

CFAES WATER QUALITY TASK FORCE

**2018 STAKEHOLDER
FOCUS GROUP RESULTS**

November 2018

INTRODUCTION & METHODS

The CFAES Water Quality Task Force (WQTF) felt it was important to the Water Quality Initiative development process to obtain external stakeholder input. Focus groups were the primary means of engaging stakeholder input and the WQTF set out to engage representatives (leaders and decision-makers) from the following key groups: Agricultural interests; Environmental/Conservation interests; Local Government; State Agencies; and, Federal Agencies. We solicited names of potential candidates from WQTF members, CFAES leadership, and external stakeholders whose networks helped expand our lists. We invited potential participants by way of email and phone with group size targets of 6-12 individuals. To encourage candid discussion, we promised confidentiality and therefore cannot share the identities of the individual participants or the names of their affiliations. The following questions were used to guide discussions.

- *What would you say are the 'most critical water quality challenges' you face in your work?*
- *Over the last 5-10 years, in what ways have you or your organization interacted with people/information/resources from Ohio State and our College of Food, Agricultural, and Environmental Sciences? (if at all)*
- *What are some of the BEST things that OSU (and CFAES) have done to help you address water quality challenges in Ohio? (give a specific example or two)*
- *What are some of the LESS successful things that OSU/CFAES have done related to water quality issues in Ohio? How can we learn from the past to improve in the future?*
- *What specific activities or resources would you most like to see the college include in the new Water Quality Initiative to help you address water quality issues?*
- *Is there anything else you'd like to ask or tell the members of the CFAES Water Quality Task Force?*

In May and July 2018, the WQTF held five focus group sessions, each lasting two hours. Sessions included a discussion facilitator (WQTF Chair) and notetaker(s) (WQTF Program Manager and WQTF Members, when possible). Audio recordings of all sessions were transcribed for later reference during information processing. The following table lists the stakeholder groups and the dates, locations, and numbers of participants for each event.

Date	Stakeholder Group	Location	Number of Participants
May 24	Agriculture/Farmer Organizations	Columbus – OSU Campus	13
May 24	Environmental/Conservation Organizations	Columbus – OSU Campus	9
July 18	Local Governments – East/Central	Wooster – OSU Campus	8
July 20	Local Governments – Northeast	Cleveland	6
July 23	Local Governments – Central/SW	Columbus – OSU Campus	5

Some focus groups (e.g. Local Governments–Northwest Region and Federal Agencies) did not come together for scheduling and/or geographic reasons. In addition, some individuals were unable to attend arranged focus group meetings. In such cases, the WQTF also solicited input by way of one-on-one phone interviews and a short online survey instrument. These methods asked the same questions of participants as those used in focus groups. **Interview and survey results are appended to the end of this report.**

GENERAL RECOMMENDATIONS

1. Broaden geographic & topical scope of CFAES WQ leadership role

With respect to water quality, OSU seems to be well known for its Lake Erie HABS work, but less known for its efforts in other water quality issues (e.g. urban & storm water, wastewater, etc.) and outside western Lake Erie. CFAES should consider if and how to go about building its capacity and reputation as a go-to place for expertise in broader geographic and topical areas of water quality. Generally, participants expressed that broadening would be positive, while some recognized the value in having particular areas of focused expertise.

- Incentivize work inside AND outside Western Lake Erie Basin
 - “[A] lot of the issues that impact Lake Erie are impacting Ohio River and our other water bodies.”
 - “I would really like to see some sort of pulling together of all of the science in the Ohio River Watershed and having an understanding of what are the really big issues.”
 - “I would say the southern half of the state feels ignored.”
 - “In the emphasis is all on the western lake area. It's all there. The problem is not all there. I wish there was science being gathered here because we have it here too, it's just that nobody wants to talk about it. Nobody knows of it, so they don't talk about it. Of course all the emphasis out there, so that's where all the money is going.”

2. Improve relevance of college research to external policy & decision-making

“I think the college needs to make a decision whether or not it's going to be a thought leader in water quality policy or not.”

The above quote captures the apparent sentiment of many focus group participants. Two general observations were made. First, it seems unclear to people how the College engages in contemporary policy issues (Lake Erie HABS being a prominent topic) using descriptors like ‘disjointed’. Second, and related, suggestions indicated that people believe the College could play a more active, cohesive role while preserving its 3rd party voice.

- Develop ways for knowledge/research to better inform agency policy & decision making, in addition to farmer decision-making.
 - “I'd say Ohio State's done a lot of great research, and I think the real problem or frustration I have is they do not take the research they've done and turn it into policy.”
- Establish a process for engaging the college for key questions & research priorities.
 - “I think the college needs to make a decision whether or not it's going to be a thought leader in water quality policy or not.” With respect to HB 150, “[T]he university said, “Our role is research, if you want science, you come to us.” The policy was done elsewhere, and then all of a sudden it kinda [sic] evolved into - couple people started throwing these articles out about policy and this and that, and it was disjointed.”
- Integrate multiple disciplines / departments into Policy work; and, coordinate more with the Glenn College.
 - “[I]ntegrate a whole lot more people than just our environmental economists in the policy discussion.”
- Be aware of and address “a perception about how the political influence to Ohio State and how that influence fits the research that's done. And the statements, and the ability for OSU to make statements that might better inform public policy. And whether that has to do with big agriculture and relationships there”.

3. Position the college to serve as a convener, facilitator

Discussions routinely brought up issues of coordination and how the College can play a significant role in facilitating coordination around water quality issues over a range of levels and formats. People are looking for someone to step up to play this coordinating role and Ohio State (in general) and the college (in particular) seem like good candidates to play this role. Examples include high-level coordination among researchers within the college, between college faculty and those in other institutions, fostering new research collaboration, and establishing platforms for dialogue, including on policy-related topics.

- Hold regular meetings as a platform for WQ dialogue, similar to the Environmental Professionals Network.
- Lake health is a critical issue and large water bodies are too massive for individual utilities/entities to take on individually; there must be **high-level coordination** with major institutions and players (public & private) in the same room.
 - At the professional level right now, how do we get all of us that are impacted by water quality into the same room? ...[Lake Erie and the Ohio River] These water bodies are too massive. There has got to be some sort of greater partnership at some higher level that can coordinate.
- Academic institutions are relatively well respected and could be a ‘broker’ bringing various parties together. It is important for parties to be able to debate and speak freely.
 - “[T]he education institutions are still well-respected and try to get a good balance. So if Ohio State is willing to push forward some organization that is pulling us all together like bringing the economists, engineers, farmers together with all of these people to try to come up with a solution that brings our state forward economically and environmentally, that would be something I would be excited about.”
 - “I think in general, that there's a tendency to sort of compartmentalize stakeholders and host forums and events that are specific to those stakeholders so that oftentimes there's this kind of preach to the choir format and with issues as broad and complex as we're dealing with, I think that the more that the university can mix it up and get multiple viewpoints, multiple stakeholders' perspectives in the same room to hash through things. It's challenging terrain but I think that you're going to see more productivity and more gains in the future if you can moderate that, facilitate it.”
 - “I believe that education universities are an area that is still well-respected. When I look at statements the farm bureau makes, I'm thinking they're really biased on this one. If there are statements the government makes they're highly biased in other ways, but the education institutions are still well-respected and try to get a good balance. So if Ohio State is willing to push forward some organization that is pulling us all together like bringing the economists, engineers, farmers together with all of these people to try to come up with a solution that brings our state forward economically and environmentally, that would be something I would be excited about.”
- OSU can play a role in the academic AND PROFESSIONAL levels.
- Continue to have these kinds of purposeful discussion sessions, strategically; not just here and there. Dean’s Advisory Group is an opportunity; also advancement / donor investment meetings. Frame efforts in deliberate collaborative manner; previous efforts less successful.
 - [T]here needs to be a purposeful cadence of these kinds of sessions to make sure we're on the right track...Strategically considered. Not just one here, one there...[T]he Dean has an advisory group... seems to be an opportunity to get started with...in the past didn't seem as productive...it depends how it's framed up, how the agendas are...around conversation points, on topics that are important at that period of time.

4. Lead by example – demonstrate best practices by using BMP’s on OSU campuses and research farm properties (e.g. 4Rs)

A couple participants voiced the importance of College demonstration sites and *practicing what you preach*, especially with respect to conservation practices.

“[W]e deal with farmers every day and we get some phone calls. We go out to the farms and say ‘you need a manure storage and it should be six months to try and get through those winter months’ and then they happen to drive by an OSU facility that’s spreading out on the snow or the winter months...they’re supposed to be the leaders...but, they’re not really following [the BMPs].”

5. Eyes on the future

Participants had general and specific suggestions for planning for future societal demand and economic opportunities in all of the College’s major roles - teaching, extension and research.

- Workforce development
 - o Forecast professional and technical needs in water management (e.g. water and wastewater infrastructure; GI; green building) and prepare the next generation.
 - “The trade labors up through the people who design and maintain the pressure and the chemists in the lab ... those are huge critical jobs that we’re going to be in massive need of not only here in Ohio but across the country in ten years as the older generation starts to retire.”
 - “[W]hen I interview, being in the lab, I get all kinds of different degrees. I don’t find there’s a straight chemist or biologist or microbiologist anymore. Everybody’s got some hybrid environmental something...[It’s] kind of a bad thing, because you don’t have any hard science people. It’s hard to find a strong chemist.”
 - o Partner with smaller institutions on workforce development opportunities
- With industry moving back to the Cleveland area, there is a need to have technology, innovation, policies, etc. in place.
- Identify opportunities to connect with MARKETS and the future for OH
 - o “Looking into what might be coming down the road, what might we look at in terms of alternative profitable crops, generating revenue for farmers that could extend these rotations but also address water quality issues at the same time.”

6. Be strategic and commit

Participants recommended that for a WQI to be successful, a sustainable strategy and long-term commitment (i.e. funding and support) are important.

- Pursue a comprehensive, concerted effort and ensure high-level, strategic leadership long-term funding & institutional commitment; build on the WQTF effort.
 - o “I think it’s been a positive that there’s been some strategic leadership to try to put stuff in place longer term effectively.”
- Use adaptive approach: Set goals and address success questions. Have our efforts been successful? What’s working / what’s not?
 - o “[D]oes the college wanna play in the water quality space? And if so, just creating another center with a name: Water, Water Quality... isn’t gonna do it. It needs to have more of a[n] organic structure to it in terms of foundation building.”

RESEARCH FEEDBACK AND RECOMMENDATIONS

Generally, OSU is recognized for the quality and value of both its research and Extension. Numerous examples were provided by participants of work they like and would like to see more of.

