

**A Very Long Title for A Big Report Because Long  
Titles are Common**

*Some tips on creating reports with Quarto with a focus on  
tables and replicated tables and figures*

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## Citation

EE Holmes, 2022. Quarto Report Template. Northwest Fisheries Science Center.

# 1 Preface

Phasellus non diam posuere, laoreet velit sed, egestas felis. Etiam eget neque in tellus lacinia tincidunt. Pellentesque scelerisque odio velit, nec fringilla nibh iaculis non. Aenean sit amet nulla ipsum. Cras felis lacus, pulvinar ac nisi et, convallis pulvinar turpis. Morbi non nibh lacus. Morbi vitae lorem massa. Sed ut turpis vel felis posuere commodo lacinia ac mi. Donec finibus lectus sit amet elit finibus, vitae rhoncus ligula tincidunt. Phasellus vitae blandit lacus. Integer sed nisl fermentum, pulvinar mauris in, posuere enim. Proin sit amet semper urna. Vivamus aliquet rutrum diam ac luctus.

## **Abstract**

Phasellus non diam posuere, laoreet velit sed, egestas felis. Etiam eget neque in tellus lacinia tincidunt. Pellentesque scelerisque odio velit, nec fringilla nibh iaculis non. Aenean sit amet nulla ipsum. Cras felis lacus, pulvinar ac nisi et, convallis pulvinar turpis. Morbi non nibh lacus. Morbi vitae lorem massa. Sed ut turpis vel felis posuere commodo lacinia ac mi. Donec finibus lectus sit amet elit finibus, vitae rhoncus ligula tincidunt. Phasellus vitae blandit lacus. Integer sed nisl fermentum, pulvinar mauris in, posuere enim. Proin sit amet semper urna. Vivamus aliquet rutrum diam ac luctus.

## 2 Tips

### 2.1 Overview

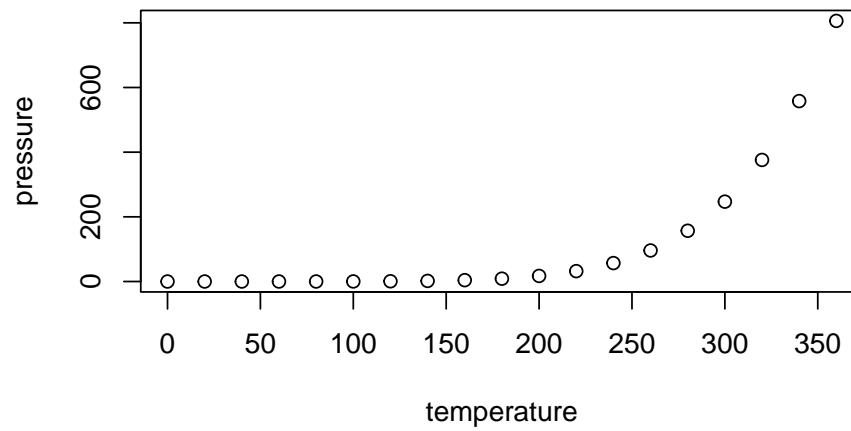


Figure 2.1: chapter 1 plot



## 2.2 General set-up

- Be as modular and simple as you can.
- Don't make everyone in your team be the markdown wizard. You only need one person to build the framework.
- Use simple child Rmds so that other team members work only on simple Rmd/qmd flat files.
- Don't put all your tables or figures in one huge file: `Table xyz.Rmd/qmd`, `Table abc.Rmd/qmd`. Have your dedicated markdown wizard figure out the automatic numbering.
- Copy reports built by others who are doing something similar to you. TALK within your center or across centers and share work.

## 2.3 Tips

### 2.3.1 Cross-references

This can be really troublesome unless you use an output that already has cross-references as part of the design. For R Markdown,

- `{bookdown}` outputs for html and PDF
- `{officedown}` for Word

These output formats give you access to cross-referencing via the `\@ref{xxx:yyy}` format and if you use `bookdown::pdf_book`, this will also work with PDF.

However, Quarto makes cross-references, auto-numbering and cross-referencing of tables and figures super easy. Quarto cross-ref page.

## 2 Tips

For example, we can make a figure with the chunk label `fig-plot` like so.

The later in the text we use `@fig-plot` to get Figure 2.2.

