

WebCOOS Workshop

July 21-22, 2026

La Jolla, CA



SECOORA
S O U T H E A S T
C O A S T A L O C E A N O B S E R V I N G
R E G I O N A L A S S O C I A T I O N



Updated Agenda: Day 2 (Morning)

9:00 am - 9:30 am	Welcome Back, Review Day 1
9:30 am - 10:15 am	Data Storage Challenges (Presentation & Discussion)
10:15 am -10:30 am	Break
10:30 am - 12:00 pm	CRN / IRA T2 and WebCOOS
12:00 pm - 1:00 pm	Lunch



Data Storage Challenges Presentation & Discussion



WebCOOS Data Storage Challenges

Josh Rhoades (Tetra Tech / Axiom Data Science)

WebCOOS Workshop, July 2026

Leading with Science®

Who is Tetrattech?

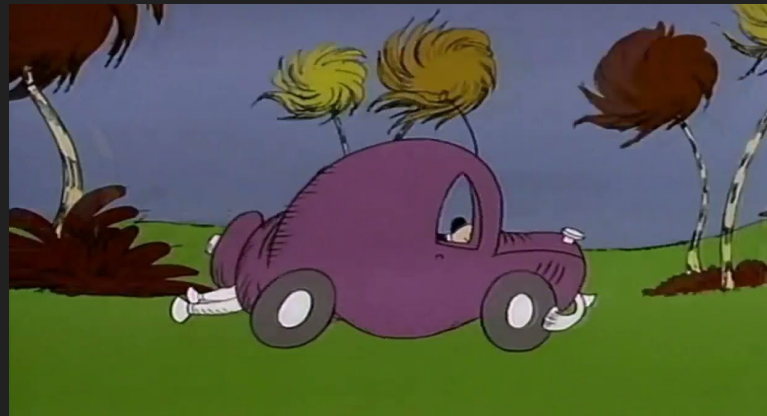
- Data Managers for WebCOOS (since 2021)
 - (originally as Axiom Data Science)
- Team:
 - James Doyle (Project Manager, Rhode Island)
 - Josh Rhoades (Software Engineer, Alaska)
 - Brian Stone (Software Engineer, Alaska)
 - Shane St. Savage (Chief Infrastructure Officer, Oregon)

(and many others along the way!)



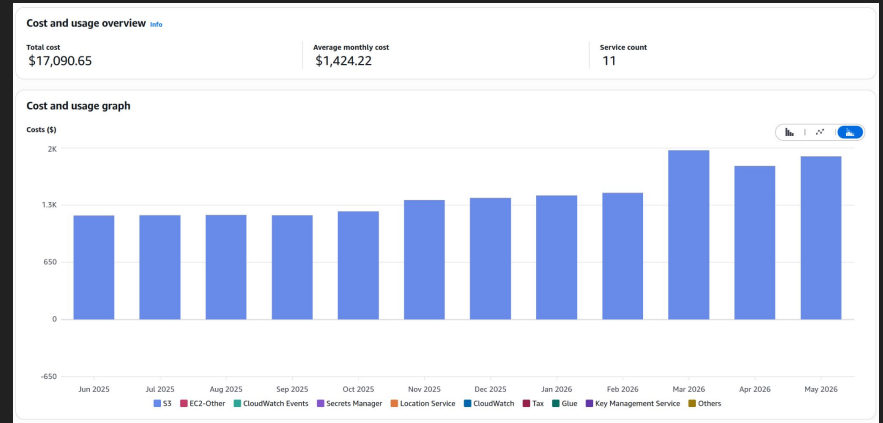
Build more highways, get more cars

- Today (in July 2026), storage is cheap. But that just means we store more data.
- Cameras are cheap(er) and are quick(er) to install. So we have more cameras (and more data).
- Modern networks and media compression methods allows us to transmit and store more media. So we store more media (and more data).
- Higher quality visuals means higher quality / more reliable downstream products, and a better training corpus for future products. So we store more data.



