



# NMFSReports

*Easily write NOAA reports  
and tech memos  
in R Markdown!*



**Emily Markowitz**

Research Fisheries Biologist  
NOAA Fisheries  
Alaska Fisheries Science Center  
[Emily.Markowitz@noaa.gov](mailto:Emily.Markowitz@noaa.gov)

June 05, 2021  
2021 R Cascadia Conference

Emily Markowitz  
EmilyMarkowitz-NOAA



@emilyhmarkowitz



<https://emilymarkowitz-noaa.github.io/NMFSReports/>

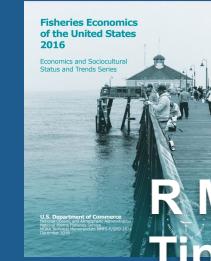


# Inspiration

While re-writing the annual high-level *Fisheries Economics of the US report*, into R Markdown, I picked up a few tips and tricks.  
*(Talk at DC satRdays 2020)*

...so I started building a package of my favorite functions to make future report writing easier and more efficient.

...then realized that this could be useful to others!



R Markdown +  
Tips & Tricks

{EmFavFuncts}

{NMFSReports}

# Previously...



# Now, with NMFS Reports...



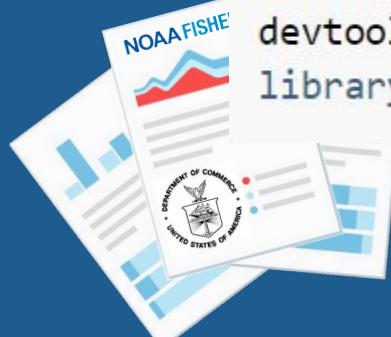
WORK IN PROGRESS

# NMFSReports

*To automatically and easily create reports in RMarkdown!  
(Report writing, but make it science!)*

<https://emilymarkowitz-noaa.github.io/NMFSReports>

```
library(devtools)
devtools::install_github("EmilyMarkowitz-NOAA/NMFSReports")
library(NMFSReports)
```