- “[T]he research is really what provides the answers and the focuses to what you need to work on...The proof that BMP worked, which then helps us sell it...We get folks like the city, which don't normally invest in agricultural BMPs to pony up some money...[because] they've seen the research, they've talked to the researchers and they can convince our bosses that it's a good investment to spend money up in the watershed rather than just on treatment.”
- “We've had a great relationship with extension over the years and I have used them many times as a resource.”

Research

A commonly recurring theme were suggestions around a need to **facilitate and foster research collaborations** inside and outside the College. Participants also shared areas of research they view as successful and potential topics for future research.

Collaborate within OSU

- “[W]e have too many disconnects around water quality in Ohio right now, and how do we optimize the depth of knowledge and expertise in the research that we're getting, but at the same time be able to knit that together and address those disconnects?”
- “The silos need to be broken down...what is the commonality of the research that has been done up to now.”
- “we have too many disconnects around water quality in Ohio right now, and how do we optimize the depth of knowledge and expertise in the research that we're getting, but at the same time be able to knit that together and address those disconnects?”
- “I think to what degree you guys can partner up with other colleges within OSU would really support the efforts going forward.”

And with researchers and organizations outside OSU

- Engage and participate outside OSU; especially with state and federal agencies, local governments, non-profit organizations, water infrastructure managers, and other key constituencies; and, avoid replicating efforts.
 - o “There are quite a few institutions doing work around water quality and making sure that your map also includes reaching out and...not replicating efforts.”
- In collaborations with other organizations and institutions, it is important for OSU to be flexible (e.g. with branding, formatting, etc.) and understand it is not about OSU, but about the collaborative.
 - o “We're fine that OSU is helping to facilitate that but...It's about the whole collective...[and] has to be for Ohio problems.”
 - o “Sometimes there's a hesitation to get Ohio State involved because...it's no longer our project, it's their project.”
 - o “What Purdue's doing, what Purdue's saying, and I'm not sure it's the same message Ohio State's saying.”
 - o “The research paper that Sea Grant puts out in September that summarizes in the four key areas all the latest research on a drinking water perspective from a tracking bloom

reducing perspective...If Ohio state could encourage other universities to issue that same type of publication for the water quality work that they were doing in their university that isn't connected to the ...higher ed funding or the GLRI funding, that would be great because it would capture everything in one spot. There is so much useless information online sometimes it's hard to dig through everything."

Partner with the private sector

- Form public-private partnerships, e.g. to fund PhD students, to work on projects relevant to the funding parties.
- "...one of the most important OSU components have been (OSU faculty) working with our efforts around technology innovation but also industry and bringing them in..."
- "...whenever we can make that connection to the private industry we generally create a blend while still supporting the base research about how to make that applied."

Expand opportunities for stakeholder advisory groups on research projects

- "some of those research projects having teams of producers and producer members who can offer real world advice...like a 'No, that's not how it works out in the real world,' type of situation. So it becomes an advisory team, a research advisory team, whatever they're called. I think some of the other projects that have come out of here have not had those and those tend to be the ones that we have to come out swinging on."
- "For some reason it just doesn't occur- it's not part of the business plan to say, lets put a group of farmers in one room and say, "Here's what I'm doing in research, does this make sense to you, is this a good thing?" These are people that do this every day, they're out there kicking dirt...I guess I'm saying, that should be a purposeful activity that should be initiated in the college. To painfully go after groups of farmers just to have talks."
- "So cataloging all the work that's being done, and then being able to categorize it and then being able to serve up to us...Just knowing what it is, and being able to sit at the table and bringing those farmers in and having that conversation."
- "So if we have these farmer advisor groups, if the research has some advisory groups when the community is trying to figure out what that research is, staff that advisory group I think is integral to what this thing is going to be that comes out of this task force. Have an advisory group that gives guidance on what's actually needed, and the dollars will follow."
- "If I can just, this is exciting conversation, because I see these advisory boards that are being brought up. I think it's absolutely critical that the research project goes on that farmer or that Ag business is in the room. I think it's critical. Because not only do the ag groups need to communicate the complexities of the issue to the researcher, but there's a lot of things that I'm hearing around the table that maybe people don't understand that there's complexities from the researcher side of things...So that's what excites me about this conversation, because that group isn't just so farmers can help guide the research group, but you need to understand the complexities of the science, too."

On-Farm research

- "So when there's research type projects that the county can be a part of and that the citizens can be part of to see what's going on. That was very helpful. So that, you know, in that instance and I'll just say across the Ag field and not just this field. The projects that have involved a farmer, you know they know what's going on. Using those connections during the research is good."

Demonstrations

- "...we've preached anything from OSU is science based. You know, it's not the stuff you grab off the internet. I think those kinds of things are very important. Demonstrations. That's what they're trying to do with this money is a demonstration and if you can support those things that's important."
- "Extension does a wonderful job of your educational outreach. That's of course your strong arm. I guess I see this initiative on a bigger research side and bigger demonstration things that counties can't do. Research demonstration projects."

Applied Agricultural Research

"What are the practical, hands-on things that we can do?"

The research discussion with agricultural organizations focused on the importance of applied research that is rooted in on-farm practicalities and opportunities to collaborate more with farmers and farming organizations at various stages research. Some participants also recognized the importance of academic freedom. People also expressed the need to advance future research to address findings that have inconsistent implications in terms of conservation practices related to water quality.

- Focus on practical, applied research that is impactful to the producer.
- Incentivize collaboration with the farming community (perhaps establish a farm advisory group) in the planning stages of the research development to ensure that is practical, solutions-oriented, etc.
 - o "I think it's got to be relevant, right? One example that's been good is the Edge of Field research...There's a demand there...the college was interested, and the dollars came into to that project. So, if we have these farmer advisor groups...that gives guidance on what's actually needed, and the dollars will follow."
- Establish a catalog / matrix of ongoing and future research so the industry can better participate. Regular meetings between Ag groups and College Development may be an avenue for info sharing.
 - o "[C]ataloging all the work that's being done, and then being able to categorize it and then being able to serve up to us. There may be some things that...if we knew it was happening...that all of us can collaborate on. Just knowing what it is, and being able to sit at the table and bringing those farmers in and having that conversation."
- Address areas of ongoing debate as an opportunity for future research.
 - o "...[W]hen there's contradictory information, because there's so many faculty members doing work in this area, if there's something that's not a victory, we should look at that as an opportunity to go solve the problem. They're not both right. We need to figure out where's the truth...To me it presents an opportunity."
- Concern about past role of OSU; perception that advice farmers used to get from OSU decades ago have led them into the trouble they are in now
 - o "if now the folk that have been providing us with guidance have had us running cross ways of the system, where do we go? Who do we trust? How does anyone attempt and quantify that they're doing a better job?"

Leadership in Monitoring and Data Management

Some stakeholders felt it was CFAES' role to help rebuild or expand statewide monitoring systems, including water quality and aquatic ecosystem condition monitoring, but also tracking trends in human aspects of the system that affect water quality (like farmer crop rotation and farm management practice use, soil test levels, septic systems, etc.).

- "Reduction from the state of Ohio in terms of the scope of what they were able to capture in terms of monitoring. Ohio has been known as having a very robust biological monitoring program, and I'm concerned about diminishment of that program at the time when we're facing some very critical issues that need more of an investment in monitoring. Monitoring tracking, monitoring and assessment and tracking."
- "I think putting in the GIS area and the geospatial Google Earth type of program developing methods to collect all this information. How many acres and...a recommendation or requirement that all the soil companies download their data into a central database. And it's just a matter of organizing that to happen so everybody has a uniform method and its not, everybody talks about how much trouble it is, you can do it with the soil test company, everybody accepts a uniform standard basis for reporting easily."
- "how many animals are in the watershed, how many tile, what's our tile density? What type of tillage is being used across those acres?"

Data management tools – or central data archives

- "My idea was to have a platform for us to put all our data because we get, I get, tons of data all day long, every day. From EPA, Army Corps, USGS, constantly...It's overwhelming obviously, so I just wanted a platform and we did have a plan to have our own platform but the person responsible for our GIS and data management program left the organization. We had to come up with a short term solution so I talked to Jen from Ohio University...The idea was at least to start tapping data because it's such a huge intake to organize and input our data. ...It was to put all of our data in their platform so at least other organizations could look into it. We can see if there's any overlap or any gaps in the data so we can improve our monitoring. So that's something really recent but that would be something interesting if someone, Ohio State University was willing to partner with us for an entire platform...for all our data...It's a lot of effort that you know, I need to change all the data that we have into a format that will work for their platform."

Specific Research Needed – Lots of suggestions

- Edge of Field work
 - “I think when it comes to research. The university needs to continue to be actively engaged in the on field, edge of field research program or programs “
 - “The edge of field testing units that have been put around the state, I think, are such an important thing. The thing that I think our college could have done better is make that a little more sustainable. We could have had that a little more fortified maybe, involved with that project, to be able to say, “We now have a long-term ability to be able to access and gain those water samples, and to figure out the path for them.”
 - “...if it goes to edge of field, or it goes to the extension, it's the hands-on, practical things that our farmers can do. I don't see a lot of that coming out of OSU. I see it coming out of other places, we talk about cover crops, but we see it coming out of other universities that our guys are asked to be referenced for that. On what are the practical, hands-on things that we can do...”
 - “...the Edge of Field study, which has been a huge effort, all the work they do to being that in, and it's giving us real data, it's not a model. All the models, they're wonderful but they really leave out a lot of detail that makes a lot of difference along the way. So Edge of Field study, this is what's really happening out there and under a lot of different circumstances. So I think in Ohio State, that's run by ARS, but Ohio State is involved with all the testing and running through their lab and so we really appreciate the commitment they're making there.”
 - “We've also seen a lot of value in the agriculture research service, the ARS program that's housed within OSU. If it weren't for Dr. Kevin King and a lot of his students that have put in place the end of tile drainage management and comparative field studies, with a lot of the work we've been doing in our watersheds, having that element of research and water quality monitoring has been the thing that has elevated our grants, I think, to award winning.”
 - To me that's the best, one of the best things, is the science that's coming out of it....It's been very educational to figure out how things may be moving off the field. Having the watershed coordinators, they are great for pulling people together, but the research is really what provides the answers and the focus to what you need to work on in the watershed group...And it's the proof. The proof that BMP worked, which then helps us sell it. Or market it. But if it's not us, somebody else is trying to convince somebody else. There's little risk because we've figured this out.”
- Focus on Ohio River and Inland Lakes
 - “I would really like to see some sort of pulling together of all of the science in the Ohio River Watershed and having an understanding of what are the really big issues.”
 - “Personally, anything that doesn't have the word Lake Erie in it I'm gonna be pretty excited about. You know, I'm invested in the lake itself, so I want it to be clean, but any attention that we can give to the rest of our hundreds of miles of rivers and streams and lakes and underground aquifers “
 - “when it comes to Ohio River watershed issues, OSU has not been one that's come to mind as having been involved, it's been the other down state or more centrally located universities, as opposed to OSU which is nearer to the watershed.”
 - “...all the triggers that have been supposed triggers do not work for our lakes. We've had blooms in November and they're like “oh, the heat” and we're like “it's freezing cold outside”. That's when we have our highest algae bloom and why...We need more

research for inland lakes, small body of water and how to recover the ones that have still got a chance I would say”

