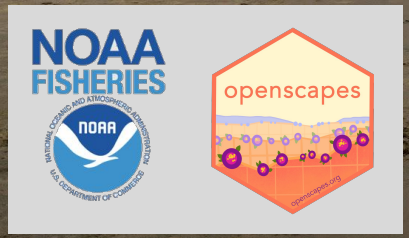
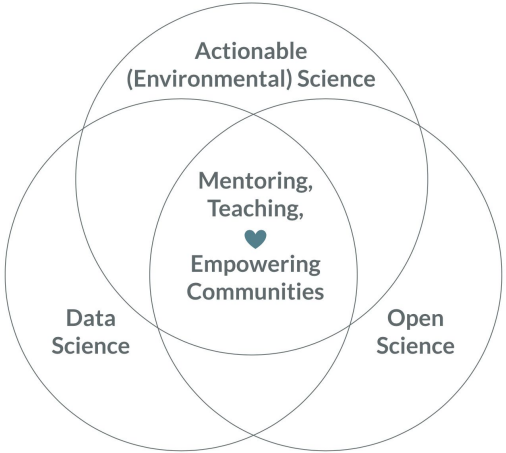
Better Science in Less Time?
Yes it is possible!



April 25, 2025

About us: We have a long history of actionable science & teaching



Our collaboration started with small sparks, in 2021

Eric Ward (NOAA Fisheries)

Erin Robinson (Metadata Game Changers)

Julia Lowndes, PhD
Openscapes
10+ years marine ecologist

Eli Holmes, PhD
NOAA Fisheries
25+ years applied mathematician

Outline

What does better science in less time look like?

NOAA Fisheries Openscapes perspectives, Spring 2025

Better Science

- more open, reproducible, efficient
- more diverse, equitable, inclusive, kind

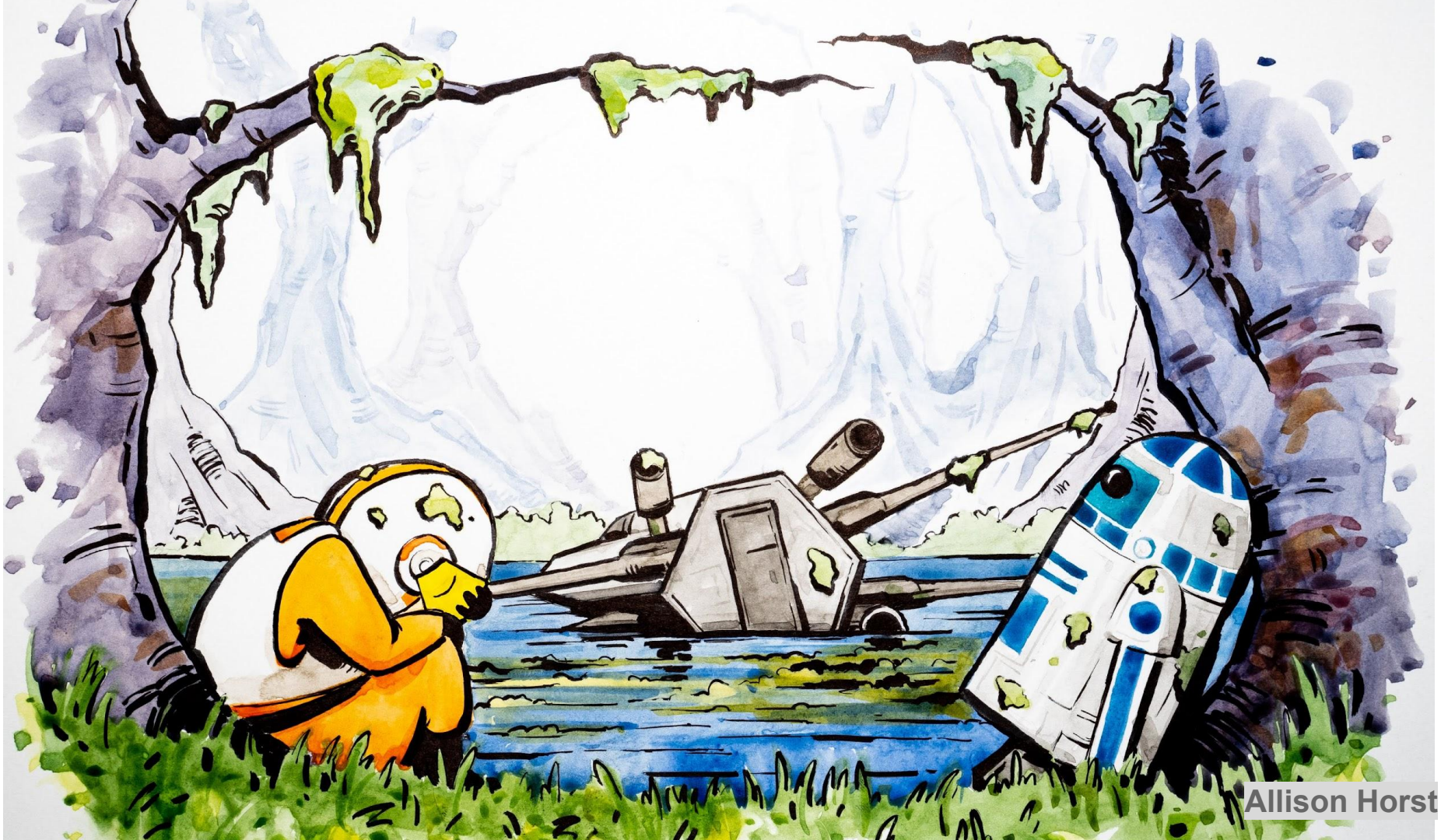
Future Us

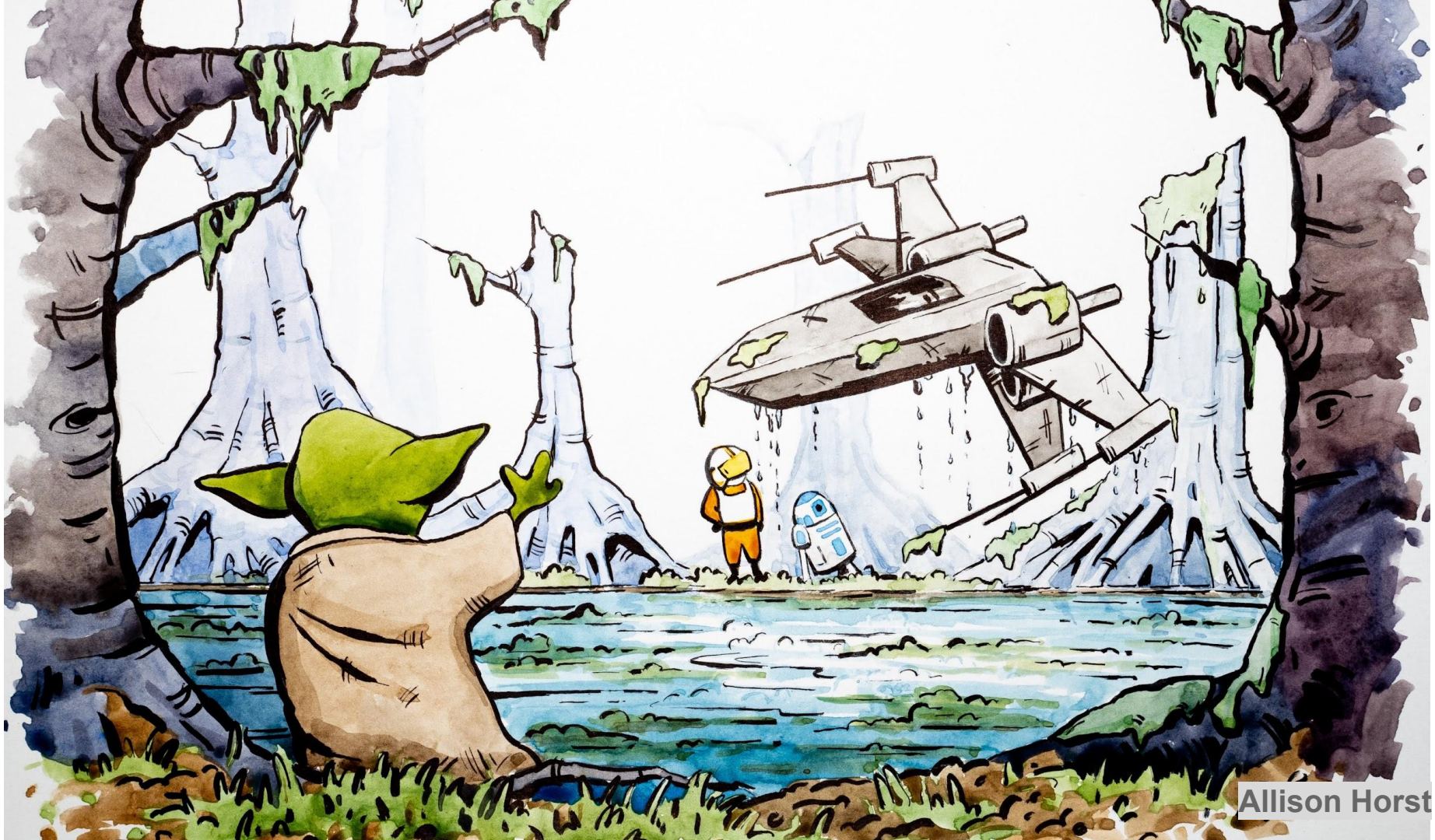
- ourselves, teams, communities
- next hour, week, decades

