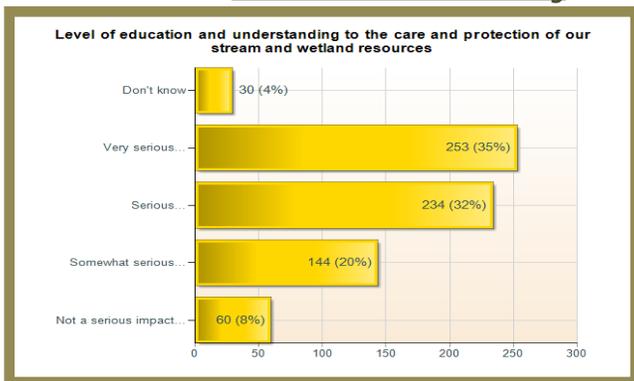


EDUCATION, OUTREACH and RESEARCH: Opportunities facing the Conservation and Restoration of Kentucky's Stream and Wetlands

OPPORTUNITIES FOR EDUCATION, OUTREACH AND RESEARCH:

Many steering committee members, stakeholders and survey respondents spoke about a “knowledge problem” in stream and wetland conservation and restoration. For many, the general public and certain other stakeholder groups (landowners and local officials, for example) lacked accurate knowledge, scientific understanding and technical information to make informed land-use and planning decisions. To narrow these gaps in knowledge and understanding, many participants spoke or wrote about the need to expand educational and training opportunities and outreach programs. While some of these proposed education and training strategies have already been discussed in regards to sewage, storm water and coal mining, this section continues the discussion on education, outreach and research given that, in and of itself, education was ranked as a priority area of concern by so many who were surveyed. Based on online survey results, respondents (n=723) reported the current “level of education and understanding” as one of the most serious threats to Kentucky’s streams and wetlands. These survey results are summarized below:

MAJOR IMPACT *Education and Understanding*



Thirty-five percent (253) of respondents rated a lack of education and understanding as a “very serious” impact.

Along with education and outreach, this final section also addresses some of the research needs that were identified by steering committee members, stakeholders and survey respondents. Here too there was common recognition that there was a need for more research so as to make more informed decisions about streams and wetlands conservation and restoration within the state.



Photo: Tennessee sign announcing that travelers are now entering the Stone River Watershed.

- Driving through Tennessee last year, I noticed some signs along I-65 and I-24 that announced you were "Entering xxx Watershed." As I am sure you are aware, Bowling Green lies on the karst sinkhole plain of south central Kentucky. The Lost River Groundwater Basin encompasses about 57 square miles and lies under a good portion of the city. District Three of the Kentucky Transportation Cabinet was approached about installing "Entering the Lost River Groundwater Basin" signs at nine locations around the city. The City of Bowling Green would pay for and install these signs. However, it came to be found out, that on page TO-404-26 of the KYTC Traffic Operation Manual, it states that "signs that specify the name of a specific watershed area shall not be permissible". So, my encroachment permit necessary to install the signs was denied
- [Continued from above] ...this would have been a great public education effort. Any ideas on how this can get this done?

-Email received from steering committee member, February 2009.

Note: Since February 2009 there seems to be a shift in KDOT assistance with watershed signage. In March, for example, the Kentucky River Basin Team suggested that they “pursue the installation of signs marking the boundaries of the Kentucky River Basin on major roadways” as “this attention-grabbing technique is used in other states, as well as in some Kentucky watersheds.” The Kentucky River Basin Team is now “coordinating with the Kentucky Transportation Cabinet on having them made and having their locations approved.”

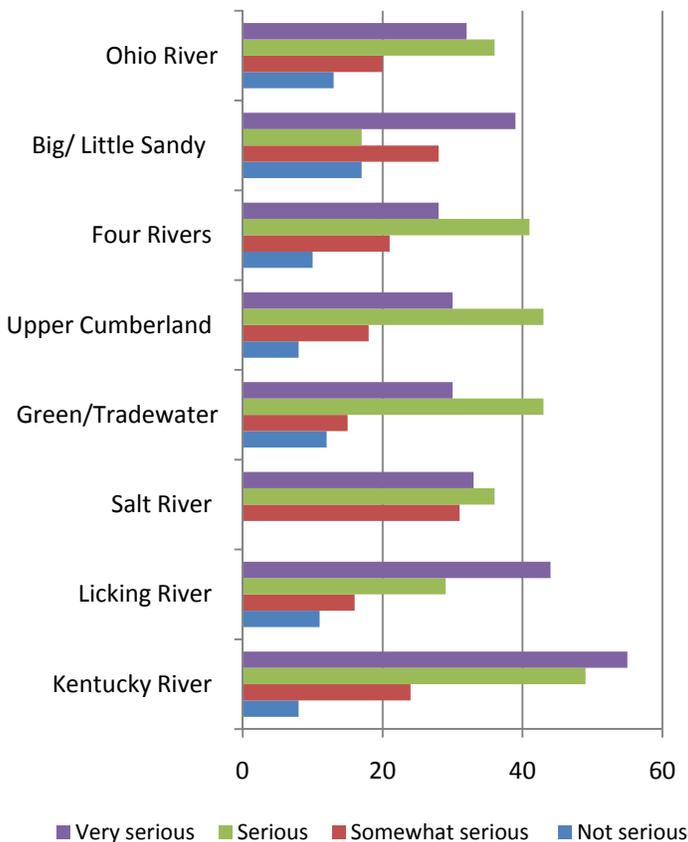
-Email received April 2009.

MORE EDUCATION AND OUTREACH

The need for education and increased understanding was expressed by many when providing critical advice on handling or mitigating the impacts of sewage and straight pipes, urban and economic development as well as for coal and energy development. Many persons who were interviewed and/ or who provided written comment spoke or wrote about the need to either educate land owners, public officials and/ or the public on matters related to the above impacts and/ or activities. Yet recall, from the initial reported trends (first page) that level of education and understanding was, by itself, listed as a priority concern among knowledgeable respondents when it came to stream or wetlands protection. Similar to coal and energy development (40%), survey respondents rated current levels of education and understanding (35%) as a “very serious impact” to Kentucky’s streams and wetlands.