- Possible questions to address
 - “Why is the DRP going up and TP going down in that river? What caused that? Why have we worsened the blooms over the past 15 years while we have continually put in more and more conservation acts?”
 - “What's it going to cost a farmer to continue with best practices?...Or flip the coin and say whether consumers are willing to pay for these best management practices”
 - “What are the water quality issues in the part of Ohio that doesn't flow north? Are they different, are they the same, are they as pressing?”
 - “There's blooms happening in areas with no ag, but there's not enough resources to go and figure out why...”
 - “one of the things that I think needs more attention or looking into is the whole infiltration compaction thing that's going on on farm fields because that is also a factor in top soil lose runoff. If we can get, or at least increase the ability of that soil, to hold water and then filtrate water, we've reduced runoff”
 - “What role does organic farming play in addressing water quality in Ohio?”
- Broad ag systems innovations
 - “focus on a systems approach which deals with not only nutrient applications, how do crops respond to X, Y, Z, nutrient applications, but how it interacts with rotation, covered cropping, other management practices that are in place.”
 - “what might we look at in terms of alternative profitable crops, generating revenue for farmers that could extend these rotations but also address water quality issues at the same time?”
- Economic Research
 - “We're really lacking a lot of the economics and understanding the cost of these issues. I shouldn't just say nutrients, but these issues. And the cost of the change, right, that's it's gonna take. And we have a lot of science about a lot of these issues that are impacting our water quality and we certainly need more. I do know that. But our economics is really lacking in understanding that.”
 - Macro-economic impacts including on other states as changes are made in agriculture and trade to address water quality.
- Urban Water Systems
 - “there's a lot of unregulated toxins in our drinking water and having an understanding of that impact and could lead to some recommendations that could protect Ohioans... partnering with businesses or industries outside of just agriculture, right, to have a better understanding of what technologies are needed or that could be support to handling some of these water quality issues.”
 - “I would add that, because of the college we've spoken a lot about agriculture today, but agriculture is only half the problem. We really didn't talk much about waste water today. That's something I see a lot.”
 - “trying to do stuff that is relevant for end users like utilities for instance. I know universities in general, their role has historically been expanding the basic knowledge, the fundamental research. But I think the applied research is where a lot of it needs to be right now.”

EXTENSION FEEDBACK AND RECOMMENDATIONS

Continue to support and build on Extension efforts.

- “We've had a great relationship with extension over the years and I have used them many times as a resource.”
- “...having the research is fantastic, but getting the people to understand it and educate the people about that research is the next hardest step and I think the grassroots efforts through the extension offices has been fantastic in getting that research around to people...”
- “(I get info on OSU research) through extension, yes. I mean because extension, you know, we all fund and very much that way...County commissioners rely on their soil and water and they rely on their extension agents so we expect them to know everything. To know those things, so I would ... if I was to know what OSU was researching, I would go to XXXX and say “okay, do they have anything in this line”. I mean there's some people that would get online, but it's easier for me to just call XXX. I'm just saying. Interactions with, because of you already see with much more interaction with the most average commissioners that you have I would think other than through whatever collaboration they do with their soil and water and their extension.”

For many participants, especially in the agricultural and local government groups, Extension is who they interact with most and is generally viewed positively. As with research, people shared numerous activities seen as successes as well as suggestions for improvement.

- Concern that extension is not as impactful as it used to be
 - o “It seems like extensions kind of fizzled a little bit and now it seems like there's a focus on re-energizing them.” Discussions around how the state funding model change was detrimental.
 - o “So, while those publications may have been good, when they redid Ohio Line they pulled a lot off and they're not there anymore, so it's hard to get that kind of information again. We look at the extension as being the outreach of being able to provide unbiased information out to the members. They, like everybody else, their programming and support to the programming has dropped because the opportunities to interact and to provide programming has also dropped. Delivery mechanism has broken.”
- Emphasis on personal presence at local level
 - o “I would just emphasize the boots on the ground. That is, to me, that is huge. Developing those relationships and so anything that can be done to improve that...would get a lot done.”
 - o Need people working in the community for a long time to build trust. “[P]eople were afraid to invite us out because they thought we were gonna turn them in. It takes a lot of time to get that trust and be able to express that knowledge to them...They do spread the information that is working for them. It's a good thing, locally if you can get the information out.”
 - o “Need to make sure we're allowing some of the counties in Ohio that don't have as many resources in helping out with soil and water conservation issues to make sure that they have resources to handle their own problems in their backyard. You know it's that mantra, think globally, act locally. There's so many things that you really are gonna have to get down to the county level to talk to those people that are trusted that know their county, that know their farmers if you wanna talk agriculture issues.”
- Should farmers expect the college to help them on WQ issues? They may expect that, but don't always get it.

- “[S]hould farmers expect the college's role to be to help them with water quality issues? ...I think farmers would kind of expect, ‘This is my college, they're here to help me.’ But that's not always the case.”
- Add more water quality and environmental training to FACT certification workshops
- Ensure Extension Educators are well-trained; some are perceived as inexperienced in areas needed and expertise variable. Specialists may be a way to address this need.
 - “I just think a lot of the extension educators are not educated in this area. And we've got lots and lots of young ones out there, and they don't have experience with this stuff and in these areas. So there's no way that they can teach all of the things that they have to teach plus this huge issue, too. They're just not experienced and knowledgeable enough to do it. That's the bottom line we've got dealing with the extension right now...And if you take that as well and say, "What's the product that they're extending out of the university? What's the research? How do they have access to it? How are they trained on it? How do they know it well enough to go out and be an extension of this university's research on it?"
 - “Knowledge, experience, and somehow that needs to be captured. But all of these, whether it's extension or whatever it is, the value of a person reflects their interest level and their commitment level...Loves it, loves what he does but therefore he excels. Just need to find more of those kinds of people.”
- Some people do not know about Extension resources available.
- Engage partners like SWCDs and NRCS to overcome legacy perceptions.
 - “...[G]oing back 20 years...one of the [OSU] vice presidents...said 'why should soil and waters [conservation districts] exist?'. I was taken aback, but there always seemed to be this tension [between SWCD's and OSUE]...even though we're partners.
- Reinvigorate efforts to engage with watershed councils in the state
 - “in extension, some of them, not all of them, would come to the meetings and provide input, like what's going on in the watershed, take back whatever collectively they learned and to also educate in their particular watersheds.”
 - “I know OSU extension. They would have people come out and work with different watershed groups. And I think that program was cut back several years ago. They did a lot of good work kind of propping up the watershed groups...And they were able to kind of keep things moving in as a facilitator between the farm groups and the urban groups and kind of bring everybody together to sit around the table and figure what was the common issues. When they went away, some of the watershed groups also went away.”
 - “Just losing support for community based watershed organizations. You know, just dried up until it's just negligible. And I think it's super short sighted for us too.”

BROADER OUTREACH FEEDBACK AND RECOMMENDATIONS

Broader environmental education efforts

- Appreciation for the Environmental Professionals Network (EPN) as mechanism for engaging policymakers and decision-makers in college science.
- "I think providing a platform for discussion, getting different viewpoints in a room, just providing that platform is very beneficial to help to build a network to get people in the same room"
- "I think putting wetlands in the public eye with the development of the Olentangy research park was a big contribution here at the university."
- "...you have the Olentangy river wetland research park that provides excellent opportunity for students to get that hands-on experience, but also answering some of those applied questions that folks have been talking about."
- Watershed Leadership Academy mentioned by several participants as key asset

Stone Lab tours and outreach work was mentioned in almost every focus group

- One of the best things that OSU has done isn't available to everybody. That's Stone Lab. Up at the lake. And as commissioners, we've been able to get in there. We were hosted in and this year we begged enough that I think rather than just a small contingent of our ag committee, I think we're gonna get the entire state board to be able to go to Stone Lab, and we're gonna go through in the morning and then go through in the afternoon. And I think the simplicity of some of the sampling is the best education...you can point out the painfully obvious and people go "Oh. Why didn't I see that? Why didn't I think of it that way?" And Stone Lab's really pretty good at that. When you get out on the lake and you see how they drag and how they sample and what they can see, how they can, you know."

General support for more engagement with public

- We need to do a better job explaining the science. Integrating advisory groups can help.
- Support efforts for faculty and staff to voice / promote scientific rationale for WQ BMP's; e.g. riparian setbacks, straightening streams / drainage management.
- Establish central public database(s) (e.g. for soil test data, tiles, conservation practices)
- Invest in monitoring & tracking
 - o "Ohio has been known as having a very robust biological monitoring program, and I'm concerned about diminishment of that program at the time when we're facing some very critical issues that need more of an investment in monitoring. Monitoring tracking, monitoring and assessment and tracking."
- How can parties learn about ongoing research?
 - o "[I]t would be nice to know what things you guys are researching...I don't know how to access what research is going on...[Farmers] want to know the science behind [conservation practices], how does this truly work? ... Is this truly going to be a well investment...it would be nice to know what research projects are out there that we could maybe showcase or try to get into a field day or something that we could share with local farmers to try to get that word out."

CHALLENGE: IMPROVE POLICY RELEVANCE OF OSU RESEARCH

There was a widespread desire to have OSU play a stronger role in the formation of policies to address water quality issues in Ohio.

- "I think the college needs to make a decision whether or not it's going to be a thought leader in water quality policy or not."
- "There's some value to university being that unbiased third party. They just need to decide what they're role is going be."
- "I think the biggest role is to provide that technical- our policies are based off of sound science, economically viable, make sense, all of that. And so you need to have those components, so a university and researchers can provide that science behind policy indictment or policy decision. Or provide economic analysis to make sure that that decision makes sense economically, that the industry remains viable and that it's good for society and good for the environment"
- "This is about having political will to change the way we do things, and the politicians are not going to change unless they get recommendations from the college. So the politics will not change unless the college changes. So the college doesn't have any new recommendations to make to the politicians they are going to stay where they're at."
- "So even if there is all this great knowledge, we can only use it so far if our politicians are not willing to accept science."
- "I'd say Ohio State's done a lot of great research, and I think the real problem or frustration I have is they do not take the research they've done and turn it into policy."
- "Challenge you run into with...policy decisions is that the issue du jour becomes very hot and when someone wants an answer... ongoing academic inquiry takes longer than the demand for the answer...how can you, release some of the research...to inform the policy decision. It's not been published yet, it hasn't gone through peer review. So, I understand the handcuffing that's there. Then it becomes, 'What role does the university play?'"