Stories from

- Ocean Health Index
- NOAA Fisheries

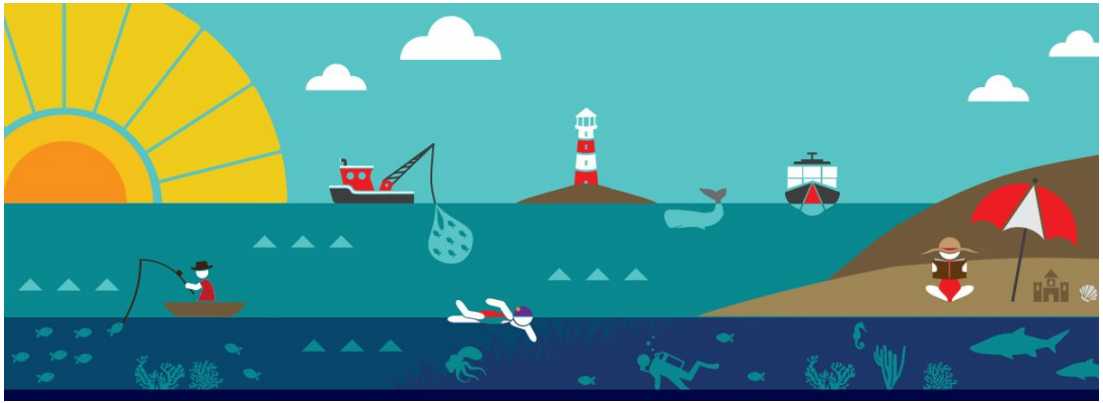
Resources & join us!


Allison Horst


Allison Horst

Allison Horst

A scientific method, tool, and community for channeling the best available scientific information into marine policy.



- Captures coupled system health, incorporates sustainability
- Boils into easy-to-understand metrics
- Is flexible to different contexts
- Stimulates actions to improve ocean health
- Is repeatable to track progress through time

Halpern et al. 2012

Ocean Health Index Impact, 10 yrs later

In 2012, it took 30 people 4 years and several $M to complete the 1st annual OHI report.

- Not sustainable if it costs $MM each time

In 2024, it's 3 masters students in 3 months and $200K.

Possible because it's reproducible, efficient, documented.

Team & collaborators can focus on new questions, making sense of results, and applications from this, not the assessment itself.

We found out the hard way that our default approaches for data analysis were not reproducible by even ourselves. So when we changed how we work, we shared & taught –

nature ecology & evolution

PERSPECTIVE

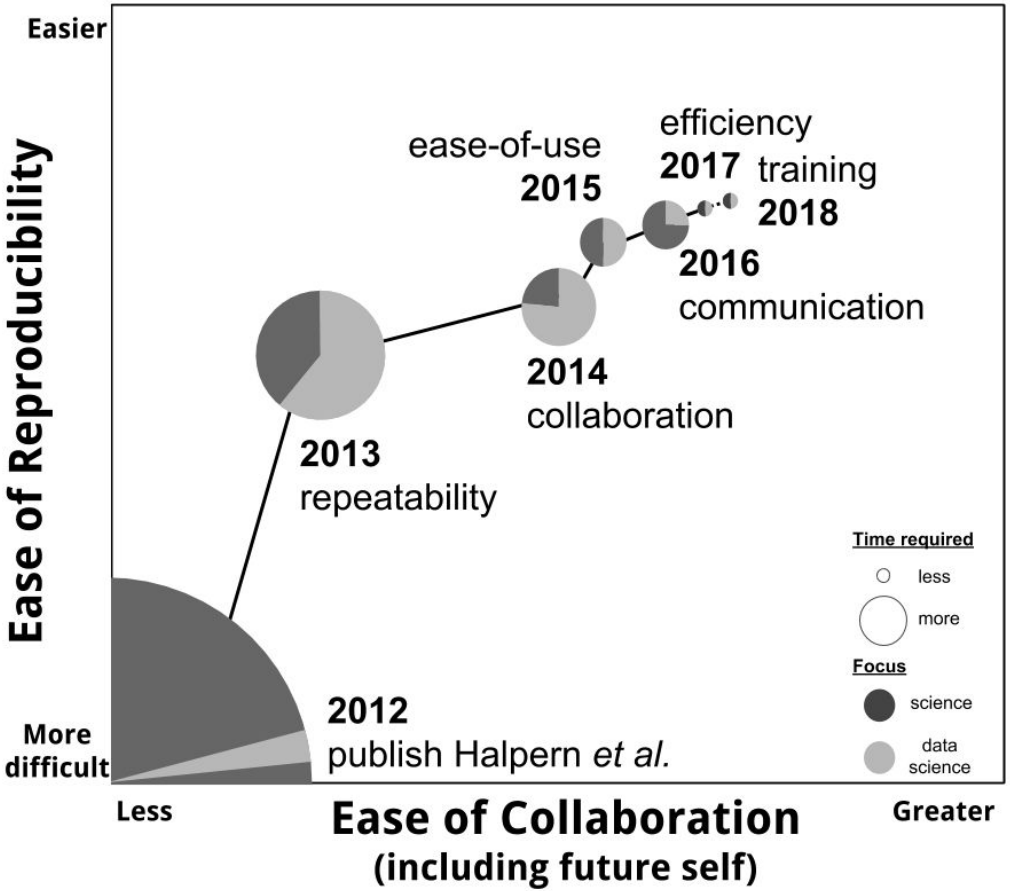
PUBLISHED: 23 MAY 2017 | VOLUME: 1 | ARTICLE NUMBER: 0160

Our path to better science in less time using open data science tools

Julia S. Stewart Lowndes[1]*, Benjamin D. Best[2], Courtney Scarborough[1], Jamie C. Afflerbach[1], Melanie R. Frazier[1], Casey C. O'Hara[1], Ning Jiang[1] and Benjamin S. Halpern[1,3,4]

Slides from R for better science in less time: Lessons from the Ocean Health Index and Openscapes - November 21, 2019: School of Aquatic and Fisheries Sciences, University of Washington, Seattle, Washington (45 minutes)

Ocean Health Index



Incremental: made progress where most needed while meeting annual deadlines

Habit building: paste text from email into GitHub Issues

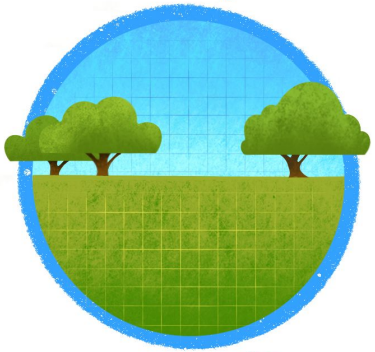
Code Review in the Lab - Melanie Frazier slides
https://ropensci.org/commcalls/2018-10-16/

Our path to better science in less time using open data science tools (Lowndes *et al.* 2017)

