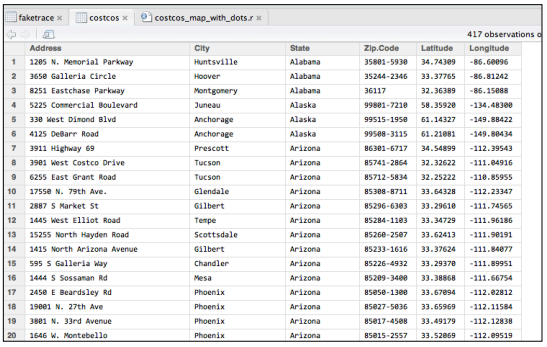
COSTCO LOCATIONS AND MAP WITH LINES

Dots on a map and dots connected by lines

This is part of the exercises described in Chapter 8: Visualizing Spatial Relationships (pp. 276-282) of the book *Visualize This*. It covers putting dots for Costco location on a US, world, and Western Region maps. In addition, it shows how to put dots on a map and connect the dots with lines.

Note: In this exercise, all dots are the same size. For placing circles of different sizes, see the world map with bubbles exercise (Facebook data set – J. Chu), which is partly based on the Scaled Points exercise on pp. 283-285, also in Chapter 8. In that exercise, we also showed how to create a key for the sizes of the circles by creating fake categories (adding rows) in the data set.

For this exercise you need to turn on the maps package in RStudio.



	Address	City	State	Zip.Code	Latitude	Longitude
1	1205 N. Memorial Parkway	Huntsville	Alabama	35801-5930	34.74309	-86.60096
2	3650 Galleria Circle	Hoover	Alabama	35244-2346	33.37765	-86.81242
3	8251 Eastchase Parkway	Montgomery	Alabama	36117	32.36389	-86.15888
4	5225 Commercial Boulevard	Juneau	Alaska	99801-7210	58.35920	-134.48300
5	330 West Dimond Blvd	Anchorage	Alaska	99515-1950	61.14327	-149.88422
6	4125 DeBarr Road	Anchorage	Alaska	99508-3115	61.21081	-149.80434
7	3911 Highway 69	Prescott	Arizona	86301-6717	34.54899	-112.39543
8	3901 West Costco Drive	Tucson	Arizona	85741-2864	32.32622	-111.04916
9	6255 East Grant Road	Tucson	Arizona	85712-5834	32.25222	-110.85955
10	17550 N. 79th Ave.	Glendale	Arizona	85308-8711	33.64328	-112.23347
11	2887 S Market St	Gilbert	Arizona	85296-6303	33.29610	-111.74565
12	1445 West Elliot Road	Tempe	Arizona	85284-1103	33.34729	-111.96186
13	15255 North Hayden Road	Scottsdale	Arizona	85260-2507	33.62413	-111.90191
14	1415 North Arizona Avenue	Gilbert	Arizona	85233-1616	33.37624	-111.84077
15	595 S Galleria Way	Chandler	Arizona	85226-4932	33.29370	-111.89951
16	1444 S Sossaman Rd	Mesa	Arizona	85209-3400	33.38868	-111.66754
17	2450 E Beardsley Rd	Phoenix	Arizona	85050-1300	33.67094	-112.02812
18	19001 N. 27th Ave	Phoenix	Arizona	85027-5036	33.65969	-112.11584
19	3801 N. 33rd Avenue	Phoenix	Arizona	85017-4508	33.49179	-112.12838
20	1646 W. Montebello	Phoenix	Arizona	85015-2557	33.52069	-112.09519

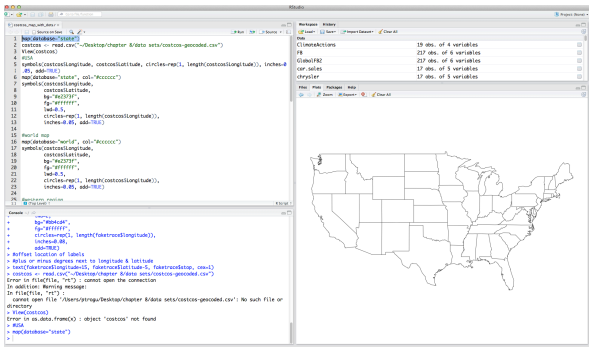
The final complete code can be found here and also at the end of this document.