(Predictably) the line goes up

- November 2023, we were concerned that we were accelerating our storage costs, reaching \$1,800/month for the S3 bucket when we were at 78TB.
- Now we're again at \$1,800/month storing 270TB.
 - More cost effective, but still has a cost.

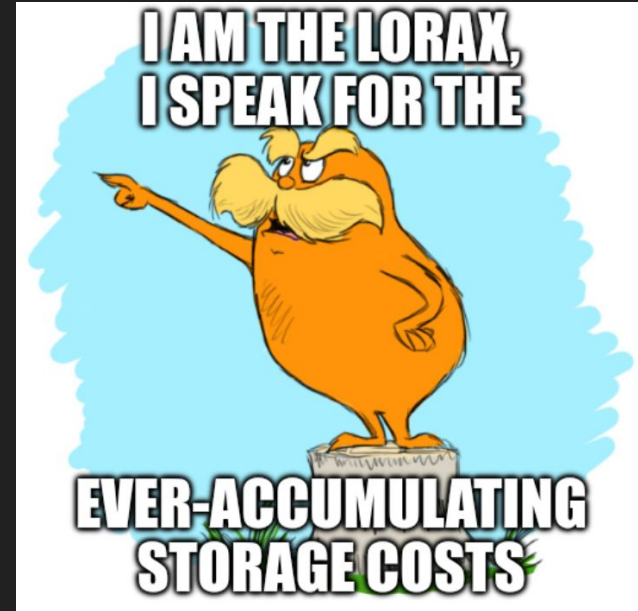


Let's do the numbers...

We see:

- ~250GB in new media per day
- ~27 million media elements
- ~270TB total storage
- Mostly 1080p video and ~1.5-3.0 megabits per second per camera.
- At peak, a few hundred megabits per second in network traffic

Storage only accumulates. So even if we turn all the cameras off tomorrow, we'll never pay ***less*** than what we pay now. Not great.



Faint Praise

Things WebCOOS does well:

- Reliable, immediate, and wide access to all media ingested through the system.
 - No rate limits, request forms, or moving availability windows.
- Data is stored both on-premise (in our data center) as well as in an S3 bucket.
 - webcoos.org uses the S3 bucket to serve media.
 - On-premise data is also accessible for bulk requests, just not widely advertised.
- Ingest pipelines run on “bare metal” server hardware, and aren’t subject to per-transaction or per-hour compute costs.

Damning Critique

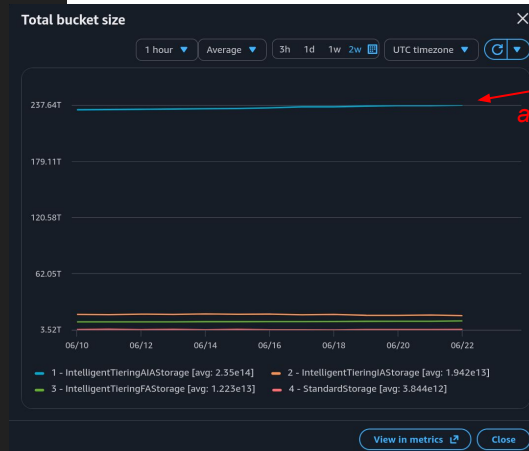
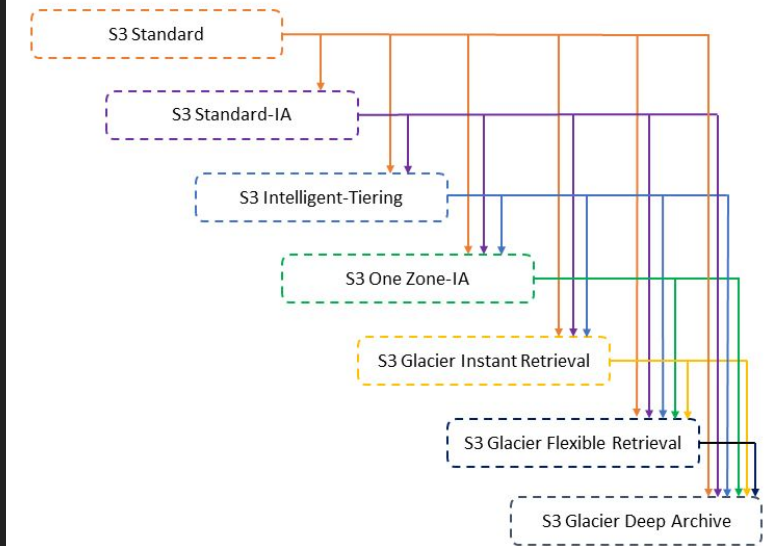
- “Highly available” has a higher costs, both up front and hidden.
 - And may be more than what is required.
- Public access means public access. And leaves us somewhat exposed to bots and other bad actors.
- Maintaining our own hardware has its own labor and overhead, and is a challenge to scale (or scale quickly).
 - Not to mention it's hard to budget for given wildly changing computer hardware costs.