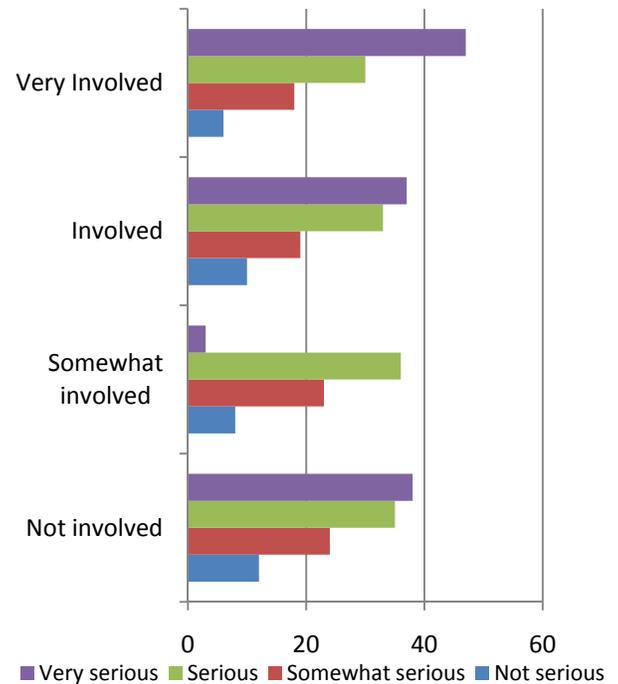
In keeping with how other top-rated impacts have been addressed, below are some further analyses and breakdowns of survey respondent views on education: As with residential growth and coal, additional analysis are provided by watershed basin, level of involvement and role or job position in relation to stream and wetland issues.

Bar Graph #7 *Lack of Education by Watershed*



N= 681; $\chi^2=41.6$, $df=36$, $sig=.241$

Bar Graph #8 *Lack of Education by Level of Involvement in Streams and Wetlands Issues*



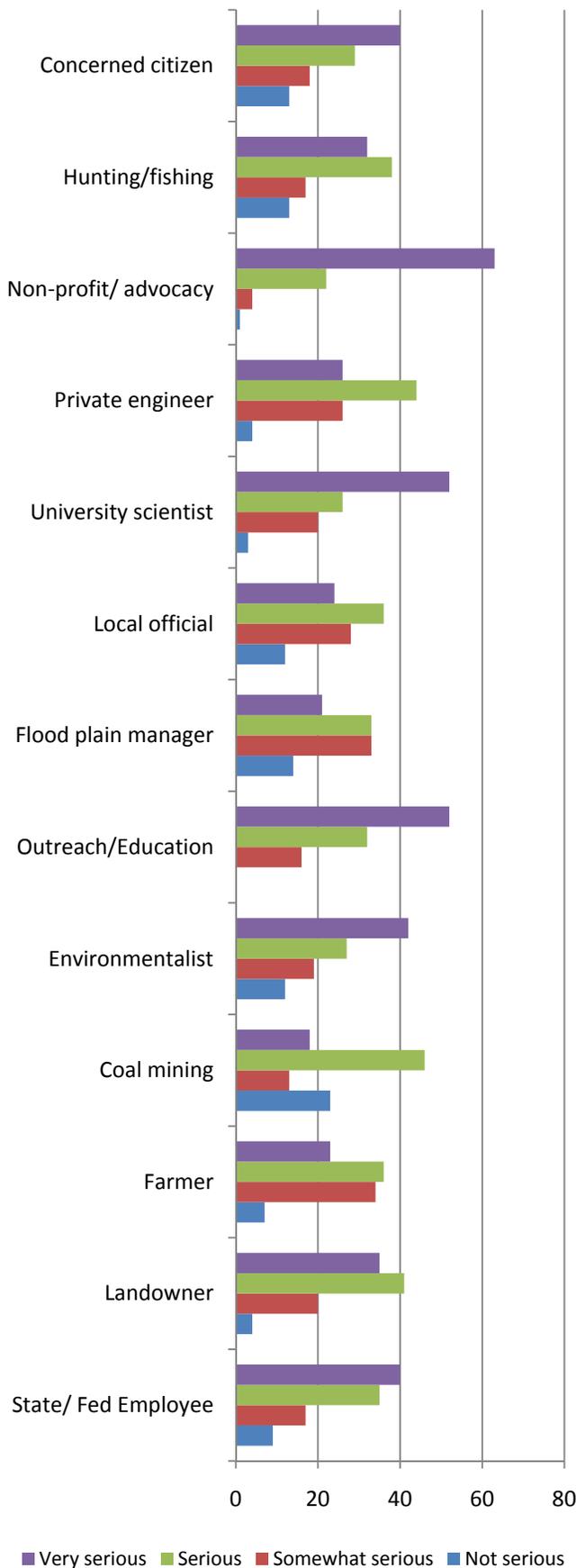
N= 693; $\chi^2=16.7$, $df=9$, $sig=.158$

Graph 7: The first chart shows some slight variation in views on the impacts of education and understanding by watershed basin. Findings show that persons from the Kentucky River (55%) and Licking River (44%) watershed regions were more likely than persons from other river basins to view ignorance and lack of environmental understanding as a “serious impact” on the State’s streams and wetlands.

Graph 8: Likewise, there was some difference in opinion between those who reported themselves as “very involved” in stream and wetlands issues and others who were less involved. According to Graph 8, those who reported themselves as very involved were more likely to rate lack of education and understanding as a very serious threat (47%) to Kentucky’s water resources in comparison to those who were somewhat involved (33%) or not involved (38%).