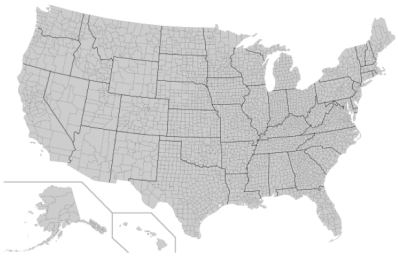
Get data set of Costco locations from the flowingdata website:
http://book.flowingdata.com/ch08/geocode/costcos-geocoded.csv

Or get Pino's edited version (recommended)
The above link is also on the resources page. Please note that was having trouble exporting the PDF of the "Western Region" plot. It might have been due to funny characters in the data set, which I cleaned up. If you have the same problem, make sure to use the edited file, not the one from flowingdata.

Load the data set into RStudio: Import data set -- Workspace > Import Dataset > From text file
(If you are loading from local file. If loading from web, see code in book, end of page 276.)

Shorten name of file to "costcos" when loading data set.

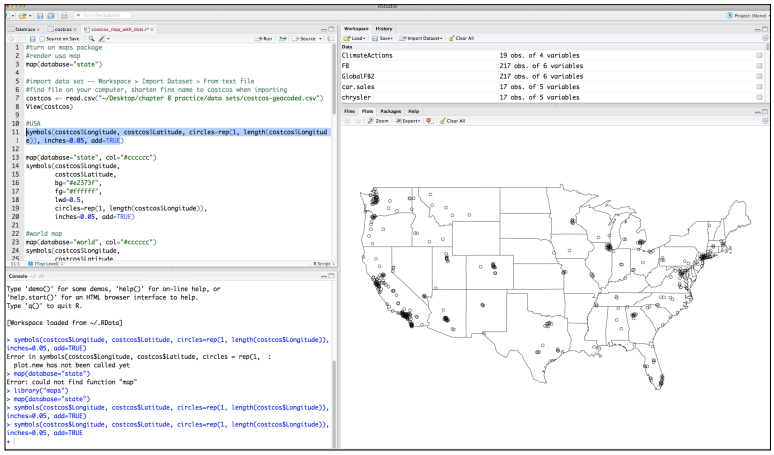




```
#turn on maps package
#render usa map
map(database="state")
```

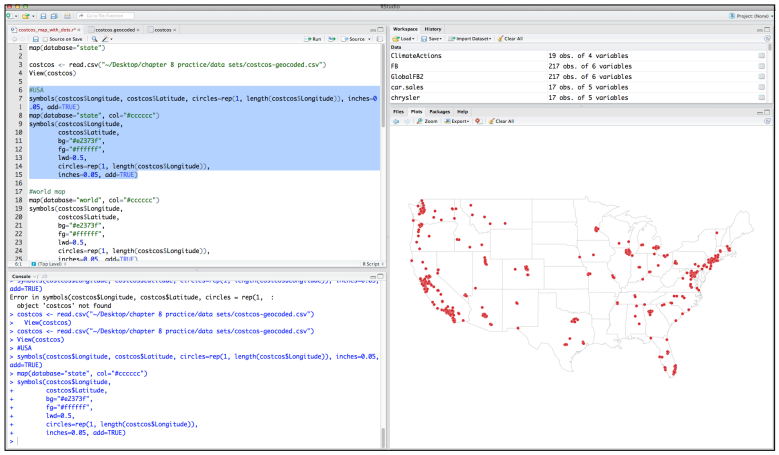
This generates a simple map with black lines. Later we'll make it out of gray lines. Note that the base maps in R may not be very detailed. Wikipedia is a great resourse for very detailed SVG maps, for example below is a link to a USA Counties map. You could use any similar map in Illustrator to swap the one that you export from R, but make sure that you are swapping "similar projection type" maps, especially for complete world maps.

