7                            537                            546
## 8                            537                            546
## 9                            537                            546
## 10                           537                            546
## 11                           537                            546
## 12                           537                            546
## 13                           537                            546
## 14                           537                            546
## 15                           537                            546
## 16                           537                            546
## 17                           537                            546
## 18                           537                            546
## 19                           537                            546
## 20                           537                            546
## 21                           537                            546
## 22                           537                            546
## 23                           537                            546
## 24                           537                            546
## 25                           537                            546
## 26                           537                            546
## 27                           537                            546
## 28                           537                            546
## 29                           537                            546
## 30                           537                            546
## 31                           537                            546
## 32                           537                            546
## 33                           537                            546
## 34                           537                            546
## 35                           537                            546
## 36                           537                            546
## 37                           537                            546
## 38                           537                            546
## 39                           537                            546
## 40                           537                            546
## 41                           537                            546
## 42                           537                            546
## 43                           537                            546
## 44                           537                            546
## 45                           537                            546
## 46                           537                            546
## 47                           537                            546
## 48                           537                            546
## 49                           537                            546
## 50                           537                            546
##     Other.Invertebrate.Species..Endangered Plant.Species..Endangered
## 1                                       348                      4537
## 2                                       348                      4537
## 3                                       348                      4537
## 4                                       348                      4537
## 5                                       348                      4537
## 6                                       348                      4537
## 7                                       348                      4537
## 8                                       348                      4537
```

```
## 9                                    348                  4537
## 10                                   348                  4537
## 11                                   348                  4537
## 12                                   348                  4537
## 13                                   348                  4537
## 14                                   348                  4537
## 15                                   348                  4537
## 16                                   348                  4537
## 17                                   348                  4537
## 18                                   348                  4537
## 19                                   348                  4537
## 20                                   348                  4537
## 21                                   348                  4537
## 22                                   348                  4537
## 23                                   348                  4537
## 24                                   348                  4537
## 25                                   348                  4537
## 26                                   348                  4537
## 27                                   348                  4537
## 28                                   348                  4537
## 29                                   348                  4537
## 30                                   348                  4537
## 31                                   348                  4537
## 32                                   348                  4537
## 33                                   348                  4537
## 34                                   348                  4537
## 35                                   348                  4537
## 36                                   348                  4537
## 37                                   348                  4537
## 38                                   348                  4537
## 39                                   348                  4537
## 40                                   348                  4537
## 41                                   348                  4537
## 42                                   348                  4537
## 43                                   348                  4537
## 44                                   348                  4537
## 45                                   348                  4537
## 46                                   348                  4537
## 47                                   348                  4537
## 48                                   348                  4537
## 49                                   348                  4537
## 50                                   348                  4537
##    Fungus...Protist.Species..Endangered Mammal.Species.Vulnerable
## 1                                    21                        536
## 2                                    21                        536
## 3                                    21                        536
## 4                                    21                        536
## 5                                    21                        536
## 6                                    21                        536
## 7                                    21                        536
## 8                                    21                        536
## 9                                    21                        536
## 10                                   21                        536
## 11                                   21                        536
```

```
## 12                                   21                    536
## 13                                   21                    536
## 14                                   21                    536
## 15                                   21                    536
## 16                                   21                    536
## 17                                   21                    536
## 18                                   21                    536
## 19                                   21                    536
## 20                                   21                    536
## 21                                   21                    536
## 22                                   21                    536
## 23                                   21                    536
## 24                                   21                    536
## 25                                   21                    536
## 26                                   21                    536
## 27                                   21                    536
## 28                                   21                    536
## 29                                   21                    536
## 30                                   21                    536
## 31                                   21                    536
## 32                                   21                    536
## 33                                   21                    536
## 34                                   21                    536
## 35                                   21                    536
## 36                                   21                    536
## 37                                   21                    536
## 38                                   21                    536
## 39                                   21                    536
## 40                                   21                    536
## 41                                   21                    536
## 42                                   21                    536
## 43                                   21                    536
## 44                                   21                    536
## 45                                   21                    536
## 46                                   21                    536
## 47                                   21                    536
## 48                                   21                    536
## 49                                   21                    536
## 50                                   21                    536
##    Bird.Species.Vulnerable Reptile.Species.Vulnerable
## 1                      799                        505
## 2                      799                        505
## 3                      799                        505
## 4                      799                        505
## 5                      799                        505
## 6                      799                        505
## 7                      799                        505
## 8                      799                        505
## 9                      799                        505
## 10                     799                        505
## 11                     799                        505
## 12                     799                        505
## 13                     799                        505
## 14                     799                        505
```

