Drone Usage Summary from the NERRs Needs Assessment

Report Generated March 2025

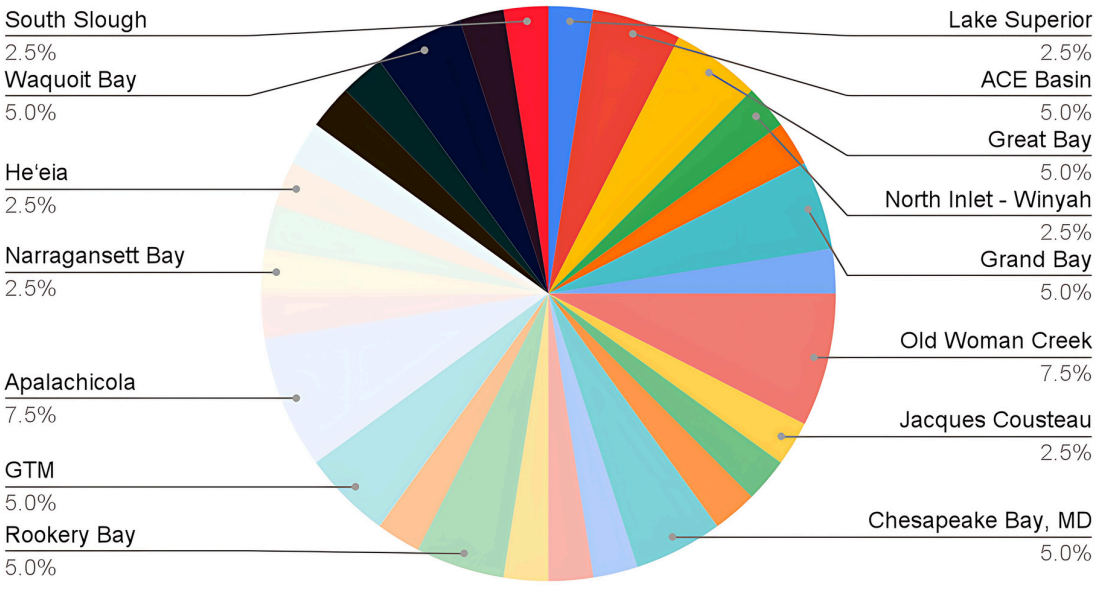
Background:

At the 2022 National Estuarine Research Reserve (NERR) Annual Meeting, a strong interest in implementing UAS-based monitoring was made evident by attendance at the Getting Creative session, which was a discussion following up on results from the “Drone the SWMP” science collaborative catalyst project. NERR staff were quick to follow up the Getting Creative session with the idea to take the information from the previous science collaborative work and create a proposal to transfer the information from that project to a more geographically diverse set of ecosystems and associated end users, which led to the funding of the "Drone the NERRs" project funded in 2023. One output from this project is to build a Community of Practice for Drone usage in the NERRs and to enable knowledge transfer. A Community of Practice (CoP) is a group of people who share a common interest, concern, or passion and thus come together and regularly interact to fulfill associated goals (Lave & Wenger, 1991). With the growing interest by NERRS staff to utilize UAS-based monitoring, and the vast expanse of NERRS across the United States, a CoP can provide a means to connect and learn in a collaborative fashion.

Who did we reach

In total there were 40 persons who responded to the survey, representing 19 NERRs. Reserve representation:

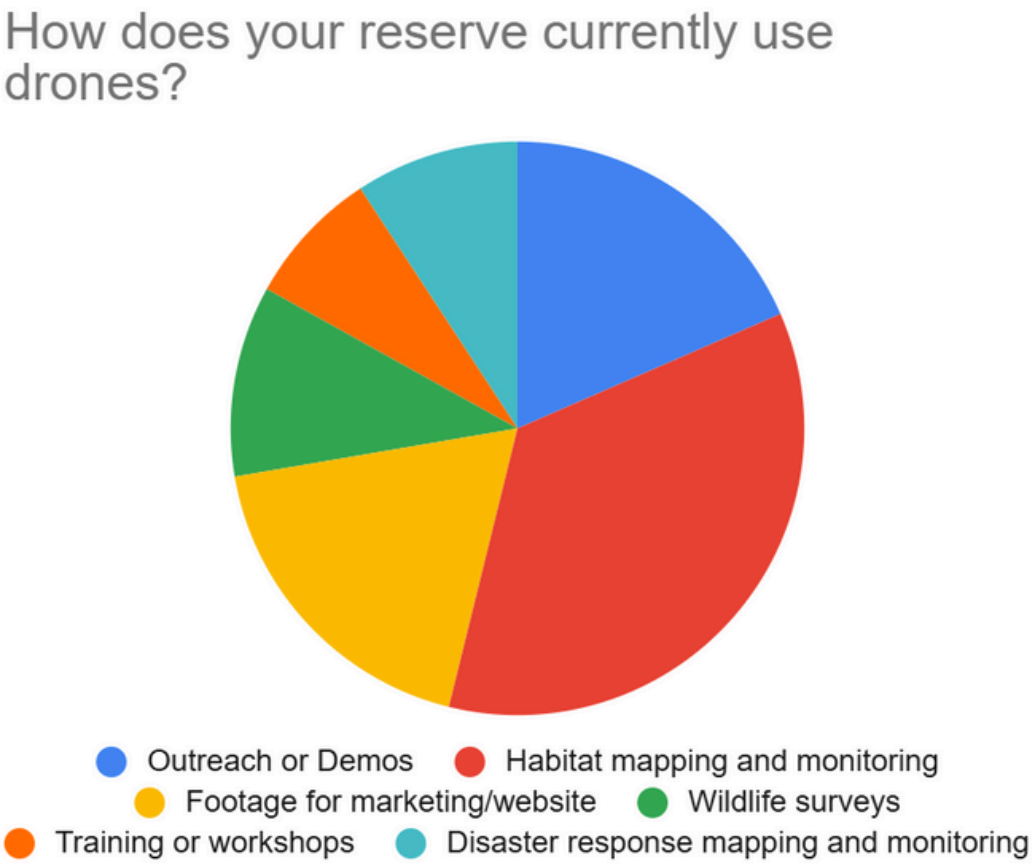
Count of Reserve:



Who uses drones

Usage

Of the 40 survey respondents, 22 (55%) of them use drones, although only 10 survey respondents indicate that they are licensed drone pilots.



The major use for drone usage is for habitat mapping and monitoring (n=23), outreach and demos (n=12), footage for marketing/websites (n=12), and wildlife surveys (n=7). Supplemental drone usage is for disaster response mapping and monitoring (n=6), and training or workshops (n=5).

Other uses mentioned include:

- Use of drones to capture images for interpretative exhibits and digital trail maps
- Making connections with schools around careers and technology
- Specifically mapping for change analysis, including pre/post-disturbance restoration intervention.

Below are the reserves that indicated possession or use of the following drone brands. Some of the survey respondents indicated that they have a drone but it is not currently in use.

Brands of Drone Used/Possessed at Reserve	**Reserve(s)** **** indicates possession of drone(s) but not using it yet ** indicates that the drone is not operational***
DJI (including Phantom, Mavic & Matrice)	ACE Basin, Chesapeake Bay- MD, Chesapeake Bay- VA, Elkhorn Slough, Grand Bay, Jobos Bay, North Inlet - Winyah Bay, **Old Woman Creek, *Padilla Bay, San Francisco Bay, Sapelo Island
Skydio	Chesapeake Bay- MD, Elkhorn Slough, *Grand Bay, *Padilla Bay
IF800 Tomcat	Apalachicola, GTM affiliate, Rookery Bay
Parrot Anafi	Apalachicola, GTM affiliate, Rookery Bay
eBee X	Chesapeake Bay- VA

Below are the imaging processing software and/or flight app and the reserves who indicated usage of the software.

Image Processing Software & Flight App	Reserve(s) * indicates software use is inactive
Pix4Dmapper	ACE Basin, Chesapeake Bay- VA, North Inlet - Winyah Bay, Rookery Bay, San Francisco Bay, Sapelo Island
ESRI Drone2map	Apalachicola, Grand Bay, GTM affiliate, Rookery Bay
DJI Pilot/Fly	Chesapeake Bay- MD, Elkhorn Slough, North Inlet - Winyah Bay, San Francisco Bay, Sapelo Island
TerraScan	ACE Basin, North Inlet - Winyah Bay
Agrisoft Inspired	Elkhorn Slough, *Padilla Bay
Ground Control	GTM affiliate, Rookery Bay
FreeFlight 7	GTM affiliate, Rookery Bay
DroneDeploy	Rookery Bay

Matchmaking Strengths and Challenges:

Below are some potential pairings of the different reserves strengths of using drones and challenges that may be mediated from collaborating with another drone user.