Graph 9: Finally, there was some difference in opinion between different stakeholder groups on the threats associated with low levels of education and watershed understanding. According to Graph 9 (following page) those doing non-profit or advocacy work were mostly likely (63%) to highly rate the lack of education as a “very serious” issue. Other groups followed next with university scientists (52%) and those directly involved in outreach and education (52%) as likely to rate the lack of education and understand as a “very serious” threat to watershed protection. On the other hand, local flood plain managers (21%), local officials (24%), and those involved in farming (23%) and coal mining (18%) were less likely to view education as a priority concern for stream and wetland restoration and conservation.

Bar Graph #9 **Lack of Education by Role or Job Position in Relation to Streams and Wetlands**



N= 693 $\chi^2=151$, $df=72$, $sig=.000$

Again, even more so than the challenges posed by urban and suburban development and coal and energy development, steering committee members and other stakeholders were most likely to consistently mention education and lack of appreciation and understanding of our watershed resources as one of the main challenges or barriers to stream and wetlands restoration and conservation within the state. Many of the comments were practical regarding the need for better outreach and the dissemination of information on current regulatory and conservation programs. Yet, other comments bordered on the philosophical with a call for a new “environmental ethic” and a subsequent “paradigm shift” in values and behaviors. Some of the practical, as well as more philosophical reflections are presented below.

- I think one of the challenges, and I’ll be a little more specific about water quality, is it’s not very tangible...it’s hard to see water quality. You can see flooding, and understand that fairly easily. But water quality is just harder to understand; it’s not as apparent. And I think people have a hard time, just the general public, has a hard time understanding things they don’t see (or) can’t really relate to, it’s not very tangible, and I think it’s more difficult to encourage a lot of spending, a lot of funding, on things that people don’t know are already a problem. ...
- *[Responding to the above comment]* You would think that, that’s the reason that education is so hard, because the water quality piece is so abstract. We’ve had large scale public education projects in the past that have worked. Cigarettes; my generation, people smoked a lot, even smoked on TV and smoked in the house, smoked in the car, and now people don’t, because we had a public education campaign, and people don’t do it anymore. And, used to be, in my generation, we didn’t have seatbelts in the car, and now we do, and you wouldn’t even think about getting in a car without buckling up, I hope. So, we had a public education plan, and it worked, and now we move forward, but with water it’s not working.... we were on another 319 project about water quality, and we had public service announcements that we did this and we did that, and it doesn’t seem to have worked very well.....So I think that’s a real challenge; how do we get everybody to understand non-point source pollution and that we are impacting our water and it’s really, really valuable? And not only are we having water quality issues, we are having water quantity issues. To me that’s a real challenge, you know...
- I believe that changing societal values and educating the general populace on not only the values of streams and wetlands (from a resource standpoint) but also about what society values. We need to make the public aware of how much these impacts are costing us. Protecting and conserving those on the front end can actually save us a lot of money on the tail end. It is crucial to get information out to the general public and at an early stage in education. Raise young children to value our natural resources so that when they become voters they will be environmentally minded and help shape the community in a positive way.

- There needs to be a connection in people's minds or ignorance will continue to be a barrier. The other component of citizen's ignorance is their lack of knowledge. Many people want the information that will allow them to protect the environment. They just do not have the information they need to manage their resources.
- I think, again, number one is public education and awareness...the more you get the public involved on these issues, that's what gets the agencies, but more importantly...most state agencies are already interested in tackling these problems, but it gets the political ear, and that's very important, so public outreach, public education and awareness of those issues is vital if we are going to be able to tackle some of these big landscape issues out there.
- It is becoming necessary to educate the public on what some of the issues are concerning Kentucky's environment. Let the public know what the problems and adverse impacts are that affect our streams and wetlands. If people are educated then maybe they will start hounding the politicians.
- To fix this, we cannot regulate our way out of it. ...It has to be through awareness and political will....Getting information into the hands of local groups is vital. Unless we can get the interest of local entities there will not be large scale conservation done. It's the locals that can make change happen in their small communities.
- Education. Land owner education, that is. Land owner outreach. It's all about the land owner, honestly. Whoever lives next to a stream and whoever is dumping stuff in. It's all about educating them. Those are the biggest barriers. Period. I think. Actually, that and funding for state and federal programs.
- One would be public awareness and concern about water quality issues; it's not at the top of the priority list, and that includes local officials. Second, would be state budget support for the agencies that enforce the regulations. Those would be my top two.
- People will accept wetlands when they realize their presence does not increase mosquitoes in a community. More people will protect and restore wetlands when they discover that it is not expensive.



- One of the barriers to overcome for wetlands is that people do not see a value in a wetland. If they have land that is wet natured (meaning they cannot plow it or use it for farming) then they see it as worthless land. People need to understand that a wetland is a natural part of our ecosystem. Wetlands are very beneficial to humans. They help make the water cleaner, improve water quality, and naturally mitigate flooding. Plus there are many wildlife benefits that wetlands provide. It is a sanctuary for many different types of wildlife that you do not often find in an up-land setting. A wet marshy area probably has bedrock or soil issues that it deals with that will cause a perched water table. It serves the same function as wetlands attached to a river or estuary. It must meet the definition of a wetland.
-Telephone interview, NRCS official
- We need to overcome people's perceptions and attitudes concerning streams and wetlands. For instance, many people just view wetlands as a haven for mosquitoes and just a waste land. A number of farmers believe it to be unproductive land which is understandable in some ways. When draining a very large wetland you will usually have fertile soil which will not have an erosion problem due to the land being so flat. On the other hand, there are many resources to be obtained and utilized from wetlands. A good wetland can recharge the whole area. Changing people's perceptions is definitely a great challenge for the future. *-Telephone interview, Another NRCS official*



Photos: Constructed wetlands behind soccer field (above) and behind football field (below). Photos provided by: Tom Biebighauser, U.S. Forest Service.