# What we need to automate a large report:



Data Download  
Automation



Streamline Report  
Creation



Consistent Grammar  
Structure



Built-in 508  
Accessibility



Version Control

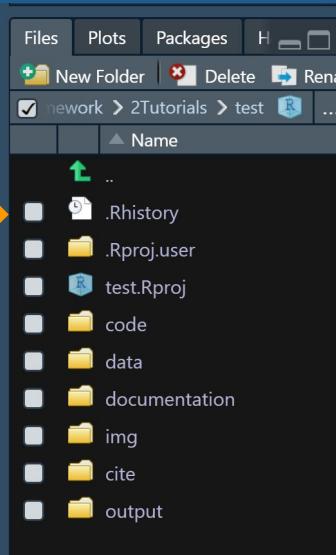


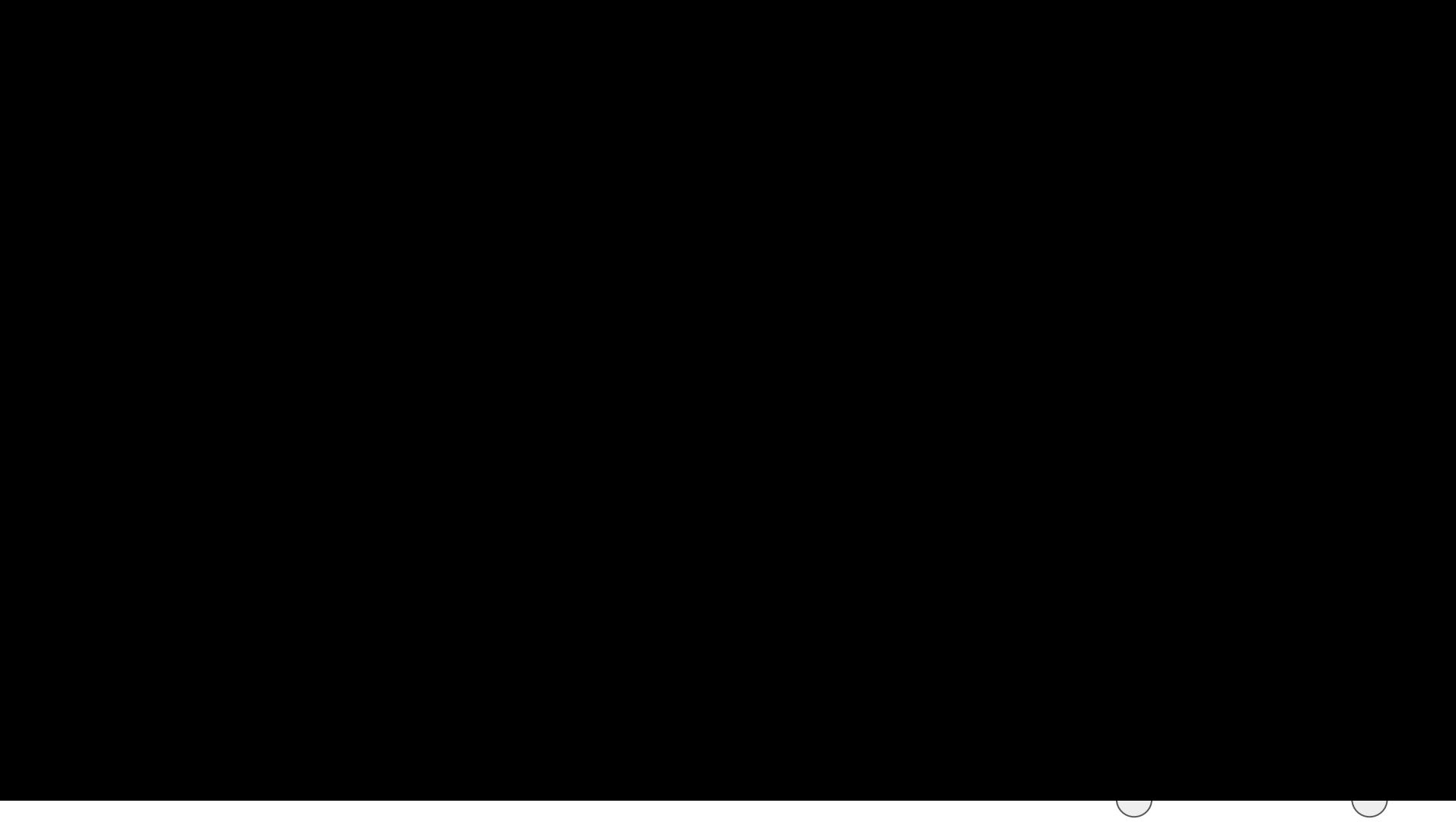
Output Flexibility

# Build a Report Outline in 3 Easy Steps



```
4 # 1. Load the NMFSReports Library
5 library(devtools)
6 devtools::install_github("EmilyMarkowitz-NOAA/NMFSReports", force = TRUE)
7 library(NMFSReports)
8
9 # 2. Build your report
10 NMFSReports::buildReport(
11   sections = c("abstract", "introduction", "history",
12               "methods", "results", "results_spp",
13               "results_discussion", "endmatter", "presentation"),
14   report_authors = "Me, Myself, and I",
15   report_title = "Data Report: All of NOAA's Coolest Data Ever!",
16   styles_reference_pptx = "refppt_nmfs",
17   styles_reference_docx = "refdoc_noaa_tech_memo",
18   bibliography.bib = "bib_example",
19   csl = "bulletin-of-marine-science"
20 )
21
22 # 3. Run your run.R file
23 source("./code/run.R")
```





AutoSave File Layout References Mailings Review View Help EndNote X8

001\_example\_001 - Saved to this PC Search

Office mobile app combines Word, Excel, PowerPoint, and more into a single app. [Download the app](#)

# W

## Example of how to use this R Markdown document

### Here is the report content:

#### Systematic writing of content

My example dataset has 100 rows in it and three columns in it.<sup>1</sup>

This sentence exemplifies how to systematically calculate a percent change: a 97% decrease<sup>2</sup>.

Here are several types of vessels: NOAA Vessel, F/V Fishing Boat, R/V University Vessel, and Private Charter.

#### Equations

Here is some equation you'll need to have in this report, of which produces the variable  $X$ .

Equation 1. Pythagorean theorem<sup>3</sup>

$$c^2 = b^2 + a^2$$

Alternative text: The Pythagoras theorem is a mathematical law that states that the sum of squares of the lengths of the two short sides of the right triangle is equal to the square of the length of the hypotenuse.

[Text blab blab]

Equation 2. Newton's Universal Law of Gravitation.

$$F = G \frac{m_1 m_2}{d^2}$$

---

<sup>1</sup> Wow, this project is so cool!

<sup>2</sup> Here's another, free-writen footnote!