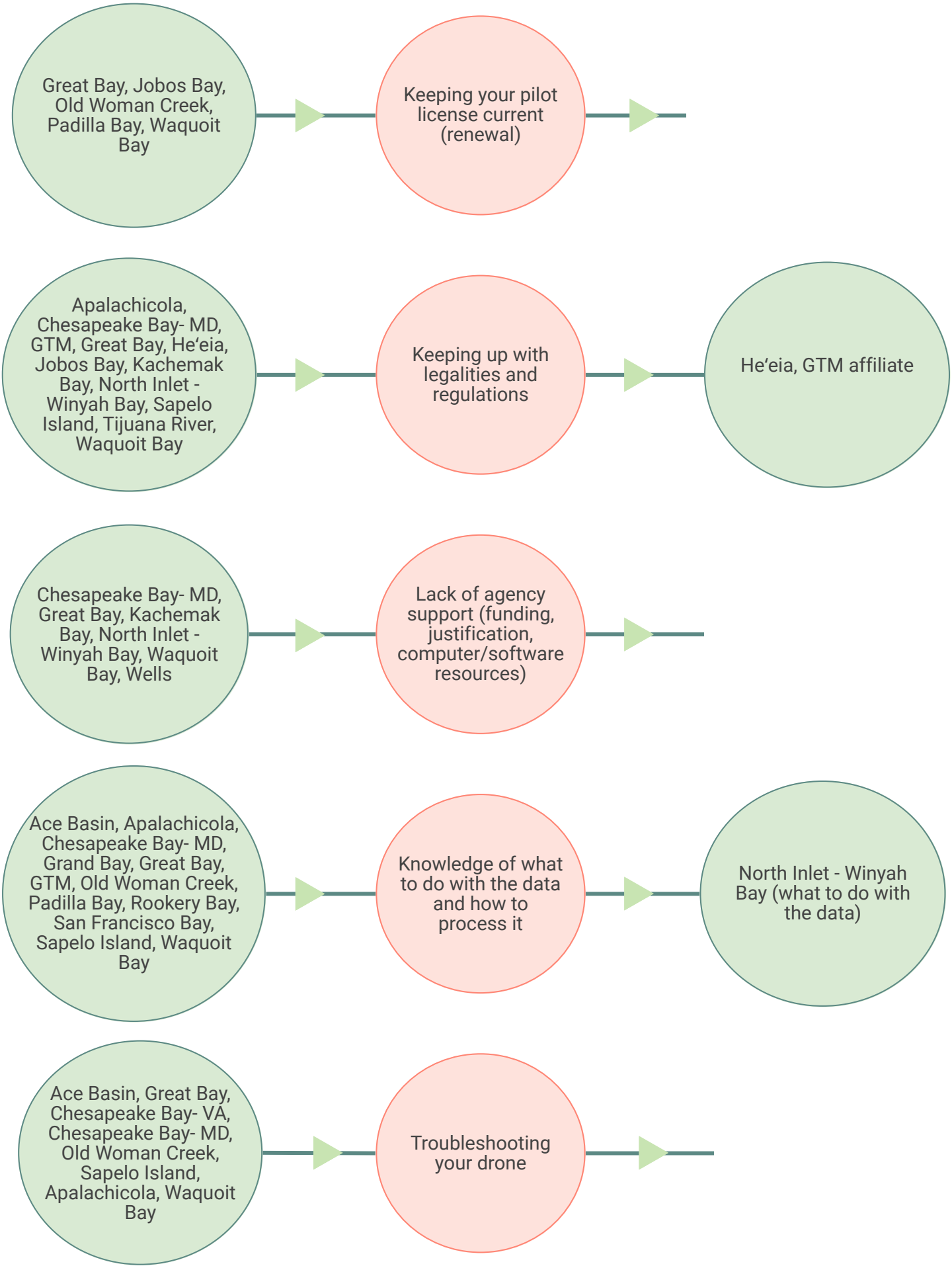
Reserve(s) experiencing challenge with drones

