



**NOAA
FISHERIES**



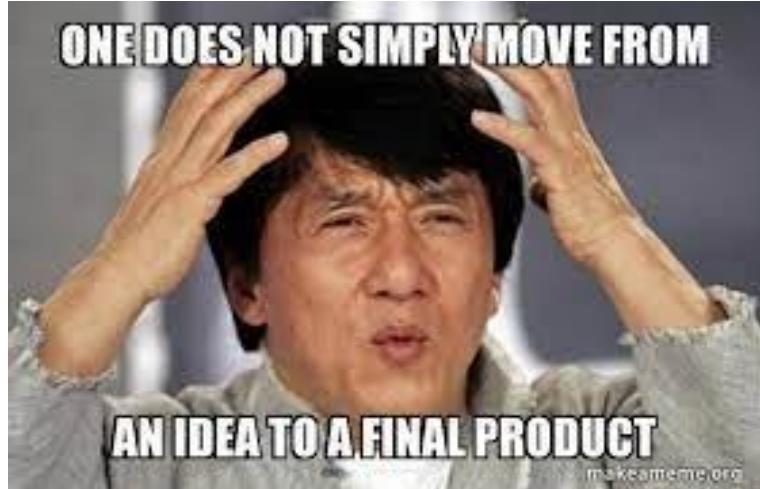
Data to Product Workflows

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NOAA Fisheries
Alaska Fisheries Science Center

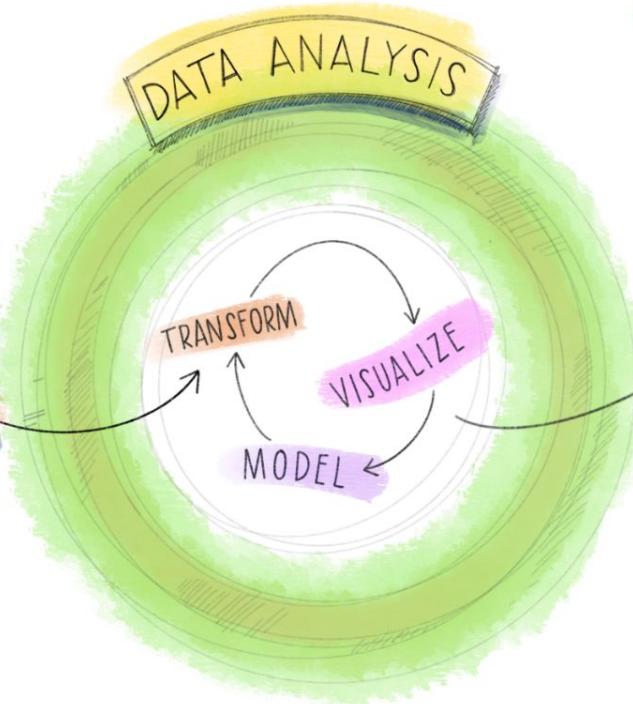
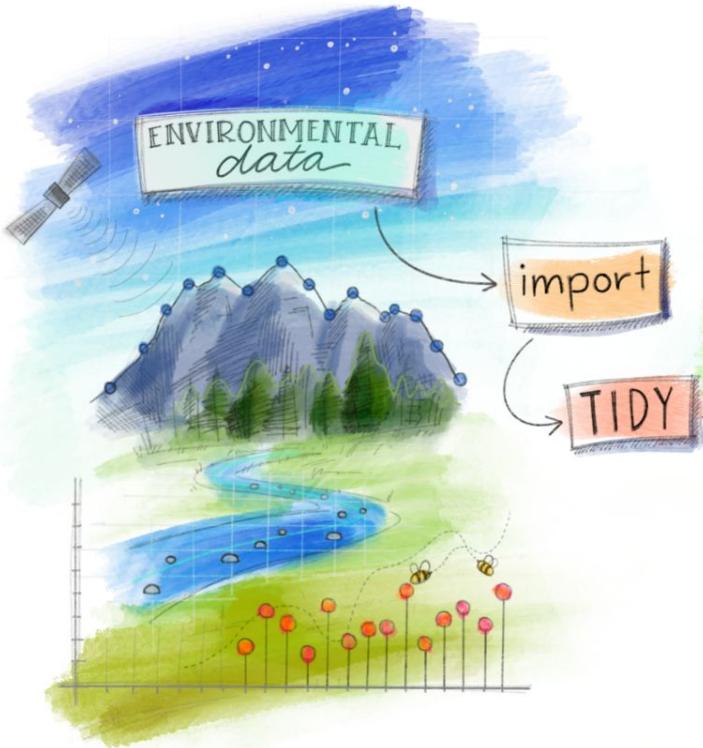
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 [EmilyMarkowitz-NOAA](https://github.com/EmilyMarkowitz-NOAA)