- It always starts with money. After that, -it's getting enough people together to make an effort to follow it through to the duration of the project. It is a slow process. It does involve some education as well in the process, -making people care...
- Lack of education. People don't know and they don't understand the importance of streams and water quality.

When asked to provide some "critical advice" to those doing long-term strategic planning on stream and wetland conservation and restoration, many persons provided insight and suggestions in expanding educational and training opportunities for many different groups and settings. As one person wrote in their open-ended comments, "education of many different audiences is critical to success. This can be challenging and requires both short term and long term efforts." Some of the suggested strategic directions from steering committee panels, telephone interviews and survey responses are provided below. While some spoke of the need to expand classroom education opportunities for young people, others spoke directly about the need to better educate landowners, local officials and homeowners:

More Education and Training for Young People:

- ...Additionally, outreach and education is real important. We need to try to reach some new segments of people that we may not have reached before and possibly try some new methods, maybe social networking, -like *Facebook*, to reach a new generation of people and educate them on the importance of what we're doing.
- We are working quite a bit with K-12, -that is a GIS frontier, K-12....Some of them have streams as their object of interest. Some of them have urban sprawl and land cover and crops in the watershed and the county. So, it seems strange that we are targeting such a young age. But the thing is, many of the teachers in K-12, they do environmental exercises without GIS. They do biology without GIS. They do archeology without GIS. They do social sciences without GIS....So that is what we want to see.
- Educate through GIS but I am a little biased...
--(quote from a GIS Specialist)
- More serious education in the middle and high schools would be a start in making people aware of the importance of improving and maintaining our streams and wetlands

EDUCATION. Get environmental impacts as a full hour class in every grade level. Kids will talk to their parents. Beyond that, door-to-door assistance in helping people to understand how they can help/contribute to environmental sustainability. People often want to help, but just don't know how.

- We must increase education of young people/students about the importance of healthy streams and wetlands. They will be the citizen advocates/activists of the future, and the benefactors of it. I have found that relying on politicians or govt. to care is insufficient.
- I feel like I'm being redundant...I think that, probably, we still have so much to do with education and I think there needs to be a clear way for citizens that have an interest or concern to act on that, and they need, maybe, more guidance on how to navigate the system to address those concerns. I talk to people... that just feel completely overwhelmed when they try to address these...so, that would be one thing.
- Like a lot of efforts, we need better education on the county level. That is something that I have preached to our County Judge-Executive. It always falls on deaf ears when it comes to educating our farmers and land owners.
- I'm going to add something that you all are going to think is crazy. [laughs] Several years ago, I had the pleasure of teaching a college class on environmental science. I wasn't trained as an environmental scientist as a student, but I did this and didn't know what to think about it. I came out of that just absolutely in love with the course. I was just sort of thinking, "Man, this is something every single person, member of this planet ought to have," -thinking about how humans interact with the environment and natural resources. I'm almost thinking we ought to have that incorporated into high school education, something where every member of the commonwealth would get some experience about how people interact with the environment. I think if you get the general population interested in the environment and conservation biology, it's going to be a lot easier to implement a lot of these things.
- I feel that in order for anything to really change for the better, environmentally, everyone needs to be involved. The only way to get everyone on board is through education. Teaching people about wetlands and streams, letting people experience natural areas, and seeing first-hand the health or lack of health of our natural waterways and how that affects all living things is the way to make the biggest sustainable impact.
- More education in schools (elementary, middle, high) needs to be conducted to help break the cycle and this education needs to relate to what is going on locally.



More Outreach to Landowners, Local Officials and Homeowners:

- Provide substantial support for outreach and education strategies, in the form of financial resources and job positions. Education should be a priority for government agencies and private business.
- Educating landowners of the available cost assistance programs that help protect the resources they own.
- Education of future landowners. Please don't trample private property rights with the heel of law and government but work upon educating the citizens as to the importance of streams and wetlands to things that are important to them.
- It is necessary to provide educational tools and references to the general public on how to protect our natural resources. A sense of pride, if you will. Through proper education of the general public, we are eliminating excuses. Then, they can no longer assume that they didn't need a permit, its either Black or White. How? Work with the science and natural resource teachers in middle school, high school and college. Implement it through 4-H, Future Farmers of America, Future Business Leaders of America. Provide knowledge to the NRCS, USDA, and Ag Coop personnel who work with the people who operate the equipment in a stream. Flood everyone's counters with pamphlets and brochures. Score an educational spot on KET or the local noon news. Small town radio stations talk. Improve websites. Put up a billboard.
- Find ways to make citizens aware (TV adv.) that their everyday actions with their lawn, etc. ends up in sewers, creeks and rivers.

- Provide more education and don't come off as controlling people's lives. Most people involved with water enforcement are out-of-touch and need to be more understanding. Government is already over controlling and over reaching, so don't make it worse when talking to the public. They are the ones that will be responsible for doing it right when you are not looking.

More Outreach to the General Public:

- Provide contact information on who has what program.
- I think involving the public, again. That's just critical and vital. Involving other agencies that can help you with those questions before you. GIS products, it's critical to be able to come and tell people the story of the landscape and the resource that is of interest. So, that's what I think we should concentrate on.
- Education of the public is crucial. I may be leading a sheltered life, but am not aware of projects or efforts in my area of the state (Anderson County). I own a small 8 acre farm and am also an avid hunter and fisher I care about my state and all of it resources.
- Make it convenient to get people involved and make it a fun event or rally to get kids involved. Most people are interested they just need a way to be involved.
- There is a lack of communication to the public... we know what is happening but we are unaware of what is being done to correct it.
- Every county in Kentucky has its own waterways problems and concerns. I would like to see more training and educational work done for my county (only).
- Better education of the public as to the real threats to water quality.
- Somehow get the message across that this issue affects all individuals and inform them on how they can contribute to make a difference.
- Public education: translate the benefits of streams/wetlands into things that people value (water quality, habitat protection).