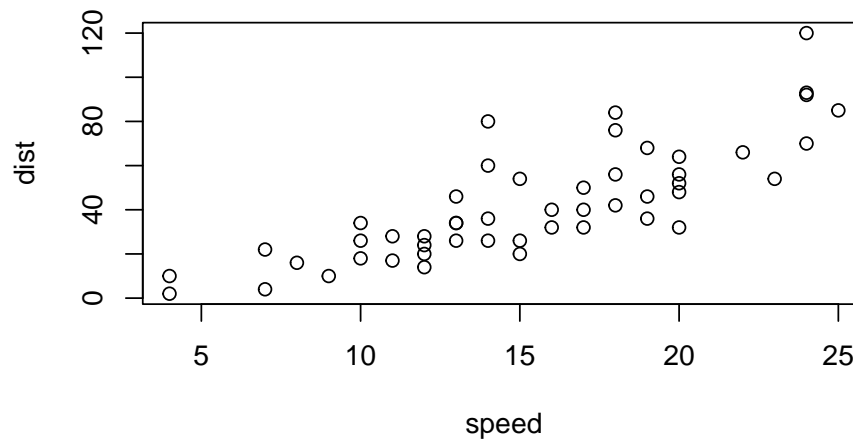


Figure 2.2: This is a plot of some data

### 2.3.2 Chunk labels

- When using R Markdown (or Quarto), it is best not to use chunk labels in the your Rmd/qmd children. It's too easy to get duplicate labels accidentally.

### 2.3.3 File paths

- if you need to reference a file in a folder, let R create the path so that it is compatible across systems:

```
file.path('figures', 'figure1.Rmd')
```

- I typically use the {here} package so that my code doesn't break if I happen to issue a change workspace directory command.

```
here::here('images', 'logo.png')
```

### 2.3.4 Tables in for loops

Making tables within `for` loops is tricky and it is different if you are outputting to Word versus html and also depends on what package that you use. See my Rmd/qmd files in the tables folder for examples of how to set it up, but also be prepared for things breaking in the future as package writers change things. This feature is really fluid. Web searches on stackoverflow are key for solving these problems.

## 2.4 Working with Word

For many of us, Word is part of our team's workflow. Here are some tips if that is the case for you:

- Check out the officeverse: `officedown` and `flextable` R packages.
- Quarto has greatly improved Word integration so many of the problems we faced with Word output may soon be solved.
- Don't build the whole report in one file. Work on individual text sections and then have RStudio (via `pandoc/knitr`) assemble the report (text, figures, tables) from the individual parts.

## 2 Tips

- How to deal with the team needing to review the assembled document (text, figures, tables):
  - Try to modularize. So maybe make individual chapters and have review happen at that level. Then you incorporate the changes into the plain text manually.
  - Use templates to make your Word doc look the way you want. The default Word template is bare bones. See my example and read about using Word templates with Quarto [here](#) and R Markdown [here](#) .

### 2.4.1 Making tables look nice in Word

The example in `Table_Counts.Rmd` and `Table_Counts_flex.Rmd` shows you tricks to make nice Word tables.

- how to include a page break in your Word doc between tables.
- using `format="pandoc"` for the table
- using `results='asis'` and `print()` so you can use `for` loops.
- centering your tables is next to impossible with `kable()`. Use the `{flextable}` package if you need that.

### 2.4.2 New pages

This is how to get a new page in Word. Make sure you are in print view on the word doc, otherwise you won't see any of the pages.

```
'''{=openxml}  
<w:p><w:r><w:br w:type="page"/></w:r></w:p>  
'''
```

## 2.5 Output templates with Quarto

Quarto is working on templates to make output to different formats easy. Here is an example of journal templates quarto-journals.

## 2.6 Weird Quarto quirks

- If you use

```
---  
title: MyTitle  
---
```

as your title spec, then you won't get the first header 2 in your pdf. Use # instead.

- If you have 2 # levels in a qmd file, you only the first chapter appearing in the TOC. The others appear weirdly as sub-chapters.
- with flextable, your table captions from knitr yaml disappear if the table breaks across a page.

## 3 Tables intro

This chapter shows a few simple examples of including tables and getting cross-referencing to work across formats (HTML, Word, PDF). See Chapter 5 for more examples and comparisons of different table outputs.