Some groups were concerned that the policy research we do seems to be unappreciative of the important role agriculture plays in the state.

- "When it comes to water quality, should farmers expect the college's role to be to help them with water quality issues?...Cause, that's not always the case. I think farmers would kind of expect, "This is my college, they're here to help me." But that's not always the case."

Appreciation for the recent white paper that was written by both OSU and non-OSU folks last fall

- "The white paper that...drew on expertise from either the extension program or people again that are in this area. So that paper should and can and could be much more relied on for this, okay we have 80% of the answers. We don't have 100, we don't have 99%, but let's use this as a guide to say we can make some decisions, move forward. So it ties back to the leadership issue. So I think Ohio State expertise and previous research was an enormous part of the value that effort..."

SUGGESTIONS TO IMPROVE COMMUNICATION & MARKETING

A number of suggestions voiced have to do with communications and marketing opportunities.

- Recognize important role of OSU as neutral 3rd party in public discussions
 - o “I think it's important that Ohio State recognize how much of a voice you have, in the eyes of the public who are looking for, not an industry answer but a third party answer.”
- Concerns about mixed messages
 - o “They don't give a consistent message that everyone can grab ahold of and go ‘This is the direction we wanna go in.’”
 - o “I do believe that Ohio State has authority, but what I guess I'd like to see is not the use of their authority so much as the use of their leadership.”
- Explore ways to address misinformation; e.g. manure vs manufactured fertilizer story
 - o “Ohio State did this research...a consortium rather, but they didn't keep promoting it. So, you had uniformed, local elected officials...”
- Understand/respond to modern information-sharing platforms, web, media, virtual, etc
- Concerns expressed about perceived contradictory information coming out of OSU related to Lake Erie and water quality; is there a mechanism to sort this out and coordinate the public messaging coming from researchers in the college?
 - o “Often times, information is published and then there is controversy around it, so that's one of the less successful things that occurs, is not having vetted it and get it validated and get some response from industry. Or from whoever. Just firing before you aim and validate.”
- Consult with a given stakeholder group (i.e. Agriculture) in advance of releasing info, if there is potential to minimize controversy.
 - o Also related to communications with farmers and agricultural organizations, avoid starting conversations on WQ with negative impacts (e.g. economic studies, surveys, etc.). “Sometimes you throw too many logs on the fire before you figure out how it got started, and it just perpetuates the negativity around the issue when you've got other folks that are trying to work on solutions. So when you get your social reviews and your surveys and you lead off with that, all you're doing is just starting a fire, and then you're trying to chase it to put it out with all the good work you're doing on the other side of the university.”
- Opportunities to better market the state's / region's water resources (e.g. north coast), sewer districts, etc. Good examples to look at are Michigan and Penn.
- Promote appreciation for the “Value of Water”
 - o “[W]e wouldn't be in this mess if people valued water as important as it really is. We're still not getting the word out to people how important water is to every aspect of our community. Because if they did value it, they would be taking actions, all of us, to make it better and support things that made it better. Anything that just gets the word out about water being important.”

Provide better access to research done at OSU

- “...it would be kind of nice to know what things you guys are researching...We don't, I guess I don't have access or know how to access what research is going on on the campus to be able to maybe set up a field day. Or just a day to go out, take farmers out and say here's what it looks like, here's you guys could present maybe the research behind it. 'Cause everything when we go out to the farms, they want to know the science behind it, how does this truly work? Is this gonna benefit me if I'm gonna invest this money in this? Is this truly going to be a well investment?”

TEACHING & Institutional Knowledge Transfer

Participants shared a number of ideas on how to maximize opportunities to train the next generation of College graduates, including technical leaders, service providers, etc.

- Explore potential for a multi-disciplinary program, e.g. similar to ESGP, but also for undergrads.
- Coursework, Capstone Projects in WQ;
- Interdisciplinary requirements – e.g. have designers, Ag majors take Env Sci & water quality courses; and vice versa. Communications course requirements for all.
- Teacher education program; have a foundation in the importance of water
- Youth programming. Education & Recreation opportunities for youth to connect with and establish a deep appreciation for water.
- Connect graduate students with opportunities in local water issues; e.g. inland lakes - why they are unique; water utilities; etc.
- “Are there any water quality classes in the college that talks about the history of water quality, the pollution control, clean water act, where we are at now, what the issues are and what are some ways we could solve it. We could get the students to be a part of the conversation.”
- “It'd be great to see one of our major institutions partner with our 2-year institutions to create a course development component.”
- “I think OSU can help at the professional level and academic level of getting the students to talk with each other. You have engineers in the same classroom with agriculture, environmental, soil science students working together to come up with solutions.”
- “...make that the capstone project for graduation. Whether it's water quality, stormwater, green infrastructure or even getting people to put their trash in the trash can.”
- “To have engineers who are more focused to interact with people that are big picture. Everything dealing with the economy and environment fit together. There is cause and effect so how do you get everyone in a big room to look at the big picture.”
- “What would make me excited... Ohio state could be a trend setting university in the nation by announcing that starting with graduating class of blah, all students will be required to do a capstone program where they have to work in groups of ten or whatever the number may be that brings in various disciplines and your group of ten will be given a real-world issue that are submitted from infrastructure, shipping, arenas...and you'll come up with a solution to a problem. It will be a course and your entire senior year will be x amount of credits. That would be amazing because that would allow these beautiful, creative mind so full of energy and aren't warped by the realities of adult responsibilities. Innovative and coming up with real-world solutions that will impact their generation.”

APPENDIX: Highlights of issues raised in each focus group session

ENVIRONMENTAL/CONSERVATION ORGANIZATIONS

Ohio River Watershed is a priority

- Nutrients are a major issue everywhere, not just in LE, but that is the perception; nutrients are an easy way to broaden the scope to help with funding, info, etc.
- Pull together science – what are the major issues?
- For 2/3 of the state – water quality standards are not as strict.
- Invasive Species
- OSU is not a big player in the Ohio River research world.

Broad perspective – in order to solve WQ problems in OH, we have to solve them for the whole country. Taking into account macro-economic impacts.

High-level strategic leadership; e.g. build on WQTF effort.

OSU can play important role as convener in the state
Hold regular meetings as a platform for WQ dialogue, similar to EPN.

Develop ways for knowledge/research to better inform policy & decision making (agencies) in addition to farmers.

- Build on the voice OSU has developed around HABs.
- Build on HABRI experience
- Establish a process for engaging the college for key questions & research priorities.
- Reshape how OSU / College engages decision-makers.
- Does OSU want to promote research or policy? These should not be exclusive of each other and policy engagement can benefit scientific research. Better coordinate with the Glenn College.

Identify opportunities to connect with MARKETS and the future for OH

- Example: Crop rotations that can turn a profit; malting barley.

Research Collaboration

- Process – find ways to knit together deep research expertise, as there seem to be disconnects around WQ in OH.
 - o Similarly...
- Silos – need to be broken down. Rather than more research, what is the commonality among the research already done?
- Engage and participate outside OSU; esp. agencies, local gov, organizations, water infrastructure, and other key constituencies

Utilize available technologies (Google Earth, satellite imagery, GIS data, etc) to collect info on what we don't know.

Establish central database(s) (e.g. for soil test data)

Establish uniform standards for reporting & tracking BMPs, e.g. crop residue, tiles, tillage, soil testing.
Invest in monitoring to maintain the robust biological monitoring OH is known for.

Importance of youth programing

- Education & Recreation opp's for youth to connect with and establish deep appreciation for water.
- Relationships to water – Recognize there are different types. E.g. farmers who want to drain their property have different appreciation based on different experiences.

Research Gaps / Opp's

- Emerging contaminants: Plastics; Toxins in Drinking water
- Economic aspects need more studies

Extension

- Fizzled over the years, but seems to be reenergizing.

Successes, Resources

- RESEARCH
- EXTENSION & outreach
- Tri-State
- P-Index
- HAB Forecast
- Larry Brown's work
- Edge-of-field studies
- Multi-Model efforts (Martin & Kalcic)
- Robyn Wilson, behavior work
- FACT TRAINING – build on this with social sciences (survey) to learn what the audience plans to do with the information. [side note: don't they already survey??]

AGRICULTURAL ORGANIZATIONS

Ensure comprehensive, concerted effort with long-term funding & institutional commitment.

POLICY

- Decide if/how OSU wants to be a thought leader in policy. College says it's a research institution, but then disjointed materials came out.
- Integrate more than just what the economists/policy people are doing. Ensure a holistic view and adequate expertise before deciding to be a player in this space.
- Value in being an unbiased 3rd party.
- Integrate more with Glenn College.

Extension / Assistance

- Should farmers expect the college to help them (wrt WQ)? They may expect that, but don't always get it.
- After website (Ohio Line?) was reorganized, it was hard to find publications, fact sheets, etc.
- Ensure Extension Educators are well-trained; some are inexperienced in areas needed. Specialists may be a way to address this need.
- Funding model change was detrimental.
- Hold regular farmer-Extension conversations.
- Nutrient Management Planning – needs streamlining. They take too long.

Applied Research

- Focus on practical, applied research that is impactful to the producer.
- Incentivize collaboration with the farming community (perhaps establish a farm advisory group) in the planning stages of the research development to ensure that is practical, solutions-oriented, etc.
- Communicate with the Ag industry and establish a catalog / matrix of ongoing and future research so the industry can better participate. Some Ag groups regularly meet with College Development.
- Stay engaged in Edge-of-Field / on-field programs & research; have a long-term sustainability plan to avoid past lessons learned mistakes.
- Build on Glen Arnold's manure work. One person statewide is not enough.
- Marry nutrient loss with yield data efforts.
- Additional topics meriting support: soil health / soil quality.
- Fund/incentivize needed research.
- Address areas of ongoing debate as an opportunity.

Communication / Results Dissemination

- The research inquiry process takes longer than the demand. Address the challenges of how to release info in advance of completion.
- Promote consultation with a given stakeholder group (i.e. Ag) in advance of releasing info, if there is potential to minimize controversy.
- Avoid starting conversation on WQ with negative impacts (e.g. economic studies, surveys, etc.).
- Recognize public opinion of OSU as an important 3rd party voice.
- We need to do a better job explaining the science. Integrating farmer advisory group can help with this.

Teaching & Institutional Knowledge Transfer

- Maximize opportunities to train the next generation of technical leaders, service providers, etc.
- Explore potential for a multi-disciplinary program, e.g. similar to ESGP, but also for undergrads.
- Environmental science & WQ coursework for Ag majors.

Academic freedom – understand the trade-off's of research based on individuals' visions and opportunistic research based on funding sources.

Dialogue / convener

- Continue to have these kinds of purposeful discussion sessions, strategically; not just here and there. Dean's Advisory Group is an opportunity; also advancement / donor investment meetings.
- Frame efforts in a deliberate, collaborative manner; previous efforts have been less successful.