The S3 Tiers

- 7 days in S3 standard (~3.9TB @ \$0.023 per GB-mo)
- After 7 days in the Intelligent Tier flow:
 - 4TB in standard access (\$0.023/GB-mo)
 - 13TB in frequent-access (\$0.023/GB-mo)
 - 18TB in infrequent-access (\$0.0125/GB-mo)
 - 237TB in archive-infrequent-access (\$0.004/GB-mo)
 - 94T in Glacier (\$0.00099/GB-mo)
 - *(old, unavailable content from WebCAT, our predecessor project)*

June 2026: About **\$1,500** in WebCOOS S3 costs, **\$360** in data transfer fees, and **\$88** for Glacier storage.



Other Problems with S3 and Cost

- Accessing an older file means promoting it to a more expensive tier.
- Network egress also has a cost, and we've seen bots and scraper agents do exactly what we tell them not to do.
- Some storage tiers have “minimum” storage period costs
 - Something like: *“If you entered X tier, and then immediately yanked it back, you still have to pay for ~90 days”*



Fighting the Good Fight

Mitigation efforts so far:

- S3 Tiers
 - Saves money on older, less-viewed media.
- GPU downscale when necessary (re-encoding at a smaller frame size and bitrate, or cropping)
- Setting reasonable camera bitrates from the start (new ingests have specific storage targets)
- Backend “retainment” policies
 - After X days, the videos for NWLON-attached cameras are automatically marked for deletion.
 - Deletion is then ‘approved’ by a human.



(There's more to this, but can get into it if there's time)

Highly Controversial Solutions

Let's just get these out of the way:

- Do nothing!
 - Easiest, but not super sustainable.
- Stop using S3, it's too expensive!
 - Sort of easy, but we generally like S3, and it's bad to have data in just one place.
- Evict all content older than X amount of time.
 - Easy, but nobody wants this.
- Evict all *video* content older than X amount of time
 - Provided it also has still images during the same time period.
- Sub-sample video content older than X amount of time
 - For example: only store the first, longest up-to-10-minute video segment per hour, remove the rest.



(It helps reduce storage, but I feel like this would make the data really hard to work with)

High-effort, Somewhat Destructive Solutions

A lot of work, but:

- Re-render older video content to a lower bitrate / frame size.
 - This would take forever (computationally), and would likely incur a huge upfront storage/network cost.
 - Would require GPU resources.
- Re-mux older videos, abusing codecs to only keep keyframes.
 - Less computation, with good space recovery (75-90% reduction). Also, videos look like slideshows, and might play weird.
 - No GPU resources.
- Select regions of interest (ROIs) to more accurately capture what we're interested in.

Not suitable for all use cases (but maybe could help somebody).

