Information and Authority: The Perception of Water Quality

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I. Abstract

I would like to ask a simple, if somewhat rhetorical question, why isn't water quality information a regular part of the daily news in this region? We tend to care most about those things that we experience or understand as part of our daily lives. I often argue that the citizens and leaders of this region suffer from panoramic myopia. We have spectacular views of the rivers from the hills and bridges, yet what we know is either what we remember, or what we see from a distance. The rivers are still perceived by many people in this region as wastelands or dumps, under the control of industry, and soiled by municipal sewage. These terms maintain distance and assure further decline. We can't care for something we know nothing about. What goes on in our public streams and great rivers is completely beyond our daily experience, comprehension or interest. Why don't we all know more about rivers, streams and water quality? Such simple questions always seem to elicit the most complicated circuitous answers. I will begin by defining the rivers as both commons and public space – land that is owned by all of us. I will then attempt to outline the issues of water quality in terms of questions about perception, information and authority. In the end I will attempt to make a cogent plea for water quality information as a part of our daily diet of news and information about our region.

Part of the reason we aren't getting news and information about our rivers is that many residents and decision makers still assume the rivers are the proper domains of industry[1]. We have no memory of the diverse uses of the rivers that proceeded the industrial era – a time when there were eighteen rowing clubs in Pittsburgh alone. We have forgotten what was lost during the industrial take-over of waterfront properties that moved whole neighborhoods to higher lands, and privatized public roads that once provided diverse access to the river (seventy-two of ninety -two roads leading to the rivers in Pittsburgh were sold to corporate interests between 1900 and 1910[2]). Rivers and streams are part of the public good that is held in common by us all. If we are to care for these commons, and the public spaces they define, we must rediscover their value on a personal level and then understand the power of our collective voice and the depth of our responsibility. Rivers and streams are an aesthetic, environmental, social and economic resource that belongs to all of us.

Part of the reason we aren't receiving daily news about water quality is that it is difficult for all of us (expert and citizen alike) to agree upon what water quality means, or how it relates to our lives. There are five questions that can be asked about water. First, does it appear clean? Second, can it support life? Third, is the life in this body of water diverse? Fourth, does fecal mater affect the body of water? Fifth, do industrial pollutants affect the body of water? Water is protected by laws, by zoning and building codes, by local, state and federal regulators and a range of institutions charged with environmental monitoring and protection. Competing interests, fear of regulatory reprisal and a history of poor information make the simple question of daily water quality reports quite challenging.

Part of the reason that we never hear about our rivers and streams in the news, is that if they are not flooding, or impacted by continuous days of combined sewer discharges[3], they are not news. Allegheny County has a significant amount of surface waters, which drain the hills, flow into the valleys then empty into our rivers. If you don't know where your nearest stream is, jump on a bicycle, point your self downhill and don't hit the brakes until you hear the gurgling of a creek, find a concrete channel and/or a manhole cover, highway or railway. These are the signs of late industrial culture that tell us water is nearby. The simple fact is that we have 90.5 miles of rivers and 2024 miles of streams in Allegheny County. Water is always nearby.

[1] The U.S. Army Corp of Engineers is in the process of raising the dam at Braddock PA by five feet and removing the dam at Elizabeth PA, creating a 30 mile long continuous pool in the region, minimizing lock-through time, and maximizing the size of barge "tows" for the barge intensive coal and coke industries of the Monongahela River Valley, http://www.lrp.usace.army.mil/lmon/intro.htm.

[2] Langord, L., (1977) *Urban Waterways: Public Access and the Public Trust*, University of Pittsburgh, 1977, P. 203.

[3] See, Hopey, D., *Pipe Dreams: Sewage problems run deep in region*, second paragraph, "warning flags," http://www.post-gazette.com/healthscience/20020714sewers0714p2.asp.

II. Our Tragedy of the Commons

Water, clean water, in our rivers and streams raises important public realm questions. The public realm can be defined at two scales: as a public space where relationships between individuals are encouraged and as the more encompassing concept of a universally shared commons. It is easy to think about being "in" a public space. Public space has both spatial and discursive forms. Public space has a perceptible boundary. Public space is where we discover a sense of belonging to a community, and, ideally, the place where we find an element of creativity or control over our lives in that community. We choose to either participate or not participate in public space activities. In contrast, the commons have no real boundary, they are part of the experience of place. The commons are a shared experience that is processed through a social-political lens. Public space is to the commons as skin is to breath in the body. The skin is the obvious and perceptible public place of our body and breath is the body-commons that sustains life and which we all share. One is an obvious physical artifact, the other a ubiquitous necessity easily overlooked until compromised or removed. Water is a ubiquitous resource that is often overlooked, is highly compromised and in the case of surface streams in the region can and has been removed by being buried and placed underground in culverts or pipes.