http://en.wikipedia.org/wiki/File:USA_Counties_with_FIPS_and_names.svg



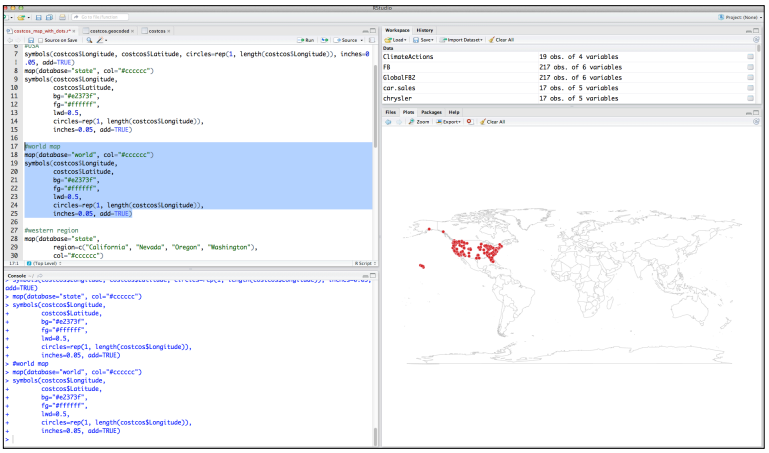
```
#USA
symbols(costcos$Longitude,
     costcos$Latitude,
     circles=rep(1,
length(costcos$Longitude)),
     inches=0.05, add=TRUE)
```

This code adds plain outlined dots to the map.



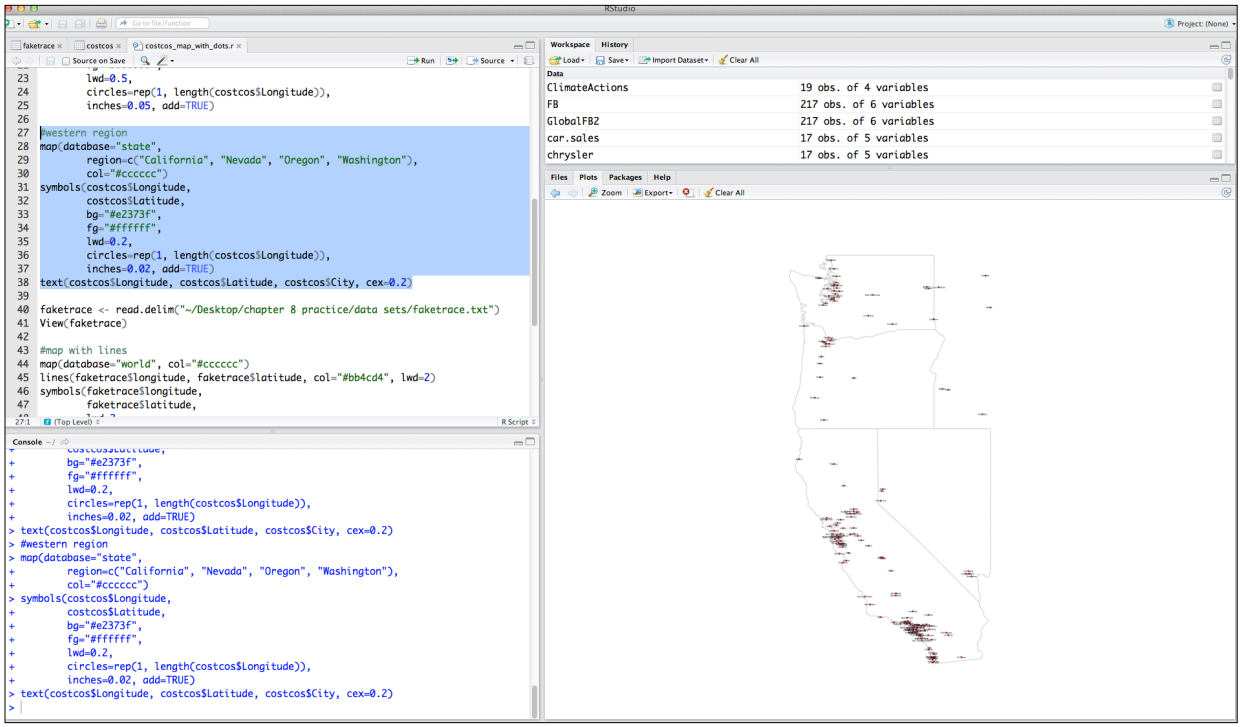
```
#USA gray outline map
map(database="state",
col="#cccccc")
symbols(costcos$Longitude,
        costcos$Latitude,
        bg="#e2373f",
        fg="#ffffff",
        lwd=0.5,
        circles=rep(1,
length(costcos$Longitude)),
        inches=0.05, add=TRUE)
```