```
## 15                              799                       505
## 16                              799                       505
## 17                              799                       505
## 18                              799                       505
## 19                              799                       505
## 20                              799                       505
## 21                              799                       505
## 22                              799                       505
## 23                              799                       505
## 24                              799                       505
## 25                              799                       505
## 26                              799                       505
## 27                              799                       505
## 28                              799                       505
## 29                              799                       505
## 30                              799                       505
## 31                              799                       505
## 32                              799                       505
## 33                              799                       505
## 34                              799                       505
## 35                              799                       505
## 36                              799                       505
## 37                              799                       505
## 38                              799                       505
## 39                              799                       505
## 40                              799                       505
## 41                              799                       505
## 42                              799                       505
## 43                              799                       505
## 44                              799                       505
## 45                              799                       505
## 46                              799                       505
## 47                              799                       505
## 48                              799                       505
## 49                              799                       505
## 50                              799                       505
##    Amphibian.Species.Vulnerable Fish.Species.Vulnerable
## 1                           639                    1172
## 2                           639                    1172
## 3                           639                    1172
## 4                           639                    1172
## 5                           639                    1172
## 6                           639                    1172
## 7                           639                    1172
## 8                           639                    1172
## 9                           639                    1172
## 10                          639                    1172
## 11                          639                    1172
## 12                          639                    1172
## 13                          639                    1172
## 14                          639                    1172
## 15                          639                    1172
## 16                          639                    1172
## 17                          639                    1172
```

```
## 18                             639                 1172
## 19                             639                 1172
## 20                             639                 1172
## 21                             639                 1172
## 22                             639                 1172
## 23                             639                 1172
## 24                             639                 1172
## 25                             639                 1172
## 26                             639                 1172
## 27                             639                 1172
## 28                             639                 1172
## 29                             639                 1172
## 30                             639                 1172
## 31                             639                 1172
## 32                             639                 1172
## 33                             639                 1172
## 34                             639                 1172
## 35                             639                 1172
## 36                             639                 1172
## 37                             639                 1172
## 38                             639                 1172
## 39                             639                 1172
## 40                             639                 1172
## 41                             639                 1172
## 42                             639                 1172
## 43                             639                 1172
## 44                             639                 1172
## 45                             639                 1172
## 46                             639                 1172
## 47                             639                 1172
## 48                             639                 1172
## 49                             639                 1172
## 50                             639                 1172
##     Insect.Species.Vulnerable Mollusc.Species.Vulnerable
## 1                         700                 1016
## 2                         700                 1016
## 3                         700                 1016
## 4                         700                 1016
## 5                         700                 1016
## 6                         700                 1016
## 7                         700                 1016
## 8                         700                 1016
## 9                         700                 1016
## 10                        700                 1016
## 11                        700                 1016
## 12                        700                 1016
## 13                        700                 1016
## 14                        700                 1016
## 15                        700                 1016
## 16                        700                 1016
## 17                        700                 1016
## 18                        700                 1016
## 19                        700                 1016
## 20                        700                 1016
```

```
## 21                          700                  1016
## 22                          700                  1016
## 23                          700                  1016
## 24                          700                  1016
## 25                          700                  1016
## 26                          700                  1016
## 27                          700                  1016
## 28                          700                  1016
## 29                          700                  1016
## 30                          700                  1016
## 31                          700                  1016
## 32                          700                  1016
## 33                          700                  1016
## 34                          700                  1016
## 35                          700                  1016
## 36                          700                  1016
## 37                          700                  1016
## 38                          700                  1016
## 39                          700                  1016
## 40                          700                  1016
## 41                          700                  1016
## 42                          700                  1016
## 43                          700                  1016
## 44                          700                  1016
## 45                          700                  1016
## 46                          700                  1016
## 47                          700                  1016
## 48                          700                  1016
## 49                          700                  1016
## 50                          700                  1016
##    Other.Invertebrate.Species.Vulnerable Plant.Species.Vulnerable
## 1                                     708                     5883
## 2                                     708                     5883
## 3                                     708                     5883
## 4                                     708                     5883
## 5                                     708                     5883
## 6                                     708                     5883
## 7                                     708                     5883
## 8                                     708                     5883
## 9                                     708                     5883
## 10                                    708                     5883
## 11                                    708                     5883
## 12                                    708                     5883
## 13                                    708                     5883
## 14                                    708                     5883
## 15                                    708                     5883
## 16                                    708                     5883
## 17                                    708                     5883
## 18                                    708                     5883
## 19                                    708                     5883
## 20                                    708                     5883
## 21                                    708                     5883
## 22                                    708                     5883
## 23                                    708                     5883
```