How we work: Technical & social infrastructure together

Tooling

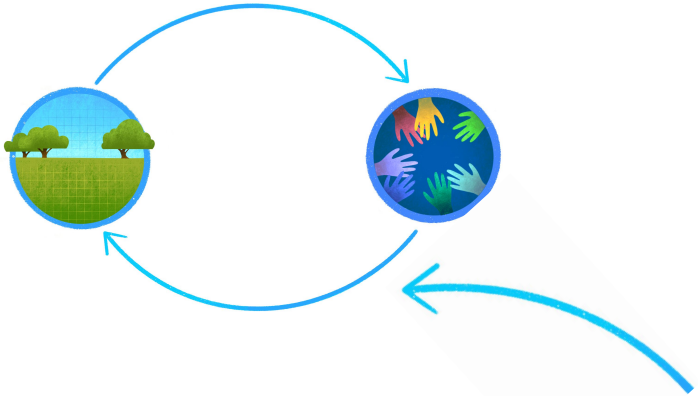
tools & workflows



People

teams & community

How we work

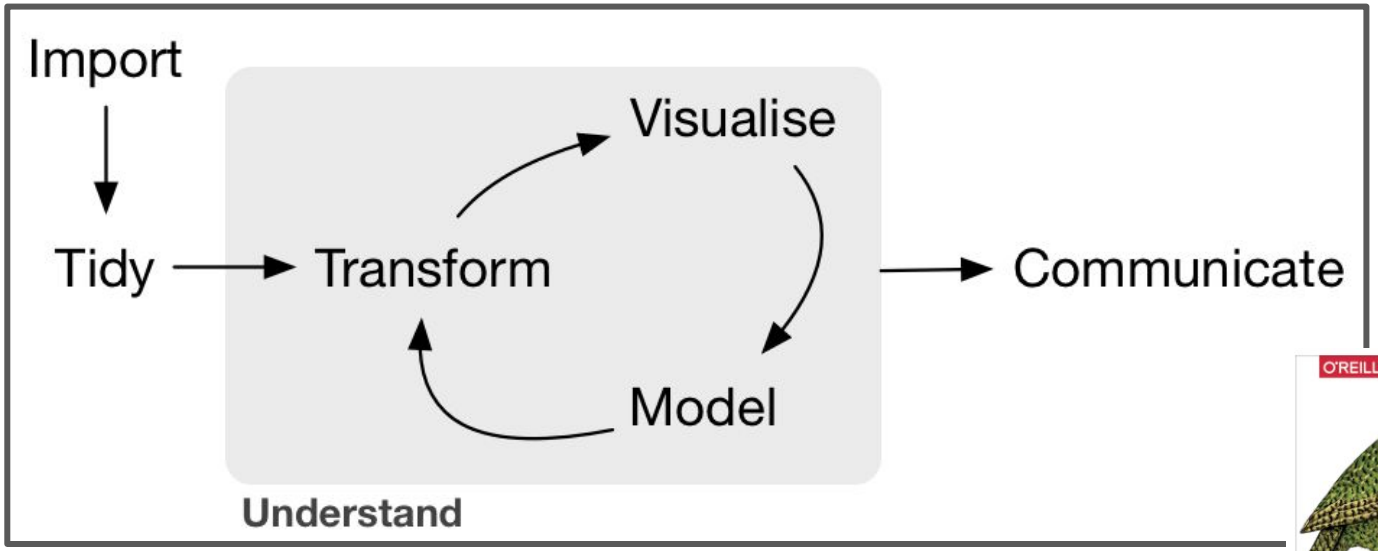


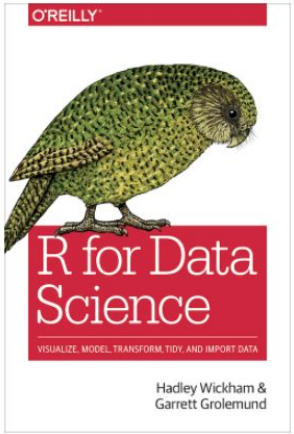
- Open source coding
- Version control
- Collaboration & distribution
- Real-time co-development
- Connection to broader communities

- **Vertical & horizontal leadership**
- **Trust, kindness, willingness, & learning**
- Create norms about data & docs, leverage overlapping skills, on/offboarding
- Join global & create local communities

Our path to better science in less time using open data science tools
Lowndes *et al*. 2017, *Nature Ecology & Evolution*

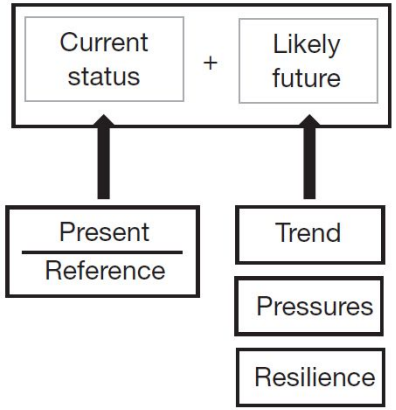
Learn from other groups: talk & draw our workflows

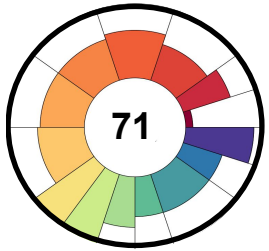




Wickham & Grolemund 2016

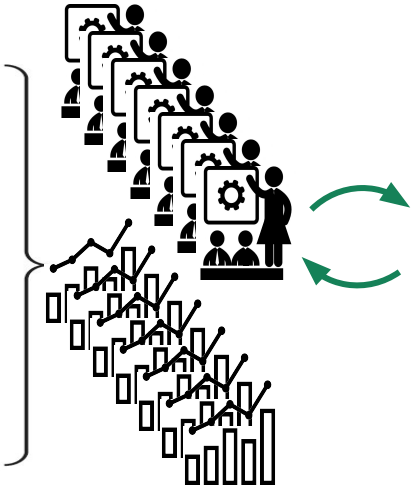
Big reports - visualize the steps

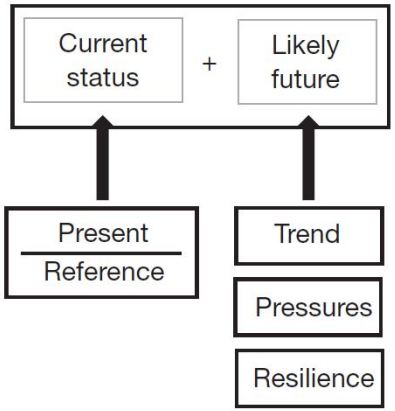


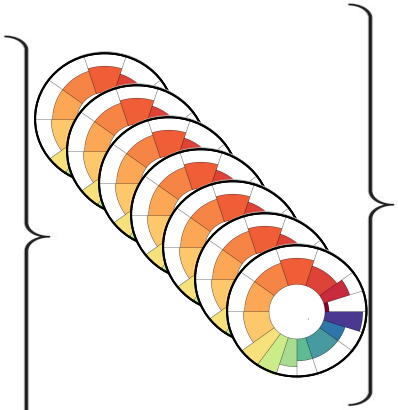


goals data models output share

Big reports - find the common, where to automate





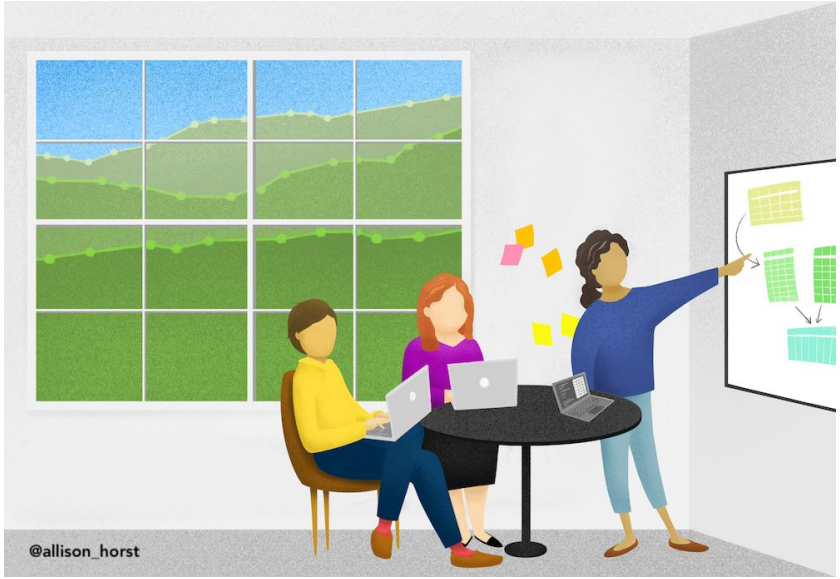


goals data models output share

OHI's pathway to better science in less time

Table 1, Lowndes *et al.* 2017

Task	Then
Reproducibility	
Data preparation	Manually (that is, Excel)
Modelling	Multiple programming languages
Version control	File duplication and renaming
Organization	Individual conventions
Collaboration	
Coding	Separate languages and conventions
Workflow and project management	Individual conventions
Internal collaboration	e-mail
Communication	
Sharing data	ftp download
Sharing methods	Published manuscript and supplementary material