October 1, 2021
NOAA NMFS NWFSC
Openscapes

What is “Data to Product” Workflow?

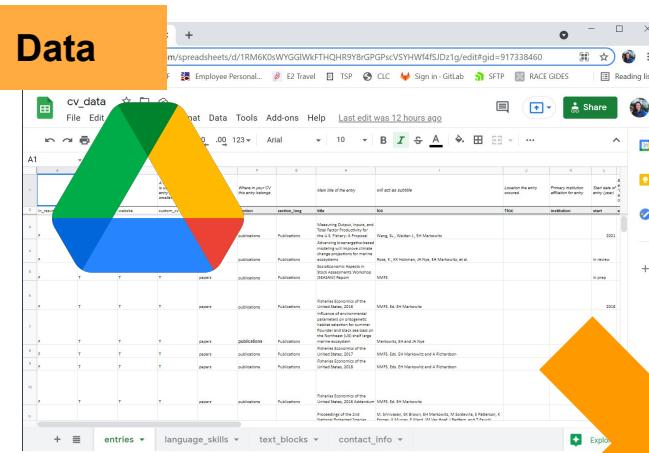


Or can they???
YES!



Let's think a bit more about what this means... with a few examples!

"Artwork from @juliesquid for @openscapes (illustrated by @allison_horst)."



`source("run.R")`

Build a personal website and CV entirely from a google spreadsheet

Final Product Website

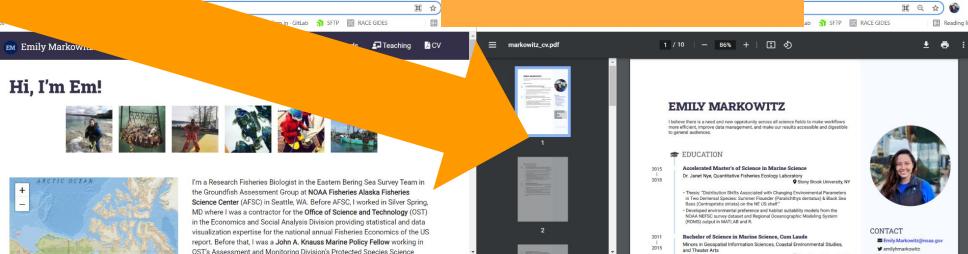


What's Em working on?

Basically there is a clear and present need for science to make workflows more efficient, improve data management, and make our research accessible and digestible to general audiences. The first step toward this is to envision analysis-to-product workflows in programs like R, and the second step is to share! Please feel free to check out my GitHub for code, make additions/edits, or let me know if you have comments. That's how we make the best available science!