```
## 24                                     708                     5883
## 25                                     708                     5883
## 26                                     708                     5883
## 27                                     708                     5883
## 28                                     708                     5883
## 29                                     708                     5883
## 30                                     708                     5883
## 31                                     708                     5883
## 32                                     708                     5883
## 33                                     708                     5883
## 34                                     708                     5883
## 35                                     708                     5883
## 36                                     708                     5883
## 37                                     708                     5883
## 38                                     708                     5883
## 39                                     708                     5883
## 40                                     708                     5883
## 41                                     708                     5883
## 42                                     708                     5883
## 43                                     708                     5883
## 44                                     708                     5883
## 45                                     708                     5883
## 46                                     708                     5883
## 47                                     708                     5883
## 48                                     708                     5883
## 49                                     708                     5883
## 50                                     708                     5883
##     Fungus...Protist.Species.Vulnerable
## 1                                    24
## 2                                    24
## 3                                    24
## 4                                    24
## 5                                    24
## 6                                    24
## 7                                    24
## 8                                    24
## 9                                    24
## 10                                   24
## 11                                   24
## 12                                   24
## 13                                   24
## 14                                   24
## 15                                   24
## 16                                   24
## 17                                   24
## 18                                   24
## 19                                   24
## 20                                   24
## 21                                   24
## 22                                   24
## 23                                   24
## 24                                   24
## 25                                   24
## 26                                   24
```

```
## 27                               24
## 28                               24
## 29                               24
## 30                               24
## 31                               24
## 32                               24
## 33                               24
## 34                               24
## 35                               24
## 36                               24
## 37                               24
## 38                               24
## 39                               24
## 40                               24
## 41                               24
## 42                               24
## 43                               24
## 44                               24
## 45                               24
## 46                               24
## 47                               24
## 48                               24
## 49                               24
## 50                               24
```

```r
inner_join(Single_Measure, Multiple_Measure, by = "Year") %>%
  select(Year, Class, Metric, Number.of.Species) %>%
  group_by(Metric) %>%
  mutate(Species = as.integer(Number.of.Species)) %>%
  filter(!is.na(Species)) %>%
  ggplot() +
  geom_line(mapping = aes(x = Year, y = Species, color = Metric)) +
  facet_wrap(~Class, scales = "free_y")
```

```
## Warning: There was 1 warning in `mutate()`.
## i In argument: `Species = as.integer(Number.of.Species)`.
## i In group 3: `Metric = "Total Assessed"`.
## Caused by warning:
## ! NAs introduced by coercion
```
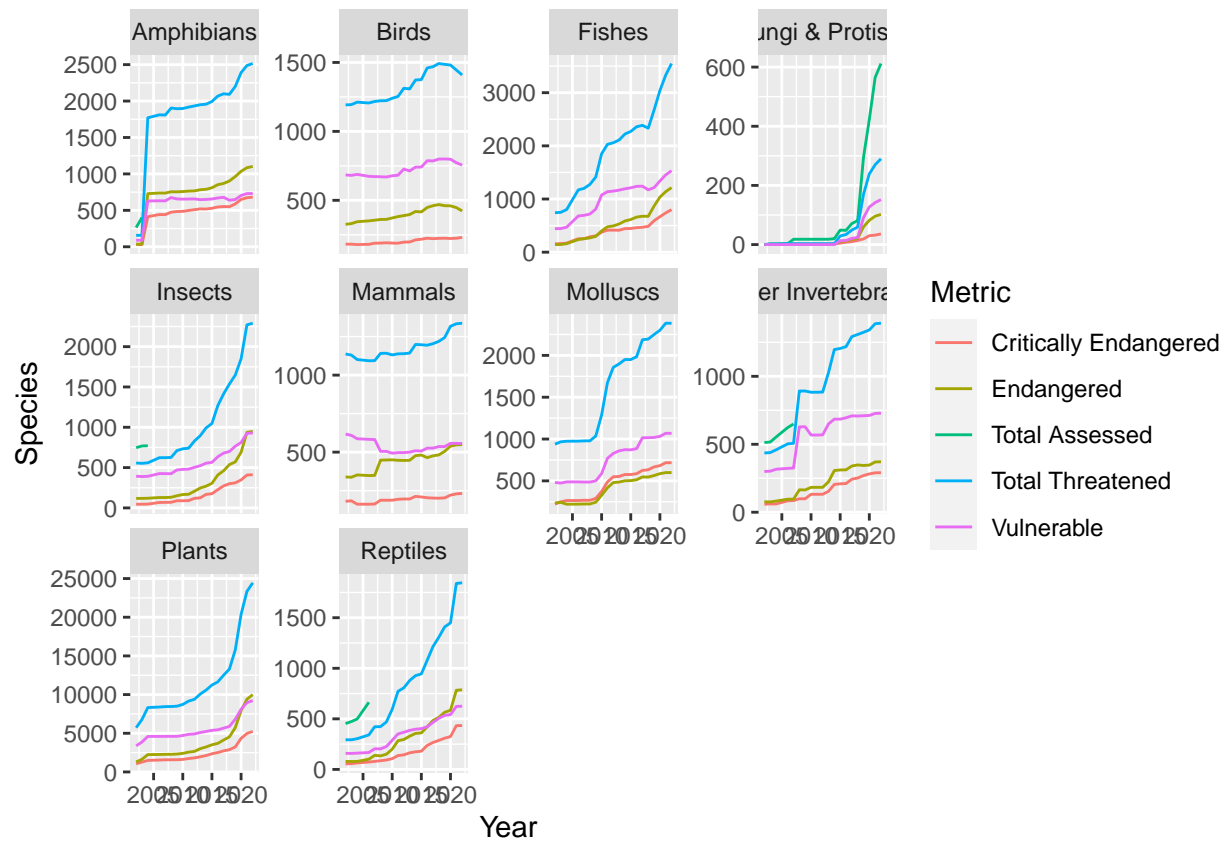
```
Multiple_Measure %>%
  rowwise() %>%
  mutate(endangered = Mammal.Species.Critically.Endangered * Other.Invertebrate.Species.Critically.Endan
  summarize(mean_endangered = mean(endangered))
```

