Whittaker biomes - examples

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Simple example

```
require(plotbiomes)
require(ggplot2)

plot_1 <- ggplot() +
  # add biome polygons
  geom_polygon(data = Whittaker_biomes,
               aes(x      = temp_c,
                   y      = precp_cm,
                   fill   = biome,
                   group  = biome_id),
               # adjust polygon border
               colour = "gray98",
               size   = 1)
plot_1
```

Adding color

Whittaker biomes - using colors as in Figure 5.5 in *Ricklefs, R. E. (2008), The economy of nature. W. H. Freeman and Company.* (Chapter 5, Biological Communities, The biome concept)

```
plot_2 <- plot_1 +
  # fill the polygons with predefined colors
  scale_fill_manual(name   = "Whittaker biomes",
                    breaks = names(Ricklefs_colors),
```

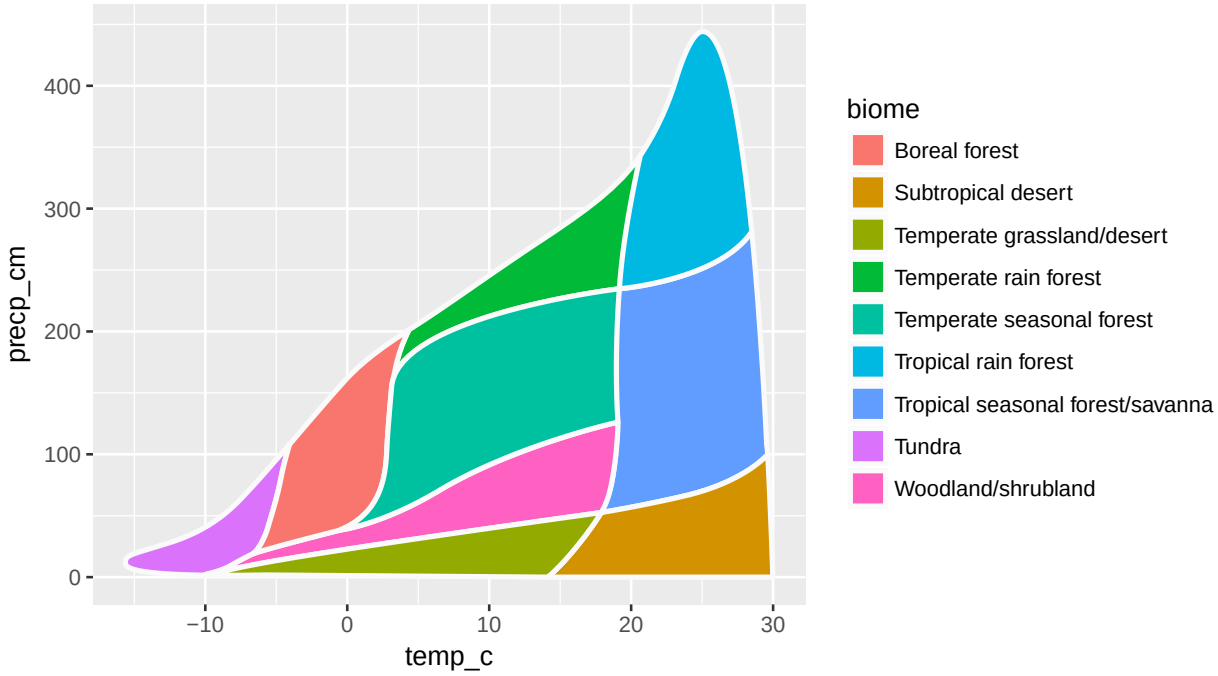

Figure 1: Simple example of Whittaker biome polygons with ggplot

```
                    labels = names(Ricklefs_colors),
                    values = Ricklefs_colors)
plot_2
```