(both solutions require touching the video in S3, which resets their timer/tier back to the most expensive)



Only Mildly Controversial Proposals

- Remove the “human approval” step for existing policies, and allow for fully automated deletion.
 - Or only automatically delete if waiting on squishy humans for too long
- A policy for removing videos that are too short, or too small.
 - Not a lot of space savings, but could improve quality of dataset as a whole.
 - Some larger videos are still corrupted or of low quality, and wouldn't be detected/deleted.
 - Risk of removing content that is still valid / valuable.
- Fearless moral inventory, asking “Do we really need to record this?”
 - Also: “Is anybody looking at this?”



(thanks, VRBO guests)



(thanks, sudden massive pipe)



(thanks, birds)

Hopefully Popular Solutions

- Use S3 tier mechanism to automatically put old media into Glacier.
 - Still indexed / searchable, but “only available on request.”
 - (But likely still available in on-premise storage)
 - Still costs something, but $\frac{1}{4}$ as much.
- Revisit existing cameras and their storage “burn rates”.
 - Room for improvement for some cameras in terms of reducing bitrates/frame rates and still get the same value from the stream.
- Add more cameras to the existing “mark videos for delete after 30 days” policy as the NWLON cameras.



Also consider: archiving data!

Questions?



josh.rhoades@tetrattech.com



10:40 am - 11:00 am

Coastal Imaging Research Network

INTRODUCTION (COASTAL IMAGING RESEARCH NETWORK)

WEBCOOS WORKSHOP, JULY 2026



COASTAL IMAGING RESEARCH NETWORK

What is CIRC?

The Coastal Imaging Research Network (CIRC) is an international group of researchers who exploit visible signatures of phenomena in coastal, estuarine, and riverine environments. CIRC members develop new methodologies to gain a better fundamental understanding of the processes shaping those environments from imagery. Data are also used in an applied sense as inputs for model boundary and initial conditions through assimilation, to validate models, and to make management decisions. The network is a collaboration between researchers from 14 countries. The coastal imaging community has grown over the last 30 years from its origins in the Coastal Imaging Lab at Oregon State University and now includes investigators from universities, government labs and agencies, non-profits, and private companies. CIRC was officially formed in 2016 to provide an integrative, multi-institutional group to collaborate on remotely sensed data techniques.

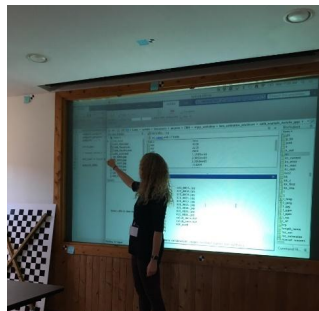
2019
Workshop
Toulouse



COASTAL IMAGING RESEARCH NETWORK (ESTABLISHED SEPTEMBER 2016)

Education

- CIRN Week (Boot camp and workshop)
- Dedicated conference sessions
- YouTube videos
- GitHub repository, wiki & forum



Palmsten & Brodie

<> Code ⓘ Issues 5 📄 Pull requests 0 📁 Projects 0 📖 Wiki 📊 Insights ⚙ Settings

Home

Allison Penko edited this page on Feb 1, 2017 · 14 revisions

Edit

New Page

← [Back to the CIRN Website](#)

Welcome to the Coastal-Imaging-Research-Network Wiki!

The Coastal Imaging Research Network (CIRN) Wiki is intended to serve as a reference for those interested in coastal imaging by describing existing functionality and future developments, facilitating and adding coherence to community development of CIRN software, and providing support to CIRN users and developers. Much of the original code was developed in the [Coastal Imaging Lab at Oregon State University](#), but the content will expand with participation of a growing

► Pages 62

CIRN

[Wiki Home](#)
[CIRN Website](#)
[CIRN Research and Workshops](#)
[Existing Monitoring Stations](#)

COASTAL IMAGING RESEARCH NETWORK (ESTABLISHED SEPTEMBER 2016)

International

Coastline

Observatory

Network

- Long term monitoring
- Open-source data
- Other nearshore data sources/model test beds