```
## # A tibble: 20 x 1
##    mean_endangered
##              <dbl>
##  1          67512
##  2          66410
##  3          62322
##  4          54810
##  5          50652
##  6          49086
##  7          43044
##  8          43681
##  9          43665
## 10          30184
## 11          25872
## 12          25608
## 13          24816
## 14          18612
## 15          18612
## 16          14018
## 17          13608
```

```
## 18            9882
## 19           11224
## 20           10679
```

```r
#assessed <- function(mass_assessed){
  #if (Year <= 2012){
    #Chordata <- mean(Mammal.Species.Assessed * Bird.Species.Assessed)
    #Amphibia <- mean(Amphibian.Species.Assessed * fish.Species.Assessed)
    #plants <- mean(Plant.Species.Assessed * Fungus...Protist.Species.Assessed)
    #Other <- mean(Reptile.Species.Assessed * Insect.Species.Assessed * Mollusc.Species.Assessed * Othe
#   } else (Year >= 2012){
#     Chordata <- mean(Mammal.Species.Assessed * Bird.Species.Assessed)
#     Amphibia <- mean(Amphibian.Species.Assessed * fish.Species.Assessed)
#     plants <- mean(Plant.Species.Assessed * Fungus...Protist.Species.Assessed)
#     Other <- mean(Reptile.Species.Assessed * Insect.Species.Assessed * Mollusc.Species.Assessed * Oth
#   }
#   return(mass_assessed)
# }
```

```r
SM_tree <- tnrs_match_names(names = "Amphibians")
tol_subtree(ott_id = SM_tree$ott_id)
```

```
## Progress [------------------------------] 0/189 (  0) ?sProgress [==============================]
```

```
## Warning in collapse_singles(tr, show_progress): Dropping singleton nodes with
## labels: Rana clamitans ott515378, Rana sphenocephala ott61437, Rana aurora
## ott771201, Glandirana ott407917, Pterorana ott3618410, Pelophylax cf
## ott7070897, Hemimantis ott4133632, Microdiscopus ott4133623, Montorana
## ott4133633, Chiromantis vittatus ott389176, Mercurana ott4133643, Beddomixalus
## ott4133641, Buergeriinae ott223222, Maitsomantis ott678997, Boehmantis
## ott484429, laevigata group ott189959, bernhardi group ott189958, Wakea
## ott484449, Tsingymantis ott976861, Boophinae ott764200, Laliostoma ott1054409,
## Ombrana ott4133654, Chrysopaa ott4133659, Alcalinae ott5926144, Liurananinae
## ott5926192, Natalobatrachus ott532110, Nothophryne ott3618085, Cacosternum
## nanum ott676305, Microbatrachella ott751405, Poyntonia ott475120, Anhydrophryne
## ott113819, Ericabatrachus ott3618087, Phrynobatrachidae ott504589, Micrixalidae
## ott1081209, Odontobatrachidae ott5536254, Lanzarana ott3618164, Trichobatrachus
## ott780979, Pararthroleptis ott4133674, Hyperolius fusciventris ott85268,
## Chlorolius ott3619081, Tachycnemis (genus in Deuterostomia) ott750024,
## Morerella ott85260, Kassinula ott3619075, Opisthothylax ott645881,
## Chrysobatrachus ott3619077, Callixalus ott3619073, Arlequinus ott3619083,
## Semnodactylus ott62328, Tornierella ott4133669, Breviceps adspersus ott3618690,
## Spelaeophryne ott660153, Probreviceps macrodactylus ott111206, Balebreviceps
## ott348136, Hemisotidae ott165721, Oninia ott789802, Genyophryne ott21522,
## Siamophryne ott7070469, Melanobatrachus ott701612, Kalophrynidae ott977735,
## Phrynella (genus in Opisthokonta) ott401609, Mysticellus ott7070618,
## Dermatonotus ott186184, Gastrophryne olivacea ott565409, Arcovomer ott844415,
## Adelastinae ott5800508, Adelastes ott3618939, Dasypops ott513414, Relictivomer
## ott190096, Anilany ott5926118, Madecassophryne ott3618941, Parhoplophryne
## ott3618937, Otophryninae ott404351, Phrynomerinae ott630304, Caluella
## ott7666463, Corythomantis ott442032, Argenteohyla ott578372, Argenteohyla
## siemersi ott100569, Nyctimantis ott1087156, Itapotihyla ott257368, Hyla
## annectans ott655531, Anotheca ott59159, Diaglena ott3620134, Acris crepitans
```