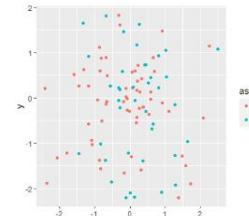
<sup>3</sup> Footnote about how cool the pythagorean theorem is.

## Example Table (Basic)

Table 1. Here is a table!<sup>4</sup>

col	x	y
A	0.19	0.14
B	0.76	0.52
C	0.62	1
D	-0.83	-1.3
E	-1.1	0.75
F	0.021	2.2
G	0.23	-0.079
H	-0.29	-0.92

## Example Figure (Plot)



The scatter plot shows a positive correlation between two variables. The x-axis ranges from -2 to 2, and the y-axis ranges from -2 to 2. Data points are colored by a third variable, labeled 'as.factor(col)'. The legend indicates three categories: 'a' (red), 'b' (green), and 'c' (blue). Most points fall between x=-1 and x=1, with a few outliers at higher values.

Figure 1. Here is a figure!<sup>4,5</sup>

\* A footnote for this figure!

\* A second footnote for this figure!

Remember the pythagorean theorem from before? That was Equation #1 and it had a footnote that said "footnote about how cool the pythagorean theorem is."

### Citations

There are a lot of ways to cite within your report, so here is an example of two: (Trey 1957) and (Artemisius (1890). Check out <https://github.com/cheatgit/knitrizations> for more info!

Note that references will appear at the bottom of this document (and any document that you put references in) but when you combine this document with all of the other documents that you create, it will shift to the bottom of the report.

## Alternative text: This is a scatter plot of random data

Here in plot 1, we see that...

### Example Figure (Reference Image)



NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION  
NOAA

## 001\_example\_001.docx

Review View Help EndNote X8

Emily Markowitz EM

Find Replace Dictate Editor

Select Date First Par... Normal

Abstract Author Bibliogr. Body Text

Compact Date First Par... Normal

Subtitle Table Con... Title Block Text

Footnote Heading... Heading... Heading...

Heading... Heading... Heading... TOC He...

Create a Style Clear Formatting Apply Styles...

Page 1 of 5 526 words

Display Settings Focus

80%



# Data Report: MAXYR Eastern Bering Sea continental shelf Bottom Trawl Survey of Groundfish and Invertebrate Fauna

L. Britt, E. J. Dawson, R. Haehn and E. H. Markowitz



1

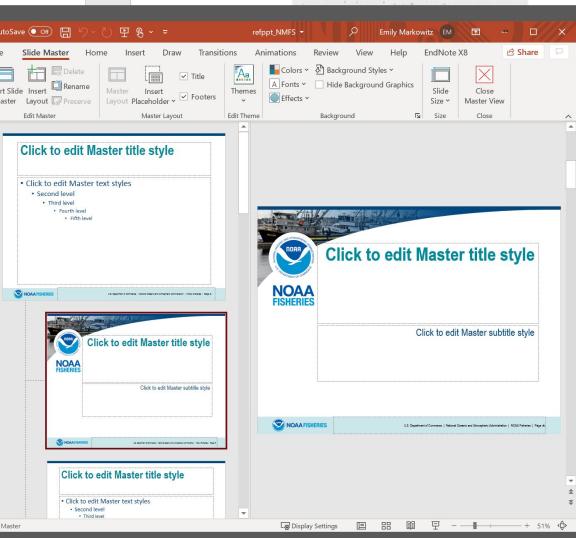
**Table 1.** Here is a table!

col	x	y
A	0.19	0.14
B	0.76	0.52
C	0.62	1
D	-0.83	-1.3
E	-1.1	0.75
F	0.021	2.2
G	0.23	-0.079
H	-0.29	-0.92
I	-1.3	-0.014
J	0.2	-0.49



## Example of how to use this R Markdown document

**Figure 1.** Here is a figure!



010\_presentation\_001.pptx

5

# Function

NMFSReports 0.0.1.0 VIGNETTES FUNCTIONS NEWS

## NMFSReports

Easily write NOAA reports and Tech Memos in R Markdown

Code is still in development.