Over 100 years ago citizens and decision makers of Allegheny County agreed to sell streets, homes and waterfront properties to industrial interests that promised long-term economic benefits. Many of those benefits lasted less than two generations. Industry and municipalities alike used the rivers as sources of water and sinks for waste. Pollution was a way of life, some believe that it was a fair price for a successful economy. Today, most of the mills have closed and nature has begun to restore herself. Municipalities in older regions, however, have ignored sewer infrastructure initially built in the 1930's and as a result, we continue to spew sewage into streams and rivers at a rate far above other urban areas in the nation. Given the chance and a respite from pollution the rivers show significant improvement. Today, rivers are very clean in dry weather and remain sewers in wet weather (The streams are less significantly improved in all conditions).[1] Where do we want clean water? It is interesting to think that while the rivers are considered an important regional asset, for every mile of river we are likely to find 20 miles or more of streams that are much easier to access. When was the last time your child or grandchild came home with wet feet on a warm summer day?

These streams and rivers are evolving into the definitive public spaces of our region; they define Pittsburgh and Allegheny County like no other city in the nation. I'll bet there isn't a single person in Allegheny County that would accept sewage pouring out of a neighbor's house and across their backyard. Would anyone hesitate to call the Allegheny County Health Department in outrage if they found a city manhole spouting a fountain of sewage that is running under their car parked on the street in the morning? What would be the reaction if you found your children sitting on the curbstone playing in it? We tend to care most about those things that impact our daily lives, while sewage in our backyard or outside our door is a major issue, sewage in our public parks is less of an issue (but a real problem in this region).[2] What goes into our public streams and great rivers is completely beyond our daily experience, comprehension or interest. We must find a way to make water quality information a regular part of the daily news in this region

The streams, rivers and air of Allegheny County are our public commons; we are just now starting to rediscover their public space value as well. We are all polluters of our rivers and streams and our municipal governments help us to do that. If a sewer pipe is leaking at home we fix it, if it leaks from a municipal sewer line into a stream... well that is another story. We can care about water because it permeates our lives, or we can care about water because it provides a unique and exciting public space in an urbanized region. We can care about water quality because it is fundamentally related to the perception of our region as a forward thinking post-industrial community. Our rivers and streams are currently under discussion and the federal government thinks it is high time we resolved the long-standing water problems of Allegheny County. Our local leaders are torn between solving the problem and/or limiting the affects of the federal regulators through legal and political tactics. It's difficult to vote to spend money on something that is neither seen, nor heard. "Out of sight, out of mind."

[1] A finding of 3 Rivers 2nd Nature, water quality study in years 1, 2 and 3. To view the water quality reports go to http://3r2n.cfa.cmu.edu.

[2] See *The Nine Mile Run Rivers Conservation Plan*, see "Sewage Discharge Problems" p.20, at http://slaggarden.cfa.cmu.edu/publications/content/conservplan/dcnr4.5j.pdf or, for more detail see the printed text of the report, Appendix IV, "Water Quality Issues in the Nine Mile Run Watershed." Section author, Dr. David Dzombak, Carnegie Mellon University. Published by The Pennsylvania Department of Conservation and Natural Resources, Rivers Conservation Program (1998).

III. Water Quality

The fundamental question that I am trying to address here, is why do our citizens know so little about water, and more to the point why don't we get daily reports about water in this region? I'd like to return to the five questions that are typically asked about water. First, does it look clean? Second, can it support life? Third, is life in the body of water diverse? Fourth, does fecal mater affect the body of water? Fifth, do industrial pollutants affect the body of water? These five questions can be grouped in terms of experience-aesthetics, aquatic life-ecosystems, and pollutants-infrastructure. These are the questions that scientists ask when they want to know about water quality.

The U.S. Clean Water Act: "To restore and maintain the chemical, physical and biological integrity of the nation's waters."