Invest

- Long-term funding is an indicator of life-expectancy.

Don't just create another 'Center' with the name WQ in it.

Research

- DRP vs TP question.
- Macroeconomic impacts on farmers (a diverse group) for addressing WQ.
- Integrate market research in studies / recommendations involving new types of crops.
- Organic Farming – WQ benefits
- How to do both fertilizer incorporation AND no-till.

Activities to replicate or extend

- Lake Erie / Stone Lab boat tours
- FACT Training
- On-farm research trials.
- Glen Arnold's work.

LOCAL GOVERNMENTS

WOOSTER

EXTENSION is critical point of contact with OSU

- Continue to support and build on Extension efforts.
- Invest in boots on the ground – it's how things happen.
- Developing relationships; building trust to improve communication; as more time is spent with farmer, info will spread.
- Institutional Knowledge Transfer – ensure adequate training, grooming of successor educators.
- Some people don't know about Extension resources available; Expertise is perceived as varying widely with respect to local issues.

Graduate Student Research

- Connect students with opportunities in local water issues; e.g. inland lakes, why they are unique, etc.

Promote demonstration projects

- Partner with cities / communities and showcase these and other successes.
- Support and participate in Workshops and How-to's; pasture walks and soil sampling are a good model to replicate.

3rd Party Expertise

- Support efforts for faculty and staff to voice / promote scientific rationale for WQ BMP's; e.g. riparian setbacks, straightening streams / drainage management.

Extreme Weather

- Support efforts to communicate about changes in extreme weather because people are being affected. It does not have to include political issues, e.g. human causes, but focus on what is happening and the effects.

Soil Conservation – recognize the WQ connections with soil conservation.

- Soil loss and associated tried-and-true conservation practices are at risk.
- Infiltration / field compaction are related topics worth investigating.

Communication

- Inform Legislators.
- Target local government elected officials (who turnover a lot)

Research Collaboration

- Make information available for people (including potential partners) to learn about ongoing research. Externals may utilize that for opportunities, e.g. educational, research collaboration, etc.

Outside Lake Erie

- WQ problems are everywhere and more science is needed outside of Lake Erie.

Lead by Example – demonstrate BMP's on OSU properties (e.g. 4Rs)

Research Opp's

- GIS map for wetland mitigation (w/ sign-off from agencies), perhaps a pilot.
- Centralized WQ data portal.
- Cytotoxin trigger(s)

ACTIVITIES TO REPLICATE, SUCCESSES, ETC.

- Lake Erie / Stone Lab boat tours
- Nutrient Management Planning
- Tri-State Recommendations
- On-Field Ohio Tool
- Extension County Educators; fact sheets
- Nutrient Trading – Richard Moore's expertise, major role in developing and gaining OEPA buy-in.
- Tappan Lake Nutrient Reduction (Ruth? Recent grad)

CLEVELAND

Coursework, Capstone Projects in WQ;

- Interdisciplinary requirements – e.g. have designers take Env Sci courses. Communications courses.
- Teacher education program; have a foundation in the importance of water, integrated w/ curricula

Plan for the future

- Forecast professional and technical needs in water management (e.g. water and wastewater infrastructure; GI; green building) and prepare the next generation.
- With industry moving back to the Cleveland area, there is a need to have technology, innovation, policies, etc. in place.

Workforce development

- Partner with smaller institutions on workforce development opportunities, e.g. in green stormwater, post-construction regulations, and other urban infrastructure needs.

Facilitator / Convener

- Lake health is a critical issue and large water bodies are too massive for individual utilities/entities to take on individually; there must be high-level coordination with major institutions and players (public & private) in the same room.
- Academic institutions are relatively well respected and could be a 'broker' bringing various parties together. It is important for parties to be able to debate and speak freely.
- OSU can play a role in the PROFESSIONAL and ACADEMIC levels.
- Be aware of historic tensions; e.g. Cleveland-Columbus; Extension-SWCD's.

Foster research collaborations

- E.g. among Economists AND Sociologists to understand and tell the story of the value of WQ.
- In collaborations with other organizations and institutions, it is important for OSU to be flexible (e.g. with branding, formatting, etc.) and understand it is not about OSU, but about the collaborative.
- Foster collaborations with other universities / institutions doing WQ work; avoid replicating efforts.
- Form public-private partnerships, e.g. to fund PhD students, to work on guided, relevant projects.

Communications, Marketing

- Amidst public perception issues, there are opportunities to better market the state's / region's water resources (e.g. north coast), sewer districts, etc. Good examples to look at are Michigan and Penn.
- Explore ways to address misinformation; e.g. manure vs manufactured fertilizer story, Heidelberg.
- Understand and respond to modern information-sharing platforms, web, media, virtual, etc.

Applied research

- Setting – NE OH could benefit from a site, e.g. like the ORP, Stone Lab, also UMin example.
- Build on examples of researchers assisting addressing problems and generating risk management implications results that water managers can use to improve activities they oversee.

Environmental field diversity – how do we reach all audiences?

Research gaps

- Policy – work is needed on where we are and where we need to be.
- Perspectives on research – differing views on diversifying portfolio of areas of expertise and tackling everything vs focusing on certain areas. Some areas, e.g. green infrastructure, OSU may not be looked to as a leader.

ACTIVITIES TO REPLICATE, SUCCESSES, ETC.

- Stone Lab / Sea Grant September Report – digestible for the public. OSU / College should do something similar.
- OSU representation / expertise (e.g. J Reuter, C. Winslow) in stakeholder dialogue (e.g. w/ technology, industry, innovation); increase capacity and distribute responsibilities for broader impacts.
- B. Sohngen' economics studies in NW OH.
- HABs; not so much of a player in urban issues (NE OH)
- Participation in GLISA (UM lead)
- OH University is providing assistance to local watershed orgs; acid mine drainage; web platform for accessible data.
- Justin Chaffin water filter effectiveness.
- Faculty referenced: Scott Hardy, Ryan Winston, Rocky Smiley
- Regional team working on updating the Ten-State Standards

COLUMBUS

ACTIVITIES

Make better use of EXPERTISE & LEADERSHIP to be an authority on topics, instead of background.

Outside LE Basin

- Anything that doesn't have the words Lake Erie in it. South half of the State feels ignored. OH River Algal Blooms.

Quantify and communicate % reductions in nutrients.

Address success questions: Have our efforts been successful? What's working / what's not?

COMMUNICATION

- Some work / results do not get out; or at least not efficiently; and, could better translate into policy.
- Public Education; OSU could improve. Value of Water – Awareness and education is needed to get the word out. We wouldn't be in this mess if people valued water.
- Policy – Improve on messaging consistency and play a role in policy, not just the 'politically safe route'.
- Explore and promote areas of commonality (areas toward a unified goal/voice) that can rally broader support. Organize / publicize high-level goals.
- Know the audience(s) and what they need to be educated about.

UTILIZE OSU RESOURCE

- Glenn College – On WQ policy issues, CFAES should better coordinate/integrate w/ Glenn.

Wastewater is a big problem, too.

Extension

- Support Counties to ensure they have resources to handle things in their areas, locally. They need education, support, and tools to make decisions.
- Extension support has been cut back in recent years, impacting e.g. watershed groups, acknowledging this is tied to state policy decisions.
- Piggy-back FertCert sessions/audiences with additional content.
- Website – ensure fact sheets / publications are easy to find.

Teaching / training the next generation

- Senior capstone projects; partner w/ cities, operators, potential employers, real-world problems.
- Merge leadership theory and environmental.
- Utilities positions, e.g. hard chemists; candidates are hard to come by. Need for chemistry degrees as opposed to hybrid environmental sci.

PREVIOUS SUCCESSES

- Research; on-field, edge-of-field
- Watershed Group Support; less funding now.
- Specific faculty/Staff: Andy Ward; Tom Koontz; Joe Bonnell; Libby Dayton; Nick Basta; Brent Sohngen;
- Watershed Academy
- Overhaul Drainage School
- Environmental Leaders Program
- Environmental Professionals Network
- Stone Lab Tours; this type of experience could be expanded to be more accessible.
- Turf Grass workshops; could be more impactful if it were less costly.

APPENDIX 1: Interviews with Key Informants Unable to Make Focus Group Meeting

In mid-August, we conducted four semi-structured, telephone interviews with stakeholders that lasted between 20-35 minutes each. The purpose of the interviews was to obtain input from people where we ran into difficulty scheduling focus groups when a sufficient number of people could attend. Interview participants leaders and decision makers representing local government in northeast and northwest Ohio. As with the stakeholder focus groups, to encourage candid discussion, we promised confidentiality and therefore cannot share the identities of the individual participants or the names of their affiliations. The following questions were used to guide interview discussions.

The interviews were based on the following open-ended questions.

- *What would you say are the 'most critical water quality challenges' you face in your work?*
- *Over the last 5-10 years, in what ways have you or your organization interacted with people/information/resources from Ohio State and our College of Food, Agricultural, and Environmental Sciences? (if at all)*
- *What are some of the BEST things that OSU (and CFAES) have done to help you address water quality challenges in Ohio? (give a specific example or two)*
- *What are some of the LESS successful things that OSU/CFAES have done related to water quality issues in Ohio? How can we learn from the past to improve in the future?*
- *What specific activities or resources would you most like to see the college include in the new Water Quality Initiative to help you address water quality issues?*
- *Is there anything else you'd like to ask or tell the members of the CFAES Water Quality Task Force?*

Interview results are organized here by question and clustered where similar themes emerged.

Question 1: What would you say are the 'most critical water quality challenges' you face in your work?

Interviewees recognized the importance of algal blooms, nutrients and agricultural runoff as a driving force/issue, but they also highlighted a wide range of other water quality issues, including climate change, dredging, infrastructure, and specific water bodies. One person noted, "It's not only the Lake Erie situation. A majority of our water goes to the Ohio river." Responses are clustered below where possible.

Nutrients & Sediment

- Economic impact - "Ag is the number one economic driver. So anything we do that affects how the farmers do their job will have economic consequences...so we have to be careful about how we do things. We also have areas with sewer districts...I realize Ag is probably contributing a majority of nutrients, but there are other things are out there."
- Legacy P & Treatment Trains - "We've got a lot of legacy phosphorus in [Grand Lake St Marys]. So how do we combat the legacy phosphorus? We still have the P coming into the tributaries. We've spent a lot of money on the treatment trains and we've seen a reduction in sediment in what's coming into the Grand Lake St Mary's. More funding for what we're calling upstream treatment trains."
- Farm soil testing - "The educational portion is going to be extremely important; we need to have all farmers doing some sort of soil testing." The interviewee referenced a presentation from Greg LaBarge where it was noted that some 30% of farmers are not soil testing. "And they're

doing, that's the way my grandpa did it, that's the way my dad did it, and that's the way I'm doing it. And that just doesn't cut it anymore. Coordination of education – and that's the difficult thing because those people aren't interested in listening.”