Learn from other groups: streamlined workflows

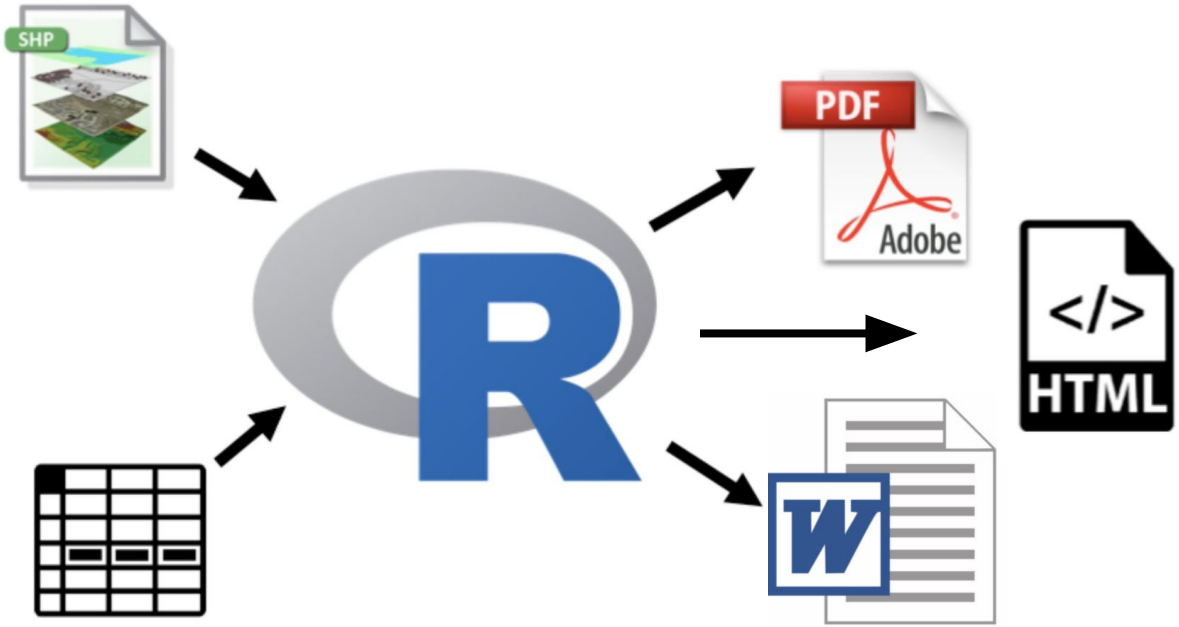


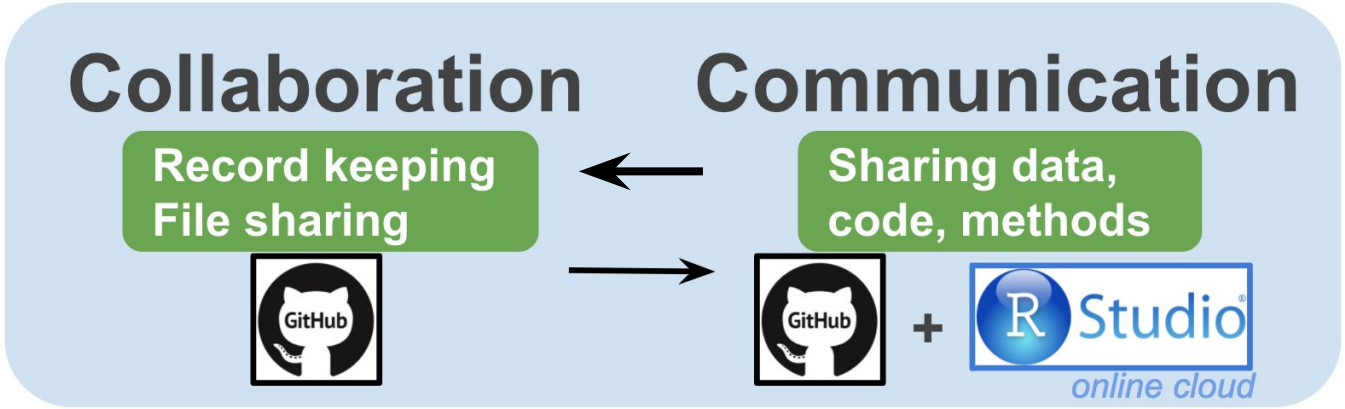
Figure adapted from
Teucher 2018

Shared tools & practices

efficiency & reproducibility:
coding and version control
are the keystone

Shared tools & practices

but also for collab & comms like you've never seen



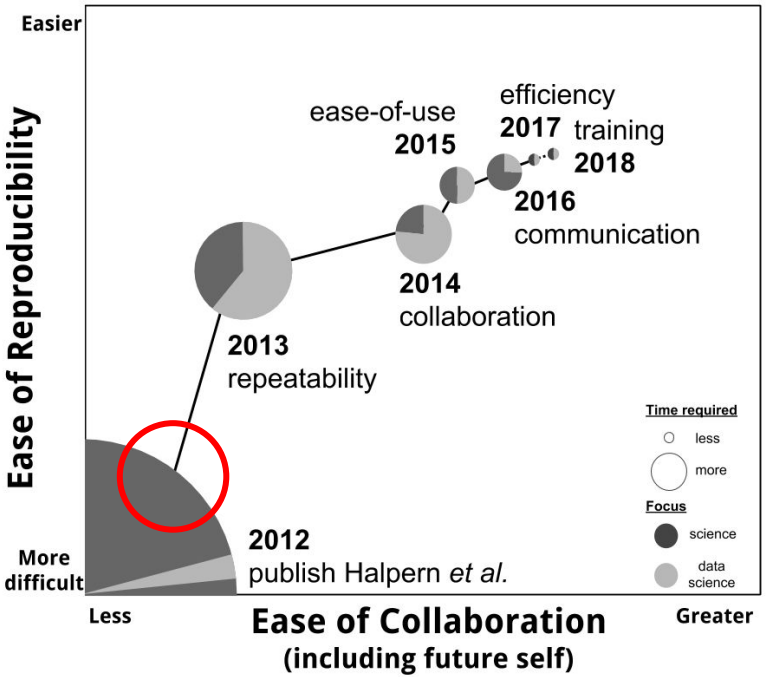
efficiency & reproducibility: coding and version control are the keystone

OHI's pathway to better science in less time

Table 1, Lowndes *et al.* 2017

Task	Then	Now	Primary open data science tools
Reproducibility			
Data preparation	Manually (that is, Excel)	Coded in R	R packages: tidyverse (dplyr, tidyr, ggplot2). Documentation: R Markdown
Modelling	Multiple programming languages	R functions and ohicore package	R packages: tidyverse, devtools, roxygen2, git2r
Version control	File duplication and renaming	Git	Git; interface with Git and GitHub primarily through RStudio
Organization	Individual conventions	Standardized team convention	RStudio projects, GitHub repositories. File structure protocols
Collaboration			
Coding	Separate languages and conventions	R and standardized team convention	Principles of tidy data; tidyverse
Workflow and project management	Individual conventions	Simplified GitHub workflow	GitHub, RStudio
Internal collaboration	e-mail	Centralized, archived conversations	GitHub issues
Communication			
Sharing data	ftp download	All versions and releases available online	http://ohi-science.org/ohi-global
Sharing methods	Published manuscript and supplementary material	Published on our website (http://ohi-science.org)	Website, with linked R Markdown outputs (webpages, presentations, etc.)

But what was this transition *really* like?



- Trust and willingness
- Team buy-in and time to learn & build: supported as part of our jobs

ohi-science.org

Lowndes *et al.* 2017

"But I work alone. I'm not part of a team."

"But I'm not supported, I don't have time."

"But I don't know where to start."