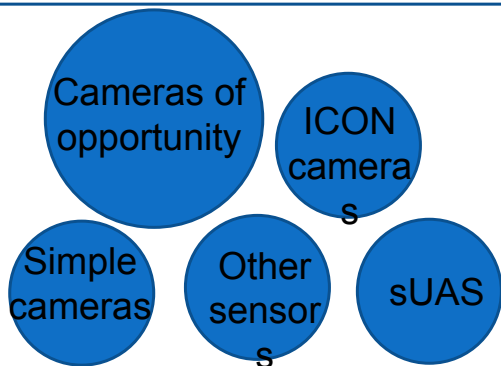


Inspirational sites:

- Field Research Facility, Duck, NC
- Narabeen Beach, New South Wales, Australia
- Sand Engine, Netherlands

MODULAR, APPLICATION-BASED DATA PRODUCTS

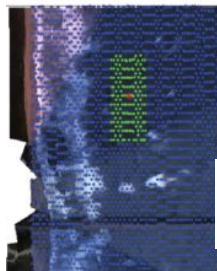
Hardware



- Many data sources
- Acquisition independent of processing

Toolboxes

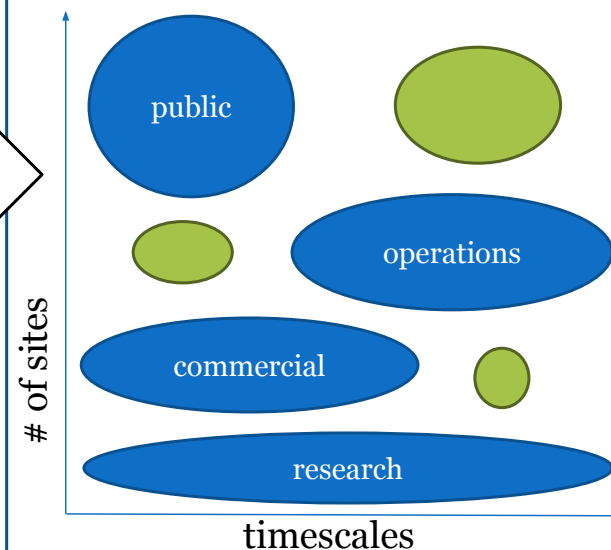
typical pixel array



$$c = \frac{\lambda}{T} = \sqrt{\frac{g\lambda}{2\pi} \tanh\left(\frac{2\pi h}{\lambda}\right)}$$

- Independent data processing toolboxes
- Good documentation
- Example: cBathy

Data products



STRENGTHENING THE COMMUNITY

- Still working on (we would love to have your help):
 - Code vetting/test data for new algorithms
 - Funding for ICON sites or CERN community resources
 - Better curation of code
 - More code developers (share your code on CERN GitHub)

CiRNWeek 2027



Come learn + share about the latest
advancements in coastal imaging!!!

Utrecht University, the Netherlands: April 5-9, 2027

CIRN Workshop and CoastSnap Users Meeting

- Oral presentations and discussion groups
- Collaboration with coastal imaging experts
- Learning opportunities

Interest form: <https://forms.gle/W2uZwkbwjyPY7c4C6>

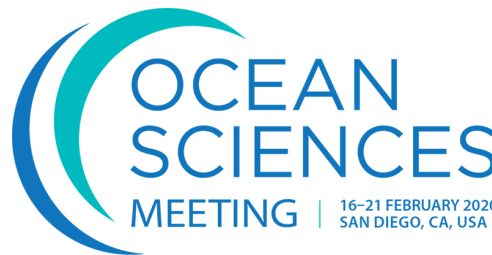
CIRN ACTIVITIES



Coastal List
advertisement for CIRN Week



Seminar Series Established
(recordings available)



Close-Range Remote Sensing of
Nearshore Processes and
Coastal Morphology



11:00 am - 12:00 PM

The Future of IRA T2/ WebCOOS

The Future of IRA T2 and WebCOOS

Gabrielle Hillyer

gabrielle@ioosassociation.org



Goals for Presentation

1. Orientation to the IRA Project, particularly W3 and where WebCOOS will sit and some specific details about the transition
2. Familiarize everyone with IRA milestones that shape future WebCOOS funding and efforts
3. Open up a discussion and Q/A about transition from OTT to IRA T2 which will continue after lunch if needed