Emily Markowitz (Emily.Markowitz AT noaa.gov)

Alaska Fisheries Science Center,  
National Marine Fisheries Service,  
National Oceanic and Atmospheric Administration,  
Seattle, WA 98195

## Installation

Learn more about this package at this pkgdown website! <https://emilymarkowitz-noaa.github.io/NMFSReports/>

The NMFSReports Package has all of the basic architecture you need to create reproducible and repeatable NOAA Tech Memos in R Markdown! This approach is perfect for efficiently rolling out annual (or other regular) reports or reports with formulaic sections (the same chapter structure but for a different area or species). Scripts integrate table, figure, data, and bibliography management and design automation.

```
library(devtools)
devtools::install_github("EmilyMarkowitz-NOAA/NMFSReports")
library(NMFSReports)
```

## Use this package with nmfpalette

A package for NOAA Fisheries color schemes

```
library(devtools)
devtools::install_github("nmfs-general-modeling-tools/nmfpalette")
library(nmfpalette)
```

## Inspiration

I've been thinking about how to efficiently create reproducible documents and rmarkdown scripts for some time. As the former editor of the Fisheries Economics of the US Report (FEUS, published by the NMFS Office of Science and Technology in Silver Spring, Maryland), I completely altered the workflow from a report that was

**Pkgdown page:**  
<https://emilymarkowitz-noaa.github.io/NMFSReports/>

NMFSReports 0.0.1.0 VIGNETTES FUNCTIONS NEWS

## Reference

### Build the Report Architecture

buildReport()  
Build your initial architecture for your new NOAA Tech Memo or Report

### Search within Report Content

is\_something\_in\_this\_matrix()  
Is something in this matrix? Let's do it!

### Work with Text

TitleCase()  
Make a String Title Case  
tolower2()  
Make a string lower case except for stated (and proper nouns).  
text\_line()  
Takes a string of words and combines them into lists.  
add\_table\_footnotes()  
Add footnotes within your tables in a smart way.

### Work with Numbers in Text

num2words()  
Convert number to text string.  
num2words\_th()  
Convert number to text string.  
pchange()  
Calculate the percent change.

### Arguments

start The value it started with.  
end The value it ended with.  
ending A text string. Default ". ".  
percent\_first Options: T/F.

### Examples

```
pchange(rates = 8, end = 1)
# [1] "An 8% increase"
pchange(start = 3, end = 6, ending = " in fish landings", percent_first = TRUE)
# [1] "A 100% increase in fish landings"
pchange(start = 3, end = 4, ending = " in fish landings", percent_first = FALSE)
# [1] "Increase in fish landings of a 33%"
```

## Calculate the percent change.

Source: n/NMFSReports.R

Calculate the percent change.

```
pchange(start, end, ending = "", percent_first = TRUE)
```

## Arguments

## Examples

NMFSReports 0.0.1.0 VIGNETTES FUNCTIONS NEWS

## Use buildReport

USE BUILDREPORT() TO BEGIN WRITING YOUR REPORT.  
HOW TO USE THE RUN.R FILE TO BE THE SKELETON OF YOUR REPORT  
FUNCTIONS AND EXAMPLES TO HELP YOU WRITE YOUR REPORT  
USE (GOOGLEDRIVE) TO ACCESS DOCUMENTS FROM GOOGLE DRIVE MADE COLLABORATIVELY

### Streamline Report Creation

```
library(NMFSReports)
library(here)
library(ggplot2)
```

## Create initial structure of report

Do everyone here a favor and create a new R project or at least set up a working directory ( `setwd()` ). There will be a lot of file management here...

To build your initial architecture for your new NOAA Tech Memo or Report, simply run the below script:

```
## title
Default = "" . Here, put the title of your report. You can change this later in the run.R file in needed.
title = "My Awesome Report!"
```

```
buildReport(author = )
```

NMFSReports 0.0.1.0 VIGNETTES FUNCTIONS NEWS

## OVERVIEW

USE BUILDREPORT() TO BEGIN WRITING YOUR REPORT.  
HOW TO USE THE RUN.R FILE TO BE THE SKELETON OF YOUR REPORT  
FUNCTIONS AND EXAMPLES TO HELP YOU WRITE YOUR REPORT  
USE (GOOGLEDRIVE) TO ACCESS DOCUMENTS FROM GOOGLE DRIVE MADE COLLABORATIVELY

### Streamline Report Creation

```
library(NMFSReports)
library(here)
library(ggplot2)
```

## Create initial structure of report

Do everyone here a favor and create a new R project or at least set up a working directory ( `setwd()` ). There will be a lot of file management here...