What's underlying Openscapes approach

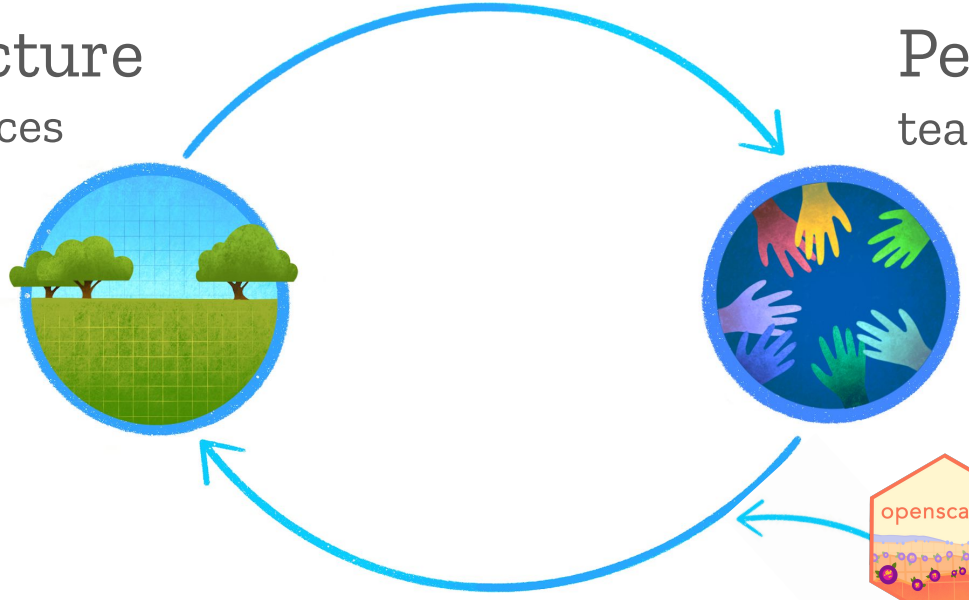
Openscapes is a mechanism that can rapidly identify needs and bring people together to solve them.
Feedback loop between using & developing infrastructure and teaching & learning from people.

Infrastructure

tools & practices

People

teams & community



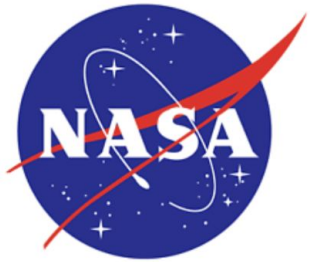
Open Science

Global movement happening all across science

A fundamental change in how science is done towards practices and workflows that promote **reproducibility, transparency, sharing, and useability** of scientific innovation.

Movement building

What's possible because of all this



Data cloud migration

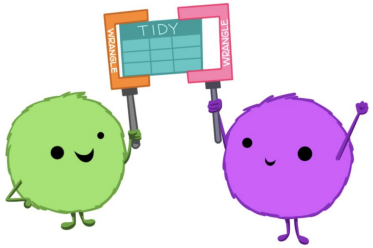
Since 2021, co-led with Erin Robinson (Metadata Game Changers)
nasa-openscapes.github.io

Data & workforce modernization

Since 2021, co-led with Eli Holmes (NOAA Fisheries)
nmfs-openscapes.github.io

Data & workforce modernization

Since 2021, co-led by Anna Holder; first org that "forked" internally
cawaterboarddatacenter.github.io/swrcb-openscapes



"How do I improve how my group collaborates with data & reports?"

Since 2019, 27 Cohorts, incl. EPA, Fred Hutch
openscapes.org/initiatives#champions-program

Big questions. Empowering that they can be approached with similar solutions: community

Openscapes Champions

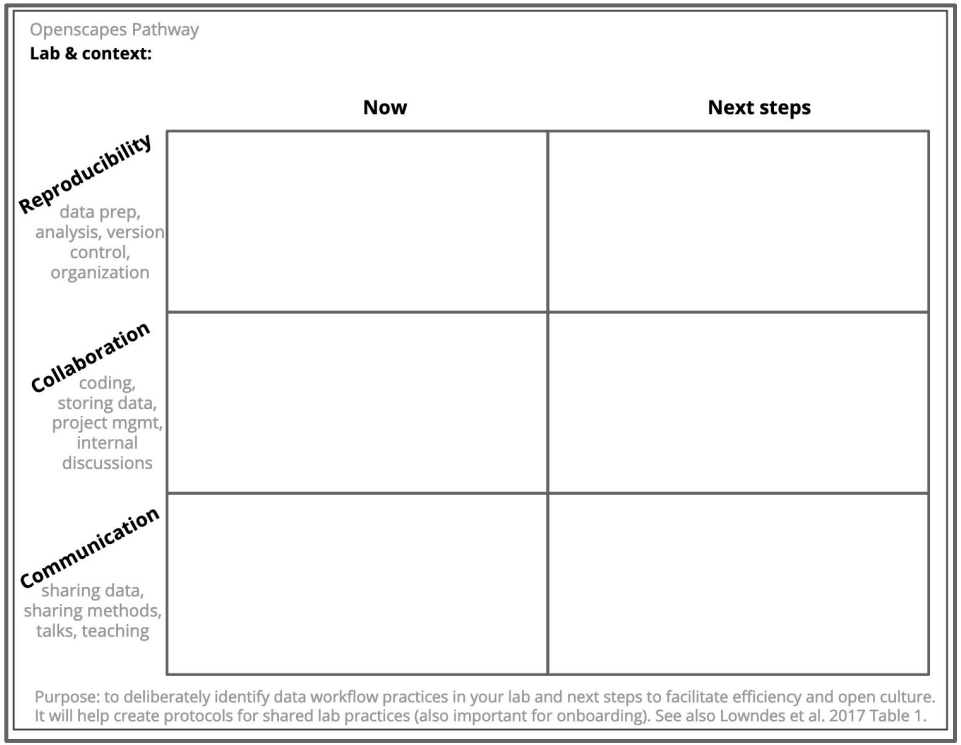
2-month remote cohorts for teams

You're invited: Fall 2025: 3 Cohorts for 120 NMFS staff! Details in summer!

Lessons based from Lowndes et al. 2017

Openscapes.org/series

Pathway tool helps teams talk through problems and while learning with, from, and for others



Openscapes Pathway

Lab & context:

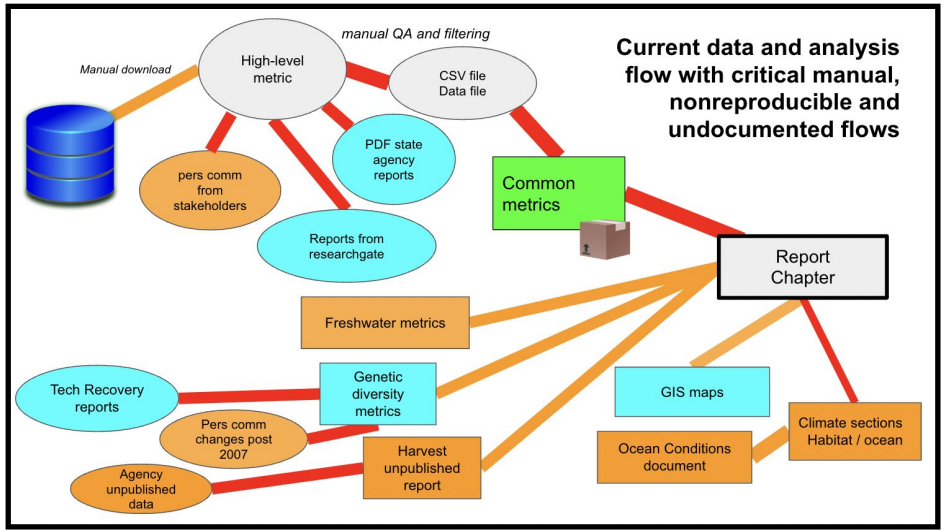
	Now	Next steps
Reproducibility data prep, analysis, version control, organization		
Collaboration coding, storing data, project mgmt, internal discussions		
Communication sharing data, sharing methods, talks, teaching		

Purpose: to deliberately identify data workflow practices in your lab and next steps to facilitate efficiency and open culture. It will help create protocols for shared lab practices (also important for onboarding). See also Lowndes et al. 2017 Table 1.