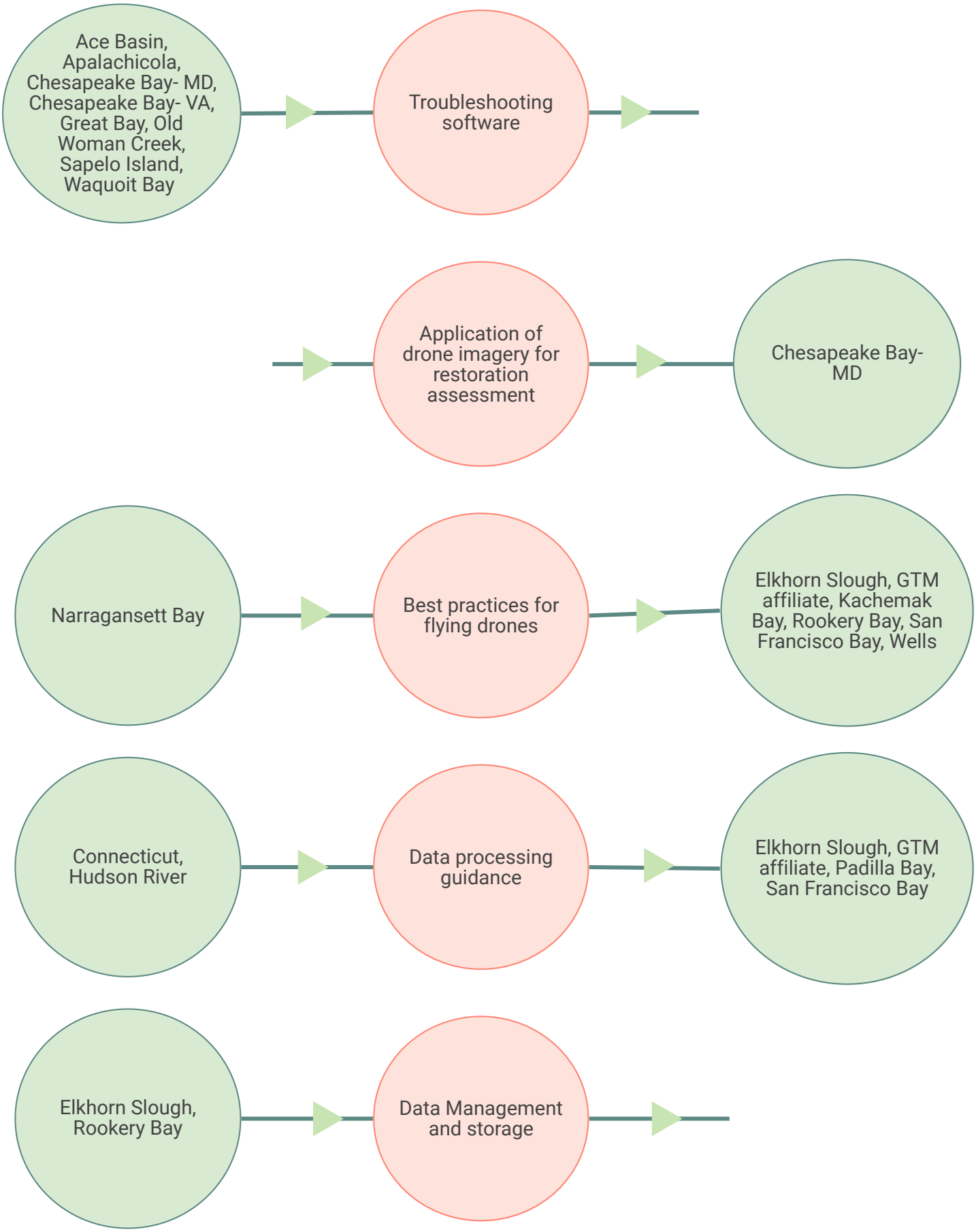
Greatest Challenges Identified

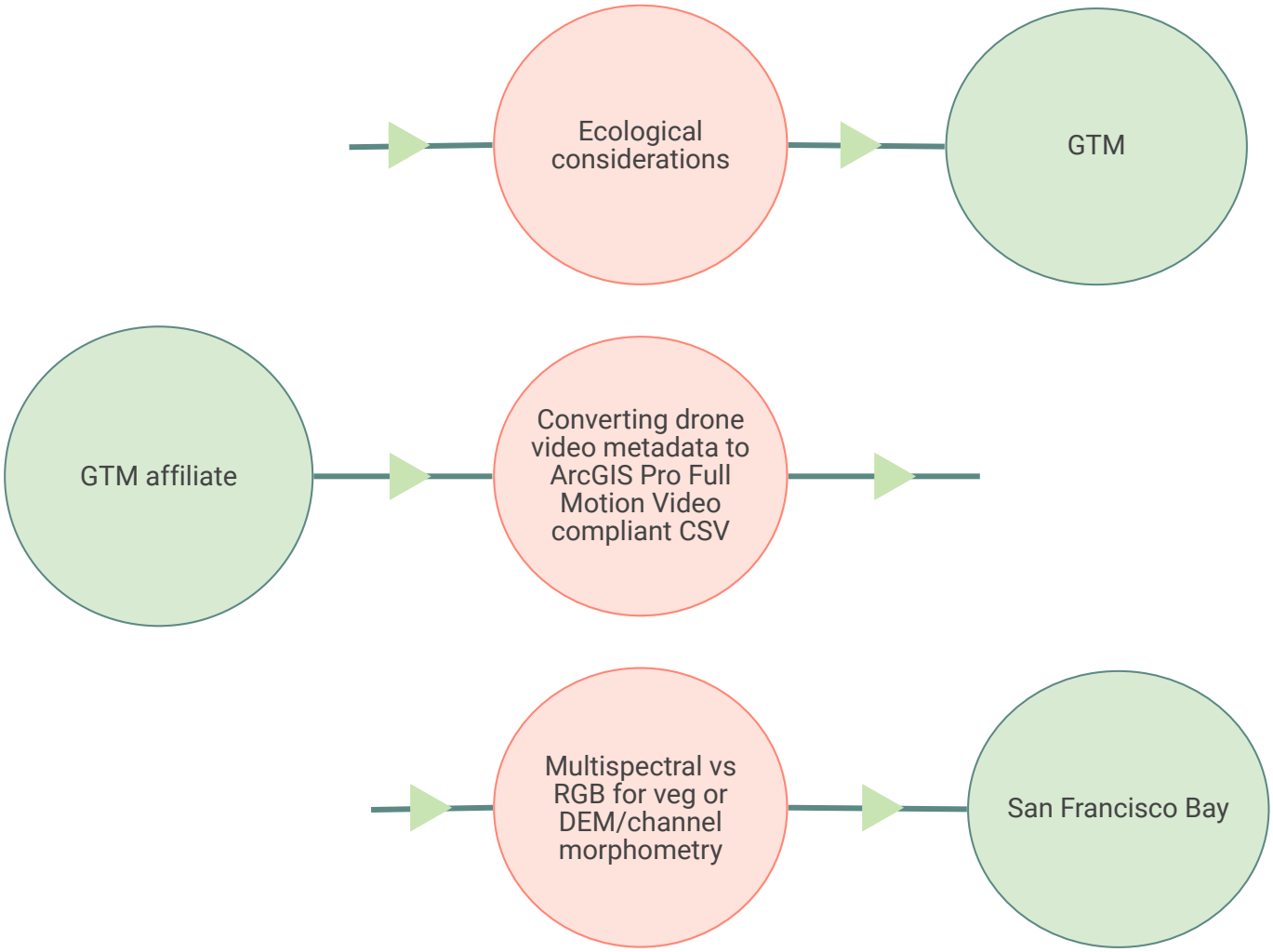
Reserve(s) that may offer corresponding strengths

Ace basin, Apalachicola, Chesapeake Bay- MD, Chesapeake Bay- VA, Elkhorn Slough, Grand Bay, Great Bay, Jobos Bay, Kachemak Bay, North Inlet - Winyah Bay, Old Woman Creek, Padilla Bay, Rookery Bay, San Francisco Bay, Sapelo Island, Waquoit Bay, Weeks Bay

Keeping up with drone technology (software, flight apps, etc.)


Great Bay, Jobos Bay, Old Woman Creek, Padilla Bay, Waquoit Bay
Keeping your pilot license current (renewal)
Apalachicola, Chesapeake Bay- MD, GTM, Great Bay, He'eia, Jobos Bay, Kachemak Bay, North Inlet - Winyah Bay, Sapelo Island, Tijuana River, Waquoit Bay
Keeping up with legalities and regulations
He'eia, GTM affiliate
Chesapeake Bay- MD, Great Bay, Kachemak Bay, North Inlet - Winyah Bay, Waquoit Bay, Wells
Lack of agency support (funding, justification, computer/software resources)
Ace Basin, Apalachicola, Chesapeake Bay- MD, Grand Bay, Great Bay, GTM, Old Woman Creek, Padilla Bay, Rookery Bay, San Francisco Bay, Sapelo Island, Waquoit Bay
Knowledge of what to do with the data and how to process it
North Inlet - Winyah Bay (what to do with the data)
Ace Basin, Great Bay, Chesapeake Bay- VA, Chesapeake Bay- MD, Old Woman Creek, Sapelo Island, Apalachicola, Waquoit Bay
Troubleshooting your drone