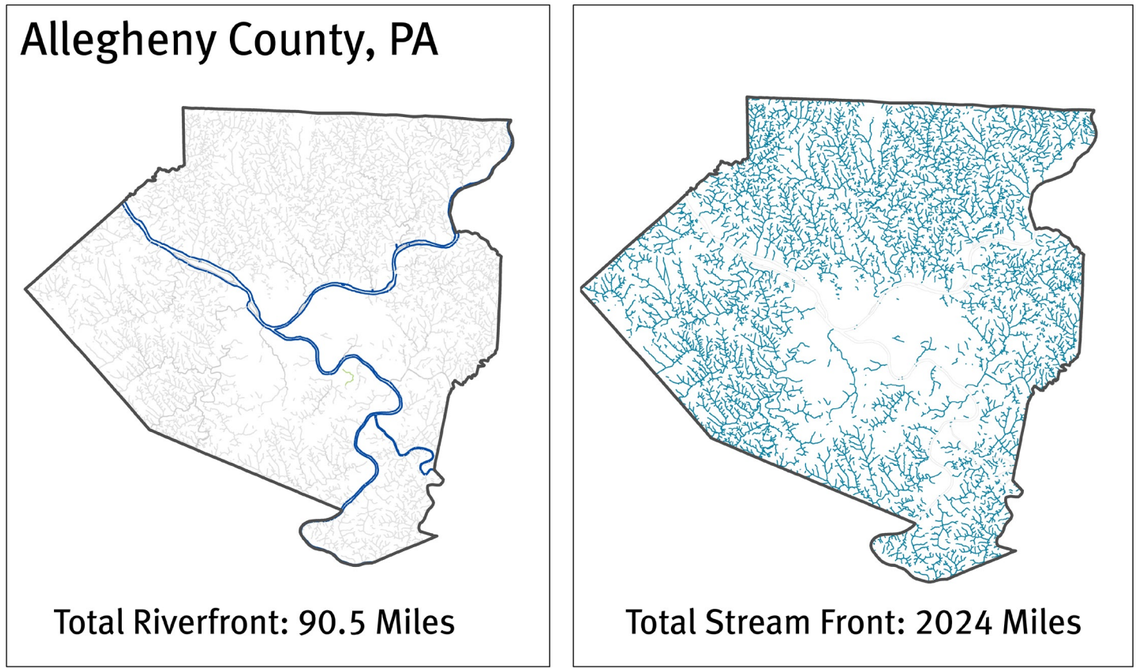

Fig. 1

IV. Questions of Experience and Aesthetics

At the simplest level, water quality can be described in terms of what we see, or in terms of what we smell. I would call these experiential-aesthetic indicators. Floating sticks, trash, muddy or cloudy water, even soap and oil on the surface tell us about the interaction between water and land. This is a point in time experience, the longer we stand along the river, or the more often we return, we begin to get a better sense of how severe the problem might be. These experiential-aesthetic indicators are the simplest kind of water quality information available. Casual observations can lead to identification of a source of pollution, but can only identify the type of pollution if a qualified water quality team is available to go on the water, take the appropriate samples and get those samples to a laboratory.

I would argue that humans have a unique ability to "learn interface," we can learn to see inter-relationships by learning new concepts. What might have once seemed a disconnected phenomenon, or an abstract symbol can have new relevance and relationship to systems. We need to learn new ways to experience and interface with our region's waters. One of the best ways to understand water quality is to begin to develop an ability to recognize the bugs that live in the bottom of a healthy stream. A diversity of benthic (bottom dwelling) organisms tells us about the biological integrity of a stream, and in turn a lack of them tells us that there is likely pollutant stress. The beauty of this bug-interface is that it places us in streams – turning rocks, walking and thinking about riffle pools, oxygen, erosion, and those places that a creature might want to call home. I like to think of this as "living river knowledge"; a conceptually informed experiential knowledge which builds a persons understanding and aesthetic appreciation for water and place. The casual application of this knowledge should not be confused with the scientific application of knowledge, which is more controlled, rigorous and able to stand up to the demands of planning, policy and the courts if necessary. I will discuss the scientific application of benthic bio-analysis in the next section.