```
## ott59141, Quilticohyla ott7070260, Rheohyla ott7070262, Nesorohyla ott7070190,
## Pachymedusa ott254792, Dryaderces ott7666055, Didynamipus ott152264,
## Barbarophryne ott5800473, Churamiti ott104959, Bufotes pewzowi ott1072351,
## Schismaderma ott506368, Sabahphrynus ott4133471, Strauchbufo ott6158681,
## Epidalea ott334615, Anaxyrus americanus ott889326, Laurentophryne ott3619734,
## Parapelophryne ott3619737, Pseudobufo ott3619739, Bufoides ott3619731,
## Metaphryniscus ott3619751, Blythophryne ott5926045, Ghatophryne ott7069948,
## Rentapia ott7069968, Silverstoneia nubicola ott638061, Hyloxalinae ott1096759,
## Lithodytes ott315881, Scythrophrys ott462991, Rupirana ott3620326, Phrynocerus
## ott3619498, Physalaemus ott6158772, Niedenia ott4133301, Allophrynidae
## ott57740, Macrogenioglottus ott726713, Insuetophrynus ott44381, Telmatobiinae
## ott777187, Hylorina ott440882, Chaltenobatrachus ott6158620, Limnomedusa
## ott914517, Chacophrys ott431943, Caudiverbera ott1068325, Atopophrynus
## ott3620196, Geobatrachus ott3620197, Ceuthomantinae ott277741, Megistolotis
## ott276283, Adelotus ott276281, Assa (genus in Opisthokonta) ott906692,
## Paracrinia ott989413, Metacrinia ott412471, Spicospina ott1039925,
## Rheobatrachidae ott918183, Hadromophryne ott971912, Atympanophrys ott542885,
## Vibrissaphora ott535112, Pelodytidae ott509554, Xenopodinae ott940173,
## Pseudhymenochirus ott140873, Rhinophrynidae ott459016, Rhinophrynus ott459015,
## Alytinae ott5334814, Discoglossus galganoi ott461369, Latonia ott4948216,
## Leiopelmatidae ott611960, Ascaphidae ott1013114, Pelodryadidae ott3620482,
## Ranoidea (genus in family Pelodryadidae) ott7666856, Iranodon ott7071233,
## Ranodon ott834698, Satobius ott5800418, Pachyhynobius ott1021854,
## Ambystomatidae ott984723, Dicamptodontidae ott60819, Laotriton ott4948201,
## Triturus marmoratus ott1041767, Triturus carnifex ott1041783, Ommatotriton
## ophryticus ott645229, Lissotriton helveticus ott9366, Lissotriton boscai
## ott830424, Tylototriton verrucosus ott932561, Tylototriton wenxianensis
## ott981376, Pleurodeles waltl ott566038, Lyciasalamandra fazilae ott1024882,
## Salamandrininae ott4948210, Pingia ott4132654, Isthmura bellii ott46162,
## Isthmura sierraoccidentalis ott98841, Parvimolge ott46159, Bradytriton
## ott798666, Nyctanolis ott224306, Haideotriton ott133635, Eurycea multiplicata
## ott839995, Stereochilus (genus in Opisthokonta) ott798664, Hemidactylium
## ott798658, Phaeognathus ott964128, Karsenia ott893551, Ensatina ott64118,
## Hydromantes imperialis ott675243, Atylodes (genus in Deuterostomia) ott693464,
## Hydromantoides ott4132648, Amphiumidae ott566022, Rhyacotritonidae ott459010,
## Sirenoidea ott336754, Chikilidae ott4948197, Praslinia ott80530, Sylvacaecilia
## ott3617918, Atretochoana ott3617929, Potamotyphlus ott7667119, Bdellophis
## ott4132629
##
##
## Phylogenetic tree with 10020 tips and 4669 internal nodes.
##
## Tip labels:
##   Odorrana_geminata_ott114, Odorrana_chapaensis_ott214633, Odorrana_grahami_ott43280, Odorrana_marga
## Node labels:
##   Amphibia ott544595, Batrachia ott471197, Anura ott991547, , , , , ...
##
## Unrooted; no branch lengths.
```

SM_tree