WebCOOS Transition

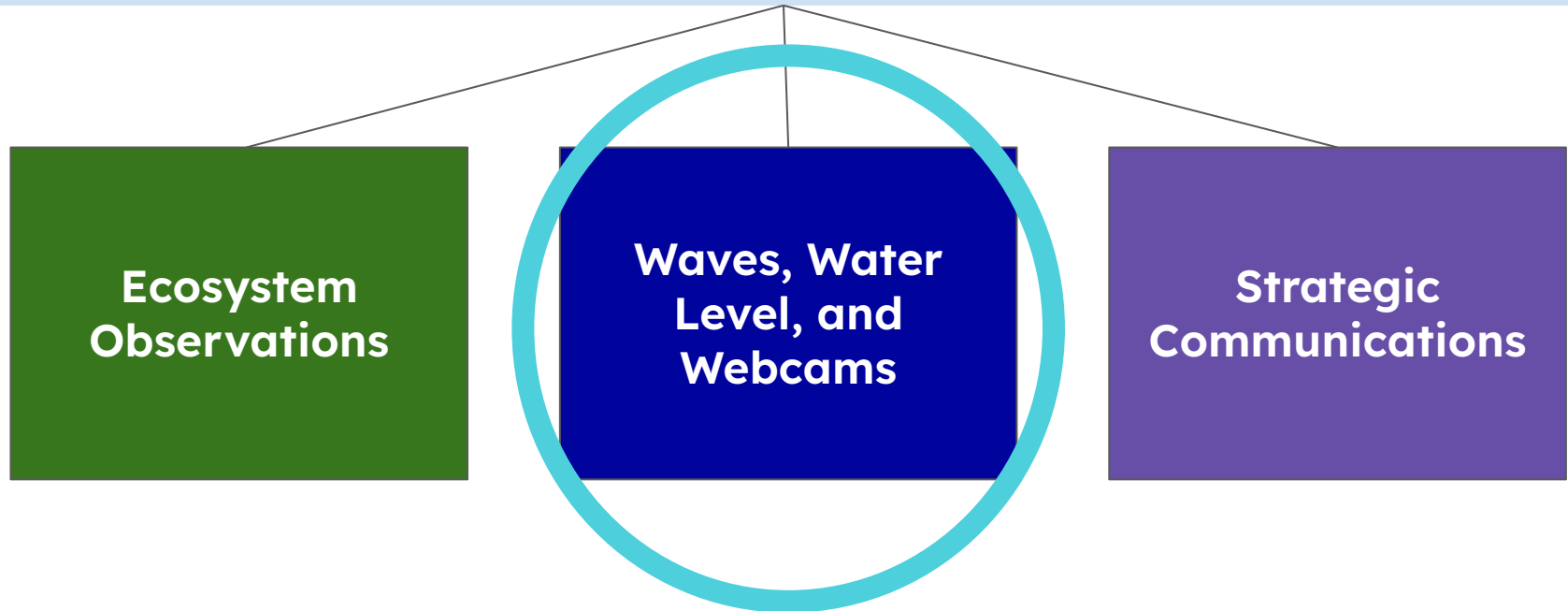
- As WebCOOS comes to a close, we look forward to continuing this work under IRA T2 as the “WebCam” project (also called WebCOOS)
- This will include a slight restructuring as I, take on a similar (**but not exact same!**) role to Theo in terms of facilitation and organization, but will also require some broader RA participation in order to keep things running smoothly
- Opportunity to continue nationwide efforts that are feasible and relevant to a majority of regions

What is the IRA T2 Project?