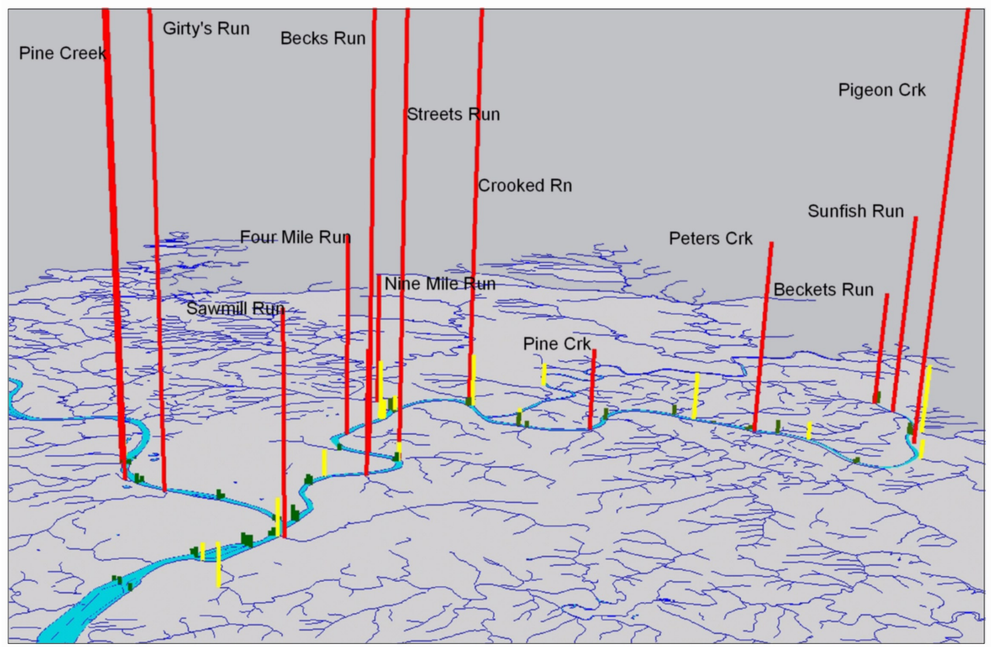

Fig. 2. 2001-2002, 3R2N Dry Weather Water Pathogen Indicator Study of Allegheny County streams and rivers. Red bars indicate ‹1000CFU, Yellow ‹200CFU, Green ›200CFU. River sites are represented by three-bar transects. Streams are single bars, all of the red bars in the graphic indicate significant coliform impact in streams.

V. Questions of Aquatic Life and Ecosystems

The second question revolves around the biological potential of water: Can it support life and does it have physical and biological integrity? To answer this question, we begin with the physical chemistry of water. To understand a stream's ability to support life we examine temperature, pH, dissolved oxygen, and turbidity to be sure that the basic conditions of life are available to organisms that live in the water.[1] These physical chemistry parameters are the first step of any water quality study. Physical chemistry has an affect on all other life and chemistry in a stream. For this reason, the physical chemistry study is a baseline analysis as relevant to biological testing, as it is to a program of testing for pathogens or metals. Biological testing is a third level that tells us who is living in our waters. Biological testing can be done with fish or benthic organisms, the bugs that live in the mud and gravel at the bottom of rivers and streams. Benthic studies are considered the most reliable indication of water's ability to support life over time. Known as bio-assessment, these communities of creatures, which include mayflies, stoneflies, caddisflies, leeches, snails and crayfish, are highly responsive to pollutants in the water. Bottom dwelling bugs, are also relatively sedentary, living and reproducing in the same place over time. Physical chemistry tells us about water quality at the moment when the sample was taken and finding a diverse grouping of bottom-dwelling bugs tells us about these creatures ability to survive and reproduce in that water over time. Without these creatures that make up the base of the aquatic food chain, there is no life in or around a body of water. Some of these are more sensitive than others, which have resulted in scientific standards called the Index of Biological Integrity (IBI) that tells us which creatures are more or less sensitive to pollutants.[2] A bio-assessment is relatively inexpensive, it is localized and the bugs are not very mobile, which means it can help with geographic source identification of point and non-point source impacts (bio-assessments have been used to monitor CSO impacts on the Ohio River[3]). A bio-assessment reflects the primary goals of the Clean Water Act and relates to the need for a pollution-free environment, which is of direct interest to the public. A bio-assessment baseline provides the means to monitor the effectiveness of land management, infrastructure improvements, water treatment facilities and other investments in water quality. A bio-assessment does not give us specific information about specific pollutants, it tells us whether or not the conditions of urban life and commerce are affecting a streams ability to support life. These critters discovered through bio-assesments are the "canary in the coal mine" for urban streams.