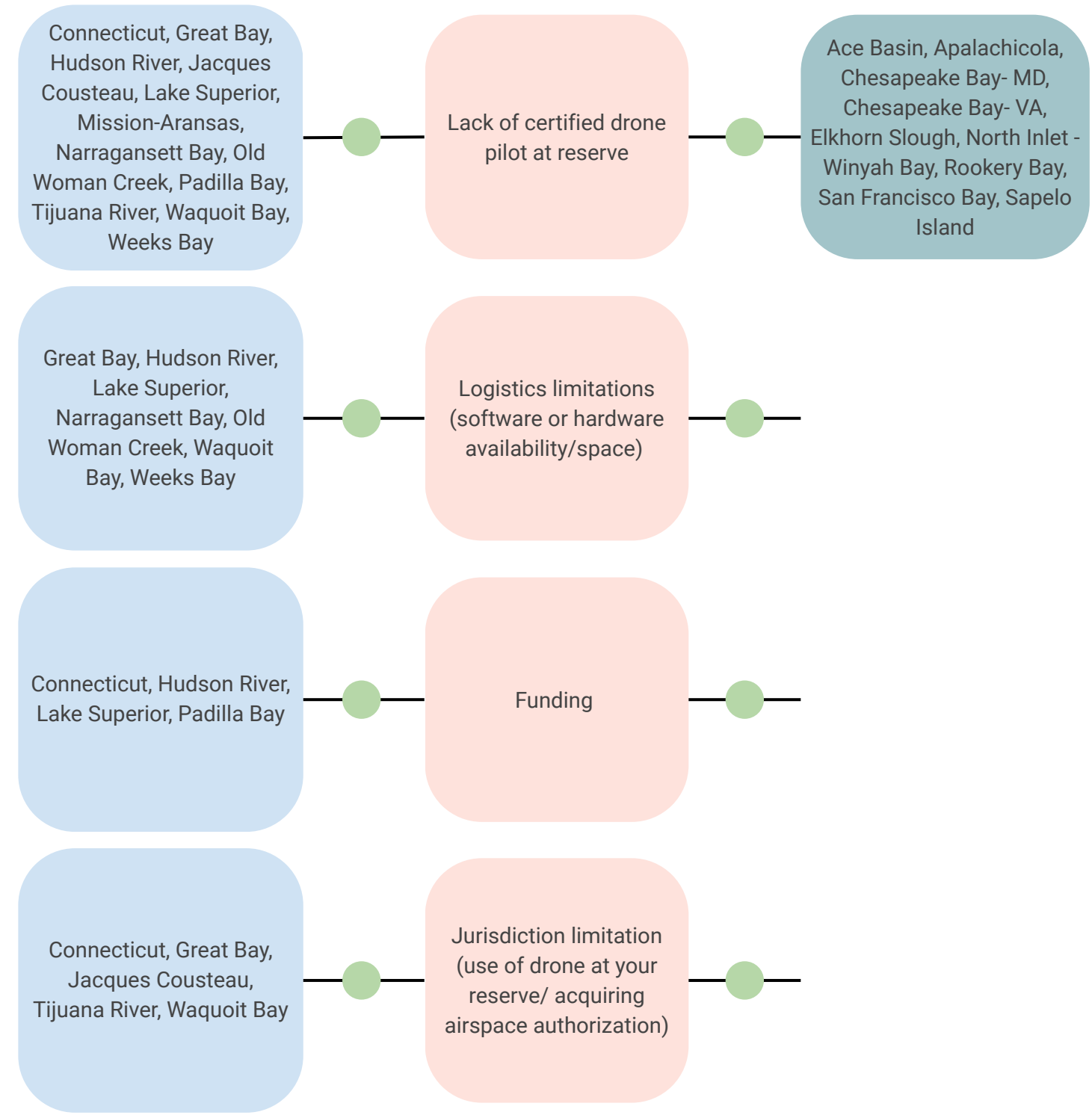

Ace Basin, Apalachicola, Chesapeake Bay- MD, Chesapeake Bay- VA, Great Bay, Old Woman Creek, Sapelo Island, Waquoit Bay
Troubleshooting software
Application of drone imagery for restoration assessment
Chesapeake Bay- MD
Narragansett Bay
Best practices for flying drones
Elkhorn Slough, GTM affiliate, Kachemak Bay, Rookery Bay, San Francisco Bay, Wells
Connecticut, Hudson River
Data processing guidance
Elkhorn Slough, GTM affiliate, Padilla Bay, San Francisco Bay
Elkhorn Slough, Rookery Bay
Data Management and storage


Ecological considerations
GTM
GTM affiliate
Converting drone video metadata to ArcGIS Pro Full Motion Video compliant CSV
Multispectral vs RGB for veg or DEM/channel morphometry
San Francisco Bay

Non- Drone Users

Of the 40 survey respondents, 18 do not use drones. Largest contributors to not using drones was mostly attributed to a lack of certified drone pilots at the reserve or due to logistical limitations.