R Markdown Reports

Final Product CV

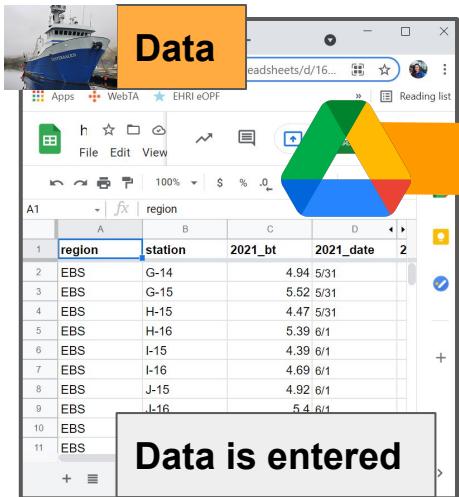


Template: https://github.com/EmilyMarkowitz-NOAA/website_cv_template

Example (my website!): <https://emilyhmarkowitz.github.io/emilyhmarkowitz/index.html>

Inspiration: https://livefreeordichotomize.com/2019/09/04/building_a_data_driven_cv_with_r/

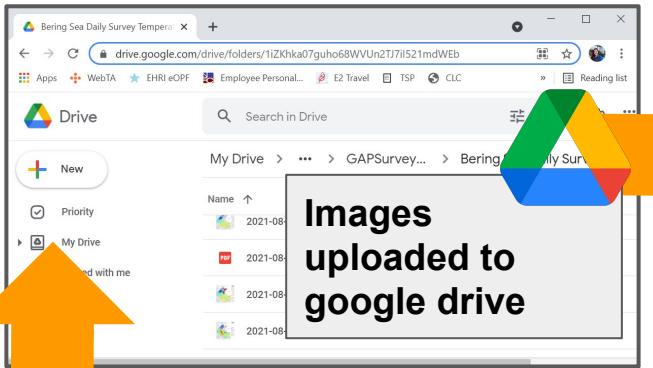
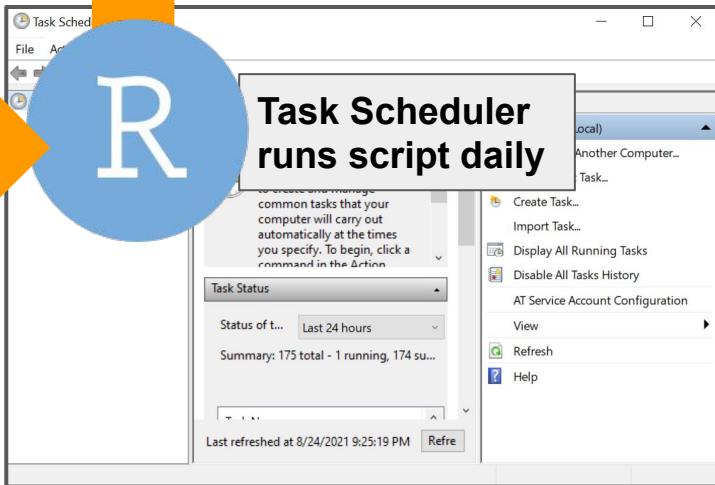
Share Daily Temperature Updates from the Bering Sea



Data

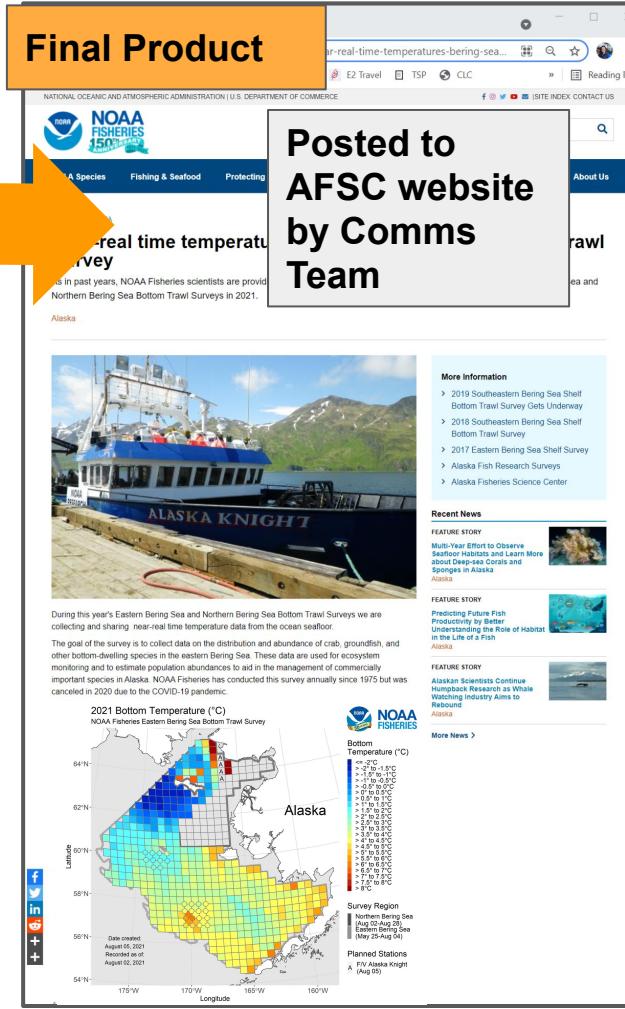
region	station	2021_bt	2021_date
EBS	G-14	4.94	5/31
EBS	G-15	5.52	5/31
EBS	H-15	4.47	5/31
EBS	H-16	5.39	6/1
EBS	I-15	4.39	6/1
EBS	I-16	4.69	6/1
EBS	J-15	4.92	6/1
EBS	J-16	5.4	6/1
EBS	EBS		