Add data points

Generate random locations and extract temperature and precipitation from WorldClim data.

```
require(raster)
# Read temperature and precipitation as raster stack
path <- system.file("extdata", "temp_pp.tif", package = "plotbiomes")
temp_pp <- raster::stack(path)
names(temp_pp) <- c("temperature", "precipitation")

set.seed(66) # random number generator
# Create random locations within the bounding box of the raster
points <- sp::spsample(as(temp_pp@extent, 'SpatialPolygons'),
                       n = 1000,
                       type = "random")
# Extract temperature and precipitation values from raster
extractions <- raster::extract(temp_pp, points)
extractions <- data.frame(extractions)
# Adjust temperature values to "usual" scale because
# WorldClim temperature data has a scale factor of 10.
extractions$temperature <- extractions$temperature/10
```

Plot the random locations. Note that points outside of rasters coverage will receive NA-s. They will be

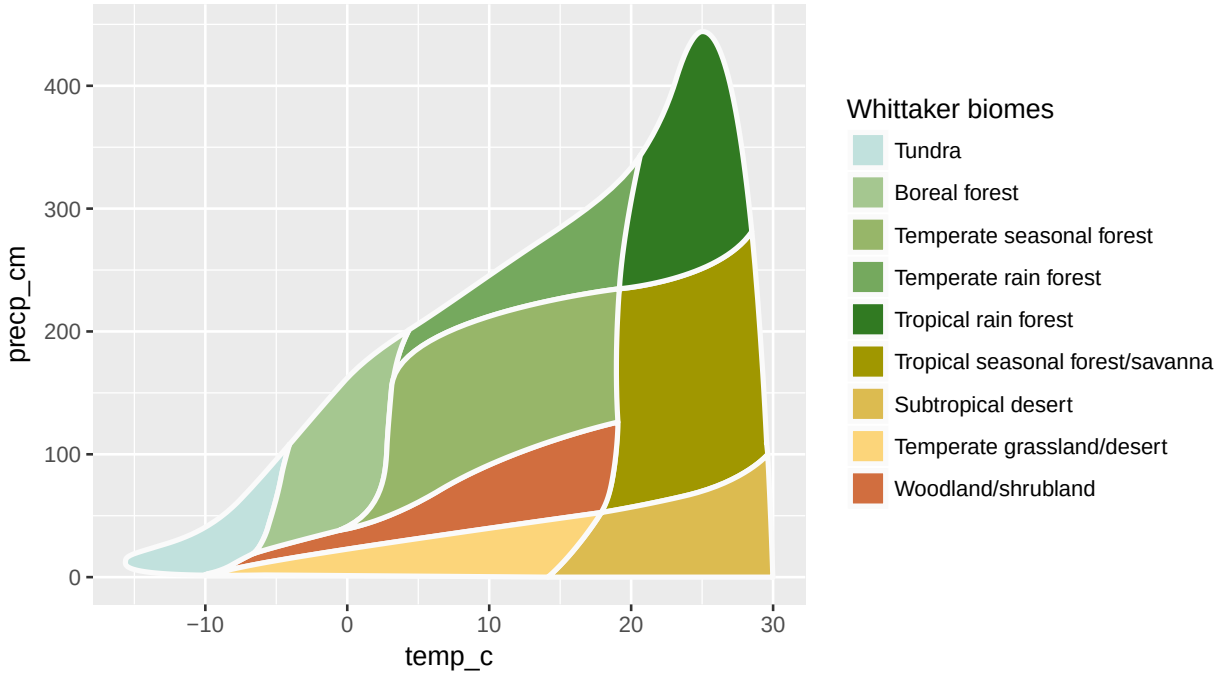

Figure 2: Whittaker biomes - original colors

dropped by ggplot.

```
plot(temp_pp[[1]]/10)
plot(points,add=T)
```

Example of plot incorporating extraction data corresponding to the locations.

```
plot_3 <- plot_2 +
  # add extraction points
  geom_point(data = extractions,
             aes(x      = temperature,
                 y      = precipitation/10),
             size   = 2,
             shape  = 21,
```