- “We have issues where runoff from agricultural areas where the inputs are nutrients and sediment; Sediment issues from not only the development areas; development filling in the floodplain and encroachment on the streams; storm water management.”

Hydrology & Storm Water - “Storm water issues, hydrology issues; whether that's too much water or not enough water; we also have sediment and erosion issues...we also have hydrologic changes through ditching or tiling.”

Sewer districts & WWTP's –

- Phosphorus effluent limits may change (“by 2021 will have to do updates”). If limits are going to be more stringent, they should be so across the board. “In places where water quality is really hitting the fan, they're looking at a ½ pound and in other places a pound of phosphorus. But it should be the same. If we need to come down to a ½ pound we're going to have make some changes.”
- “Stormwater management and CSO issues are huge...Basement flooding and stream flooding, especially with more violent storms and frequent bursts; we'll expect more flooding.

Climate Change

- “There's been somewhat of a climate change. I'm not a global warming fan, but we do have climate change. The Earth has had climate change over the last half million years.”
- “We have bigger rainfalls that could lead to the problem.”
- “We're doing a climate change action plan for the county. There will be slightly more precipitation and storm bursts; so, what does that mean for the county? Climate change in terms of oceans leads to acidification; I don't know what that means to the great lakes to fresh water. Invasive species have always been an issue; will there be climate change elements to that as well?

Cuyahoga River (and dredging)

- “It violates the Clean Water Act, it has for many years. Are there things we can do to delist it under the Areas of Concern. 2019 is the 50th anniversary of the last time the river burned. In the next year there's going to be a lot of discussion in Cleveland around that event either tarred us or have been able to come back from that. Public relations, commercial applications; the freshness, and quality of the water. Those are some things we have concerns about.”
- “Dredging issues and what to do with dredge materials, beneficial uses. We've been fighting with the USACE for years over the dredge materials from the Cuyahoga; would like more support from the federal government; they want to dump the dredge material into the lake and we think that's a really bad idea.”
- “And how do we find, money or incentives, for dredge materials relocation areas (DMRA's), where the ODNR dredge crews pump the sediment out of the lake to dewater and it takes a 5-7 year process to make that happen and then it gets reclaimed. So probably looking at it from a little bit different perspective than other stakeholders, but that's what we're addressing and seeing as the biggest issues.”

Grand Lake St Marys - "We have dealt first hand with the microcystin algae issues. Back in 2010, forced the city of St Mary's the lake is their water source for drinking water, we've been on the forefront of this and lots of dollars have been poured into the watershed. And really I think, we've got a lot of the livestock producers that are on board, the SWCD, the Dept of Ag, there's a lot of dollars that have been poured in. And I don't want to say that we're satisfied, but having the livestock producers on board and we've got all of the nutrient management plans that have been written and created and followed, I hope, as they're written."

Coastal erosion - "Coastal erosion, high water; again people's altering for residential, industrial or commercial."

Question 2: Over the last 5-10 years, in what ways have you or your organization interacted with people/information/resources from Ohio State and our College of Food, Agricultural, and Environmental Sciences? (if at all)

Two of the four respondents reported significant interactions with College faculty and staff doing applied research and extension work. They also described attending meetings and presentations; one provided detail on several projects their organization is involved in.

- Edge-of-Field studies presentations; Wooster, Greg LaBarge; Libby Dayton.
- "We're involved with OSU Extension. I've participated in edge of stream, where water quality research and education is being done."
- Blanchard River project
- NRCS-ARS - "We follow the ARS [Agricultural Research Services] group I don't know how affiliated they are with Ohio State."
- "We've submitted some proposals to Sea Grant."
- Storm water BMP's - "Worked on a project doing storm water BMP's, LID / GI practices. An ongoing project with Ryan Winston. We have a few pervious pavements and bioretention sites for collecting grab samples."
- Ag conservation efforts / On-field Ohio - "More specifically we have a project called pay for performance. What we're trying to do is come at conservation promotion from a slightly different way. So instead of paying an out-right cost per acre, we'd actually use models to help a farmer identify (a) where conservation is needed on the farm and (b) if we put conservation on there, what value do they represent. So we use models to figure that out. We work with two different models, one was a nutrient tracking tool; we were working closely with Heidelberg University, they received a CIG grant, to take an intelligent model, it takes an Apex model, and then it creates a user interface; we were using that for a while, and all models have their issues and we ran into difficulties. And then we started exploring the On-field Ohio model that Libby Dayton's group was coming up with. And between those we tried to find the sweet spot using those two models."

Two respondents reported having little or being unfamiliar with the specifics of their organizations' interactions on water issues with OSU/CFAES.

- A little bit with Ohio Sea Grant. Previously with Byrd Polar / Climate group.
- "I would have to venture to say that through a lot of the science that's been done at Grand Lake St Mary's, OSU has been involved, but I can't provide any specificity. We've had lots of universities involved. When the lake became extremely unhealthy there were a lot of people coming with the panacea to the issue and we wanted to do everything science based. We kind

of work with the lake restoration committee, it's kind of an ad hoc committee that's put together with all local stakeholders to come up with the ideas and the solutions and the PR."

- "I've never been to the Stone Lab. The invitation has been made several times. Up on Lake Erie. That maybe someday I'll take advantage of. That's another connection that's been offered, but I've just not utilized."

Question 3: What are some of the BEST things that OSU (and CFAES) have done to help you address water quality challenges in Ohio? (give a specific example or two)

When asked about the best things the College does, interviewees identified Edge-of-Field Studies, Nutrient Management Plans, and the Sea Grant institute. Two people elaborated on the importance of research as follows:

- "We do follow a lot of the research that comes out of there quite a bit. As we're trying to discuss changes or needed changes with our farming community. Lots of times we're scouring the research or trying to get some of the professors to come up and speak; we're not trying to come up with the research on our own. You guys have been a huge data resource in that respect."
- "The research that's being done, I think the program is called the edge-of-stream. It'll be very interesting to see what the final research proves on that and what strategies they have to deploy for our ag producers in the watershed area."

Question 4: What are some of the LESS successful things that OSU/CFAES have done related to water quality issues in Ohio? How can we learn from the past to improve in the future?

Interviewees provided constructive feedback on areas of the College's work apparently perceived as valuable that also have room for improvement. Their advice focused on improving strategic investment, on-field research partnerships, and outreach / Extension efforts, including communication.

Coordination and strategic with resources and spending

- "When problems in Lake Erie first hit the forefront, we threw some money at it from numerous different places, but I'm not sure we accomplished anything other than 'we spent some money'. That's my biggest concern...We have to be resourceful with the dollars we have and actually accomplish. We spent a lot of money on cover crops and those are all good...Learning from the past, just throwing a lot of dollars at things without having an end-game in mind. With the cover crops. We could have done a better job in that respect. And that's not necessarily a knock on the university. That's what happened in reality. If the university can help coordinate, that would be a good thing. "
- The same interviewee said, "I don't think there's something we've done badly. We need to keep using science to lead us, to work on the future."

Local Extension Educators with limited expertise or skillsets.

- The local educator is “good at relaying info/data; but not lining people up and getting them involved, engaged. It’s not their forte. But other county educators do have that capability, we could use some educators helping those in other counties.”

‘Closing the loop’ on research partnerships

- “We have farmers very interested in becoming research farms, or participate in some of the research; and in the cases where we have made connections, I know from the farmer aspect they never really got their data back, so they left feeling soured from the experience...And I don’t think Ohio State is the only one that’s done that. I think researchers have a hard time closing the loop on partnering with a lay person on doing the research and (a) making sure you’re giving the data back or (b) in a way they can understand. And so I think they feel like they’re being left out of the partnership.”

Meeting the need for expert speakers

- It seems that there’s a lot of need out there. And there’s probably more need than can be provided for. I know it’s hard to get responses back from some of the professors; it might be difficult to get somebody up there...It’s extremely hard. When everyone’s trying to do their own field days or farmers meetings they’re trying to get the research. I feel like one of the things the [Soil & Water Conservation] Districts do really good is they’re kind of the conduit to get the research to the people who need to digest that research. And one of the things we’ve learned is that people don’t want to travel far anymore. So what happens is, you have all these meetings and field days that really small geographic area of people that will go to that meeting so you have lots of them. I feel for the potential speakers that are getting bombarded with several different events, but they can’t go to all of them because they have to do the research so I get it, but it’s also unfortunate because we’re just not getting the message out, we’re not meeting the people where they are. And the people aren’t going to drive to Columbus to get it.”

Science communication matched to the audience

- “With the farmers, the information that is given is never given in terms that a farmer understands. The kilograms or milligrams per liter. Everything has to be turned back to pounds per acre. Those are the terms that. There’s a lot of info that gets lost and then there’s a lot of wasted time that someone’s trying to take data that’s released from the university and then re-translate it into something that’s more palatable for the people who need the information. And again that’s not an OSU thing that’s a research thing.”

Question 5: What specific activities or resources would you most like to see the college include in the new Water Quality Initiative to help you address water quality issues?

Of any portion of the discussions, interviewees offered the most input on this final section on what to include in an initiative. This was also the case for the two who reported little experience interacting with the College, but had a lot of advice and ideas for where they see research needs in their work. The feedback is clustered below in groups having to do with agriculture and nutrient management, coordination & partnerships, communication, and research & policy related recommendations.

Agricultural / Nutrients

- Target the “Lower costs things: lower hanging fruit.” – Soil Testing and recommended Nutrient Application rates. Get to the 30% of population that isn’t soil testing. Apply based on soil tests. Nutrient management plans. Data, yearly, yield data”
- “Practices, cover crops, bi-level ditches. Control structures. These all have costs and can take land out of production.”
- “And how you get folks at that table, we’re going to have to be innovative, we’re going to have use some dollars to incentivize. You know you don’t need to spend any dollars on me, we’ve already started doing that...Use some incentive money to get that last 30% at the table.
- In today’s economy dollars and cents are going to talk as much as anything because things are getting tight...Study done 2-3 years ago, 220 fields. When it was zero recommended, we still had farmers applying 160 pounds. When you’re looking at the cost of phosphorus, that guy was dropping \$55-56 an acre to put that P on there that wasn’t even required by the test. There’s where we got the problem, we got to eliminate that. Incentivize. And point out that hey you just spent this much money and that’s hurting your bottom line.”