This code makes the map gray and the dots red with a white border. Note that the dots' color is defined by both a "fill" (bg) and a "border" (fg). This means that when the file is exported to PDF, two objects are used to render the dot: a fill with a separate border around it. This is not efficient and can cause problems later on, so in Illustrator you might want to delete all the borders and add them back if needed so that each dot is a single object with two attributes: fill and border.



```
#world map
map(database="world",
col="#cccccc")
symbols(costcos$Longitude,
        costcos$Latitude,
        bg="#e2373f",
        fg="#ffffff",
        lwd=0.5,
        circles=rep(1,
length(costcos$Longitude)),
        inches=0.05, add=TRUE)
```

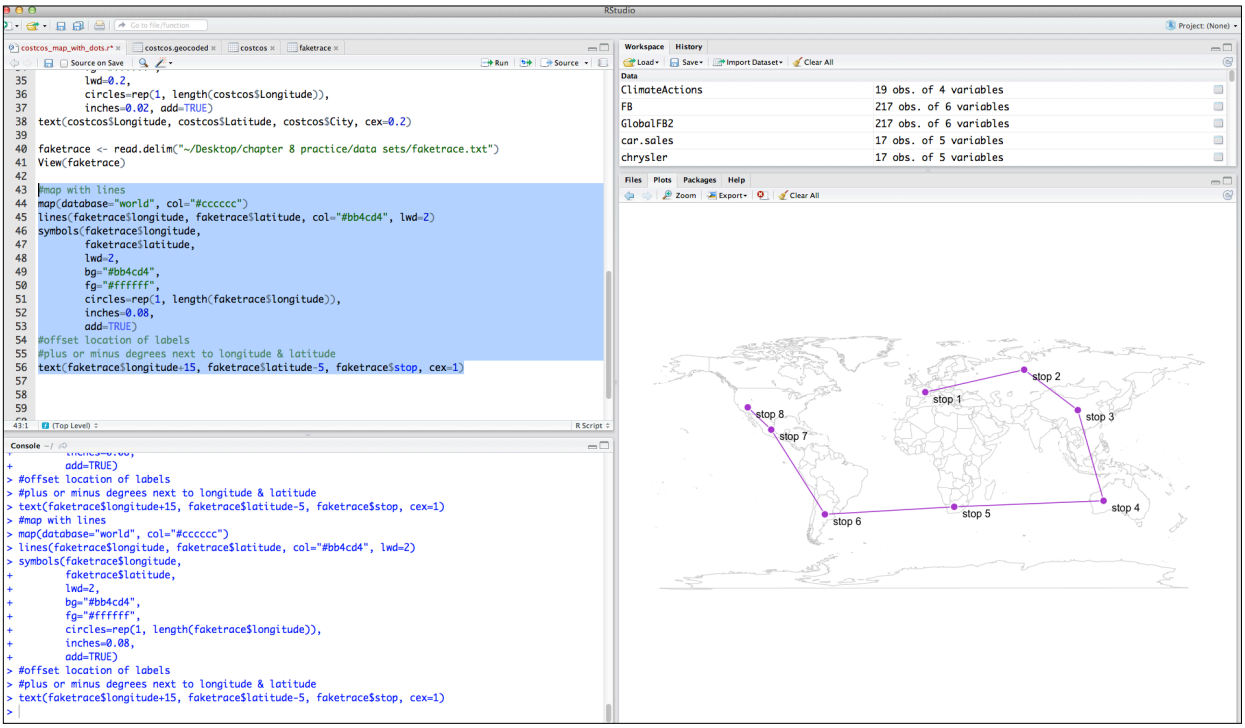
Loading the "world" map instead of the "state" map allows Hawaii and Alaska to be included, but you will need to edit out the rest of the world map later in Illustrator if you don't need it.




```
#western region
map(database="state",
        region=c("California", "Nevada", "Oregon", "Washington"),
        col="#cccccc")
symbols(costcos$Longitude,
        costcos$Latitude,
        bg="#e2373f",
        fg="#ffffff",
        lwd=0.2,
        circles=rep(1, length(costcos$Longitude)),
        inches=0.02, add=TRUE)
text(costcos$Longitude, costcos$Latitude, costcos$City, cex=0.2)
```

The “region” argument used above allows to select individual states as needed. Notice that cities in states neighboring Washington and Oregon are also rendered. Edit these out later in Illustrator.
Note: the width of the borders in the dots is defined by “lwd” (line width). I made the dots and the name of the cities rather small in order to differentiate each city later in Illustrator.