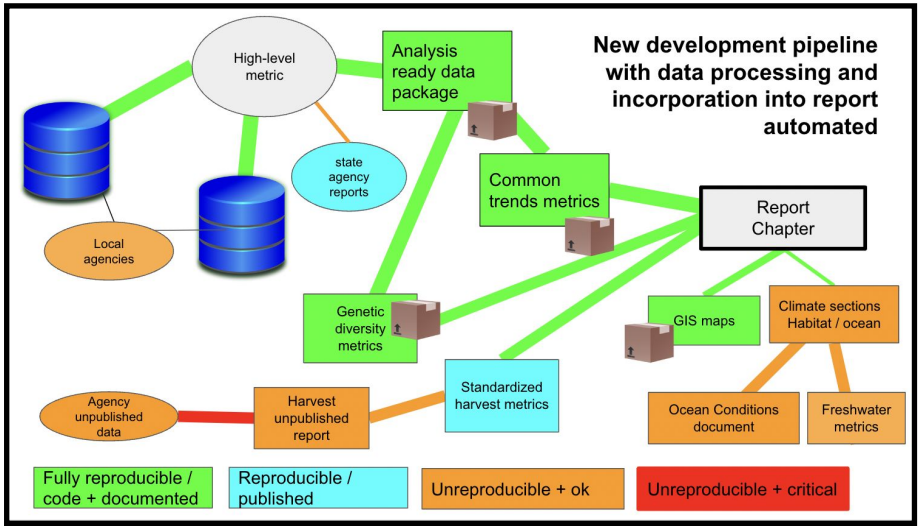
Workflow analysis by a NOAA Fisheries 2022 Openscapes team

"Our report feeds into another report but we don't really talk with each other"

Current workflow



New workflow



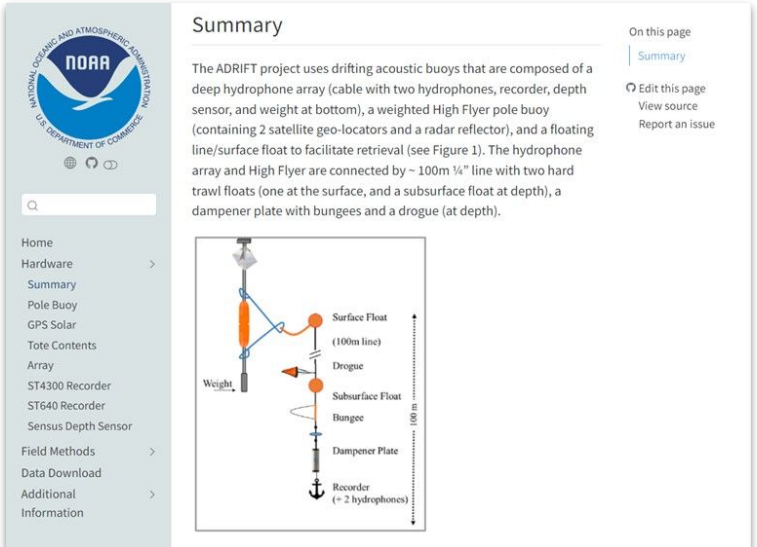
Red lines (left) were critical workflows of data or analyses that the team identified as the key targets for improving their workflow.

Green lines (right) are reproducible & documented steps that save the team time.

Kourtney Burger, Biological Science Technician, NOAA Southwest Fisheries Science Center

2022 Openscapes Champion, shared her story in a blog post

Living documentation, regularly updated



[ADRIFT Field Methods website](#) - "… a living document where we can outline our methodology and update/archive specific components of our methods and hardware as changes are made."

[Blog post](#), [Documentation website](#) & [source on GitHub](#)

Josh London, Wildlife Biologist, NOAA Alaska Fisheries Science Center

An Openscapes Mentor since 2022, shared his story at ESIP 2023

- **Building new skills builds morale**
  - People feel like they're making a difference, advancing science, instead of feeling stagnant
- **Small cultural shifts; it's not just about the tools**
  - Collaborative meeting notes & better documentation
  - More inclusive communication
  - Fundamental changes in how we get things done
- **Move away from hero mentality**
  - I'm not alone
  - It's ok to ask for help early
- **Finding the right moments to build things out**
  - Along with doing our daily work

Blog post with recording of ESIP 2023 panel.

AST Lab Manual - Acoustics for IWCPS

Manual Outline for IWCPS:

- **How to Set Up Acoustics Lab**
- **Daily Operations**
  - Sunrise and sunset tasks
  - Processing tasks
- **Accessing Data and Real Time Survey Updates**

Goals:

- Inclusive conversations — ***everyone*** is up to date on changes
- Help track all the details
- Make tasks approachable and teachable

AST Lab Manual - Acoustics for IWCPS

3. Setting up the EK80:

EK80 software is run on two computers: (1) The ship's EK80 PC, located in server rack, and (2) AST's PC, located on the port side of the Acoustic's Lab across from ship EK80 PC. The ship's EK80 PC operates the non-18-kHz WBTs. AST's EK80 PC is operating the 18-kHz WBT and the EC150-3C. **Confirm version of EK80 software is the most recent version on both computers.**

3.1. Networking:

A SyncbackFree profile on the Echoview PC backs up data from both PCs to the NAS drive (\\192.168.123.24\ast-data\2407RL\ACOUSTIC_DATA) every 15 minutes.

3.2. Settings for both the Ship EK80 PC and the AST EK80 PC:

- `Ping Mode` set to **maximum**.
- `Recording Range` set to **on**.
- `Drop Keel` sensor configuration should reflect the centerboard's current position. Confirm with the ship Survey Tech that drop keep is updated.
- Set files to save as the maximum allowable file size (Output -> File Setup -> File Size -> check `Maximum`).

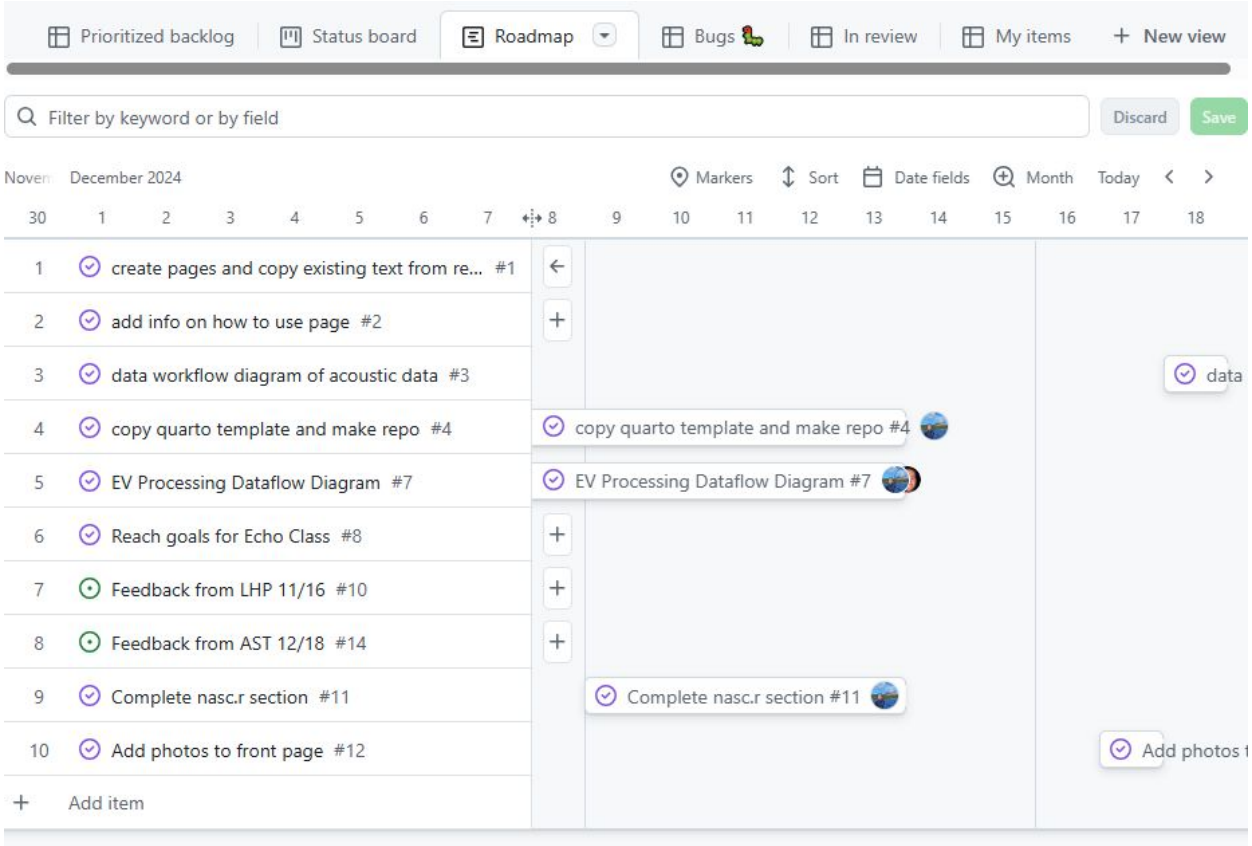
3.3. Settings for AST EK80 PC - 18 kHz WBT PC:

Set Save Location:

- The AST 18-kHz PC is set save files directly to an external 4-TB HDD.