Ag Conservation Recommendations – Use Caution

- “The other thing I’ll say too is that research in general has to be really careful about saying, different types of things that are perceived good or bad, or this should just be done. “
- “Without really looking at the practicality of what they’re really asking the change to be. And I’ll say one of the things, I’ve had I don’t know how many researchers have come into our area and say just get the manure two inches below the ground and everything will be just fine. We don’t have liquid manure application going on in the county and so, but we have sediment issues. So yeah we can till it under but that increases our sediment issues. So it really in some ways, when one piece of research comes out it can muddy the whole thing because they’re not looking at it as a whole system, they’re looking at that one element that they were trying to solve. You can’t look at phosphorus reduction without looking at what will that do to sediment and erosion increase. I feel worried or cautious that we get blinders about one thing that we want to solve.”

Coordination and Partnerships

- “We need to have a coordinated attack...OSU in partnership with the Farm Bureau, Extension, Sea Grant, SWCD’s; [OSU] can be that lead person to coordinate.”
- “As we gather this information, become a conduit to work with local soil and water’s, stakeholders, farmers, and those on the cutting edge. Collaborative effort - Extension, university and soil and water coordination – that you have to soil test and to apply based on the soil test.”
- “I think the university is best entity through the Extension and in coordination with the soil and waters to accomplish that, because they have the research to back up the recommendations.

That if you do this, we're going to accomplish the 40% reduction and still meet our agriculture production goals in Ohio and keep ag number one."

- "But we need to do a more coordinated effort on the whole realm of things as we provide the edge of field studies. Target dollars in specific watersheds. Maybe that *is* cover crops. Maybe that is getting to that last 30% of farmers who don't soil test. OSU could put more effort into those nutrient management plans."

Water Quality – Food Security – Conservation Linkages

- "And I also think that we discuss water quality in a vacuum all the time. And we really need to start an interdisciplinary approach to water quality and food security and the conservation that's really linked to both of those. Helping meet both of those. If it's going to stay a voluntary program. Most of the farmers I've worked with, their motivation was not to feel good, to do the right thing. They want to do the right thing, but they feel fiscally bound to do what it takes to stay afloat and to stay competitive. The fact that we kind of bombard them with, just do this because you're going to save the lake or do whatever. If we don't add that economic element about why this make sense to your bottom line. And how the economics fit in and even the resilience of your farm to environmental changes. To me if that message doesn't get pushed, there's not the data. We discuss it with farmers all the time, but we don't have the data to back it up. And it's interesting because we have to pull data about yields and economics and food security and we have to try and meld them in ourselves and we really don't have the skill sets for that type of thing. So it would really be nice to have somebody close that loop."

Facilitate data & information sharing

- "[T]here are a lot of research institutes that are working on our behalf and Wright State Lake campus is literally housed right on the bank of Grand Lake St Mary's and Heidelberg is involved with it. Probably just to make certain that all available resources is and data that's collected by all the institutions can be shared and utilized for the benefit of all and not being held close to the vest and utilized by other researchers."

Partner with other Colleges / Universities

- "We kind of have a person, I mentioned Wright State, Dr. Jockman, he's a wonderful resource and he's done a lot of good and serves on the lake restoration commission. But he is just one person, and he does have his students that work. And then Wright State did put up an Ag services building near the lake and maybe something to dovetail and maybe Ohio State already has the curriculum in place."

COMMUNICATION – "Keep getting the ideas out there."

- Be honest with the public and stakeholders that Lake Erie is not going to be a quick fix.
- "My biggest concern is spending money as wisely as possible...This problem wasn't created overnight; it was created over 80 years ago...And our university extension, soil & waters, and political folks have got to be up front with folks. This is NOT going to be a quick fix item. I know our governor touts that we can do this, this and this. Well, we may do this, this and this and we may still have. It's the climate. It's a legacy thing, there's nutrients on the bottom of the lake. It's not going to happen overnight. I think the more people can be honest about that. I'm not afraid to tell a newspaper or an irate person. That it's not a quick fix. We need to be honest about that. If we go for the quick fix, we're going to pour money down the drain."

- “Keep in touch with people. I know we have to be careful about how we release data this, that this isn’t something that we endorse, but I do think we need to keep getting the ideas out there. Farmers on the leading edge can start doing things and can lead other farmers on how to do things. So they can start to implement. Example: Blanchard River project, farmer developed a fertilizer application tool they developed themselves that would incorporate the fertilizer into the ground as they go. And those are all promising ideas but they have a dollar amount. It’ll definitely work but how do we commercialize it so others can use it. If you can incorporate into the top two inches instead of placing on top as is usually done.”
- “Do you guys ever work on policy related things? I was almost kind of wondering if you do social science. The work that they’re doing and the social science thing. I would love to see it more bolstered. I think it’s unfortunate that we have some groups that are making claims that there’s so much adoption going on and there’s so much voluntary action and we’re not seeing that. we’re talking to our counterparts in other counties and they’re not seeing that either and we’re not sure where the numbers are coming from. And I go and look for their research but I never see their research getting out and communicated.
- “The science communication of the research coming out of OSU, that’s definitely got to get bolstered because what it comes down to is there’s a few people who are sneaking it out and distributing it, but it’s not coming at our doorstep. But yet there’s lots of other numbers coming out and god knows where they’re coming from.”

Policy and Research Recommendations

Soil Health & Water Quality

- “I know some people are starting to jump on the bandwagon; the connection between soil health and water quality; I think it is extremely hard to understand and that its complexity has made research to shy away from it. And to me, that’s the critical piece that we’re missing.”

Hydrology

- “The hydrology issue is a huge issue. Our streams are dryer than they used to be at some points. And our systems are so altered. When I look at the watershed and I look at the loading. You can either change the concentration or you can change the flow and I think there’s a lot of opportunity to change the discharge and flow and we can get at some of these reduction flows. And I just feel like that’s not tackled. Urban and Ag. I feel like we have a better handle on it in the urban areas and I think there’s great ways to handle it in the agricultural areas, but nobody’s looking into it and giving it any credence.”

Phosphorus prescriptions

- “If that requires every farmer in order to buy phosphorus, need to have a prescription written by a certified crop adviser based on a soil test, maybe that’s the way we have to go. And I know there’ll be some farmers out there who think that’s really intrusive, it’s still giving them the tools they need to apply the nutrients they need to produce 180 bushel corn crop or a 220 bushel corn crop on that part but knowing there’s nutrients in accordance with best management practices.”

Create a Water Center for *understanding the value of water*.

- Topics to cover include the following, with additional detail quoted below.
 - Value of water
 - Water economics and water system financing.
 - Water and natural resource law
 - Riparian setbacks
 - Invasive species
 - Dredging and dumping
 - Great Lakes Compact – reuse & reselling water
 - Clean Water Act violations
 - Freshwater technology
 - Beach quality and recreation
 - Value of green infrastructure
 - Climate change impacts on precipitation for Ohio / region
 - Central basin algae and dead zone.
- “I would like [OSU] to be a center for understanding the value of water. We’re on the Great Lakes, right so, fresh water is a huge natural resource what we have an abundance of, that other places don’t have; I’d like to put value to that in some respects, how do we explain it to people in the world so that people understand we should cherish it and protect it. Cleveland State has this energy policy center, where they’re thinking about energy economics, energy policy, energy law; it would be great if OSU had something similar to that, thinking about water economics, water system financing. Sewer systems and water systems are incredibly expensive, maybe there’s different materials we should be using to do stuff...maybe there’s people in the law department that iterates with your group, so there’s future lawyers that understand natural resource law and water law. And then policy right, we got policy issues all the time around water...what should riparian setbacks be, what should invasive spp, dredging and dumping, reuse and reselling of water, we’re members of the great lakes compact – there should be people who are smart about that; and then water quality, there’s people who violate water quality standards all the time, how can we push back or go after that. That would be very helpful if Ohio State had this great center with smart people who are thinking about this stuff all the time and teaching about it to further generation of students to be adept at that.
- “Ownership of water; we’ve got the Cleveland water company which is huge, one of the best water companies in the world. But in the state of Ohio we’ve got all these little water companies; some are going broke, some of them can’t, don’t have enough resources to adequately test for water quality standards; some are public some are private; you know, global thinking about what the water distribution structure for the state of Ohio should look like.
- “There’s also technology, we’re on the great lakes, with all this access to fresh water. I was in Israel with a group of people from Ohio and we did a tour of businesses and local governments, and thought leaders on water systems and technologies. And I think it makes sense for Ohio State to be seen as the leader, what are technologies to reduce waste, what are the tech to clean water, there’s cutting edge water tech that OSU could be working through. How do you measure adequately, how do you protect water systems cyber security from Russian hackers – protections that water utilities need.
- “I really do think climate change is going to be dramatic, it scares the hell outta me. Modeling precipitation changes and how it affects Ohio. There’s general modeling, but if you guys can figure this thing out at a state level or a great lakes level, just really figuring out climate change impacts and impacts on precipitation, that would be helpful.

- “Beach quality – our beaches have been shut down for three days because of CSO’s; sewer districts shut down the beaches. It happens all the time. Recreation, I guess, especially on hot summer days, the lake is free, the beaches are free and people can go cool off on them. So, when they’re shut down, that’s a problem and I know it’s a CSO problem, but maybe there’s other techniques that you can be thinking of to...I don’t know...we’re building big big tunnels to store water. I guess that would be the other thing. If you could document the real value of green infrastructure for CSO control for sw control, that’s one of the things we’re working on here.
- “In terms of Algae stuff, mostly a western basin issue, but we had beaches shut down around the fourth of July weekend because of central basin algae break outs and I think we’re starting to see those more, so what’s the future of algae in the central basin? What does that mean for dead zones in the lake? And sea grant has done a lot of work on that, I know; and, I understand that our water intakes are pretty protected from that stuff.
- Resource for management agencies to research recommended approaches
- “Is there going to be proven science that if we were going to implement some of these cure-alls that business individuals and groups are trying to sell to us and if there’s more of a role that research institutions can play and maybe soften the cost of doing so that would be fantastic. When the lake first got very sick there were lots of people that said all you got to do is add X, Y, Z and it will cure the lake. Or if you implement this piece of equipment it’s going to capture sediment. And we don’t know and we really want to do things with science and evidence-based technique before money is spent. And so we have in the past worked with Battelle and others to help us prove or disprove if this is something we want to invest in or stay away from. So if there’s any type of resource available, at OSU, or a research institute and say, is this something that has validity and reliability that we should invest in? Or is this some snake oil that we should stay away from?”

APPENDIX 2: On-Line Survey Responses from External Stakeholders

In the process of scheduling certain focus groups representing local government in northeast and northwest Ohio, we ran into difficulty scheduling times where a sufficient number of leaders and decision makers could attend. As such, in mid-August, we sought alternate means to obtain input, including semi-structured, telephone interviews (reported separately) and a web-based survey, discussed here. We created and made available a Qualtrics-based survey for people to enter their input electronically. The open-ended, narrative questions asked (below) mirrored those used to guide the focus groups and telephone interview discussions. The survey also asked respondents to rank a predefined list of activities, which was similarly posed to CFAES faculty and staff in an earlier survey.