Data is entered



Final Product

Posted to AFSC website by Comms Team



NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION U.S. DEPARTMENT OF COMMERCE

NOAA FISHERIES 150TH ANNIVERSARY

A Species Fishing & Seafood Protecting

near real time temperature survey

During past years, NOAA Fisheries scientists are providing Northern Bering Sea Bottom Trawl Surveys in 2021.

Alaska

More Information

- 2019 Southeastern Bering Sea Shelf Bottom Trawl Survey Gets Underway
- 2018 Southeastern Bering Sea Shelf Bottom Trawl Survey
- 2017 Eastern Bering Sea Shelf Survey
- Alaska Fish Research Surveys
- Alaska Fisheries Science Center

Recent News

FEATURE STORY

- Multi-Year Effort to Observe Seafloor Ecosystems and More about Deep-sea Corals and Sponges in Alaska

FEATURE STORY

- Predicting Future Fish Productivity by Better Understanding the Role of Habitat in the Life of a Fish

FEATURE STORY

- Alaskan Scientists Continue Humpback Research as Whale Watching Industry Aims to Return

More News >

2021 Bottom Temperature (°C)

NOAA Fisheries Eastern Bering Sea Bottom Trawl Survey

Bottom Temperature (°C)

- 2° to -2°C
- 2° to -1°C
- 1° to 0°C
- 0° to 0.5°C
- 0° to 1°C
- 1° to 1.5°C
- 1.5° to 2°C
- 2° to 2.5°C
- 2.5° to 3°C
- 3° to 3.5°C
- 3.5° to 4°C
- 4° to 4.5°C
- 4.5° to 5°C
- 5° to 5.5°C
- 5.5° to 6°C
- 6° to 6.5°C
- 6.5° to 7°C
- 7° to 7.5°C
- 7.5° to 8°C

Survey Region

Northern Bering Sea

Date created: Aug 20, 2021

Last updated: Aug 02, 2021

Planned Stations

A F/V Alaska Knight (Aug 05)

B

C

D

E

F

G

H

I

J

K

L

M

N

O

P

Q

R

S

T

U

V

W

X

Y

Z

Longitude

Latitude

Repo: <https://github.com/EmilyMarkowitz-NOAA/GAPsurveyTemperatureMap>

Article: <https://www.fisheries.noaa.gov/alaska/science-data/near-real-time-temperatures-bering-sea-bottom-trawl-survey>

Develop a tool that anyone(!) can use to calculate hearing threshold shifts in marine mammals