VI. Questions of Pollutants and Infrastructure

The next group of questions revolves around potential recreational impacts and is based on human health concerns. Do the rivers have chemical integrity and are they relatively free (more on this below) of sewage? These are the water quality questions that address the conditions that limit or constrain the human use of the rivers. The fourth level of water quality requires testing for pathogen indicators. Is there an excess of fecal matter in our water? Pathogens such as coliforms are used as indicators of possible sewage contamination because they are commonly found in human and animal feces. Their presence in surface water suggests that pathogenic organisms might also be present and body contact water recreation may be a health risk. Once it is clear that pathogens are present, it is important to develop a strategy to identify the geographical areas that may be the geographic source of contamination. There are two types of geographic sources that might be contaminated, non-point and point sources. Non-point sources are locations such as stream reaches, neighborhoods, city parks or forests. Point sources can be leaking sewer lines or specific outfalls, which may be malfunctioning, illegal sanitary sewer outfalls or stormwater outfalls that have illegal sanitary sewer tie-in.

The question of the source of pathogen indicators is fraught with complications that place legal and economic impacts (the potential for regulatory lawsuits and legal fines) in direct conflict with proper monitoring, management and maintenance of the infrastructure systems. Municipalities and regional sewer authorities are hesitant to have problems identified, as it provides regulators with an opportunity to take legal action. At the same time without monitoring it is impossible to gage the effectiveness of a sewer and stormwater system. As a result, there has been a surprising amount of effort expended to control the collection of water quality data and mitigate its distribution. Other efforts question the specific species-source of pathogens, which can only be resolved through expensive DNA testing. Finally, the public value of science is based in its ability to state the truth about nature and in its ability to develop theories that extend that truth into meaningful predictions. Pathogen indicators and their standards are questioned by municipal officials and couched in uncertain terms by regulators. This makes it hard for the rest of us to understand their value in making an argument for infrastructure renewal. Despite these considerations, pathogen indicators are the best tools available to help us understand scope of degradation, and to discover the geographic source of some of the water quality problems created by urban development.

> *Members of two bacteria groups, coliforms and fecal streptococci, are used as indicators of possible sewage contamination because they are commonly found in human and animal feces. Although they are* ***generally not harmful*** *themselves, they indicate the* ***possible presence***

[1] Life in stream relies upon cool water, dissolved oxygen and a sweet spot on the pH scale not to acidic, and not too alkaline (between 6.5 and 8.5). Turbidity or particles suspended in the water have the potential of affecting all of these parameters, plus it can minimize the sunlight, which supports plant growth in streams.

[2] http://www.dep.state.pa.us/dep/deputate/watermgt/WC/subjects/WaterSNAPSHOT/SNAPSTDataEntrySheet2000.doc

[3] Edwards, G.M., Tennant, P.E., Lyons, J.T., (1998) "Evaluation of Wet Weather Pollution Sources on Large Rivers Using Biological Communities." *Ohio River Sanitary Commission Report.*

> *of pathogenic (disease-causing) bacteria, viruses, and protozoans that also live in human and animal digestive systems. Therefore, their presence in streams* ***suggests*** *that pathogenic microorganisms* ***might*** *also be present and that swimming and eating shellfish* ***might be a health risk*** [emphasis added].[1]

There are a number of methods for testing for pathogens, one is a fecal coliform test which is the Pennsylvania State Standard, the other is an E. coli test recommended by the U.S. Environmental Protection Agency (USEPA, 1999) as an indicator organism to replace fecal coliform. However, the Pennsylvania Department of Environmental Protection has not yet adopted this recommendation. Testing for E. coli may be one way to mitigate the legal and economic disincentives. The E. coli test is significantly cheaper and requires less laboratory equipment than the standard fecal coliform test, which may mean that more institutions could become involved in testing the 2014.5 miles of open surface water in our region.