Banner Photo: Environmental Education in Kentucky sponsored through the Kentucky PRIDE program and KY State Government. While many persons mentioned “more serious” formal classroom and course work opportunities but several mentioned the prospects for more “fun” opportunities for young people though EE in Kentucky and also through KY Division of Water and KY Fish and Wildlife educational programs. However, one mentioned that said that these public education (and training) programs have become seriously underfunded and that funding educational programs needs to be “top priority.”

MORE RESEARCH AND BETTER UNDERSTANDING

Many persons –especially those on the Steering Committee- identified the need for further research and understanding in specific, targeted areas. One of those areas already cited was within the newly emerging field of determining and assessing “ecosystem services.” A number of steering committee members spoke of the need of developing tools and techniques to assess the functions and values of the state’s streams and wetlands so as to more appropriately value them, from both a public and regulatory standpoint. This research need was also well-expressed by one survey respondent in their open-ended comment:

- Mitigation wetlands are not evaluated for quality, but only quantity and canopy coverage. The quality of the wetland as indicated by the hydrologic functionality, plant and animal diversity, and habitat should be evaluated for impacts so that diamonds are not replaced with lumps of coal, but that the environmental value is rightly discerned.

Another area identified for further research were Kentucky’s isolated wetlands, -those wetlands that are solely recharged by groundwater. In a prior section, there was the call for some major “ground truthing” to document these isolated areas through remote sensing and GPS techniques. In addition, it was said via other conversations that Kentucky, in the years ahead, might be compelled to develop water quality standards for its isolated wetland regions. One committee member mentioned the need to understand the groundwater component of these wetland regions and to not ignore the prospect of working with USGS on such hydrological assessments: “No one has approached the USGS to be involved in a State partnership” and as they want to say:

- Ground water is a big contributor to surface water and it is a big contributor to wetlands. We do not know what is going on except in a scant few communities where that is their drinking water. This is a challenge but it is a necessary change that needs to take place...

Another survey respondent also stressed the importance of studying groundwater hydrology in this case for karst systems and the aquifers that comprise a large part of the state.

- Because of the large areas of Kentucky that are underlain by karst aquifers more effort needs to be spent on delineating the springsheds of these aquifers and identifying springsheds with water quality problems. This is important because the discharge from karst springs sustain flow in the regional base flow stream.

In previous sections, several steering committee members mentioned the need to better study and convey the importance of ephemeral and intermittent headwater streams in the water cycle. Another advisory member said:

- Ephemeral streams should be regulated by the Division of Water of the Federal government. These streams are very crucial to the health of the environment. There is a special circle of life affected by these streams that intertwines with intermittent streams and perennial streams.

One survey respondent mentioned this as well but with regard to ephemeral or seasonal woodland wetlands:

- What is often ignored are the temporary wetlands, which are incredibly productive (most often more productive than permanent ponds) and are required habitats for a large number of plant and animal species. These wetlands receive no protection under the Clean Water Act, although some states do protect them under state law (e.g., Tennessee, Indiana Ohio North Carolina). We are partially surrounded and need to work toward including these in conservation plans and laws.



Photo: An ephemeral wetland, -a wetland that temporarily holds water in the spring and early summer and after heavy rains. These wetlands dry up by mid to late summer and are without a connection to surface water flows. For this reason, ephemeral wetlands are free of fish which allow them to be a successful habitat and breeding grounds for certain amphibians and invertebrates, -Taken from: Tom Biebighauser. A Guide to Creating Vernal Ponds. (Photo provided by: Tom B.).

- ... Anybody with land wants a pond on their property. They want a big, deep pond. They think that is good for fish and wildlife and that’s fine, but I don’t think you get as much wildlife on a pond whereas when you take small, wet pools that are in woodlands and places... You’d be amazed what species use those little wetland areas. Most people, I don’t think, have an appreciation for how much wildlife depends on these areas. A whole range from frogs to salamanders...bats will use them... bigger animals like deer ... You don’t need a big pond to enhance wildlife. You can use a small pool at the edge of the woods or at the edge of the fields. They have as much benefit...

-Telephone interview NRCS official

Some steering committee members have said already that we have enough “tools: and that we are consistently documenting “decline, decline, and decline.” For them, as well as others, there was a pressing need to “Act. Now,” -as one member, already quoted said, “the longer we wait to act, the more we are losing rather than gaining.” This expressed concern for action (implementation) rather than more “research” was inherent in many conversations and comments. Yet, in the same breath, there was also common recognition among steering committee members of the pending and pressing need for research, especially within the emerging scientific field of stream restoration and restoration ecology. Many recognized the need to develop more “integrated data bases” from which to share project data on project successes and failures and subsequently, to develop “matrices of success” in order to advance scientific and practical understanding within this emerging field. Below are some of the comments on the need for more monitoring from steering committee members as well from telephone interviewees. The last segment of this subsection contains the comments of various survey respondents on monitoring and better analysis of restoration projects. Their comments and critical advice confirm as well the need for more targeted research within this field and within Kentucky’s various stream mitigation programs:

- I think, a lot of times, these restoration and conservation projects are short-term type of projects. For example, you might have a coal mine or a proposed coal mine in a drainage area somewhere, and folks are real interested in what the impact of that particular mine is. So, they do pre-, during, and post-mining studies, but virtually no time is there very long-term studies that are done. This is especially true in restoration projects. If you’re going to restore a stream or portions of a stream, then I think a long-term effort has to be made in regard to those sorts of things. .. Like I said, in about the last 10 or 15 years, the state has really started doing a lot more, and there’s a lot of diversity of agencies that are involved in these sorts of projects.



Photo: Restoration failure due to flash flood event.
Photo provided by: Kentucky Department of Fish and Wildlife Resources.