D: STATIONARY SOURCE: Non-explosive, Intermittent
VERSION 2.0: 2018

Project Information
User Provided Information
Technical Guidance
Received Length

Step 1: GENERAL PROJECT INFORMATION
PROJECT TITLE
PROJECT SOURCE INFORMATION
PROJECT CONTACT
PROJECT DESCRIPTION

Step 2: WEIGHTING FACTOR ADJUSTMENT
Weighting Factor Adjusted [dB] *

Step 3: SOURCE-SPECIFIC INFORMATION
Source Level (dB SPL) *
Source Level Type
public (A) sound
private (C) sound
Additional Source Details
Receiving Sound Product
Receiving Sound Product
Receiving Depth
Receiving Depth

NOTE: The User Provided Information section is intended to be used in conjunction with the Technical Guidance of PTI sound thresholds. This section and receiving sound product information are not required to be filled in if user has access to the Technical Guidance of PTI sound thresholds.

RESONANT FREQUENCIES: Consult use WTB higher than minimum applicable frequency (See GROWT for more information on WTB applicable frequencies)

Step 4: SOURCE-SPECIFIC INFORMATION
Source Level (dB SPL) *
Source Level Type
public (A) sound
private (C) sound
Additional Source Details
Receiving Sound Product
Receiving Sound Product
Receiving Depth
Receiving Depth

NOTE: The User Provided Information section is intended to be used in conjunction with the Technical Guidance of PTI sound thresholds. This section and receiving sound product information are not required to be filled in if user has access to the Technical Guidance of PTI sound thresholds.

RESULTANT DISPLAYS

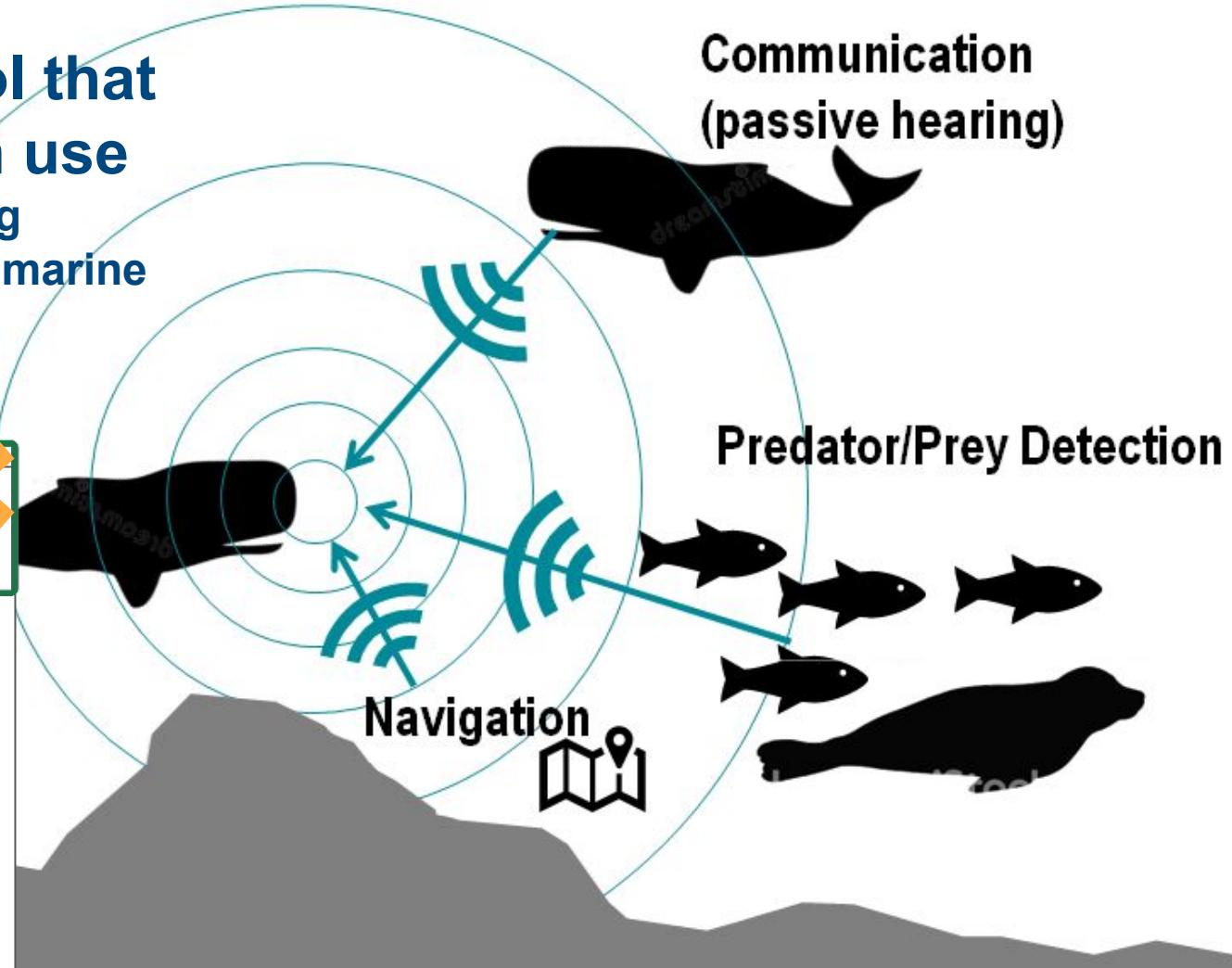
Receiving Sound Product	Low-Frequency Equivalent	Mid-Frequency Equivalent	High-Frequency Equivalent	Wideband Equivalent
WTB - Threshold	WTB	WTB	WTB	WTB
WTB Length In Seconds	WTB	WTB	WTB	WTB

