

QID6 - Consent to

Answer

Yes, I agree to participate	%	98.40%	Count	123
No, I do not wish to participate	%	1.60%	Count	2

1. - 1. Which lakes do you work on or represent? (select all that apply)

Answer	%	Count
Superior	21.90%	53
Michigan	22.31%	54
Huron	19.01%	46
Erie	17.36%	42
Ontario	11.98%	29
Other (please specify)	7.44%	18
Total	100%	242

2. - 2. In which category of respondent do you belong?

Answer	%	Count
Fishery Manager	25.00%	30
Fishery Biologist	28.33%	34
Academic Scientist	17.50%	21
GLFC Citizen Advisor	0.83%	1
Other (please specify)	28.33%	34
Total	100%	120

3. - 3. If you checked "Fishery Manager" which of the following groups would you consider your primary constit

Answer	%	Count
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Recreational fishers	33.87%	21
Commercial fishers	22.58%	14
Tribal fishers	17.74%	11
The general public	25.81%	16
Total	100%	62

4. - 4. For how many years have you been in a professional Great Lakes fishery position?

Answer	%	Count
<5 years	26.80%	26
10 years	23.71%	23
15 years	12.37%	12
15-20 years	10.31%	10
>20 years	26.80%	26
Total	100%	97

#1 - 5. What type of basic data would be the most useful to collect, where, and how often? (check a... - What

Answer	Select all that apply	Total
Dissolved oxygen	100.00%	64
Water temperature	100.00%	68
pH	100.00%	38
Conductivity	100.00%	31
Turbidity	100.00%	49
Chlorophyll a	100.00%	59
Blue-green algae	100.00%	43

Other (please specify)	100.00%	9	9
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#2 - 5. What type of basic data would be the most useful to collect, where, and how often? (check a... - Where

Answer	Great Lakes	Great Lakes tributarie		Nearshore areas		Fish spawn	
Dissolved oxygen	27.78%	45	23.46%	38	24.69%	40	24.07%
Water temperature	27.78%	55	24.24%	48	24.24%	48	23.74%
pH	27.37%	26	25.26%	24	23.16%	22	24.21%
Conductivity	22.73%	15	33.33%	22	24.24%	16	19.70%
Turbidity	24.03%	31	25.58%	33	27.13%	35	23.26%
Chlorophyll a	34.03%	49	18.75%	27	29.17%	42	18.06%
Blue-green algae	32.38%	34	18.10%	19	32.38%	34	17.14%
Other (please specify)	28.57%	12	23.81%	10	26.19%	11	21.43%

#3 - 5. What type of basic data would be the most useful to collect, where, and how often? (check a... - During

#4 - 5. What type of basic data would be the most useful to collect, where, and how often? (check a... - How c

QID17 - If you would like to provide additional information regarding any of your responses to the above ques

*Of course more data is always better, but I think I identified the most important time frames

*Could be useful to characterize the hypoxic zone of the central basin of Lake Erie

*I primarily work in inland waters that are in Great Lakes Basins, so I tailored my responses to that backdrop.

*Temp and chlorophyll highest priority but other listed WQ parameters are important as well. I'm not a v

*I do not consider myself a fisheries worker, but a physical scientist dealing with the Great Lakes. My highest i

It would seem stand along sensors (HOBO, YSI) would be a more appropriate and higher resolution option for

*Water data is often able to be collected at relatively short intervals - with new sensors and technology - so sl

temporal changes in those parameters are rare, often only grab samples for short times of year, high res data

*Collection of organisms or video work would be of particular interest to us.

Depending on how you plan to use an AUV swarm, temperature could be important. We already have good su

*I'm very new to fisheries management, so please weigh my responses accordingly.