The Meeting Local Resilience Needs Through National and Pan-Regional Collaboration project **leverages existing IOOS infrastructure and Regional Associations' expertise** to provide coastal economies with the data and tools needed for better planning, preparedness, and resilience. The project integrates three initiatives and existing IOOS (Integrated Ocean Observing System) capacity. The first two initiatives – Ecosystem Observations (EcoObs) and Water Level, Waves, and **Webcams (W3) focus on monitoring coastal events to facilitate informed decision-making.** The third initiative, enhances enterprise-wide Service Delivery. Through user engagement and scalable technology and information solutions, these three initiatives collectively aim to improve data management, efficient product development, and service delivery nationally.

Pan Regional Collaboration

IRA Topic 2 Funding



What does this all look like in real time?

IRA Coordination Team

Program Specialists

EcoObs

EcoObs Coordination Team

MBON Working
Groups

PAM RA
Group

SDC

SDC Coordination Team

Strategic
Comms
Team

Engagement
& Outreach
Group

W3

W3 Coordination Team

Waves

WL

WC

WG

WG

WG

WG

WG

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W3

W3 Coordination Team

Waves

WL

WC

WG

WG

WG

WG

WG

Major Goals for IRA T2 WebCOOS

Installation

- 9 of RAs have planned installations under IRA T2
- Other installations may exist outside of that (BIL, Core, etc.)
- Total is ~65 under IRA T2 (but some are “cameras of opportunity”, so TBD)

Maintenance of Data Pathways

- Continue using webcoos.org through SECOORA; including some website updates mentioned yesterday

Documentation

- Maintaining / updating (when relevant) SOPs or other documentation

Mentimeter Results from Yesterday

**Rip Currents
Detection Products
(especially East
Coast)**

**Visibility / Fog
Detection**

Flood Detection

**Data Management
/ Code Sharing**

**Documentation of
Product implementation/
Standardization of
Methods**

**Expanded / Application
of code products like the
co-location script of WL
and WebCam Data**

**Small group review of
updated website and
determine
implementation**

**Creating user surveys,
dialogues with partners,
other communication
discussions**

**Continuing data storage
discussions - potentially
reviewing data deletion
policies by use-case**

**Proposal Development for
potential future grants /
funding**

Mentimeter Results from Yesterday

Rip Currents
Detection Products
(especially East
Coast)

Visibility / Fog
Detection

Flow

Management
/ Code Sharing

Documentation of
Product implementation /
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Proposal Development for
potential future grants /
funding

Maintaining our current datastreams to service users

Goal considerations - Data Management

Data Management
/ Code Sharing

Documentation of
Product implementation/
Standardization of
Methods

Expanded /
Application of code
products like the
co-location script of
WL and WebCam
Data

Mentimeter Results from Yesterday

Rip Currents Detection Products (especially East Coast)	Visibility / Fog Detection	File Management / Code Sharing
Documentation of Product implementation/ Standardization of Methods	Continuing data storage discussions - potentially reviewing data deletion policies by use-case	Small group review of updated website and determine implementation
Expanded / Application of code products like the co-location script of WL and WebCam Data	Proposal Development for potential future grants / funding	

Maintaining our current datastreams to service users

Some of these goals are interconnected, can be supported through other spaces (NOAA DMAC Team, Code Sprint, etc.), and serve towards maintaining our data services

Goal Considerations - Communication



Goal considerations - Looking Towards the Future



Continuing data storage discussions - potentially reviewing data deletion policies by use-case

Proposal Development for potential future grants / funding

Looking forward, these efforts may create more streamlined expansion or continued implementation in the future of WebCOOS

Defining WebCOOS Under IRA T2

OTT WebCOOS Meetings

Cadence: One Hour meeting every 2 months

Participants: RAs, Pls, etc.

Goals: Share out any issues, discuss ongoing research, identify any challenges



IRA T2 WebCOOS Team

Cadence: One Hour meeting every 1-2 months

Participants: RA staff or dedicated Pls, Surpline, IOOSA

Goals: Share progress and updates with Surpline, discuss any major actions by the group, establish any WGs and hear any WG updates

WG: Proposal Writing

WG: Specific Data Challenge

Defining WebCams Under IRA T2

What are your
thoughts on
this structure?