ALTERNATIVE METACOGNITIVE APPROACHES

Reliability Duration (Seconds)	Low-Frequency Equivalent	Mid-Frequency Equivalent	High-Frequency Equivalent	Wideband Equivalent
100	WTB	WTB	WTB	WTB
1000	WTB	WTB	WTB	WTB
10000	WTB	WTB	WTB	WTB
100000	WTB	WTB	WTB	WTB

RESONANT DISPLAYS

Receiving Sound Product	Low-Frequency Equivalent	Mid-Frequency Equivalent	High-Frequency Equivalent	Wideband Equivalent
WTB - Threshold	WTB	WTB	WTB	WTB
WTB Length In Seconds	WTB	WTB	WTB	WTB



Develop a tool that anyone(!) can use to calculate hearing threshold shifts in marine mammals

- Intuitive and limits user error
- Saves time
- Produce mutually helpful outputs

The screenshot shows a Shiny application interface with a blue hexagonal logo on the left. The main content is divided into five sections:

- Step 1: PROJECT FORMATION**: Fields for Project Title (Example), Project Contact (First Last), and Project/Source Information (Including Assumptions) (A test run).
- Step 2: SOUND SOURCE AND SOUND METRIC**: Fields for Sound Source (Stationary drilling vessels or platforms), Source Level Metric for Calculating Cumulative Sound Exposure Level, and LRMS SPL Source Level.
- Step 3: INCORPORATING AUDITORY WEIGHTING FUNCTIONS**: A dropdown menu for Is the Source Broad or Narrowband? (Single frequency (WFA)).
- Step 4: THRESHOLD CALCULATION INPUTS**: Fields for Source Level (L_{RMS} SPL) (10), Duration of Sound Production (hours) within 24-h period (4), and Propagation (xLogR) (2).
- Step 5: WEIGHTING FUNCTION PARAMETERS**: A dropdown menu for Weight Function Adjustment (kHz) (2).

Final Product Website

Results

WEIGHTING FUNCTION ADJUSTMENTS (dB)

Low-Frequency cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otarid Pinnipeds	
Adjustment (dB)	-0.01	-19.74	-26.87	-2.08	-1.15

Showing 1 to 1 of 1 entries
All entries are applicable frequencies.

