



NMFSReports

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



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2021 R Cascadia Conference

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EmilyMarkowitz-NOAA

 [@emilyhmarkowitz](https://twitter.com/emilyhmarkowitz)

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

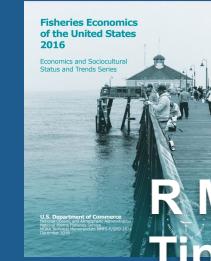


Inspiration

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...



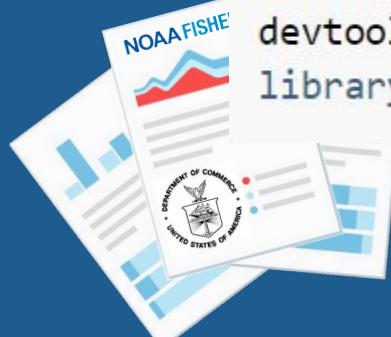
WORK IN PROGRESS

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

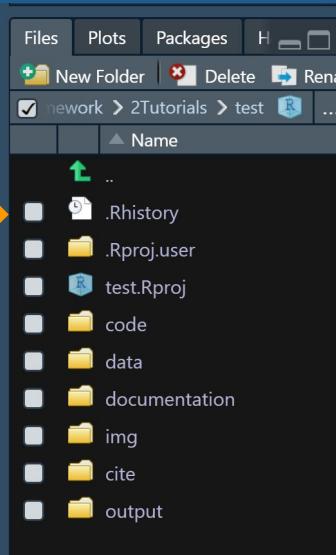


Output Flexibility

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")
```



Streamline Report
Creation

Video Demo

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.¹

This sentence exemplifies how to systematically calculate a percent change: a 97% decrease².

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 theorem³

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

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.

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

¹ Wow, this project is so cool!

² Here's another, free-written footnote!

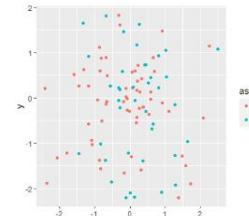
³ Footnote about how cool the pythagorean theorem is.

Example Table (Basic)

Table 1. Here is a table!⁴

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!^{4,5}

* 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 (Artemisina 1889). 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 - Saved to this PC

Emily Markowitz EM

Review View Help EndNote X8

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...

001_example_001.docx

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

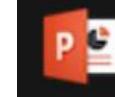
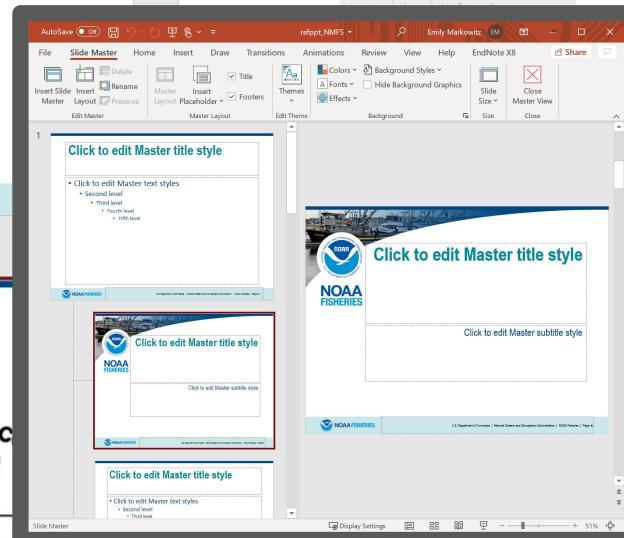
Table 1. Here is a table!

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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!



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 to begin writing your report

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

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```
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```

Vignettes



Streamline Report Creation

```
R Untitled1* x 0_example.Rmd x ABC Knit ...  
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/knitr 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/knitr> 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

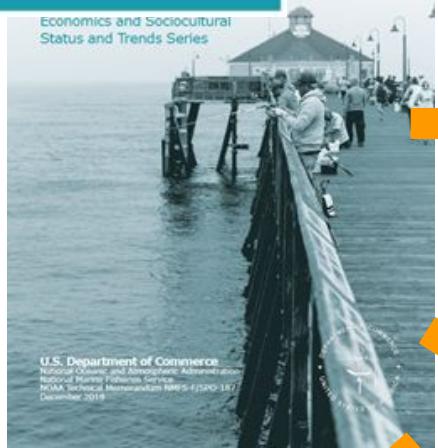
PDF



The screenshot shows a tree view of tags. At the top level is <Document>. It contains three <Art> tags. Below that is a <Sect> tag, which contains two more <Sect> tags, one <TBody> tag, and one <P> tag.



Output Flexibility



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

United States

Total Landings & Landings of Key Species/Species Groups (millions of pounds)

Region/State	Commercial	Recreational	Marine Economy	Other						
United States	2,276	1,960	1,948	2,811						
Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Total	7,043	7,333	7,761	8,106	8,095	9,461	9,753	9,350	9,320	9,665
Fish & Other	8,996	8,453	8,484	8,233	7,844	9,196	7,890	8,405	8,104	8,314
Shellfish	1,955	1,275	1,308	1,373	1,322	1,287	1,268	1,129	1,158	1,138

Key Species

Commercial	Recreational	Marine Economy	Other	
Alewife pollock	2,276	1,960	1,948	2,811
American lobster	98	118	118	108
Blue crab	162	178	190	260
Monkfish	1,344	1,497	1,280	1,094
Pacific halibut	43	63	42	140
Pacific salmon	860	755	788	788
Sea scallop	42	43	40	41
Shrimp	249	305	249	312
Tuna	48	49	40	50

Download Table ▾

Online Webtool

NOAA FISHERIES Office of Science & Technology

Highlights from the Annual Report Fisheries Economics of the United States, 2016

Bar chart: Total landings (millions of pounds) by species group.

Line graph: Total landings (millions of pounds) from 2012 to 2016.

Fact Sheets and Infographics

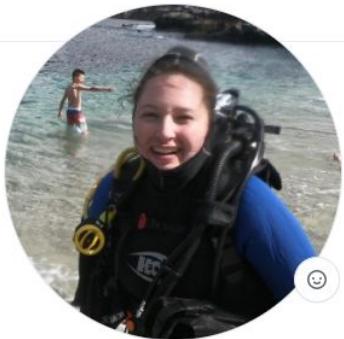
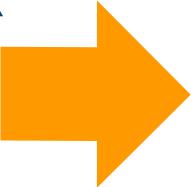


Saltwater Recreational Fisheries Snap Shots

... 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/)

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@EmilyHMarkowitz



NOAA
FISHERIES

Different Strategies for Teaching Your Colleagues R:

Lessons Learned and
Recommendations

June 05, 2021

Chante Davis¹, Emily Markowitz², and Diana Dishman¹

¹NOAA Fisheries WCR, ²NOAA 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

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.