(cont. on next page)



For the "map with lines" above, please **get the "faketrace" data set here**. It's a slightly different version than the one from the book as I added a column named "stop". We'll use these names (stop 1, stop 2, etc) to label the dots.

```
#import data set -- Workspace > Import Dataset > From text file
#find file on your computer
faketrace <- read.delim("~/Desktop/chapter 8 practice/data sets/faketrace.txt")
View(faketrace)

#map with lines
map(database="world", col="#cccccc")
lines(faketrace$longitude, faketrace$latitude, col="#bb4cd4", lwd=2)
symbols(faketrace$longitude,
        faketrace$latitude,
        lwd=2,
        bg="#bb4cd4",
        fg="#ffffff",
        circles=rep(1, length(faketrace$longitude)),
        inches=0.08,
        add=TRUE)
#offset location of labels
#plus or minus degrees next to longitude & latitude
text(faketrace$longitude+15, faketrace$latitude-5, faketrace$stop, cex=1)
```

The "lines" command connects the dots with lines based on the longitude and latitude information. The "symbols" command again generates the dots. The "text" command creates the labels. Notice that it's easy to offset the location of the labels with respect to the dots by simply adding or subtructing (in this case degrees but I assume it could be pixels) from the longitude and latitude, directly in the code (I used +15 for longitude and -5 for latitude).

CODE FROM EXERCISE:

```
#turn on maps package
#render usa map
map(database="state")

#import data set -- Workspace > Import Dataset > From text file
#find file on your computer, shorten fine name to costcos when importing
costcos <- read.csv("~/Desktop/chapter 8 practice/data sets/costcos-geocoded.csv")
View(costcos)

#USA
symbols(costcos$Longitude,
       costcos$Latitude,
       circles=rep(1, length(costcos$Longitude)),
       inches=0.05, add=TRUE)

#USA gray outline map
map(database="state", col="#cccccc")
symbols(costcos$Longitude,
        costcos$Latitude,
        bg="#e2373f",
        fg="#ffffff",
        lwd=0.5,
        circles=rep(1, length(costcos$Longitude)),
        inches=0.05, add=TRUE)

#world map
map(database="world", col="#cccccc")
symbols(costcos$Longitude,
        costcos$Latitude,
        bg="#e2373f",
        fg="#ffffff",
        lwd=0.5,
        circles=rep(1, length(costcos$Longitude)),
        inches=0.05, add=TRUE)

#western region
map(database="state",
        region=c("California", "Nevada", "Oregon", "Washington"),
        col="#cccccc")
symbols(costcos$Longitude,
        costcos$Latitude,
        bg="#e2373f",
        fg="#ffffff",
        lwd=0.2,
        circles=rep(1, length(costcos$Longitude)),
        inches=0.02, add=TRUE)
text(costcos$Longitude, costcos$Latitude, costcos$City, cex=0.2)

#import data set -- Workspace > Import Dataset > From text file
#find file on your computer
faketrace <- read.delim("~/Desktop/chapter 8 practice/data sets/faketrace.txt")
View(faketrace)

#map with lines
map(database="world", col="#cccccc")
lines(faketrace$longitude, faketrace$latitude, col="#bb4cd4", lwd=2)
symbols(faketrace$longitude,
        faketrace$latitude,
        lwd=2,
        bg="#bb4cd4",
        fg="#ffffff",
        circles=rep(1, length(faketrace$longitude)),
        inches=0.08,
        add=TRUE)
#offset location of labels
#plus or minus degrees next to longitude & latitude
text(faketrace$longitude+15, faketrace$latitude-5, faketrace$stop, cex=1)
```