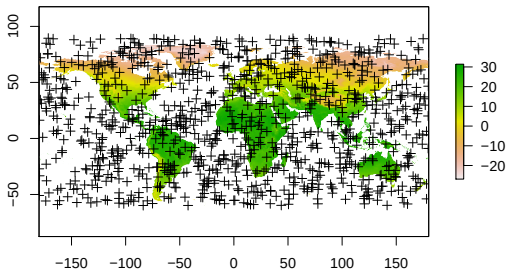

Figure 3: Random locations

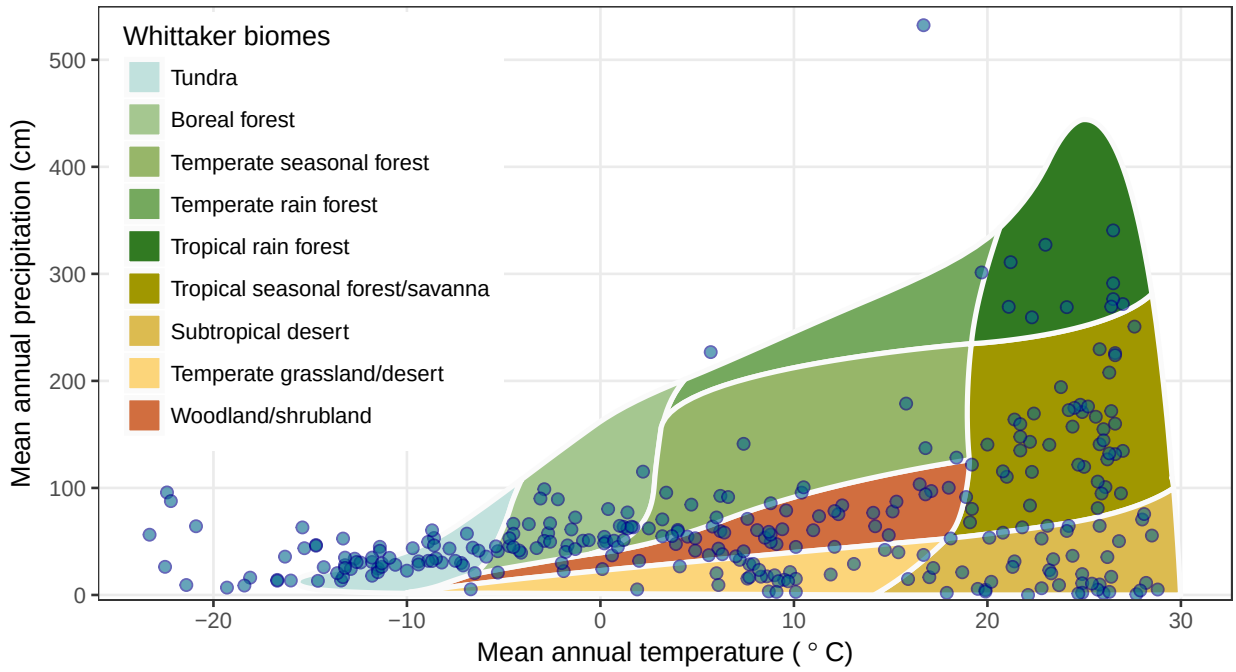

Figure 4: Example of plot with superimposed data extracted from WorldClim

```
              colour = "Blue 4",
              bg     = "Deep Sky Blue 4",
              alpha  = 0.6) +
  # set axes label names
  labs(x = expression("Mean annual temperature ("~degree~"C)"),
       y = "Mean annual precipitation (cm)") +
  # set range on OY axis and adjust the distance (gap) from OX axis
  scale_y_continuous(limits = c(-5, round(max(extractions$precipitation/10,
                                              na.rm = TRUE)/50)*50),
                     expand = c(0, 0)) +
  theme_bw() +
  theme(legend.justification = c(0, 1),      # anchor the upper left corner of the legend box
        legend.position = c(0.01, 0.99),     # adjust the position of the corner relative to axes
        panel.grid.minor = element_blank()) # eliminate minor grids

plot_3
```

```
## Warning: Removed 705 rows containing missing values (geom_point).
```