- I’m going to talk a little bit more about technical issues, and I’m going to speak specifically about stream restoration, because that’s what I’m most familiar with. One of them is, ... most stream restoration projects, and I’m talking about the past ones, not the ones onboard right now or the future, but the past ones, they mainly were meant to reduce bank erosion or in the process they put some kind of grate control in the stream bed and then planted some trees on the bank and then maybe put habitat in, - so installing habitat in the existing channel and reducing bank erosion, those were the two main issues.... [But] if you think about it, just taking a stream in the configuration that it is in, it’s got poor habitat for a reason, it didn’t produce its own habitat for some reason, and it probably wasn’t only because the trees weren’t there. There are probably some other things going on, and so that’s where I see what it’s been like up to now with people are going into an existing channel, not really understanding why things are the way they are, and then trying to put habitat back in and trying to make the bank stop eroding...that’s what’s been done so far...
- [*Continued from above*] What needs to be looked at, in terms of effort are things like ground water; where is the ground water in the system? Most of the summertime flow, in fact 90% of the time, the stream is flowing because ground water is entering the channel, so ground water is important, and it hasn’t really been looked at, at all, in past restorations. The effect of floods, when you put habitat in the channel, when a flood comes by, what does it do to the habitat and what does it do to the stream structure? Most channels have been built for, what are called ‘bank full conditions’ and designs actually are for the bank full condition. And so, what happens when a big flood comes along? The effects of fine grain sediments, silt and sand; to this point we know that siltation is the most common cause of impairment of channels, and impairment of habitat, and the remedy for that, as far as restoration goes, has been fix the banks, lay them back, plant trees on it, but what about the sediment coming in from upstream? What about the effects on downstream? Those two things haven’t been looked at very well. The effects of restoration on water quality, specifically nutrients, we really don’t know a lot about that. We think, in a few studies that have been done, that there can be quite an improvement, both in dehydrification, and for phosphorous retention in stream restorations, however, it’s been over a very limited design sequence. And so, we think there is a lot more that can be done and learned about looking at efforts to understand these things. And then there are the upstream and downstream transitions from the restoration to something that’s not restored upstream and something that’s not restored downstream. Those kinds of things really haven’t been taken into consideration in the restorations to date, although people are thinking about these things and are moving forward.

- ... I think the biggest thing that I would point out is that we're still learning in this field in terms of what we can do with stream mitigation and restoration. I've actually seen some of the streams that we have had engineered and restored as recently as 10 years ago and where the restorations have totally failed. The engineering is actually progressing quite a bit; we're better off than where we were. We've still got a long way to go in understanding the geomorphology in some of these wetlands and — well, streams, primarily. In some of the wetlands, we have restorations that were engineered well.
- [*Continued from above*] I think we're getting to the point where we are starting to understand what we need to put into the restoration of a stream — but not fully. There are a lot of different aspects of it that this sector is trying to grasp, and they're doing a pretty good job of it. We've got a ways to go....
- I think there needs to be a lot stronger effort in regards to monitoring and studying projects so that we can really understand what's working and why it is working and what's not working. This way we can improve design versus continuing to make our same mistakes. I think we also need to consider looking at efforts to do work within the watersheds, not just in one stream -such as nutrient offsetting that could be impeded or riparian buffer restoration.
- I think one of the greatest challenges or barriers to conserving or restoring wetlands is knowledge of successful techniques. You talk to people around the country about restoring a stream or a wetland and they will tell you that it can't be done. They'll say 'You know what? We have to stop wetland drainage; we have to stop stream modifications'. Well, that's not going to happen. It's going to continue, and it is continuing. Get to know contractors and you'll find out that it's still continuing. The wetlands and the streams are still being modified. So, we are developing techniques that work. We have techniques now where we can build wetlands in places that we were not able to build them years ago. So, knowledge of these techniques, and teaching folks how to use them, whether an engineer, or a biologist, or a person operating a dozer, so that you will be successful, I think will go a long ways with restoration.
- The problem with stream restoration work or wetland restoration work is within the definition of the '*metrics of success.*' In the past, non-point sources have been somewhat ill-defined in terms of how successful the programs are or how futile it is. Has there been an increase in water quality of a stream? For every acre of waterway that may be impacted positively, there are other actions in different parts of the State that offset it. Such negative occurrences include mountain-top removal activities, industrial activities, mining activities, etc. Although there are regulations concerning degradation, we are still seeing more and more streams becoming impaired. ...I am not convinced that we are actually making headway to a level that would be perceptible.
- I participate in a lot of habitat restoration work which are related to mitigation efforts. We try to mitigate for impacts by finding the greatest streams and restoring the habitat. This is a fairly new science with a plethora of research still emerging on it. This is a tremendous opportunity. There is more money, time, and attention focused on stream restoration efforts today than in a long time. By putting the money on the ground and striving to restore habitats we are generating new questions and learning a whole lot. We can capitalize on this by answering some of our present questions.
- As far as current efforts go, I'm not hands-on with the restoration effort, but I feel the work that we do is important toward the restoration effort, because we do a lot of bio monitoring for fishes, primarily, and we can give a lot of information to the people who are doing that restoration for the particular types of habitats that are needed for fishes. Of course, when a restoration project takes place, it's good to have some pre-project data, know what's going on and know what fishes are there, what fishes have historically been there, and then, through restoration efforts, try to emulate the type of habitat that those animals need.
- [*Continued from above*] Then, the important thing is also going in after the fact and doing some bio monitoring to see whether, in fact, it is happening — whether this restoration effort is actually aiding fish assemblages. I know in a lot of the programs out there, the general time is about five years out where they do some monitoring. In some cases, that monitoring only includes going out and making sure that the riparian area is still existing and everything is still living; looking at geo morphological processes, making sure that everything is still intact; and then sometimes bio monitoring goes along the wayside, so I think it's very important for the fishes, and other aquatic animals, to determine whether this is in fact beneficial to them as well, so in those efforts, we need to make sure that we're monitoring for those freshwater assemblages as well.
- They have been monitoring some streams that have special protected status. They may have a federally protected fish species. There are some down in Bell County that I've been working on every year that have an endangered — well, actually it's a federally threatened — fish called a Blackside Dace. We are monitoring that species, along with other fish populations, and looking at the effects of ongoing coal mining activities on those populations.