To build your initial architecture for your new NOAA Tech Memo or Report, simply run the below script:

```
## title
Default = "" . Here, put the title of your report. You can change this later in the run.R file in needed.
title = "My Awesome Report!"
```

```
buildReport(author = )
```

# Vignettes



## Streamline Report Creation

```
1 ---  
2 output:  
3   word_document:  
4     pandoc_args: ["--metadata-file=header.yaml"]  
5     reference_docx: styles_reference.docx  
6     df_print: kable  
7     csl: "../cite/citestyle.csl"  
8     bibliography: "../cite/bibliography.bib"  
9 ---  
10
```



Citation Style

Bibliography

docx or pptx Style

```
53 ## Citations  
54  
55 There are a lot of ways to cite within your report, so here is an example of two: [@RN686] and  
56 @RN621. Checkout https://github.com/cboettig/knitcitations for more info!
```

### Citations

There are a lot of w

Arrhenius (1889). C

### References

Arrhenius S. 1889. Über di  
säuren. Zeitschrift für physi

Fry FEJ. 1957. The physio

### Citations

There are a lot of ways to cite within your report, so here is an example of two: (Fry 1957) and Arrhenius (1889).  
Checkout <https://github.com/cboettig/knitcitations> for more info!

### References

Arrhenius S. 1889. Über die reaktionsgeschwindigkeit bei der inversion von rohrzucker durch säuren. Zeitschrift für physikalische Chemie 4: 226–248.

Fry FEJ. 1957. The physiology of fishes. London: Academic Press.

(We're not at  
html-based or  
code-to-pdf  
reports yet - this  
is what editors  
expect to receive.)



Built-in 508  
Accessibility

## Accessible colors and fonts using MS styles.

```
1 ---  
2 title: ""  
3 author: ""  
4 date: ""  
5 output:  
6   word_document:  
7     df_print: kable  
8     reference_docx: word-styles-reference.docx  
9 ---  
10
```

The screenshot shows the Microsoft Word ribbon with tabs like Design, Layout, References, Mailings, Review, and View. A large blue arrow points from the top-left towards the ribbon area. The Styles pane on the right lists various styles such as Abstract, Author, Bibliogr..., Body Text, Compact, Date, First Par..., Normal, Subtitle, Table Con..., Title, Block Text, Footnote..., Heading..., and TOC Head... with their corresponding font and color swatches.

W

Formatting styles to tag sections (H1, H2, H3) that are inherited into screen reader tags.

H2 (Header 2)

## Economic Impacts

P (Paragraph)

The premise behind economic impact modeling is that every dollar spent in a regional economy (direct impact) is either saved or re-spent on additional goods or services. If those dollars are re-spent on other goods and services in the regional economy, this spending generates additional economic activity in the region.  
r paste0("^[", Footnotes.list\$ft\_FEUStool, "]")

Footnote

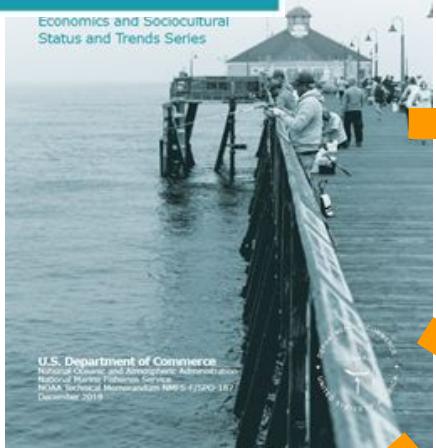
PDF



The screenshot shows a file structure or tag viewer with a tree view. The root node is <Document>. It has children <Art>, <Art>, <Art>, and <Sect>. The <Sect> node is expanded, showing its children: <Sect>, <TBody>, <P>, and <P>. A large blue arrow points from the bottom-right towards the <Sect> node.



## Output Flexibility



The same code can be used to reproducibly produce other products:  
**(For example)**

Region/State	United States
Year	2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017
Species Group	Total, Fish & Other, Shellfish
Key Species	Fish & Other
Commercial	Alosa pollock American lobster Blue crab Haddock Polar halibut Pacific salmon Red snapper Sea scallop Shrimp Tuna
Recreational	
Marine Economy	
Glossary	

Online Webtool



Fact Sheets and Infographics

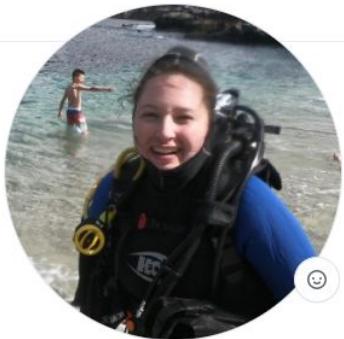
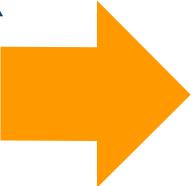


Saltwater Recreational Fisheries Snap Shots

... and is now being applied to many products and reports at AFSC!