*I am not sure how useful my or other answers will be to such a general question. Yes all the variables can be

*Benthic invertebrate communities diversity and abundance, particularly in regard to benthic habitat type, qu

*Frequency of data collection depends on the questions being asked. E.g., depth surveys could be done once

*Timing of collection depends on season- I don't think weekly collections are necessary in the winter - but dur

*DO profiles are useful but measurements at the sediment water interface is very important and just immedi

*Any of these potential basic measurements could be useful, but I'm not certain that the scale of a swarm of

*Researchers at the University of Minnesota-Duluth already have an autonomous glider that collects water qu

#1 - 6. What type of specialized data would be the most useful to collect, where, and how often? (chec... - Wh

Question	Select all that apply	Total	
Mapping of habitat characteristics	100.00%	66	66
Sonar detection of groupings of fish	100.00%	51	51
Images/video	100.00%	42	42
Water samples	100.00%	37	37
Other (please specify)	100.00%	4	4

#2 - 6. What type of specialized data would be the most useful to collect, where, and how often? (chec... - Wh

Question	Great Lakes		Great Lakes tributarie	Nearshore areas		
Mapping of habitat characteristics	23.60%	42	22.47%	40	25.84%	46
Sonar detection of groupings of fish	26.43%	37	21.43%	30	24.29%	34
Images/video	24.77%	27	18.35%	20	24.77%	27
Water samples	25.93%	28	25.00%	27	27.78%	30
Other (please specify)	18.75%	3	25.00%	4	25.00%	4

#3 - 6. What type of specialized data would be the most useful to collect, where, and how often? (chec... - Du

#4 - 6. What type of specialized data would be the most useful to collect, where, and how often? (chec... - Ho

QID20 - 7. If you chose mapping of habitat characteristics please more specifically explain your answer here.

7. If you chose mapping of habitat characteristics please more specifically explain your answer here.

Depending on the size of these AUV's, they may be able to get into shallower water than our research vessels

Bottom substrate, extent & type of submerged aquatic vegetation, etc.

Mapping of characteristics would include:DepthWidth (wetted and bankfull)DischargeLarge woody debrisSedi

Amount of vegetation; amount of woody debris; substrate type.

Better understanding of the distribution of suitable brook trout spawning habitat in Great Lakes tributaries. M

Potential lake trout and brook trout spawning areas. suitably located cobble shoals for lake trout and nearsho

Not sure how images / video differs from habitat but I can%ôat envision an AUV collecting question driven im

Substrate composition, Depth

Material and structure make up (i.e., rocky, sand, woody debris).

Substrate features including biota

Lentic area larval sea lamprey habitat

Spawning habitat, nursery habitat, substrate type, depth, flow, temperature, DO

Mapping of substrate types and bathymetry as well as macrophyte beds would be most useful.

Mapping of habitat characteristics is critical to identifying available spawning habitat for Great Lakes fishes, particularly for sea lampreys.

For Sonar detections do you mean hydro-acoustic surveys or acoustic telemetry? I am assuming hydro-acoustic.

Habitat can be many things, temp, oxygen, light/ darkness, plants, rocks, substrate type, high res data on these

Lake trout, Walleye, and Sturgeon for suitability and quality

We would love to be able to georeference our habitats - specifically a barrier put in place to prevent invasives

Substrate, mussel cover, submerged aquatic vegetation

Having an up to date map of nearshore habitat would be useful during the review of shoreline development projects.

Map out coarse substrates for spawning, and potentially capture fish using those habitats.

Critical spawning habitats

I don't know enough about the sonar technology to understand if it could be useful. Part of the uncertainty is

I don't know enough about the sonar technology to understand if it could be useful. Part of the uncertainty is

Mapping habitat may be useful for determining areas with a high probability of reproductive success or likely

Mapping bottom substrate types would be very useful for investigating current spawning areas, and what little

Only coarse maps of bottom substrate types are available in only a few parts of Lake Michigan, and those are

Thermal cover, spawning locations, wetted areas

Mapping Great Lakes tributary habitats would give managers the ability to determine which habitats should be

Lamprey spawning habitat in tributaries Quagga/Zebra mussel aggregations

Detailed maps of bottom habitat as a GIS layer upon which layers of other data could be added

Depth contours, substrate, vegetation cover and height, amount of woody debris, etc.

Substrate hardness/roughness, vegetation, etc.

There is a lot to learn about habitat throughout Lake Michigan - bottom substrate, habitat/structure in the open water, etc.

Mapping can be done once every 2-5 years

Sediment structure, vegetation.

Depth, substrate, plant cover would all be useful measurements for me.

I believe AUVs could be used to identify offshore habitat (e.g., reefs) and nearshore habitat (e.g., cobble/boulder fields).