In this chapter, I am going to use `{flextable}` for Word and HTML and `{kableExtra}` for PDF. See Chapter 5 for a comparison of `{flextable}`, `{kableExtra}` and `{gt}`. There is a current problem that Quarto is not processing the cross-references with `{flextable}` into PDF and Word. But this is a known problem and they are working on it. `{flextable}` is the only table package that I have found the tends to work as expected across platforms. The `{officer}` package uses it so it works well with Word and works well with LaTeX.

\*Note, I am using some customized functions to be able have a uniform look for my tables. These are in `tables/_common.R`.

### 3.1 Example table

This is an example a table. We can reference Table 3.1 easily and it is auto-numbered.

### 3 Tables intro

Table 3.1: This is a simple table.

	mpg	cyl	disp	hp	drat	wt
Mazda RX4	21.0	6	160.0	110	3.90	2.620
Mazda RX4 Wag	21.0	6	160.0	110	3.90	2.875
Datsun 710	22.8	4	108.0	93	3.85	2.320
Hornet 4 Drive	21.4	6	258.0	110	3.08	3.215
Hornet Sportabout	18.7	8	360.0	175	3.15	3.440
Valiant	18.1	6	225.0	105	2.76	3.460
Duster 360	14.3	8	360.0	245	3.21	3.570
Merc 240D	24.4	4	146.7	62	3.69	3.190
Merc 230	22.8	4	140.8	95	3.92	3.150
Merc 280	19.2	6	167.6	123	3.92	3.440

*Note:*

kable

## 3.2 Including table files

It is often good to have your files in separate files so that when you edit your tables, you only have to work on the table code.

```
```{r child=here::here("tables", "Table_flex.Rmd")}
```
```

|                 | Df | Deviance | Resid. Df | Resid. Dev |
|-----------------|----|----------|-----------|------------|
| NULL            |    |          | 99        | 129.5      |
| ethnicity       | 3  | 47.2     | 96        | 82.2       |
| grade           | 1  | 1.7      | 95        | 80.5       |
| ethnicity:grade | 3  | 7.2      | 92        | 73.3       |

We can add a captions to a flextable with `set_caption` but then we won't have access to Quarto's cross-format (Word, HTML, PDF) cross-referencing engine. We can also use `tab.cap="caption"` in the chunk yaml but again we don't get the cross-referencing engine.

```
set_caption(ft,
  caption = "a table caption with set_caption",
  style = "Table Caption")
```

## 3.3 Cross-references

In Quarto, table links use the table label `@tbl-tablabel` where `tablabel` is the label you put on the table chunk. In the text it looks like this Table 3.3. The chunk yaml looks like this



### 3 Tables intro

Table 3.3: This is a table with a number.

| Year | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 1954 | NA  | NA  | NA  | NA  | NA  | NA  | 0   | 0   | 2   | 3   | 4   | 4   |
| 1955 | 5   | 6   | 8   | 10  | 10  | 12  | 14  | 15  | 17  | 18  | 19  | 20  |
| 1956 | 22  | 24  | 25  | 26  | 26  | 28  | 29  | 29  | 30  | 31  | 34  | 34  |
| 1957 | 33  | 32  | 33  | 35  | 37  | 38  | 39  | 39  | 40  | 41  | 42  | 42  |
| 1958 | 44  | 46  | 47  | 49  | 50  | 53  | 52  | 54  | 54  | 54  | 54  | 56  |
| 1959 | 57  | 55  | 57  | 58  | 59  | 59  | 60  | 61  | 62  | 63  | 62  | 62  |
| 1960 | 63  | 65  | 65  | 66  | 68  | 69  | 69  | 71  | 73  | 76  | 78  | 79  |
| 1961 | 80  | 80  | 80  | 83  | 83  | 84  | 85  | 89  | 88  | 90  | 91  | 93  |
| 1962 | 94  | 97  | 98  | 100 | 100 | 103 | 104 | 105 | 105 | 105 | NA  | NA  |

*Note:*

kable

```
#| label: tbl-tablabel
#| tbl-cap: "my caption"
```

## 3.4 Dynamic table captions

You can create captions dynamically.

### 3 Tables intro

```
dt <- mtcars[1:10, 1:6]  
tbl_cap <- paste("This is a dynamically created caption. The length of mtcars is",
```

Unfortunately you cannot dynamically create your chunk labels too.