The infographic below shows the reserves on the left that are interested in using drones but are experiencing barriers to starting or maintaining a drone program, the barriers to using the drones in the middle and reserves that possess knowledge or expertise to aid in overcoming the barrier.



Narragansett Bay, Weeks Bay	Don't know where to begin/Lack of knowing where to go for support and drone basics (pilot license, selecting drone type, software, flight apps, computer specs)	Ace Basin, Apalachicola, Chesapeake Bay- MD, Chesapeake Bay- VA, Elkhorn Slough, GTM affiliate, Jobos Bay, Sapelo Island, Wells
Lake Superior, Narragansett Bay	Staff capacity	

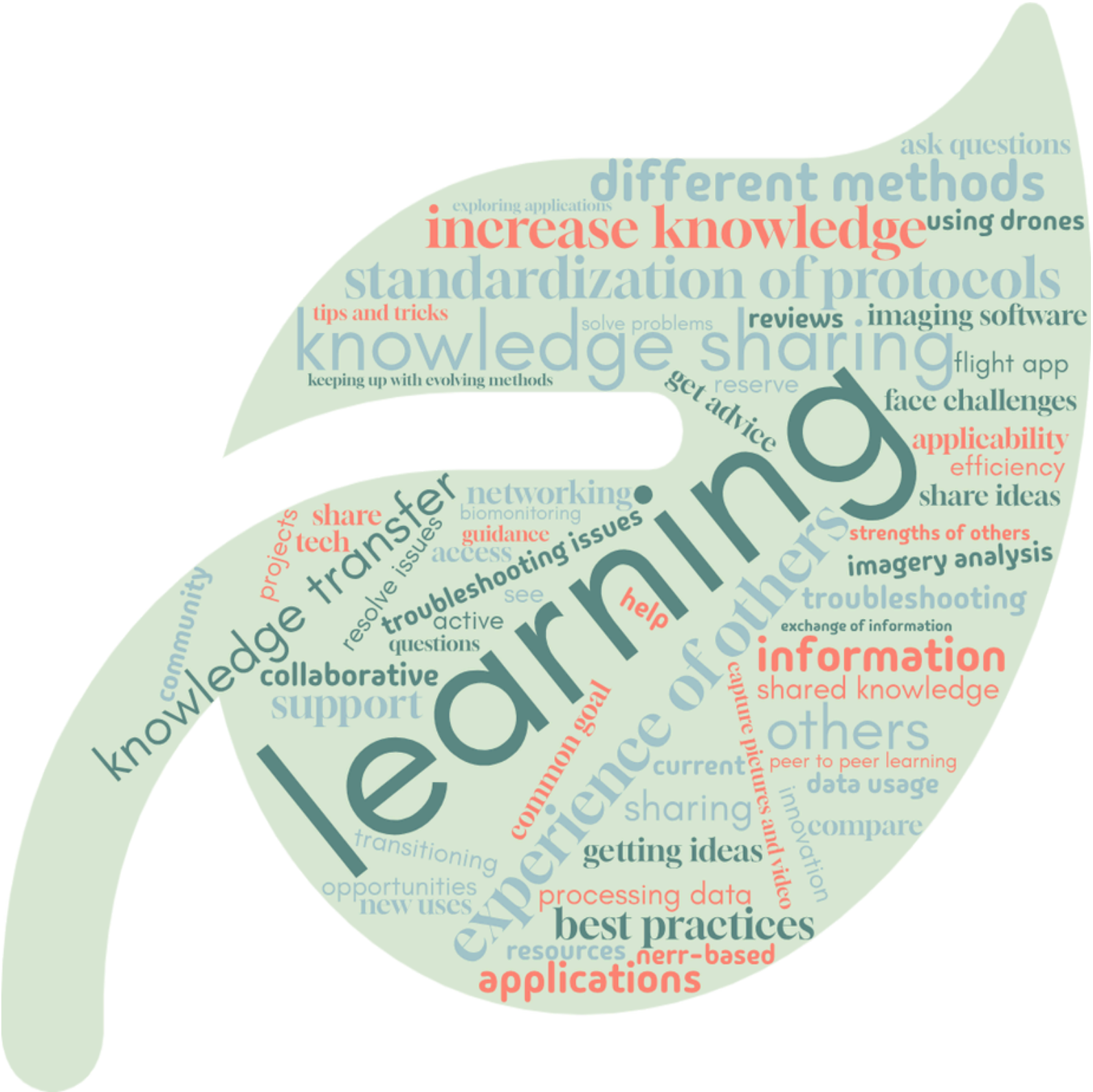
Reserves that are not using drones, but would like to in the future are paired below with the reserves who are currently using drones for the ideal usage or expertise to facilitate the collaborative efforts of the Community of Practice.