Data characterizing substrate are not consistently available for many areas of the lakes, including nearshore regions.

It would be beneficial to map spawning habitat where aggregations of spawning Cisco are found. On Lake Superior, spawning habitat is often associated with rocky substrates.

QID22 - 8. If you chose sonar detection of groupings of fish, which groupings of fish are of interest to you and why?

Answer	%	Count
Lake trout	15.50%	42
Lake whitefish	14.02%	38
Yellow perch	11.07%	30
Walleye	13.28%	36
Lake sturgeon	13.65%	37
Pacific salmon	9.23%	25
Alewives	9.96%	27
Sea lamprey	8.12%	22
Other (please specify)	5.17%	14
Total	100%	271

Other (please specify)

Other (please specify) - Text

Steelhead

brook trout

Bloater, Cisco, eels, round gobies

Coregonids

Steelhead and Coaster brook trout

NA applicable to my inland fishery position

Cisco Sp.

Cisco

other pelagic planktivores such as smelt/bloaters/etc

Cisco

Cisco

Cisco - Coregonus artedii

brook trout

QID27 - 9. If you chose images/video, what specifically do you think would be most important to capture in images/video?

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Lamprey attachment occurrence information would be helpful to me, along with behavioral images from spawning

Evidence of spawning behavior or egg deposition

Fish movement; feeding; spawning; types of substrates and colonization by any invasive species.

The bottom

We have started to consider using video and images to index adult walleye abundance during the spawn.

As noted above, images and video can be very informative (we collect many hours of footage every year) but

Any video work needs to be highly targeted. Thousands of hours of underwater footage is very boring.

Group size, species identification, and behaviors (space use during migratory movements).

spawning, feeding, schooling behavior

Algal cover of substrate

Observations of specific habitat types selected for spawning and behaviours of spawning fish.

Spawning activity for native fish species, specifically lake trout, lake sturgeon, and lake whitefish.

Targeted images of suspected spawning habitat

Fish use of spawning grounds - any other sorts of behavioral aspects to spawning (eg inter- and intraspecific interactions)

of invasive species like gobies or lamprey

Use of spawning substrate; to determine the importance of substrate quality, fouling for egg development & evidence for use

The use of the habitat by aquatic invasive species - if we could, it would be ideal to even inspect the predation by any and all videos of fish in the environment are very popular with the public, and are useful during outreach

Images of habitat conditions

Bottom substrate, cladophora and dreissenid mussel colonization of rocky substrate. Blue-green algal blooms

Round goby and dreissenid mussel densities, bottom substrate type

Bottom substrate and fish or invertebrates using the area.

fish behaviour at/near spawning locations

Habitat features. Spawning fish. Feeding fish. Invasive species (extent and type).

Benthic community composition, video of sufficient quality for identification of pelagic and benthic fish

Bottom habitat and invertebrates

Physical habitat and fishes

If the swarm has the ability to travel with fish, it would be highly informative to have images of sea lamprey at

Recreational anglers regularly report seeing large "bait balls" on their graphs. Their assumption is that the bait

Impacts to spawning grounds- predation, disturbance etc...

substrate measurements (sonar and hardness measures) need some images to validate and type.

Type/location of spawning fish. Specific habitat use by non-spawning fish.

Trying to determine whether correlation between HAB characteristics and visual appearance

presence or absence, instances of feeding or predation, spawning.

It seems like there is not a lot known about the specific interactions and behaviors of deep water fish in the G
Round Goby abundances, habitat features, nesting fish.

Identified habitat may be able to be monitored for use as spawning/nursery areas and presence of invasive sp

Related to collection of habitat data, I think that image/video of substrate conditions or other structures woul
nearshore and tributary habitat characteristics, fish assemblages

QID23 - 10. If you chose water samples, what specifically do you think would be most important to determine

Answer	%	Count
Heavy met	27.38%	23
Total Susp	30.95%	26
Dissolved (25.00%	21
Other (plei	16.67%	14
Total	100%	84

11. Would an open access data repository be the best option for sharing data collected by the AUV swarm wit

Answer	%	Count
Yes	68.00%	51
Maybe	30.67%	23
No (please	1.33%	1
Total	100%	75

Should this data be collected? (select all that apply)

ing habitat Total

39 162

47 198

23 95

13 66

30 129

26 144

18 105

9 42

What times of year is it most important to collect this data?