### 3 Tables intro

Table 3.4: This is a dynamically created caption. The length of mtcars is 32 rows. Here we show 10 rows.

|                   | mpg  | cyl | disp  | hp  | drat | wt    |
|-------------------|------|-----|-------|-----|------|-------|
| Mazda RX4         | 21.0 | 6   | 160.0 | 110 | 3.90 | 2.620 |
| Mazda RX4 Wag     | 21.0 | 6   | 160.0 | 110 | 3.90 | 2.875 |
| Datsun 710        | 22.8 | 4   | 108.0 | 93  | 3.85 | 2.320 |
| Hornet 4 Drive    | 21.4 | 6   | 258.0 | 110 | 3.08 | 3.215 |
| Hornet Sportabout | 18.7 | 8   | 360.0 | 175 | 3.15 | 3.440 |
| Valiant           | 18.1 | 6   | 225.0 | 105 | 2.76 | 3.460 |
| Duster 360        | 14.3 | 8   | 360.0 | 245 | 3.21 | 3.570 |
| Merc 240D         | 24.4 | 4   | 146.7 | 62  | 3.69 | 3.190 |
| Merc 230          | 22.8 | 4   | 140.8 | 95  | 3.92 | 3.150 |
| Merc 280          | 19.2 | 6   | 167.6 | 123 | 3.92 | 3.440 |

*Note:*

kable

## 4 Tables in a for loop

Outputting tables (or figure) in a for loop works fine in Quarto, but there is no way to set the table numbers dynamically and get all the cross-references working in Word, HTML and PDF. We really need that dynamic numbering and cross-reference feature in a big report.

### 4.1 Example of tables produced in a for loop

Look at the [Code](#) (link at top in HTML output) to see the `cat(knitr::knit_print(tab))` trick for getting your tables to appear.

### 4.2 Getting the cross-reference links

We have to use a bit of magic to get our dynamic table numbers and links using Quarto's cross-referencing. The trick is to use a child Rmd (or qmd) in a for loop. This trick can be used for figures too but I'll just show it here with tables. This code inspired from [this gist](#).

We use `knit_expand()` and make a child Rmd that uses double curly braces like `{{value.to.match}}` in the code. That way the value at the time this Rmd was embedded can be referenced. Note that if `value.to.match` were a string (which it is not in this example), we would need to add quotes around `{{value.to.match}}` in our code.

#### 4 Tables in a for loop

Table 4.1: We can set a caption but no way to cross-reference it

|               | mpg | cyl | disp | hp  |
|---------------|-----|-----|------|-----|
| Mazda RX4     | 21  | 6   | 160  | 110 |
| Mazda RX4 Wag | 21  | 6   | 160  | 110 |

*Note:*

kable

Table 4.2: We can set a caption but no way to cross-reference it

|               | mpg | cyl | disp | hp  |
|---------------|-----|-----|------|-----|
| Mazda RX4     | 21  | 6   | 160  | 110 |
| Mazda RX4 Wag | 21  | 6   | 160  | 110 |

*Note:*

kable

#### 4 Tables in a for loop

Table 4.3: Cars with 4 cylinders. These tables have cross-ref links via @tbl-xyz.

|            | mpg  | cyl | disp  | hp |
|------------|------|-----|-------|----|
| Datsun 710 | 22.8 | 4   | 108.0 | 93 |
| Merc 240D  | 24.4 | 4   | 146.7 | 62 |
| Merc 230   | 22.8 | 4   | 140.8 | 95 |

*Note:*

kable

With this approach we get our numbered tables and we can reference the tables usual such as Table 4.4. Click on the Code link at top (HTML output) to see how it's done.

Table 4.4: Cars with 8 cylinders. These tables have cross-ref links via @tbl-xyz.

|                   | mpg  | cyl | disp  | hp  |
|-------------------|------|-----|-------|-----|
| Hornet Sportabout | 18.7 | 8   | 360.0 | 175 |
| Duster 360        | 14.3 | 8   | 360.0 | 245 |
| Merc 450SE        | 16.4 | 8   | 275.8 | 180 |

*Note:*

kable

## 5 Kable vs Flex vs qt

Here I compare a three different ways to make tables.