On this page

Report & Track Issues



- Throughout survey & year after year
- Notification when new procedures are changed
- Tracking changes year after year
- File management for survey related documents
- Training for volunteers & employees

NOAA Fisheries Open Science

Elizabeth Eli Holmes, Ph.D (lead)
Jonathan Peake, Ph.D (co-lead)

NMFS OPEN SCIENCE

RESOURCES & TRAININGS

NOAA FISHERIES

NMFS OPEN SCIENCE

Community Building and Skill Building

Openscapes

NOAA FISHERIES

openscapes

Support for ‘mentors’, organizers, leads

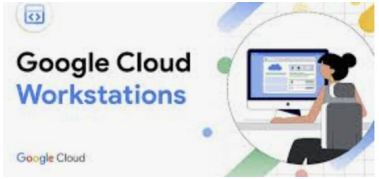
Data Science academy

Training Infrastructure

jupyterhub

training and workshop hub for intra-mural or extra-mural activities

Help for on-boarding to Cloud Computing



Trainings and Hack Events

Training Page

- GitHub
- Quarto Reports
- R
- Python
- Cloud Computing
- Remote Sensing Data

Join one of the NMFS Open Science Google Spaces to get updates

1:1 and Team Support

AMA Help Desk with Jon Peake every Wednesday. Sign up for a slot!
Training Page has link

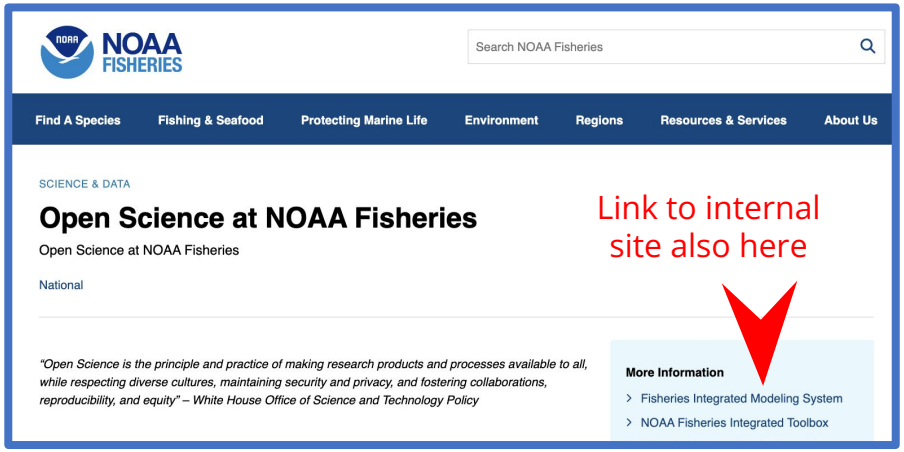
Team trainings. Email Jon and Eli and we will set up a time to work with your team.

Coworking with Stef

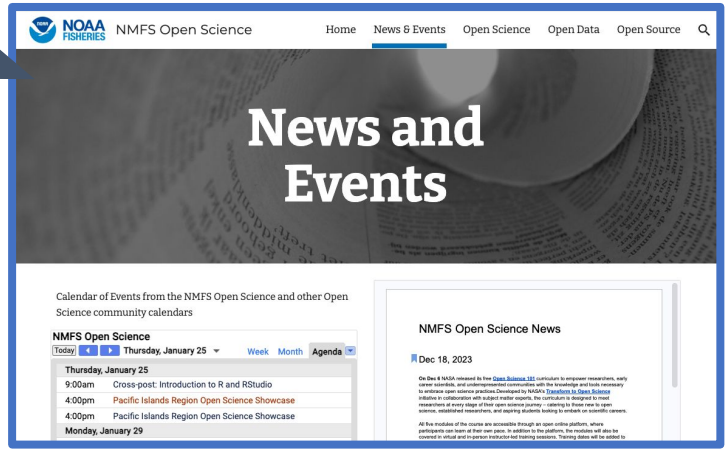
Fall 2025 Openscapes Champions cohort

NMFS Open Science - Communications hub

Internal:
https://sites.google.com/noaa.gov/nmfs-hq-st-open-science



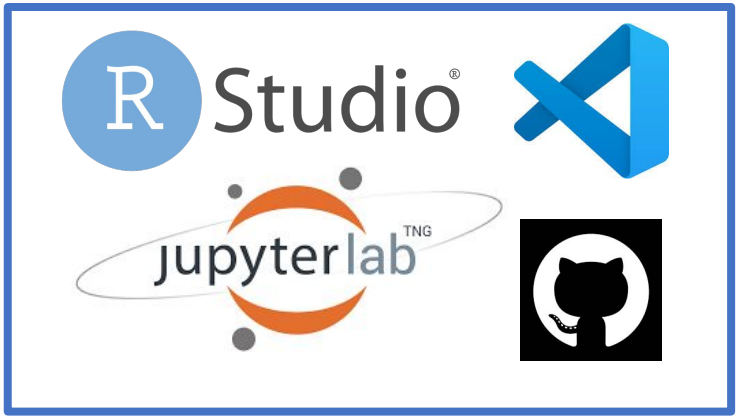
Link to internal site also here



Public: https://nmfs-opensci.github.io

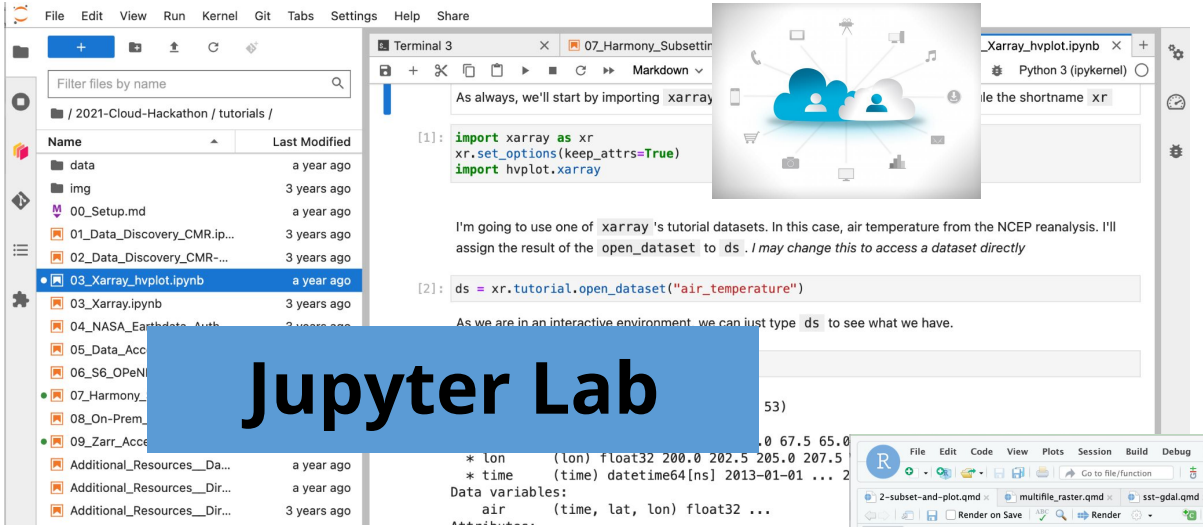
NOAA FISHERIES

NMFS Openscapes Jupyter Hub for learning, training and workshops



A compute platform where you can try out tools without having to install things. Create things and share!
Quarto, GitHub, RStudio, JupyterLab, QGIS, ASAR, VAST, ML