Survey Respondents who provided Critical Advice on Streams and Wetlands Restoration and Conservation by Referencing the Need for more Research and Monitoring:

- Biological monitoring (long-term) is needed but often not required.
- One of the first tasks is to identify the current locations and status of wetlands. I am unclear if there is a coherent plan to protect wetlands in the state. Monitoring is essential to determine if change has occurred.
- Conduct risk-based assessments to identify and prioritize the most vulnerable/impacted streams and wetlands. Encourage state and federal decision-makers to pursue the best possible methods in terms of creating sustainable data networks and more robust analytical tools and regulations. Involve the appropriate regulators in the planning process recognizing that the science is as critical as the planning process and consensus building process. Take the time to develop a comprehensive picture of what is happening across the entire spectrum of local, state and federal agencies and organizations. Realize that in the long term, we must have an optimized data collection strategy: climatological, hydrological and biological. Shortages of data have long been a major roadblock to good decision making and has not gotten the attention that it deserves when it comes to funding decisions.
- Without the supporting data, statements are only opinions and are not defensible.
- I would suggest gathering all current data, checking priority lists, prioritizing wetlands/streams needing treatment in each watershed to 11 digits then make available a priority list by watershed and a potential funding source list from various sources such as WRP(Federal) Stream Restorations(State) and partnering with state and federal agencies to make these lists available and trying to offer as many financial incentives as available to help out the struggling family farms still in existence to implement conservation practices and be more in compliance or to help those with citations to help bring them into compliance with existing rules and regulations.
- Must TEST effectiveness of supposed remediation with targeted studies
- Take a look at real impacts and consider where the most "bang" for the buck and effort is. Don't be politically motivated and look at the science and information.
- We need to complete more detailed inventories before drawing major conclusions that could impact a particular industry. For instance, are the high nitrate and phosphorus levels in the wetland or stream from animal waste and commercial fertilizers or from straight pipes and/or lawn fertilizer in an adjacent subdivision?
- I offer technical assistance to one of the conservation reserve programs, which has a decent objective, but for the most part it will enrich already rich landowners in a select area. Monitoring to determine its actual impact was also almost left entirely out of the program... For the obscene amount of money being poured into this program the federal or state government could have purchased thousands of acres of river bottoms to create permanent conservation and hunting areas that every citizen could enjoy rather than enriching a select few.
- When evaluating where to restore streams and wetlands, it is essential that a watershed wide study approach be taken to make sure that the restoration is not a band-aid, but that the real problems are fixed.
- Work with a state map and set priorities of very vulnerable and/or very valuable streams/wetlands. Develop case studies (pilot projects) - also the narratives can be useful to publicize the importance of these resources.
- Development of hydro geologic models for central and east KY. More regulatory flexibility in wetland creation sites & methods. Transparency in regulatory process and review.
- Make decisions based on sound science, allow for long term monitoring, and establish protected areas. Long-term should be just that, LONG term. Not 5 or even 10 years but 50 to 100 years at a minimum.

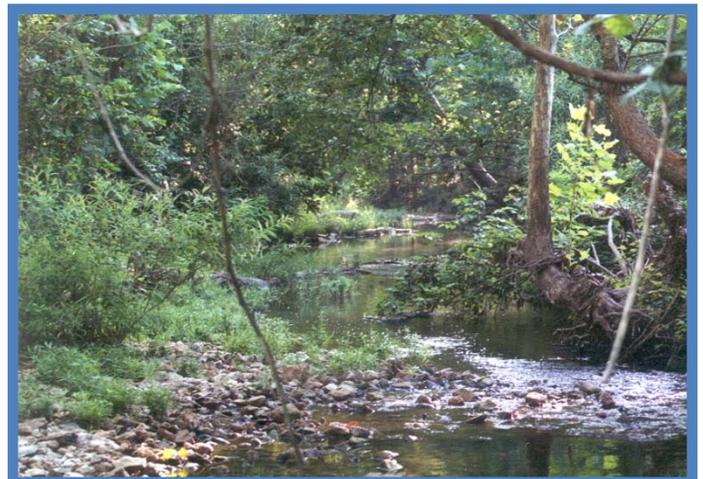




Photo: Planting a tree buffer to protect a riparian area.
Photo provided by: Conservation Reserve Program (CREP)

- Stream and wetland restoration projects should be prioritized so that funds can be most efficiently used. What type of problem is apparent and what your desired results from the project should be known and fully understood before the project is funded. If the desired result is improving aquatic life use of a stream or wetland, then improving the habitat alone may not achieve the desired result. If, for instance, the habitat of a stream with high conductivity is restored, the aquatic life use may not improve because the high conductivity is the dominant impact not habitat loss.
- [Continued from above] In streams and wetlands that do not have good aquatic life upstream or in the receiving stream, restoration may not improve aquatic life use either because there are a limited number of intolerant seed organisms. Restoration projects that focus on habitat limited areas that partially support aquatic life use within larger watersheds that fully support aquatic life use, would be a more efficient choice of projects. You could expect to see improvement within 5 years. In most restoration projects, aquatic life use improvements cannot be documented in a short time frame. Improvements may not be seen for 10-15 years. It is also important to choose other options that would more efficiently improve water quality, -e.g. riparian zone re-establishment along Bluegrass streams may be more effective in reducing nuisance algal growth in streams than reducing nutrient inputs to background levels.

Several Steering Committee members spoke about the need to improve and expand riparian areas around streams and creeks so as to improve water quality and aquatic habitat. Several committee members saw the establishment of such riparian buffer zones as essential to restoring the integrity of Kentucky's streams. Likewise, several persons who were surveyed also provided open-ended comment regarding riparian buffer zones and some provided critical advice on targeting research and application strategies within this area.