### 5.1 kable

Here is the {kable} table Table 5.1. {kabel} is part of {knitr} so definitely going to be supported by Quarto since Quarto uses the {knitr} engine. Cross-referencing works across HTML, PDF and Word but output to Word is not always great.

```
library(knitr)
library(kableExtra)
# note hold_position not working in Quarto v1.0.38.
kbl(dt, booktabs = TRUE) %>%
  kable_styling(latex_options = c("scale_down")) %>%
  kableExtra::footnote(symbol = c(f1, f2))
```

#### 5.1.1 kable quirks

- Make sure to put `always_allow_html: true` in the yaml at the top of your Rmd or qmd file if outputting to Word. I can't figure out how to put it in the '
- Word output is often not good looking. This is a known issue with `kable`



## 5 Kable vs Flex vs qt

Table 5.1: kable: Donec bibendum pharetra arcu vitae porttitor. Morbi ac quam nunc. Ut cursus dolor a mauris aliquet vulputate. Morbi elementum ullamcorper augue, et tincidunt libero facilisis posuere. Nam congue velit non elit sollicitudin aliquet.

|                   | mpg  | cyl | disp  | hp  | drat | wt    | qsec  | vs | am | gear | carb |
|-------------------|------|-----|-------|-----|------|-------|-------|----|----|------|------|
| Mazda RX4         | 21.0 | 6   | 160.0 | 110 | 3.90 | 2.620 | 16.46 | 0  | 1  | 4    | 4    |
| Mazda RX4 Wag     | 21.0 | 6   | 160.0 | 110 | 3.90 | 2.875 | 17.02 | 0  | 1  | 4    | 4    |
| Datsun 710        | 22.8 | 4   | 108.0 | 93  | 3.85 | 2.320 | 18.61 | 1  | 1  | 4    | 1    |
| Hornet 4 Drive    | 21.4 | 6   | 258.0 | 110 | 3.08 | 3.215 | 19.44 | 1  | 0  | 3    | 1    |
| Hornet Sportabout | 18.7 | 8   | 360.0 | 175 | 3.15 | 3.440 | 17.02 | 0  | 0  | 3    | 2    |
| Valiant           | 18.1 | 6   | 225.0 | 105 | 2.76 | 3.460 | 20.22 | 1  | 0  | 3    | 1    |
| Duster 360        | 14.3 | 8   | 360.0 | 245 | 3.21 | 3.570 | 15.84 | 0  | 0  | 3    | 4    |
| Merc 240D         | 24.4 | 4   | 146.7 | 62  | 3.69 | 3.190 | 20.00 | 1  | 0  | 4    | 2    |
| Merc 230          | 22.8 | 4   | 140.8 | 95  | 3.92 | 3.150 | 22.90 | 1  | 0  | 4    | 2    |
| Merc 280          | 19.2 | 6   | 167.6 | 123 | 3.92 | 3.440 | 18.30 | 1  | 0  | 4    | 4    |

\* Here is a footnote about this table

† Here is a second footnote.

- Do not pass in caption to `kbl()` if you want to use Quarto's cross-reference engine.
- `kbl(..., format="pandoc")` can help for Word if your templates stop working but destroys the PDF output.

## 5.2 flextable

Here is the `{flextable}` table **?@tbl-flex**. `{flextable}` gives you a lot more control over your tables with a grammar format (like `ggplot2`). It also gives nice output to Word, PDF and HTML. Sadly in Quarto v1.0.38 cross-reference and table captioning for Word and PDF is completely broken, but the developers know about this. The `{officer}` package, which I think Quarto is leaning on for Word generation, use `{flextable}` so I am hoping that `{flextable}` gets moved into the RStudio suite.

```
library(flextable)
dt %>%
  flextable() %>%
  autofit() %>%
  flextable::footnote(i = 1, j = 1:2,
    value = as_paragraph(c(f1, f2)),
    ref_symbols = c("a", "b"),
    part = "header") %>%
  font(fontname="Times New Roman", part="all") %>%
  fontsize(size=12)
```

| mpg <sup>a</sup> | cyl <sup>b</sup> | disp  | hp  | drat | wt    | qsec  | vs | am | gear | ca |
|------------------|------------------|-------|-----|------|-------|-------|----|----|------|----|
| 21.0             | 6                | 160.0 | 110 | 3.90 | 2.620 | 16.46 | 0  | 1  | 4    |    |

<sup>a</sup>Here is a footnote about this table

<sup>b</sup>Here is a second footnote.