IRA T2 WebCOOS Team

Cadence: One Hour meeting
every 1-2 months

Participants: RA staff or
dedicated PIs, Surflin, IOOSA

Goals: Share progress and
updates with Surflin, discuss
any major actions by the group,
establish any WGs and hear
any WG updates

Working
Group (as
needed)

Working
Group (as
needed)

Vote: Is this How We Want to Move Forward?

**Please raise your hand if you
approve of this structure
and would like to move
forward with it!**



Mentimeter Results from Yesterday

**Rip Currents
Detection Products
(especially East
Coast)**

**Visibility / Fog
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New Mentimeter – Ranking of Goals



An aerial photograph of a coastal town. The top half shows the ocean with a sandy beach and waves. The bottom half shows a dense residential area with many houses, streets, and some commercial buildings. A dark blue banner with white text is overlaid in the center.

Considering the Transition from OTT to IRA T2

Will Surfline appoint one POC? Does each RA contact Surfline directly?

- Going forward, Webcoos/RAs will have a **single customer service representative who will serve as their primary point of contact for all operational questions** related to the platform, cameras, and machine learning. As needed, this representative will coordinate with Surfline internal specialists, such as camera and data science experts, to provide additional support.
- Additionally, we hope to engage with Surfline to attend some (or all) of IRA T2 WebCOOS meetings, to facilitate reporting / questions from RAs
- The RA's will have the option to have Surfline manage their cameras (For a fee) or manage the cameras themselves.

Can we get more looped into when cameras go "offline" or have our partners looped in so they are aware of known issues?

- Yes! Surflink can provide RAs & partners with access to a dashboard that delivers visibility into camera performance and status.

What is the cost if a camera breaks / needs to be replaced?

- Repair costs will vary depending on the nature of the issue and the camera's location. **Minor repairs** may cost as little as **\$500**, while more **extensive work**, including **a full camera replacement**, can cost up to **approximately \$4,000**.
- Surflife can provide camera repair services on an as-needed basis. Clients will be billed for the cost of parts and labor, plus a 25% service markup. For example, if a repair requires \$500 in parts and \$150 in labor, the total cost before markup would be \$650. Applying the 25% markup results in a total charge of \$812.50

How do we add new cameras to the system?

What is the cost to have Surflin install a new camera?

- ~\$4k without solar and battery. There could be additional fees if the installation is in remote areas (Pacific Northwest, Alaska, etc...)

What is the data pipeline fee/long-term cost?

- Surflin currently estimates each camera over 100 (total in the system) will cost \$1250 per year or ~\$1k per incremental camera per year.

What is the mechanism to pay Surflin?

- Surflin can invoice just the RA directly.

How are new products funded/applied?

- Current products are shoreline change, object detection & counts, and rip current detection
- There are no new products in the pipeline. However, Surfline has some advanced capabilities (products) that will be available on a limited number of cameras:
 - ~33 cameras can have object detection/counts;
 - ~15 cameras can have shoreline change
- Rip current product is still very developmental and we are still figuring out a solution.
 - Currently, rip detection is running on ~6 cameras.
- New Surfline products will be released on a rolling basis. Surfline will provide updates on product availability via email and during WebCOOS calls. As new products become available in the dashboard, WebCOOS can use any remaining machine learning credits from their allotted balance to enable new machine learning capabilities on their cameras.
- **IMPORTANT** - Some new products features will be available to WebCOOS for free, Surfline will determine which features will require credits and which features will be included for free

Is there a cost for tools getting applied to a camera?

- Once the allowance (on previous slides) has been met, the cost to run the object detection or shoreline change tools is how much for each camera
 - Object detection (33 cams): \$2750 per year per incremental camera
 - Advanced capabilities (11 cams - Shoreline, waves, run-up, etc...): \$5500 per year per incremental camera



Lunch

12:00 pm - 1:00 pm

Up Next: Product Session and Future Efforts, 1:00 pm