# Thanks!

Be sure to check  
out these other  
great talks!



Emily Markowitz  
EmilyMarkowitz-NOAA

[https://emilymarkowitz-noaa.github.io/  
NMFSReports/](https://emilymarkowitz-noaa.github.io/NMFSReports/)

Emily.Markowitz@noaa.gov



@EmilyMarkowitz-NOAA



@EmilyHMarkowitz



NOAA  
FISHERIES

## Different Strategies for Teaching Your Colleagues R:

Lessons Learned and  
Recommendations

June 05, 2021

Chante Davis<sup>1</sup>, Emily Markowitz<sup>2</sup>, and Diana Dishman<sup>1</sup>

<sup>1</sup>NOAA Fisheries WCR, <sup>2</sup>NOAA Fisheries AFSC Groundfish Assessment

Chante.Davis@noaa.gov, Emily.Markowitz@noaa.gov, Diana.Dishman@noaa.gov Diana Dishman  
DianaDishman-NOAA



NOAA  
FISHERIES



Diana Dishman  
DianaDishman-NOAA

## Helping Regulatory Teams Work Better, Together

Diana Dishman

NOAA Fisheries West Coast Region, Protected Resources Division, Portland Branch

Cascadia R Conference - Digital Track  
June 4, 2021



Chante Davis  
ChanteDavis-NOAA



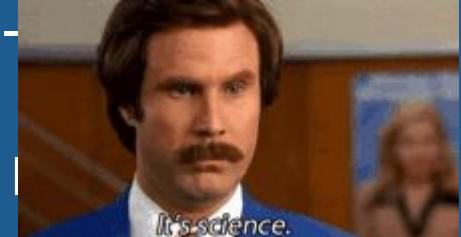
Emily Markowitz  
EmilyMarkowitz-NOAA



Diana Dishman  
DianaDishman-NOAA

# Development

- 2021-03-15 Gave talk at the NEFSC Seaside Open- and compared notes on report writing
- 2021-02-11 Presented progress and concept at the I Fisheries Integrated Toolbox (FIT) meeting
- 2020-11-30 Presented idea to FIT organizers for <https://noaa-fisheries-integrated-toolbox.github.io/>
- 2020 Compiling package for personal use from tips and tricks learned from rewriting FEUS.



# MS Word and PPTX Styles

**(We're not at html-based or code to pdf reports yet - this is what editors expect to receive)**



A screenshot of Microsoft Word showing a slide master layout. The ribbon at the top includes tabs for File, Slide Master, Home, Insert, Draw, Transitions, Animations, Review, View, Help, and EndNote X8. The 'Slide Master' tab is selected. On the left, the 'Master Layout' pane shows a list of master layouts: 'Insert Master', 'Inset Master', 'Slide Master', 'Insert Placeholder', and 'Master Layout'. The 'Inset Master' layout is currently selected. The main content area displays a slide with a blue header bar containing the NOAA Fisheries logo and the text 'Click to edit Master title style'. Below the header is a large red box containing the same text. A callout bubble points to the red box with the text 'Click to edit Master subtitle style'. At the bottom of the slide, there is a footer section with the NOAA Fisheries logo and the text 'U.S. Department of Commerce | National Oceanic and Atmospheric Administration | NOAA Fisheries | Page 1'. The status bar at the bottom right shows the page number '51%'. The 'Animations' tab is active, showing options for 'Colors', 'Font', 'Effects', 'Background', 'Size', and 'Close'.