## 5 Kable vs Flex vs qt

| mpg <sup>a</sup> | cyl <sup>b</sup> | disp  | hp  | drat | wt    | qsec  | vs | am | gear | ca |
|------------------|------------------|-------|-----|------|-------|-------|----|----|------|----|
| 21.0             | 6                | 160.0 | 110 | 3.90 | 2.875 | 17.02 | 0  | 1  | 4    |    |
| 22.8             | 4                | 108.0 | 93  | 3.85 | 2.320 | 18.61 | 1  | 1  | 4    |    |
| 21.4             | 6                | 258.0 | 110 | 3.08 | 3.215 | 19.44 | 1  | 0  | 3    |    |
| 18.7             | 8                | 360.0 | 175 | 3.15 | 3.440 | 17.02 | 0  | 0  | 3    |    |
| 18.1             | 6                | 225.0 | 105 | 2.76 | 3.460 | 20.22 | 1  | 0  | 3    |    |
| 14.3             | 8                | 360.0 | 245 | 3.21 | 3.570 | 15.84 | 0  | 0  | 3    |    |
| 24.4             | 4                | 146.7 | 62  | 3.69 | 3.190 | 20.00 | 1  | 0  | 4    |    |
| 22.8             | 4                | 140.8 | 95  | 3.92 | 3.150 | 22.90 | 1  | 0  | 4    |    |
| 19.2             | 6                | 167.6 | 123 | 3.92 | 3.440 | 18.30 | 1  | 0  | 4    |    |

<sup>a</sup>Here is a footnote about this table

<sup>b</sup>Here is a second footnote.

### 5.2.1 flextable quirks

- Cross-refs broken in Word and PDF. Known issue.

## 5.3 gt

Here is the {gt} table Table 5.3. {gt} has many of the same features as {flextable} and is in the RStudio suite so maybe it'll get more Quarto

## 5 Kable vs Flex vs qt

support in the long run. But like {kable}, the Word output is not so great, at least not by default.

```
library(gt)
dt %>%
  gt() %>%
  tab_source_note(source_note = f1) %>%
  tab_source_note(source_note = f2) %>%
  tab_options(
    table.font.size = px(18),
    table.font.names = "Times New Roman",
    data_row.padding = px(1))
```

gt: Donec bibendum pharetra arcu vitae porttitor. Morbi ac quam nunc. Ut cursus dolor a mauris aliquet vulputate. Morbi elementum ullamcorper augue, et tincidunt libero facilisis posuere. Nam congue velit non elit sollicitudin aliquet.

| mpg  | cyl | disp  | hp  | drat | wt    | qsec  | vs | am | gear | carb |
|------|-----|-------|-----|------|-------|-------|----|----|------|------|
| 21.0 | 6   | 160.0 | 110 | 3.90 | 2.620 | 16.46 | 0  | 1  | 4    | 4    |
| 21.0 | 6   | 160.0 | 110 | 3.90 | 2.875 | 17.02 | 0  | 1  | 4    | 4    |
| 22.8 | 4   | 108.0 | 93  | 3.85 | 2.320 | 18.61 | 1  | 1  | 4    | 1    |
| 21.4 | 6   | 258.0 | 110 | 3.08 | 3.215 | 19.44 | 1  | 0  | 3    | 1    |
| 18.7 | 8   | 360.0 | 175 | 3.15 | 3.440 | 17.02 | 0  | 0  | 3    | 2    |
| 18.1 | 6   | 225.0 | 105 | 2.76 | 3.460 | 20.22 | 1  | 0  | 3    | 1    |
| 14.3 | 8   | 360.0 | 245 | 3.21 | 3.570 | 15.84 | 0  | 0  | 3    | 4    |
| 24.4 | 4   | 146.7 | 62  | 3.69 | 3.190 | 20.00 | 1  | 0  | 4    | 2    |
| 22.8 | 4   | 140.8 | 95  | 3.92 | 3.150 | 22.90 | 1  | 0  | 4    | 2    |

## 5 *Kable* vs *Flex* vs *qt*

|      |   |       |     |      |       |       |   |   |   |   |
|------|---|-------|-----|------|-------|-------|---|---|---|---|
| 19.2 | 6 | 167.6 | 123 | 3.92 | 3.440 | 18.30 | 1 | 0 | 4 | 4 |
|------|---|-------|-----|------|-------|-------|---|---|---|---|

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Here is a footnote about this table

Here is a second footnote.