```
##   search_string unique_name approximate_match ott_id is_synonym flags
## 1    amphibians    Amphibia             TRUE 544595      FALSE
```

```
##   number_matches
## 1             6
```

```r
MM_tree <- tnrs_match_names(names = "Mollusc")
tol_subtree(ott_id = MM_tree$ott_id)
```

```
## Progress [-------------------------------] 0/2732 (  0) ?sProgress [----------------------] 17/2
```

```
## Warning in collapse_singles(tr, show_progress): Dropping singleton nodes with
## labels: Cyclophorus perdix ott5263410, Cyclosurus ott4960866, Aulopoma
## ott4960836, Elgonocyclus ott4960861, Micraulax ott4960842, Tropidogyra
## ott2929163, Opisthostoma brachyacrum ott5321522, Opisthostoma wallacei
## ott5321542, Diplommatina superba ott230617, Eclogarinia ott7944368, Benigoma
## ott7943995, Clostophis ott4960785, Entypogyra ott2921765, Euthema ott7944370,
## Niahia ott4960771, Pseudonicida ott2920653, Pugnellia ott2923692, Cochlostoma
## adamii ott4960750, Cochlostoma nanum ott4960744, Cochlostoma achaicum
## ott4960727, Cochlostoma roseoli ott179550, Cochlostoma septemspirale ott500894,
## Rhabdotakra ott2925543, Toffolettia ott4961035, Imerezia ott5693100,
## Apolloniana ott2920370, Naggsiaconcha ott4960850, Proelektrea ott2915564,
## Cochlostoma henricae ott4960712, Alpinipupina ott7945022, Cordillerapina
## ott7945035, Cretatortulosa ott7945037, Cyclomastoma ott2919611, Kanapa
## ott4159422, Protocallia ott2925199, Sulapina ott2914462, Daronia ott2916865,
## Cyclopedus ott7944913, Cyclovendreysia ott4961011, Mexcyclotus ott4961018,
## Rugicyclotus ott2925604, Xenocyclus ott4960924, Neomaizania ott4159465,
## Thomeomaizania ott4159464, Viviparoidea ott7494476, Cipangopaludina chinensis
## ott64315, Bellamya unicolor ott684902, Bellamya heudi ott846670, Margarya
## melanioides ott96205, Filopaludina sumatrensis ott212983, Filopaludina martensi
## ott6353794, Sinotaia quadrata ott884084, Heterogen ott4159417, Eyriesia
## ott4159415, Trochopaludina ott2920648, Apameaus ott7945290, Boganmargarya
## ott7945379, Celetaia ott7945381, Fretacaeles ott7945387, Glaucostracia
## ott2927416, Igapaludina ott2922102, Kaya ott2918916, Macromargarya ott7945457,
## Pedinopomus ott2917850, Rubeyella ott2925012, Scalipaludina ott2917843,
## Wealdenia ott2919142, Ampullarioidea ott560991, Forbesopomus ott4159402, Penion
## cuvierianus ott2900470, Neobuccinum ott265007, Cominella nassoides ott2900573,
## Cominella mirabilis ott2900614, Cominella quoyana ott2900596, Godfreyena
## ott4157041, Buccinulum pertinax ott2900704, Buccinulum linea ott843181,
## Sulcosinus ott2901776, Parficulina ott2901242, Appisana ott2901268,
## Chlanificula ott2901274, Volutopsion ott2901276, Chauvetea ott2901278,
## Corneobuccinum ott2901284, Micrologus ott2901288, Ornatoconcha ott2901299,
## Parancistrolepis ott2901210, Turrivolutopsius ott2901328, Euthriostoma
## ott2901571, Steye ott2901616, Ptychosalpinx ott2901522, Pseudoneptunea
## ott2901375, Fascinus ott2901891, Strebela ott5704753, Chickcharnea ott4156966,
## Spikebuccinum ott4156995, Fusinella ott2926037, Helicofusus ott4157006,
## Germonea ott4157009, Bathyancistrolepis ott4157033, Eclectofusus ott5704754,
## Falsimacme ott7495785, Anomacme ott4157121, Muffinbuccinum ott4157124,
## Buccininae ott7495742, Buccinulini ott2911728, Crenatosipho ott4157126,
## Drepanodontus ott4157128, Paracalliloncha ott4958686, Anna (genus in
## Lophotrochozoa) ott4958689, Aidemofusus ott5704755, Chlanidotella ott7495769,
## Minioniella ott7495811, Akiracolus ott7950745, Dorsaninae ott5704760, Bulliinae
## ott5704758, Neoteron ott2901197, Buccinanopsinae ott7496017, Busycotypus
## ott33661, Busycoarctum ott2920079, Trophonofusus ott2898347, Harasewychia
## ott2898333, Ollaphon ott2898599, Angulofusus ott5321421, Tarantinaea
## ott5722733, Fractolatirus ott2898408, Nodopelagia ott2898613, Lightbournus
```