# The run.R file acts as the spine of the report

## run.R

```
1 #' ---  
2 #' title: 'Data Report: MAXYR Eastern Bering Sea continental shelf Bottom Trawl Survey of Groundfish and Invertebrate Fauna'  
3 #' author: 'L. Britt, E. J. Dawson, R. Haehn and E. H. Markowitz'  
4 #' purpose: Run Scripts and R Markdown Files  
5 #' start date: 2021-06-01  
6 #' date modified: 2021-06-01  
7 #' Notes:  
8 #' ---  
9  
10 # START -----  
11  
12 # *** REPORT KNOWNS -----  
13 report_title <- 'Data Report: MAXYR Eastern Bering Sea continental shelf Bottom Trawl Survey of Groundfish and Invertebrate Fauna'  
14 report_authors <- 'L. Britt, E. J. Dawson, R. Haehn and E. H. Markowitz'  
15 report_yr <- substr(x = Sys.Date(), start = 1, stop = 4) |  
16  
17 # *** OUTPUT TYPE -----  
18 #Is this for InDesign?  
19 indesign_flowin <- FALSE  
20  
21 # *** SOURCE SUPPORT SCRIPTS -----  
22  
23 source('./code/directories.R')  
24  
25 source('./code/functions.R')  
26  
27 source('./code/dataDL.R')  
28  
29 source('./code/data.R')  
30  
31 # MAKE REPORT -----  
32  
33 # *** HOUSEKEEPING -----  
34  
35 # Keep chapter content in a proper order  
36 cnt_chapt <- "000"  
37 # Automatically name objects with consecutive numbers  
38 cnt_figures <- 0 # e.g., Figure 1  
39 cnt_tables <- 0 # e.g., Table 1  
40 cnt_equations <- 0 # e.g., Equation 1  
41 # Save object content  
42 list_equations <- list()  
43 list_tables <- list()  
44 list_figures <- list()  
45
```

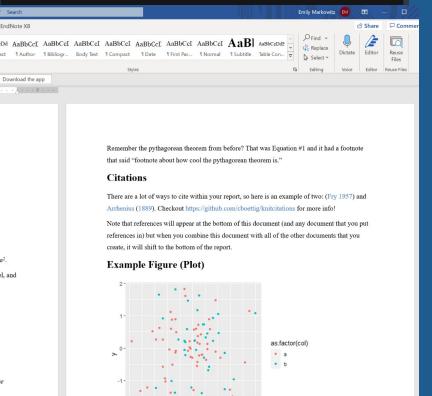
```
46 # *** RUN EACH REPORT SECTION -----  
47  
48  
49 # *** 00 - Example -----  
50 cnt_chapt<-auto_counter(cnt_chapt)  
51 cnt_chapt_content<-"001"  
52 filename0<-paste0(cnt_chapt, "_example_")  
53 rmarkdown::render(paste0(dir_code, "/00_example.Rmd"),  
54 output_dir = dir_out_chapters,  
55 output_file = paste0(filename0, cnt_chapt_content, ".doc"))  
56  
57  
58 # *** 01 - Abstract -----  
59 cnt_chapt<-auto_counter(cnt_chapt)  
60 cnt_chapt_content<-"001"  
61 filename0<-paste0(cnt_chapt, "_abstract_")  
62 rmarkdown::render(paste0(dir_code, "/01_abstract.Rmd"),  
63 output_dir = dir_out_chapters,  
64 output_file = paste0(filename0, cnt_chapt_content, ".doc"))  
65  
66  
67 # *** 02 - Introduction -----  
68 cnt_chapt<-auto_counter(cnt_chapt)  
69 cnt_chapt_content<-"001"  
70 filename0<-paste0(cnt_chapt, "_introduction_")  
71 rmarkdown::render(paste0(dir_code, "/02_introduction.Rmd"),  
72 output_dir = dir_out_chapters,  
73 output_file = paste0(filename0, cnt_chapt_content, ".doc"))  
74  
75  
76 # *** 03 - History -----  
77 cnt_chapt<-auto_counter(cnt_chapt)  
78 cnt_chapt_content<-"001"  
79 filename0<-paste0(cnt_chapt, "_history_")  
80 rmarkdown::render(paste0(dir_code, "/03_history.Rmd"),  
81 output_dir = dir_out_chapters,  
82 output_file = paste0(filename0, cnt_chapt_content, ".doc"))  
83  
84  
85 # *** 04 - Methods -----  
86 cnt_chapt<-auto_counter(cnt_chapt)  
87 cnt_chapt_content<-"001"  
88 filename0<-paste0(cnt_chapt, "_methods_")  
89 rmarkdown::render(paste0(dir_code, "/04_methods.Rmd"),  
90 output_dir = dir_out_chapters,  
91 output_file = paste0(filename0, cnt_chapt_content, ".doc"))  
92
```

Files Plots Packages Help Viewer

New Folder Delete Rename More

Home > Homework > test > code

Name	Size
00_example.Rmd	9.5 KB
01_abstract.Rmd	378 B
02_introduction.Rmd	382 B
03_history.Rmd	377 B
04_methods.Rmd	377 B
05_results.Rmd	377 B
06_results_spp.Rmd	381 B
07_results_discussion.Rmd	388 B
08_endmatter.Rmd	646 B
09_presentation.Rmd	936 B
data.R	364 B
dataDL.R	810 B
directories.R	3 KB
functions.R	2.1 KB
header.yaml	65 B
run.R	6.3 KB
style.docx	87.8 KB
styles_reference.pptx	1.1 MB



# What is R Markdown?

R Markdown provides a single medium for writing code and generating reports.