How often should this data be collected?

Question, please do so here.

You as the researchers can determine whether they are useful or not, given that I don't usually work in the Great Lakes water quality person but I would rank pH low At least at the offshore / whole lake scale. I assume the AUV sw

ould be collected at the shortest time interval as feasible with gear - In my opinion. I checked almost all boxes

urface temperature data from NOAA, so value added would be temperatures at depth once warming begins and

is important and can be important in all the specified habitats. This does not really lead to priorities. E.g., if you

ately above the sediment water interface (like maybe 18 inches up. This needs measuring over a variety of sub

quality data. Being a fisheries manager, I am more interested in fish biomass estimates (primarily Cisco).

Where should this data be collected? (select all that apply)

Fish spawning habitat Total

28.09%	50	178
27.86%	39	140
32.11%	35	109
21.30%	23	108
31.25%	5	16

During what times of year is it most important to collect this data?

How often should this data be collected?

and collect data that we normally cannot collect. Mapping of habitat likely can happen anytime, unless it is in s

ment

Mapping of habitat characteristics at known spawning sites would increase our understanding of habitat preference areas for brook trout - areas of potential groundwater upwellings.

Imagery without user intervention. Water samples would be nice but equipping AUV with a good multi-sonde / Li

atic survey in my answer . The how often does not make sense - (a survey once per year which could be every
e parameters is rare.generally speaking i would be most interested in substrate type and associated plant growth
; from colonizing an area. Using an AUV would also be useful to map out our trap lines when they are in the water

; related to technology, but another part is related to scale. I don't have enough information about water sampling
; related to technology, but another part is related to scale. I don't have enough information about water sampling
nursery areas. It may also be useful in determining areas that need to be restored on the Great Lakes.
e mapping has been done was often pre-dreissinid invasion and those substrates may have been altered
outdated and likely have changed. Mapping of large woody debris complexes would be useful as well.

open water vs. nearshore, etc. We are routinely asked to review permit applications for dredging projects or hal

regions and tributary mouths, at a resolution that can help us to understand differences in productivity that cor

poral, we have declining frequency and amplitude of Cisco recruitment events over the past 40 years. A better

...ning aggregations and other times of the season. Where in the water column do we see different types of fis

...they are generally designed around specific questions that require user intervention (stop, slow, zoom, pan, r

ttacks/attachments, especially first attacks of recently metamorphosed sea lampreys as they exit the streams

it balls are schools of alewives. It would be nice to get footage that would either confirm or deny their suspicion

pecies (e.g., Dreissenid mussels and Rond Goby). Video imaging would be useful in this process and could also

varms would fly up and down through the water column to provide vertical profiles of all parameters. In terms

id before fall turnover. More thought needs to be put into this aspect of your proposal. I submit that DO is an is

u want to understand what might be inhibiting lake trout production you might focus on spawning habitat and

nces by certain species of fish. Determination of species presence (brook trout, species at risk) in Great Lakes tr

OPC could likely get most info (because AUV would be payload limited to a finite number of samples)

uld result from differences in substrate. Additionally, we lack data on other types of habitat structures that may influence spawning behavior. Our understanding of spawning habitat and behavior could assist in identifying causes of recruitment failure.

otate, etc) that I can't see happening in a super valuable way with an AUV on a programmed course (consi

be used to locate or identify juvenile life stages of certain species (e.g., Lake Trout and Lake Whitefish).

; of frequency, as often as possible (so depending on the spatial extent the AUV was programmed for daily work

1 year round. If similarly for black bass then maybe only April -October. Most of the variable will show substar

tributaries that are currently unknown in order to protect important spawning habitat features. Sonar detection

tant speed and course). Also within habitats characterization, in a general way in guess I figured there would b

rtial seasonal variation at time scale of less than a month and for some purposes you might want variables like

of groupings of fish - not sure of the resolution for this feature, but identifying when fish are staging before mo

ie some recording of basic features (likely with video). What other attributes would be considered: bathymetry

y, substrate classification (size, hardness, poreosity, mussels / epibenthos, macrophyte density & height (and t

ype), etc