THRESHOLD ISOPLETHS RESULTS

Underwater Acoustic Thresholds

Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otarid Pinnipeds	
SEL _{cum} Threshold	199	198	173	201	219
PTS Isopleth to threshold (m)	1.9e-74	8.3e-84	7.2e-75	1.8e-76	5.2e-85

Showing 1 to 2 of 2 entries
All entries are applicable values.

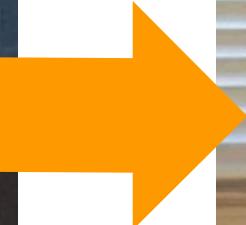
Download report from analysis

Shiny App: <https://jmlondon.shinyapps.io/AcousticThresholds/> *Location changing

Repo: <https://github.com/EmilyMarkowitz-NOAA/MarineMammalAcousticThresholds>

Similar Effort by Megsie Siple!: <https://jmlondon.shinyapps.io/NMFSAcousticDeterrentWebTool/> *Location changing

Workflow management



Consider: Would your current product development workflows benefit from similar data-driven approaches?

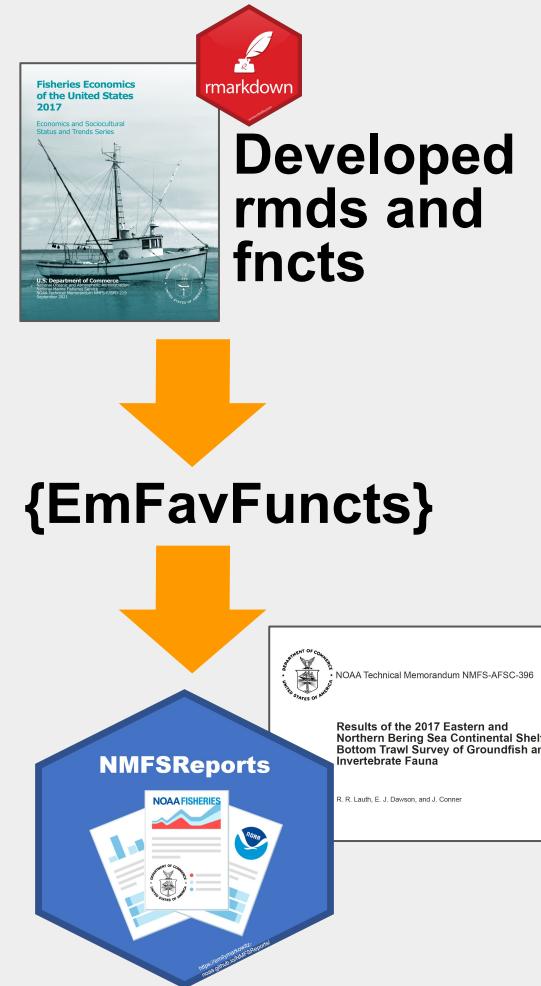
{NMFSReports}*

- 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](#); [FEUS 2017](#))
- ...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 and leveraged by others! ([Talk at R Cascadia 2021](#))

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

Repo: <https://github.com/EmilyMarkowitz-NOAA/NMFSReports>

*Package is still in development



Previously...



Now, with NMFS Reports...



"Artwork from [@juliesquid](#) for [@openscapes](#) (illustrated by [@allison_horst](#))."

Integrate content on
google drive and
directly from data
sources



Data Download Automation

Use templates and
functions with
helpful
documentation!



Streamline Report Creation

And dynamic!
(e.g., “a” vs “an”
“Increasing” vs
“decreasing”)



Consistent Grammar Structure

Yes, it's
possible! (e.g.,
colors, text
reader friendly
outputs)



Built-in 508 Accessibility



Version Control

Save and
share your
work



Output Flexibility

Create reports,
factsheets, summary
tables, and graphics

Chat soon!



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 Twitter: EmilyHMarkowitz

Takeaways:

- 1) You can create thoughtful data to product workflows for almost anything!
- 2) We don't just run models and obtain outputs, we can strategically use those outputs to make final products, too!

Prep for next session with Chanté Davis:

These are one-person dev examples, so think about how we can work on projects like these collaboratively and enhance each other's workflows.