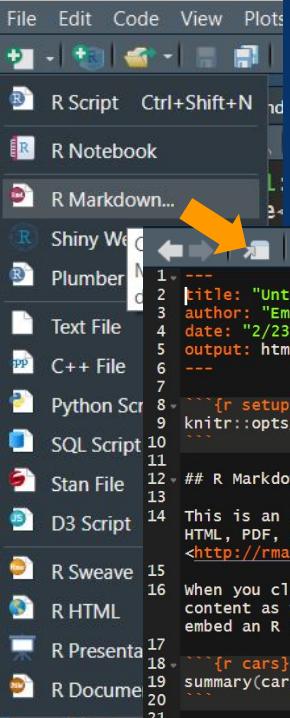


R Markdown



1. Use an R Markdown file to load data, run code, connect to databases, servers, spark clusters, and more.

2. Publish the results as a html, pdf, or Word file, or as a slide show, book, handout, dashboard, website, or interactive app.



```
1 ---  
2   title: "Untitled"  
3   author: "Emily Markowitz"  
4   date: "2/23/2021"  
5   output: html_document  
6 ---  
7  
8 ```{r setup, include=FALSE}  
9 knitr::opts_chunk$set(echo = TRUE)  
10  
11  
12 ## R Markdown  
13  
14 This is an R Markdown document. Markdown is a simple formatting syntax for authoring  
HTML, PDF, and MS Word documents. For more details on using R Markdown see  
http://rmarkdown.rstudio.com.  
15  
16 When you click the **Knit** button a document will be generated that includes both  
content as well as the output of any embedded R code chunks within the document. You can  
embed an R code chunk like this:  
17  
18 ```{r cars}  
19 summary(cars)  
20  
21  
22 ## Including Plots  
23  
24 You can also embed plots, for example:  
25  
26 ```{r pressure, echo=FALSE}  
27 plot(pressure)  
28  
29
```

## YAML metadata Setup

Text

Table Code Chunk

Text

Plot code chunk

## HTML

### Untitled

Emily Markowitz  
2/23/2021

### R Markdown

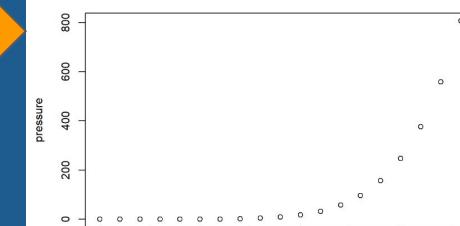
This is an R Markdown document. Markdown is a simple formatting syntax for authoring HTML, PDF, and MS Word documents. For more details on using R Markdown see <http://rmarkdown.rstudio.com>.

When you click the \*\*Knit\*\* button a document will be generated that includes both content as well as the output of any embedded R code chunks within the document. You can embed an R code chunk like this:

```
summary(cars)  
  
## speed dist  
## Min. :4.0 Min. : 2.00  
## 1st Qu.:12.0 1st Qu.: 26.00  
## Median:15.0 Median : 36.00  
## Mean :15.4 Mean : 42.98  
## 3rd Qu.:19.0 3rd Qu.: 56.00  
## Max. :25.0 Max. :128.00
```

### Including Plots

You can also embed plots, for example:





Streamline Report  
Creation

# Time for a demonstration!





**NOAA  
FISHERIES**

**Emily Markowitz**

**Research Fisheries Biologist**

**NOAA Fisheries**

**Alaska Fisheries Science Center**

**Emily.Markowitz@noaa.gov**

**@emilyhmarkowitz**

**<https://emilymarkowitz-noaa.github.io/NMFSReports/>**

# NMFSReports

*Easily write  
NOAA reports and tech memos  
in R Markdown!*

**June 05, 2021  
2021 R Cascadia Conference**



**Emily Markowitz**  
EmilyMarkowitz-NOAA