The fifth level of water quality requires testing for heavy metals by looking at bottom sediments, or the flesh of fish to understand the impacts of industrial activity. Are there heavy metals[2] currently entering our regional waters, or is this an industrial legacy problem? Are they impacting humans through the fish that is caught in the rivers and then eaten at dinner? Given our industrial heritage these are significant questions with long-term implications. The following text illustrates the degradation of our rivers due to the presence of PCB's[3] and Chlordane[4]. There is little or no information about the streams that run through neighborhoods, parks and backyards. The other question, which is not addressed as yet, is the relative duration of these pollutants in our regional rivers, which can be characterized as slow moving lakes, constrained by dams. A final question for consideration is the relative impacts of construction, dredging or any other activity that might re-suspend these pollutants in the water column potentially impacting drinking water intakes. The regulation below limits new sources, but not the re-suspension of old sources.

> *The Pennsylvania Department of Environmental Protection gives notice of proposed Total Maximum Daily Loads (TMDLs) for PCB and chlordane due to fish consumption advisories. A TMDL is a tool for implementing State water quality standards and is based on the relationship between pollution sources and in-stream water quality conditions. A TMDL establishes the total amount of pollutant loading that may be discharged to a surface water body while still meeting water quality standards. These TMDL's are listed because long-term unrestricted consumption of fish taken from the water body segment could lead to human health problems.*[5] [The water body segments are listed in fig. III.]

Water body	Segment	PCB	Chlordane
Allegheny River	Lock and Dam 3 to mouth	X	
Monongahela River	Lock and Dam 2 to mouth	X	X
Monongahela River	Maxwell Lock & Dam to Dam 4	X	X
Monongahela River	Point Marion to Grays Landing Dam	X	X
Ohio River	Pittsburgh to Montgomery Dam	X	X
Chartiers Creek and Little Chartiers Creek	Canonsburg to mouth Below Canonsburg Lake	X	X

Fig. 3

[1] U.S. Environmental Protection Agency, *Monitoring and Assessing Water Quality, Volunteer Stream Monitoring: A Methods Manual* Chapter 5 section 11. Fecal Bacteria. http://www.epa.gov/volunteer/stream/vms511.html

[2] Heavy metal refers to any metallic chemical element that has a relatively high density and is toxic, hightly toxic or poisonous at low concentrations. Examples of heavy metals include mercury (Hg), cadmium (Cd), arsenic (As), chromium (Cr), thallium (Tl), and lead (Pb).

[3] Polychlorinated biphenyls (PCBs) are a mixture of individual chemicals, which are no longer produced in the United States, but are still found in the environment. PCBs have been used as coolants and lubricants in transformers, capacitors, and other electrical equipment because they don't burn easily and are good insulators.

[4] Chlordane is a manufactured chemical that was used as a pesticide in the United States from 1948 to 1988.

[5] Proposed Total Maximum Daily Loads for Polychlorinated Biphenyl (PCB) and Chlordane Due to Fish Consumption Advisories [29 Pa.B. 497].

VII. Conclusion

The question of water quality is complicated by physical realities. The sheer number of river and stream miles in our region is daunting given that there may be ten people from regulatory agencies available for field sampling on a good day. Developing a water quality baseline for this region is a primary goal if we are to have any sense of the relative success of costly infrastructure improvements. At the same time it is clear that we need good indicators that will reveal the most significant information about our surface waters with the least amount of funds. This region suffers from many needs and too few funds. Understanding the differences between bio-assessment for aquatic life and ecosystems and the assessments that indicate the pollutants typical of urban infrastructure is one point of consideration. Developing an integrated (but strategic) biological, chemical and pathogen indicator testing program is essential if we are going to move this region towards surface water quality and away from its history of physical, chemical and biological degradation. Understanding the spatial realities of our surface water challenge makes a clear case for the skills and techniques of analysis to be diversified and the results widely distributed.

Currently, water quality monitoring is the primary charge (a secondary activity) of a range of local and state regulators, (The Allegheny County Department of Health, the Pennsylvania Department of Environmental Protection) a single multi-state agency (The Ohio River Sanitary Commission, ORSANCO) and two federal government agencies (The U.S. Army Corp of Engineers and the U.S. Geological Survey). Watershed associations, universities and non-profits have all taken an interest in water quality monitoring as well, with the support of the Pennsylvania Department of Environmental Protection. Curiously there is not a lot of raw data or interpreted information available.