### 5.3.1 *qt* quirks

- Table captions broken in PDF. Known issue. The “Table X.” part is missing.
- I couldn’t get `{gt}` to respect my font request for HTML unlike for `{flextable}`

## 6 Figures intro

This chapter shows a few simple examples of including figures and getting cross-referencing to work across formats (HTML, Word, PDF).

### 6.1 ggplot2

We can see in Figure 6.1 that there are many time series. The number of panels is chosen automatically using `{ggplot2}`.

## 6 Figures intro

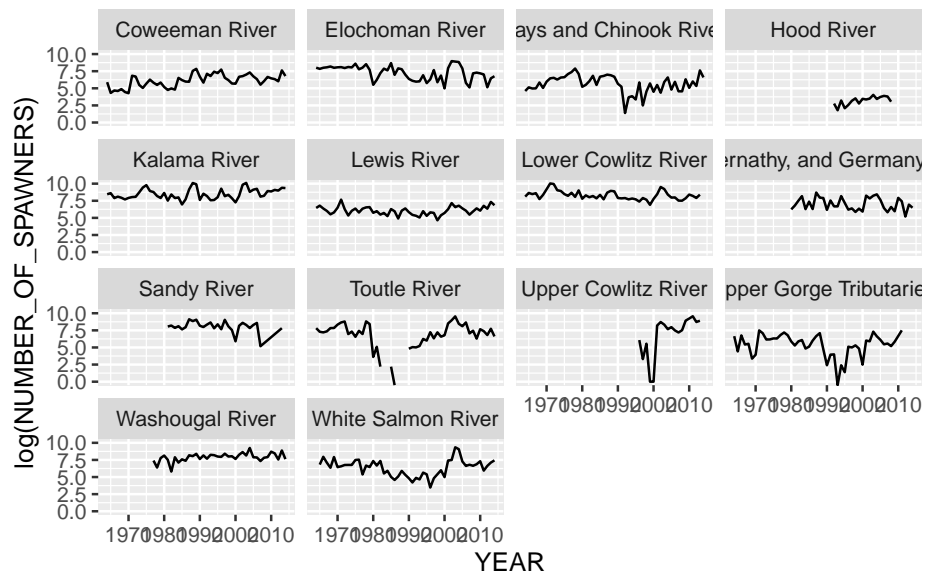


Figure 6.1: Plot of the data

## 7 Conclusion

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## 7 Conclusion

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## References

# Appendices

This is an example of a large number of tables in appendices. All the data are in the **data** folder.

## Appendix A

| Year | Spawners | Fracwild |
|------|----------|----------|
| 2000 | 290      | 1.00     |
| 2001 | 802      | 0.73     |
| 2002 | 877      | 0.97     |
| 2003 | 1,106    | 0.89     |
| 2004 | 1,503    | 0.91     |
| 2005 | 853      | 0.60     |
| 2006 | 566      | 1.00     |
| 2007 | 251      | 1.00     |
| 2008 | 424      | 0.52     |
| 2009 | 783      | 0.63     |
| 2010 | 639      | 0.70     |

## 7 Conclusion

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\*\* data file:  
Lower\_Columbia\_River\_Chinook.csv  
mod date: Fri Jul 29 07:21:42 2022 -0400

\* These spawner counts are from river  
redd surveys.

## 7 Conclusion

| Year | Spawners | Fracwild |
|------|----------|----------|
| 2000 | 146      | 0.62     |
| 2001 | 2,806    | 0.82     |
| 2002 | 7,893    | 0.00     |
| 2003 | 7,348    | 0.65     |
| 2004 | 6,880    | 0.01     |
| 2005 | 2,699    | 0.05     |
| 2006 | 324      | 1.00     |
| 2007 | 168      | 1.00     |
| 2008 | 1,320    | 0.10     |
| 2009 | 1,467    | 0.18     |
| 2010 | 1,318    | 0.12     |

\*\* data file:

Lower\_Columbia\_River\_Chinook.csv

mod date: Fri Jul 29 07:21:42 2022 -0400

\* These spawner counts are from river  
redd surveys.