```
## ott4157234, Dentifusus ott4157268, Aurantilaria ott5722740, Opeatostoma
## ott2898521, Fusilaria ott5722739, Parvofusus ott7951801, Pseudolathyrus
## ott7951835, Taphon ott2899433, Minibraria ott2910697, Axifex ott7951081,
## Pictocolumbella ott2899770, Salitra ott2899792, Nodochila ott2899884, Zetekia
## ott2899906, Cilara ott2899835, Rhombinella ott2899972, Zella ott2900151,
## Pseudanachis ott2899819, Gatliffena ott2900270, Glyptanachis ott4156915,
## Bifurcium ott4156939, Ramoliva ott7495922, Alcira ott4156899, Euspiralta
## ott5704768, Columbellina ott2900271, Ithiaesopus ott2921219, Lavesopus
## ott4156946, Trahaldia ott7951362, Belomitridae ott5693112, Cancellarioidea
## ott178259, Cancellicula ott5723226, Fusiaphera ott382377, Cancellaphera
## ott4156877, Cancellariinae ott5704851, Oamaruia ott2902565, Gergovia
## ott2902525, Nevia ott4156880, Terenolla ott581846, Arielia ott2911052, Conus
## damottai ott700915, Conus navarroi ott1092956, Conus grahami ott1092955, Conus
## anabathrum ott2903405, Conus buxeus ott2903299, Conus princeps ott835879, Conus
## cedonulli ott2903687, Conus generalis ott261276, Conus ochroleucus ott457444,
## Conus regius ott835874, Conus cancellatus ott700914, Conus textile ott126307,
## Conus magus ott126318, Conus arenatus ott170806, Conus praecellens ott42557,
## Conus daucus ott707666, Conus vexillum ott16228, Conus miliaris ott351605,
## Estellarca ott45581, Conasprella comatosa ott451667, Californiconus ott2904043,
## Kenyonia ott4157552, Kioconus ott7496306, Plagioconus ott7952677, Turridrupa
## bijubata ott65036, Dotomella ott2910744, Typhosyrinx ott2911074, Epidirella
## ott2911461, Rhodopeoma ott2911713, Paraclathrella ott2912280, Decollidrillia
## ott2911813, Gurales ott2914246, Domenginella ott4157373, Gemmulopsis
## ott7953908, Ingaunoturricula ott4157397, Hauturua ott2912708, Comarmondia
## ott2912819, Strombinoturris ott2911482, Turricula nelliae ott151996,
## Caliendrula ott2910651, Trachydrillia ott2910157, Benthoclionella ott2913644,
## Belaturricula turrita ott2912505, Austroturris ott2913615, Darbya ott4958990,
## Austrocarina ott2910568, Naskia ott4158114, Aguilaria ott2910982, Abyssocomitas
## ott2910639, Kurodadrillia ott2910805, Anticomitas ott2909997, Conorbela
## ott2911597, Conticosta ott2911974, Hormospira ott2912723, Antimelatoma
## ott2913480, Cretaspira ott2911286, Dallspira ott4157599, Monilispira
## ott4157610, Toxicochlespira ott142637, Vitricythara ott2904124, Oenopotella
## ott2910201, Vitjazinella ott2910203, Bellacythara ott2911976, Apitua
## ott2912388, Cacodaphnella ott2910197, Paraspirotropis ott2911869, Suturocythara
## ott4158085, Euryentmema ott2910414, Thatcheria ott454998, Truncadaphne
## ott2902709, Tuskaroria ott2902737, Microgenia ott2902701, Glyphostomoides
## ott2902731, Abyssobela ott2902772, Zenepos ott2904260, Abyssothauma ott4157302,
## Vepridaphne ott4157309, Awheaturris ott2917675, Pseudolusitanops ott7953415,
## Ancistrosyrinx ott2910454, Artemidiconus ott2910053, Bouchetispiridae
## ott4959721, Bouchetispira ott4959722, Emozamia ott2910147, Rhizochilus
## ott2910944, Liniaxis ott2911261, Mexacanthina lugubris ott741356, Chorus
## ott1033820, Ocenotrophon ott2911160, Roperia (genus in Opisthokonta)
## ott2910468, Crassilabrum ott2910478, Pterorytis ott2910797, Muregina
## ott2910481, Calcitrapessa ott2913553, Inermicosta ott4157678, Trochia
## ott4157680, Chicocenebra ott4157814, Tribulus (genus in Opisthokonta)
## ott278926, Stramonita haemastoma ott663884, Drupa ricinus ott974323,
## Concholepas ott685790, Phrygiomurex ott2911211, Bedevina ott4157723, Xastilia
## ott4157829, Distichotyphis ott2910682, Brasityphis ott4157797, Minortrophon
## ott2911687, Anatrophon ott2911879, Xenotrophon ott2913738, Xymenella
## ott2914065, Lenitrophon ott7496698, Cinclidotyphis ott2913007, Nass ott2910288,
## Heteropurpura ott2923094, Claremontiella ott7954654, Carinomitra ott7496525,
## Magnamitra ott7496538, Neotiara ott7496585, Roseomitra ott7496598, Cymbiini
## ott5704814, Minicymbiola ott2908397, Argentovoluta ott2908450, Zidonini
## ott5723150, Harpovoluta ott2908590, Zidona ott2908435, Athletinae ott5704815,
```