NOAA FISHERIES



Jupyter Lab

OS
rocker/geospatial
with R 4.2 + suite
of packages

Rocker/verse
TMB
VAST, sdmTMB, etc

OS
pangeo +
machine-learning
tools + one of our
python modules

echopype

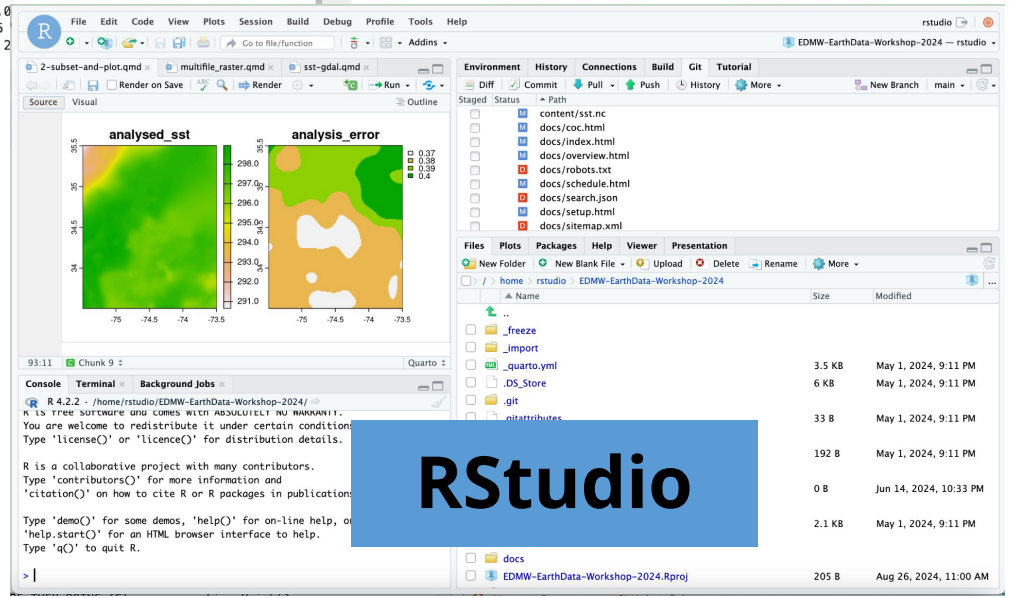
PANGEO

acoustics
pipelines

python™

qiime2

microbiome
bioinformatics



RStudio

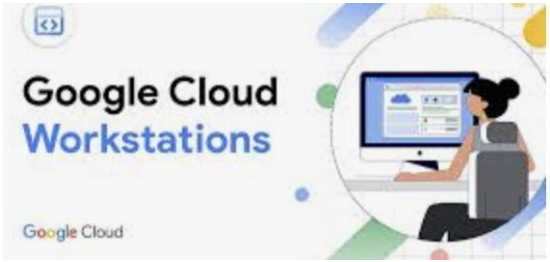
Try it out now!

https://noaa.nmfs-openscapes.2i2c.cloud/

Ok what about when we want to start working?

Install the tooling locally

Heavier duty computations

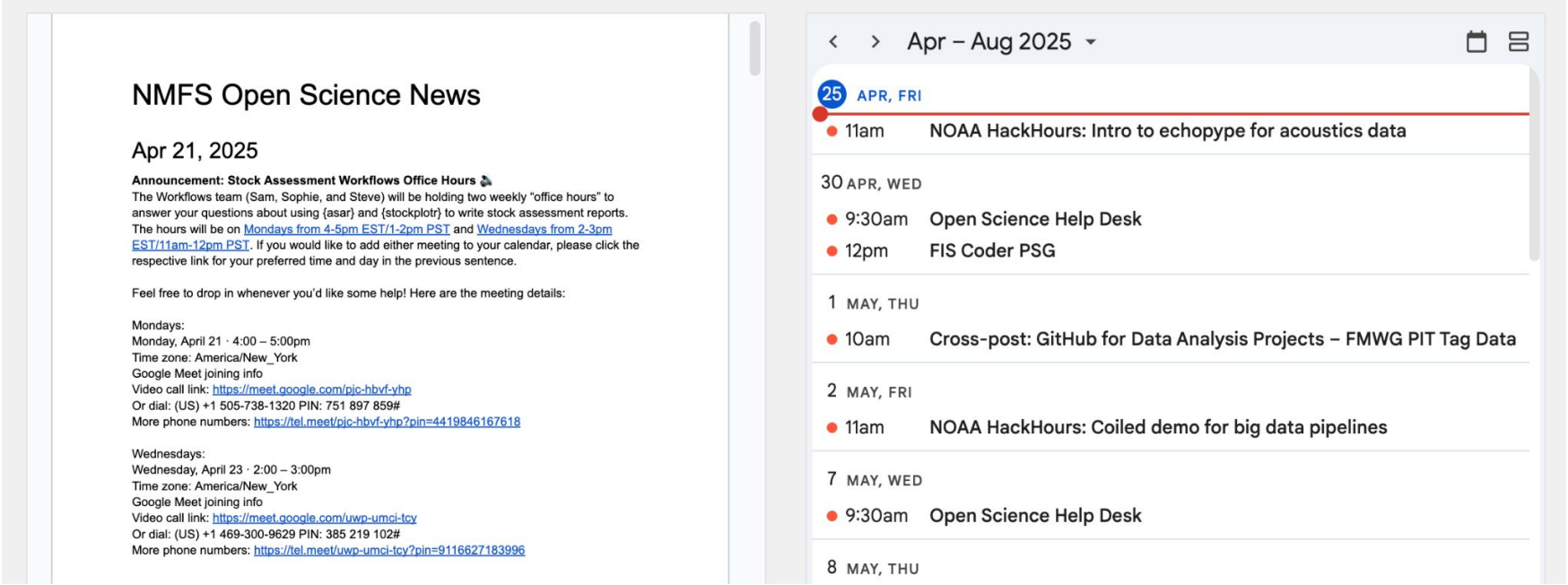


Example of how of how a community JupyterHub accelerates collaboration: CryoCloud for the CryoSphere community

[CryoCloud: Accelerating Discovery for NASA Cryosphere Communities with Open-Cloud Infrastructure]

NMFS Open Science News and Events

https://sites.google.com/noaa.gov/nmfs-hq-st-open-science/news-community



NMFS Open Science News

Apr 21, 2025

Announcement: Stock Assessment Workflows Office Hours 🔊
The Workflows team (Sam, Sophie, and Steve) will be holding two weekly "office hours" to answer your questions about using {asar} and {stockplotr} to write stock assessment reports. The hours will be on Mondays from 4-5pm EST/1-2pm PST and Wednesdays from 2-3pm EST/11am-12pm PST. If you would like to add either meeting to your calendar, please click the respective link for your preferred time and day in the previous sentence.

Feel free to drop in whenever you'd like some help! Here are the meeting details:

Mondays:
Monday, April 21 · 4:00 – 5:00pm
Time zone: America/New_York
Google Meet joining info
Video call link: https://meet.google.com/pjc-hbvf-yhp
Or dial: (US) +1 505-738-1320 PIN: 751 897 859#
More phone numbers: https://tel.meet/pjc-hbvf-yhp?pin=4419846167618

Wednesdays:
Wednesday, April 23 · 2:00 – 3:00pm
Time zone: America/New_York
Google Meet joining info
Video call link: https://meet.google.com/uwp-umci-tcy
Or dial: (US) +1 469-300-9629 PIN: 385 219 102#
More phone numbers: https://tel.meet/uwp-umci-tcy?pin=9116627183996

Apr – Aug 2025

25 APR, FRI
- 11am NOAA HackHours: Intro to echopype for acoustics data

30 APR, WED
- 9:30am Open Science Help Desk
- 12pm FIS Coder PSG

1 MAY, THU
- 10am Cross-post: GitHub for Data Analysis Projects – FMWG PIT Tag Data

2 MAY, FRI
- 11am NOAA HackHours: Coiled demo for big data pipelines

7 MAY, WED
- 9:30am Open Science Help Desk

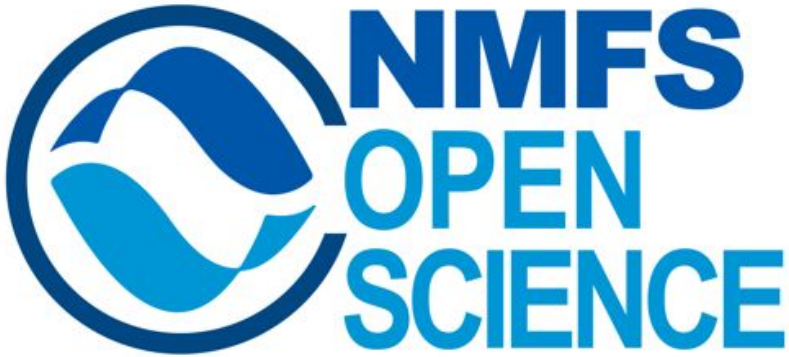
8 MAY, THU

NMFS Open Science Google Spaces & Groups

- NMFS R User Group
  - Google Space
  - Calendar
- NMFS Python User Group
- Coder PSG
- GitHub User Group
- NMFS Open Science
  - Google Space
  - Calendar
- NMFS AI Slack

How to find?

- https://sites.google.com/noaa.gov/nmfs-hq-st-open-science/events-community
- Search Google Groups and Calendars
- fisheries.noaa.gov search for “open science” and look at links on right



https://nmfs-opensci.github.io/

Look for link to our internal site!