- *Initially, we are interested in learning more about the specific water quality issues that decision-makers in Ohio are dealing with. In a few sentences, what would you say are the 'most critical water quality challenges' you face in your work?"*
- *Over the last 5-10 years, in what ways have you or your organization interacted with people/information/resources from Ohio State and our College of Food, Agricultural, and Environmental Sciences? (if at all)*
- *What are some of the BEST things that OSU (and CFAES) have done to help you address water quality challenges in Ohio? (give a specific example or two)*
- *What are some of the LESS successful things that OSU/CFAES have done related to water quality issues in Ohio? How can we learn from the past to improve in the future?*
- *What specific activities or resources would you most like to see the college include in the new Water Quality Initiative to help you address water quality issues?*

We receive eight (8) useable survey responses.

Table 1 summarizes how respondents described their roles and geographic areas.

Table 1. Profile of Respondents.

Position / Role position	Area: urban or rural
Elected official: 5	Mostly Rural: 4
Staff of nonprofit organization: 2	Mostly Urban: 1
Staff of government agency: 2	Mix Rural/Urban: 3
Farmer: 1	
Level of government	Region of Ohio
County: 7	West Central: 2
City: 1	Central: 3
State: 1	Northwest: 3

Responses are summarized below by survey question and grouped into similar themes. As mentioned above we promised confidentiality to encourage candid responses. As such, while most of the original text is included below to preserve respondents' verbiage, some details (e.g. affiliation, location, etc.) were deleted for this report.

In general, the responses focused largely, though not exclusively, on agriculture-related topics. Themes surfaced recurrent with the focus groups and individual interviews. For example, respondents expressed the importance and successes of OSU/CFAES research (especially applied research, e.g. Edge-of-Field work), Extension, and Stone Lab. Areas considered *less successful* (i.e. opportunities to improve) included coordination and science communication. Complimentary, specific recommendations for the Water Quality Initiative clustered around resources for farmers, applied research, and communication.

Question 1: Initially, we are interested in learning more about the specific water quality issues that decision-makers in Ohio are dealing with. In a few sentences, what would you say are the 'most critical water quality challenges' you face in your work?"

Respondents expressed a range of challenges related to water quality with many, but not all, falling within the agriculture-nutrients-algae topic sphere.

- Coordination / Leadership
 - "I am [f]rustrated with the federal, state agencies including the Universities who are forcing funding, or doing the research not collaborating with each other.
 - "I tend to think that while I am glad the present effort is being conducted with this survey that OSU should have been more at the forefront of this issue."
- Public engagement – "The challenges I face are getting the public engaged and involved in water quality related events and programs."
- Farmers – Several responses addressed impact on farmers.
 - Economic pressures on farmers - new regulations & nutrient management plans.
 - Legislation within the farming community, "Ag is the #1 Economic driver...The situation did not happen overnight and will not be solved overnight."
 - "Working with our agricultural community to allow them to continue to produce food and fiber while giving them tools to limit their negative impact on water quality is a goal or challenge depending on how you look at it."
 - "Balancing the interests of vital industries, agriculture in particular, with the need for safe and sustainable water supplies for drinking, recreation, and wildlife. The ongoing algal blooms in Lake Erie's Western Basin (and other areas across the state) have raised discussions over greater regulatory oversight of commercial fertilizer in this watershed. This regulatory concern amongst those in agriculture must be balanced against the need for healthy water."
- Nutrients
 - "(e.g. fertilizers, organics, pollutants, etc.) into the storm water systems of Central Ohio."
 - "[F]inding resources to implement upstream treatment trains in the tributaries flowing in to Grand Lake St. Mary's."
- Harmful algal blooms
 - Lake algal growth prevention for drinking water and tourism – "The realities are it is a complex problem with many different entities concerned with both the problem and finding an economically viable solution."
 - Misinformation -"Being located at the epicenter of the Maumee River Basin...really understanding what is fact or fiction concerning information on algae blooms."
- Hydrology and Drainage
 - "Greater 'storm surge' impacting the quantity of water entering these streams and rivers."

- “[C]urrent weather patterns play a part that we have no control over.”
- Above ground reservoirs, “which allow more control over the water being used.”
- Drinking / wastewater treatment - County and municipal facility management
- Dredging – “Finding adequate land and resources to provide Dredge Material Relocation Areas to dredge internal loading of sediment in to.”

Question 2: Over the last 5-10 years, in what ways have you or your organization interacted with people/information/resources from Ohio State and our College of Food, Agricultural, and Environmental Sciences? (if at all)

Several respondents referenced OSU Extension in various ways, as well as, programming at Lake Erie and Stone Lab. Responses also mentioned engaging through the Wooster campus, Soil and Water Conservation Districts, County Commissioner meetings, and interactions with field studies, Edge-of-Stream seminar(s), lab testing's, student research projects, internships and employment. One respondent elaborated on research, as follows:

“We utilize OSU CFAES research and expertise as the hub of scientific and technological expertise on a host of agricultural and environmental issues. We have relied on CFAES in particular, as a source of information on Lake Erie water quality. CFAES is seen as a neutral arbiter with fact-based information that is generally accepted by the public and local leaders.”

Two respondents reported very little interaction with OSU/CFAES. One added: “I hope that a comprehensive water quality plan involving OSU and partners will put more emphasis on the capabilities of OSU Extension and that our County will find funding to support our businesses that impact water quality.”

Question 3: What are some of the BEST things that OSU (and CFAES) have done to help you address water quality challenges in Ohio? (give a specific example or two)

Consistent with focus group and interview discussions, survey responses emphasized the importance of OSU/CFAES research, Extension, and Stone Lab, and some included detail.

Research

- "Research coming out of OSU Stone Lab and CFAES has been respected and much appreciated by our members. Partnering with entities like NOAA, the HAB forecast is closely followed in our organization.”
- “There's a lot of groups making many claims about who's to blame for the water quality challenges, so OSU's commitment to science-based information is very helpful in this ongoing discussion.”
- Stream monitoring; macro invertebrate studies; species reintroductions; mussel inventories and studies
- Edge of Field studies
 - “...and other information collected and distributed to the farming community”
 - “need to continue to release data, that there are measures that can accomplish the goal of a 40% reduction”

Extension

- “The work of OSU Extension and OARDC are also very much appreciated in addressing this challenge. Having boots on the ground makes a real impact.”

Stone Lab

- “Having access to Dr. Winslow at Stone Lab and other meeting to discuss, explain and show how the research is being done.”
- “Stone Lab is probably the best thing that OSU has supported.”

Education:

- “[E]ducation and understanding that it is a complex situation with continued research being necessary.”

Question 4: What are some of the LESS successful things that OSU/CFAES have done related to water quality issues in Ohio? How can we learn from the past to improve in the future?

Regarding less successful things the College has done, respondents gave a variety of brief and general comments, with a few more specific ones clustered around science communication.

Communication – The following comments suggest opportunities to improve science communication and data / results availability.

- “The Field to Faucet initiative was announced as being a big help to the farming community but has seemed to fizzle out with no real results to be able to speak of.”
- “I don't think there was any failures, but I do think we need to release as much data as possible from the Edge of Field and other studies”
- “OSU/CFAES needs to make sure that its research is presented to the public in a manner that promotes understanding. It's easy to feel overwhelmed in a sea of data. While data from the many OSU studies is vital, the findings must be presented in a manner that community leaders, lawmakers, and the general public can understand and grasp. The water quality challenge is becoming more of a household discussion issue, so the research needs to address this broader audience.”

Extension

- “More boots on the ground, out discussing the water issues and getting input from the AG community.”

Internships

- “Challenges with the changes to internship criteria and eligibility could greatly impact our ability to give students real life experience prior to graduation.”

Funding / Planning

- “I do think we need to look at more long term items for Conservation measures and then acquiring funding for those long term measures”

Leadership

- “Not sure what hasn't been successful. I think OSU should be leading the way in education and practice and not worrying too much ahead of time whether or not something will be viewed as a success.”

Question 5: What specific activities or resources would you most like to see the college include in the new Water Quality Initiative to help you address water quality issues?

One respondent acknowledged the challenge associated with water quality and suggested the need to invest strategically and in a coordinated fashion, “Definitely is an uphill battle, but is workable...Need to coordinate funding, not the shotgun approach that has been used so far”. Most specific recommendations for what to include in an initiative clustered around resources for farmers and applied research. One respondent elaborated on improving science communication. Details follow.

Resources and Support for Farmers - Several respondents recommended supporting farmers in various ways, one noting: “The Community at large is demanding results. We need to see that the farming community is getting the resources they need to create results.” More specific activities are as follows:

- Nutrient Management Plans - “Work for nutrient management plans for all farmers”
- Soil testing - “Soil tests, from data that I have seen we still have about only 70% doing grid soil testing”
- Nutrient Application
 - “Neutral advisory for nutrient application”
 - “Application based on the soil test, prescription needed to purchase?”
- Drainage control devices & monitoring equipment - “Additional dollars(\$) to continue to help the AG community install drainage control devices and tools to monitor the results of the devices.”
- State of Ohio Bonding – “Support the State of Ohio Bonding for future projects and incentives to the Ag Community”
- “Reworking of the rules on filter strips, to allow the harvesting of phosphorus enriched growth on these strips.

Applied Research – Respondents recommended specific areas warranting research investment and one noted the importance of research

- “Time is of the essence. We need science - not directives from the Governor.”
- Studies / pilot projects in Central Ohio - “Studies and or pilot projects working with developers and/or existing projects which have a direct impact on the waterways of Central Ohio”
- Drinking water treatment technology for algae - “Help research solutions to treating the "green" water for consumption.”
- Agricultural conservation practices - “As a land bank college, it makes sense to focus on agricultural issues such as unintended runoff, tile drainage issues, nutrient retention and best practices using present technology.”
- Ag Conservation return on investment studies – “Real studies involving the use of reduced tillage, cover crops, timing of fertilization, methods of fertilization, levels of fertilization to maximize the return on investment not just the yield levels of production”
- Green infrastructure & stream restoration projects

- On-campus demonstration projects – “Resources could include the source of funding, public input considered, and if it was student driven.”

Communication

- A respondent emphasized the need to make information broadly, publicly available and in ways that are accessible to non-experts.
- “I think there should be some sort of public facing component to the Water Quality Initiative to readily share the findings as they are released. The information needs to be presented in a manner that most people can comprehend. Maps, graphics, tables, etc. Anything that allows complex scientific information to be condensed into documents/webpages is a good step. Again, the data is needed and appreciated, but it has to have a broader impact beyond the immediate scientific community.”

Woody debris management – This comment should be explored for if/how it can be included in research and/or Extension efforts:

- “Dollars(\$) to help clean out tributaries of the Maumee River to remove trees and other debris which is contributing to the water quality issue.”