Who is looking at water quality in this region? Our regional drinking water plants have been monitoring their intakes for decades. This is an isolated and site specific source of information, but primarily captured in paper form and with different methods. It is not a data source that is easily assembled or interpreted. The Ohio River Sanitary Commission (ORSANCO) has been sampling a single source downstream from ALCOSAN for over quite some time[1] and they have recently included an upstream transect (lines across the river with 3 sampling points) to their sampling. ORSANCO focuses upon 5 random samples per month from which they establish our regional ability to meet federal and state standards for water quality compliance. For the most part we do not comply and indeed are further outside compliance than other urban centers in our region. Many ORSANCO publications addressing the larger multi-state Ohio River basin are available online,[2] and the current studies relevant to Allegheny County are made available (by request) monthly, but not widely distributed until the end of the year[3].

3 Rivers 2nd Nature (3R2N), a project of the STUDIO for Creative Inquiry, at Carnegie Mellon University with funding from the Heinz Endowments is working with 3 Rivers Wet Weather, ALCOSAN, the Allegheny County Sanitary Authority and the Allegheny County Health Department to develop a county wide water quality study. This program identifies and samples thirty-six transects (lines across the river with 3 sampling points) throughout the county over a five-year period, and the project primarily focuses upon dry weather conditions. Asking the questions of pathogen indicators and physical chemistry to understand the water quality opportunity. Sampling sites are established in physical proximity to waterfront parks, marinas and fishing sites where people are likely to be accessing the rivers. Water quality in the rivers has proven to be better than expected in dry weather.

Wet weather tests are also conducted in the rivers, with the goal of four wet weather events each year. Initial wet weather studies indicate a decrease in impact and duration of pathogen indicators as you move upstream away from the urban core.

The project has also established a dry weather testing program at the mouths of rivers where physical chemistry, pathogen indicators and a bio-assessment program is underway. Streams have proven to be more resilient than expected from a biological point of view and, at the same time, are more impacted from than previously expected. Pathogen indicator counts are quite high in dry weather when there should be no sewer overflows.

None of the work at 3R2N is designed to address the federal and state water quality program compliance. Six samples are taken in each area over a four to six week period in either explicit dry weather or explicit wet weather conditions. The program provides a baseline of information, which will provide interested parties with a means to gage the restoration or further degradation of our waterways in the future. 3R2N studies for the years 2000 (the Pittsburgh Pool) and 2001 (The Monongahela River Valley) are currently are publicly available online.[4] The 2002 studies from the Allegheny River Valley will be available online in two months.

The U.S. Geological Survey (USGS) has begun a rigorous study of pathogenic indicators in relationship to sewer overflows and receiving waters. This program targets five transects (lines across the river with 3 sampling points) where physical chemistry, pathogen indicators and sophisticated hydrologic and hydraulic data is assembled. Following the classical scientific model, this rigorous program is seeking to establish the truth about the nature of our water quality problem. They are also working to develop theories that lead to meaningful predictions about managing and redesigning our infrastructure to achieve regulatory compliance and best protection of public health during wet weather events. The USGS has excellent publications, which contextualize our regional watershed issues in the context of national studies.[5] Neither of the specific Allegheny County Studies for the 2002 or 2001 study has been approved for public distribution as of the date of this publication.

It should be quite clear by now that there is not a lot of Allegheny County specific water quality information out there, and in turn we have a number of significant water quality problems. It should also be clear that there is an attempt to establish a public geographic regional baseline (3R2N) and a rigorous expert regulatory baseline (ORSANCO) (USGS). There is no information available that would provide citizens and experts alike with a daily understanding of water quality in our region. The question of water quality deserves discussion at both the expert and citizen levels. Singular disciplines, or commercial interests that benefit from a singular solution to the problem should not dominate the questions of water

[1] Orsanco published “Bacterial Objectives for the Ohio River” in 1955.

[2] http://www.orsanco.org/rivinfo/pubs/wquality.htm

[3] http://www.orsanco.org/rivinfo/pubs/pdf/WaterQualityJanJul2001.pdf

[4] http://3r2n.cfa.cmu.edu. (See Pittsburgh and Monongahela Reports section).

[5] http://water.usgs.gov/pubs/circ/circ1202/pdf/circular1202.pd

quality, and the potential response. Invested interest and the dualities of political and economic desire are powerful attractors, which have skewed problem statements as well as solutions since the tribal days of mankind. We must recognize the value of diverse voices and minds in our midst here in the three rivers region. We must seek out alternatives to typical solutions and be willing to consider the ecological and social along with the technical if we are to address the question of water quality in any meaningful way.