- I see a lot of stream bank erosion problems due to the fact that all trees or vegetation near the stream are destroyed. Buffers I think would greatly reduce this and I don't mean 300ft buffers just 25 to 50 feet stream buffers. Something may be a landowner can consider without taking up too much land.
- Need to find ways to enhance protection of riparian zones rather than spend mitigation resources on individual activities.
- We have tons of soil washing away and no one seems to be interested in controlling runoff. I am told that in order to have a local watershed, you must establish a taxing district of all affected landowners. If soil erosion is part of the stream control, it should be more important than additional tax burden of a few local citizens. FSA advised to plant trees along stream banks to stop erosion. My problem is that large, existing trees are being undercut and washed away. Tree planting is not the answer... controlling runoff is a better solution.

From Telephone Interviews:

- I think it's pretty ineffective and the reason I think that is that the trees that they are planting die or are dead when the farmers plant them because of the time that they get them and the time they actually get them in the ground. Sometimes it's too wet and they can't get out or it's the spring and they are too busy and so often times the trees are dead when they are put out and I find that to be so counterproductive. The spacing on the trees are too narrow which causes maintenance problems so often times those trees grow up in Johnson grass and thistles and hemlock which can be a disaster. The fences are hard to maintain on a creek bank on the stand point of all of the floods that we have and so often times it just isn't very well handled in my opinion although I get the theory. I'm not negative with the theory and I believe that in a perfect world, it would be a great thing but it just seems to not work very well.
- [Continued from above] The one we are dealing with right now is after two years of drought in this area, and this was ground zero... it wasn't any worse than it was here, there is so little positive vegetation left other than weeds based on a UK agronomy survey that was done. Some of the fields have as much as 60% weeds and bare ground and that's a really bad thing on those stream banks. So, getting those fields reseeded so we don't have that soil erosion.
- Under challenges there's one other thing I really want to mention, and that is the insect that is infecting the Hemlock trees in Eastern Kentucky. The Hemlocks are such a cornerstone for the riparian areas throughout eastern Kentucky that if we have a huge crash of the Hemlock population, I see that as a huge threat, a huge challenge to maintaining or restoring the water quality of a lot of our eastern Kentucky streams.

Several others (either advisory members, stakeholders or survey participants) mentioned other research questions related to climate change, conductivity, sedimentation and, in general, water chemistry:

- ...depending upon on how you define the years ahead, you know, if you're looking at a time scale of 50 years or so I would say the possible impacts of climate change is one of the biggest challenges.
- There are things that we need to be looking at that weren't foreseen back in the 70's and early 80's. And again, conductivity is one. We were concerned about things like rivers that were catching on fire, and then we were concerned about acid mine drainage which is similar to the main concern. Now we are starting to look at things that weren't foreseen, and so we don't always have the stream standards that would be a very good tool for state and federal agencies. We don't have groundwater standards at all. We just have surface water standards. I think that is one of the challenges. For instance, when we talk about protecting the ground water that's the base for wetlands and steams, we don't really have any quantifiable standards.
- Sediment is a pollutant and it's a big TMDL issue. We are not collecting data on it right now. It is not cheap to collect the data and analyze it. Funding is a big challenge and so, -bring together funds from various groups. Coordination between the different federal agencies needs to increase. Get the right people in the right positions to make it happen. It has to be a priority for people. Political barriers are there too. Environmental issues are low on their radar. Also, there is very little data at all that I am aware of and that needs to change. Urban areas are attempting to do some of this but it's almost non-existent in rural areas.
- We must strive to find a way to protect the chemical attributes of streams and wetland ecosystems in KY. We now have a pretty good working knowledge of how to restore the physical and biological attributes but these streams and wetlands are not complete without bringing the chemical aspects back to these systems.

Funding the needed research, however, was consistently expressed as a challenge. Yet, many mentioned the potential for collaboration between agencies, universities, non-governmental organizations and local entities. As one survey respondent wrote, "there already exists a network of experts - the Conservation Districts" that could potentially be used for collecting, compiling and sharing data. Several other persons in their telephone interviews and/or in their open-ended comments suggested the prospect of building stronger partnerships with local citizens for conservation and restoration research and observation:

- I have been in many of the streams and rivers in my areas fishing but I also study the condition of the land and the wildlife and aquatic life I come in contact with. While they are not scientific studies per se, I try to keep up with the condition of the water. Number and types of mussels for example. The numbers of aquatic mammals and birds in a given area.
- I would say that the US Fish and Wildlife, these departments, whether it be the biological part of it, or just whatever section that they are trying to do, whether it's the wetlands, or the eagle projects and stuff like that, because my wife and I, and our children, when they was young, we would go down and we would look for the eagles, we would count the eagles, we would try to find places where we could see them in a nesting situation. We would also go and check out for the deer, and see how many had been born that year. These were projects that my wife and my children were raised on. I am not a professional fisherman but I take people fishing all the time. Mainly to enjoy the day, but also to kind of show them how too...you know, if you're going to take fish, take them, but If you're going to put them back...you got to learn how to put them back. This is another thing that I would like to see, some educational programs especially on trout to show how to properly release a fish.



- [Continued from above] I guess you could say that would be the US Fish and Wildlife areas. As a volunteer for 22 years, myself and other people that have been with programs that I've been with...I see these people actually getting out and doing programs...as well, so, it's not just one...doing it all. It's several little programs but as far as money wise -we have to count on grants from the government, hopefully, that could make it where we could protect the eagles, make it to where we could protect the deer because we don't want people just going down there and putting out snares and killing out of season. Down at the Wolf Creek Hatchery, which is mostly what I am concerned about, because this is in my county, this is in an area that I love so well. We have deer, we have beaver, we have skunks, opossums and we have the eagles. But this year alone, I've only seen two eagles the whole year and that has gone from, where I've seen seven one year. I don't know what happened to them or where they are at, but the gray heron I've even seen a decrease in them. The geese, which I used to see on the river by the hundreds - now is just a few... We need to work, as a partnership...to make sure we protect these.