Reserve(s) Interested in Using Drones	Drone Usage Topic of Interest	Reserve(s) with Knowledge or Expertise in Topic of Interest
Chesapeake Bay- MD, Connecticut, Grand Bay, Great Bay, Hudson River, Jacques Cousteau, Lake Superior, Mission-Aransas, Narragansett Bay, Old Woman Creek, Tijuana River, Waquoit Bay, Weeks Bay	Habitat mapping and monitoring	Ace Basin, Apalachicola, Chesapeake Bay-VA, Elkhorn Slough, Grand Bay, GTM, He'eia, Jobos Bay, Kachemak Bay, North Inlet - Winyah Bay, Rookery Bay, San Francisco Bay, Sapelo Island, Waquoit Bay, Wells
Connecticut, Grand Bay, Great Bay, Hudson River, Mission-Aransas, Narragansett Bay, Old Woman Creek, Old Woman Creek, South Slough, Tijuana River, Weeks Bay	Footage for marketing/ websites	Ace Basin, Chesapeake Bay-MD, Elkhorn Slough, Grand Bay, He'eia, Kachemak Bay, Padilla Bay, Rookery Bay, Sapelo Island, Wells

Chesapeake Bay- MD, Connecticut, Great Bay, Jacques Cousteau, Old Woman Creek, Rookery Bay, South Slough, Tijuana River, Waquoit Bay	Outreach and demos	Ace Basin, Apalachicola, Chesapeake Bay- VA, Elkhorn Slough, Grand Bay, GTM affiliate, Kachemak Bay, Padilla Bay, Waquoit Bay
Chesapeake Bay- MD, Connecticut, Hudson River, Mission-Aransas, Narragansett Bay, Old Woman Creek, Weeks Bay	Wildlife surveys	Ace Basin, Elkhorn Slough, Grand Bay, Rookery Bay
Chesapeake Bay- MD, Connecticut, Mission-Aransas, Old Woman Creek, Rookery Bay, South Slough, Waquoit Bay, Weeks Bay	Training or workshops	Chesapeake Bay- VA, Elkhorn Slough, Kachemak Bay, Wells
Grand Bay, Hudson River, Jacques Cousteau, Lake Superior, Mission-Aransas, Weeks Bay	Disaster response mapping and monitoring	Ace Basin, Grand Bay, GTM affiliate, North Inlet - Winyah Bay, Rookery Bay
	Restoration monitoring, general and scientific	Chesapeake Bay- MD, He'eia

Benefits of a Community of Practice

Participants were asked what the greatest benefit from participating in this community of practice would be, and responses were collected and used to generate a word cloud (below). Common themes included new collaborations, increased knowledge and knowledge sharing, learning from others' experiences and applications of drones, and use of the community as a collective resource for problem solving.



What would you like to learn from a Community of Practice?

Survey results indicates the need for best practices/techniques for flying drones (n=6), request for data processing and share out (n=5), information on software use (especially for habitat mapping) (n=4), and overall troubleshooting (n=1). Additional themes are captured in the circles below (*the larger the circle, the more answers indicated the benefit or need from the Community of Practice).

Other Learning Resources:

Below are compiled responses from the survey identifying other successful known CoPs, recommended experts who may be able to share information or lessons learned, and any other thoughts that would be of benefit to the Community of Practice as it is developed.

Existing Communities of Practice for Drones

- SECOORA (Drones in the Coastal Zone)
- Drone the NERRs through the Chesapeake Bay Sentinel Site Cooperative
- Oceans Unmanned
- Florida Oyster Recovery Science
- WAGISA (Washington GIS Association Drone Special Interest Group)
- Seagrass CoP for the Gulf

Additional Thoughts

- Elkhorn Slough is developing a workflow for classification of the images through free software with Google Earth Engine that they would love to share with others.
- People see benefits from collaborating for monitoring efforts and also discovering the partners other Reserves have to help benefit from drone technology.

Find more details on our project page by clicking the link or scanning the QR code below:

https://nerrssciencecollaborative.org/project/Black23