The Rouge River Wet Weather Project in Detroit, focused upon infrastructure renewal alone built huge underground storage tanks, spending millions of dollars to capture excess wet weather flows. They have not succeeded in restoring the chemical, physical and biological integrity of their regional waters although they are maintaining them in what can only be described as dysfunctional stasis. We can do better.

> *Although significant volumes of raw sewage have been eliminated, most of* ***the Rouge River still does not meet the Michigan water quality criteria for human contact during dry or wet weather****. On the bright side, more than 60 of the 157 CSO outfalls have been controlled or eliminated. The new CSO basins have reduced the volume of overflows (from the outfalls they control) by 60 to 80%.* [6] [emphasis added]

The question of truth according to the French philosopher Michel Foucault is "thoroughly imbued with the relations of power." Current physical chemistry and pathogen indicator water quality testing in Allegheny County continues to improve, although it is complicated and slowed by the political realities and machinations of powerful institutions. There is ongoing water testing which focuses upon physical chemistry and biology, but little that addresses pathogens or metals. At the same time the dominant sources of impairment appear to be pathogens and metals. It has been said that information is knowledge and if it is so we have precious little knowledge, and what little we have has been too often veiled and hidden behind legal tactics. We cannot ascertain or achieve biological integrity with attorneys and engineers; we cannot end the development policies that impact water quality without the support of biologists, landscape architects, urban historians and planners at the table. To date our regional water quality discourse has been homogenous and complicated by invested interests. To achieve long-term water quality investment and renewal we will need to diversify the sources of information, as well as the groups that access that information. We will need to change the economic realities of fieldwork and lab work. We will need to establish and publicize daily feedback loops about the quality of our living rivers and streams as well as their impacts. We will need to make the science of water quality matter by helping citizens to see water as a public component of the regional aesthetic that either defines us or damns us.

To accomplish this I would like to propose and work with others to plan a daily water quality report, starting with the city of Pittsburgh. Once a day physical chemistry and pathogen indicator samples would be taken along the North Shore Park, the South Side Park and in the back channel of Washington's Landing. Each sample should be described for its relevant weather conditions and referenced to the standards for interpretation. These are three sites of significant public access and use. Additionally once a week a stream should be sampled in dry weather. The Orsanco data could be used as a tool to discuss the monthly regulatory conditions. This information should be a feature of the weather pages in our regional newspapers; it should be a regular byline in radio and television news. Water quality and stewardship of our aquaitic resource needs to become a subject of conversation for citizen and expert alike.

A daily public report on water quality must be based upon a specific place on the waterfront. Over time interested observers will begin to understand these public places along the river and their land/water conditions. A dynamic relationship between water and weather will be revealed, as well as the impact and recovery of water quality over time. Adding monthly testing of streams, we raise the issue of neighborhood impacts and dilution factors. Adding the Orsanco regulatory data we begin to see the complexity of the relationship between perception, knowledge and regulation. But the ultimate question, which is framed by the lack of information in this region, is how to ameliorate the impact and authority of our regional communities of interest who constrain information? How do we find common ground in the interpretation and distribution of water quality information? Over the last ten years at Carnegie Mellon, I have had the pleasure of getting to know David Lewis, one of our nation's most revered and eloquent urban planners. Whenever I have exhibited doubts about complex knowledge, conflict and public discourse he has admonished me with the words of Thomas Jefferson.

> *I know no safer depositary of the ultimate powers of society but the people themselves; and if we think them not enlightened enough to exercise their control with a wholesome discretion, the remedy is not to take it from them, but to inform their discretion by education. This is the true corrective of abuses of constitutional power.*[7]

Until we help the citizens and decisions makers see the clean water potential they will not care about the filthy problems of chronic sewer discharges and sewer overflows. Until we can reveal the cause and affect of action versus inaction on the environment and ecosystems, we are left with only one argument for infrastructure investment – regulatory penalty. Penalties are quite literally a "hell" of a way to convince a community to invest in their own environmental future.

[6] (1999) Rouge River Report Card, Rouge Remedial Action Plan Advisory Council, P.11.

[7] Thomas Jefferson to William C. Jarvis, 1820.