```
## Ampulla ott2908332, Volutini ott5723152, Neptuneopsis ott2908579, Plicolivinae
## ott5704825, Lyriopsis ott6359814, Liopeplum ott2908318, Babylonia formosae
## ott275718, Marigordiella ott2912672, Caribeginella ott5722930, Gibbacousteau
## ott5722931, Marginellona ott2910110, Afrivoluta ott2911969, Moruminae
## ott5704794, Plesiocystiscinae ott5704797, Extra ott2912869, Ticocystiscus
## ott4158024, Pleioptygmatidae ott2911014, Suluspira ott5321452, Enigmavasum
## ott2902023, Cryptofusus ott2902000, Syrinx (genus in phylum Mollusca)
## ott4958803, Fustifusus ott4157144, Tropidofusus ott7496926, Clavogyra
## ott7955859, Tudiclinae ott5704765, Daffymitra ott4157843, Egestas ott2902057,
## Recourtoliva ott7496842, Olivancillariinae ott7955551, Agaroniinae ott7496793,
## Calyptolivinae ott7496794, Eoancilla ott4157915, Triumphis ott2911835,
## Testallium ott4158003, Zoila friendii ott585, Cribrarula cumingii ott15258, F


##
## Phylogenetic tree with 92564 tips and 7259 internal nodes.
##
## Tip labels:
##   Cyclophorus_turgidus_angulatus_ott56, Cyclophorus_turgidus_radians_ott521861, Cyclophorus_turgidus_
## Node labels:
##   Mollusca ott802117, , , , Gastropoda ott409995, , ...
##
## Unrooted; no branch lengths.
```

MM_tree

```
##   search_string unique_name approximate_match ott_id is_synonym flags
## 1       mollusc    Mollusca              TRUE 802117      FALSE
##   number_matches
## 1              1
```

```r
Single_Measure %>%
  mutate(Species = as.integer(Number.of.Species)) %>%
  group_by(Year, Class) %>%
  filter(!is.na(Species)) %>%
  filter(Class == "Birds") %>%
  summarize(bird_mean = mean(Species))
```

```
## Warning: There was 1 warning in `mutate()`.
## i In argument: `Species = as.integer(Number.of.Species)`.
## Caused by warning:
## ! NAs introduced by coercion
```

```
## `summarise()` has grouped output by 'Year'. You can override using the
## `.groups` argument.
```

```
## # A tibble: 20 x 3
## # Groups:   Year [20]
##     Year Class bird_mean
##    <int> <chr>     <dbl>
## 1  2002 Birds       596
## 2  2003 Birds       597
## 3  2004 Birds       606
```

```
##  4  2006 Birds      603
##  5  2007 Birds      608.
##  6  2008 Birds      611
##  7  2009 Birds      612.
##  8  2010 Birds      620
##  9  2011 Birds      626.
## 10  2012 Birds      656.
## 11  2013 Birds      654
## 12  2014 Birds      686.
## 13  2015 Birds      688.
## 14  2016 Birds      730
## 15  2017 Birds      734.
## 16  2018 Birds      746
## 17  2019 Birds      743
## 18  2020 Birds      740.
## 19  2021 Birds      722.
## 20  2022 Birds      704.
```