

LOST CREDIBILITY?: SCIENTISTS, ADVOCACY AND ACID RAIN

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ABSTRACT

Shortly after the passage of the 1990 Clean Air Act Amendments, the March 1991 signing of the United States Air Quality Accord, and the release of the National Acid Precipitation Assessment Program's Integrated Assessment in November of 1991, there appeared a firestorm of criticism directed at the science of acid rain. Some of the severest criticism came from within the scientific community, as prominent researchers castigated scientists for lacking objectivity, for failing to distinguish between science and policy, and for out-right advocacy of policy positions. The findings of this study, based on interviews of both United States and Canadian scientists in 1997, suggest that while many scientists continue to share these concerns, more and more scientists are viewing advocacy as a moral and civic obligation.

INTRODUCTION

The culmination of separate and bilateral acid rain policies in Canada and the United States was marked by the passage of the Clean Air Act Amendments in November of 1990, the signing of The Agreement Between the Government of the United States of America and the Government of Canada on Air Quality in March of 1991, and release of the National Acid Precipitation Assessment Program's (NAPAP) Integrated Assessment Report on the causes and effects of acid rain in November of 1991. NAPAP was a Congressionally-mandated program initiated under the Acid Rain Precipitation Act of 1980 and given the task of compiling the "best available scientific, technological and economic information" relevant to acid rain.

These events signaled an end to the decade-long policy debate over acid rain and promised cleaner air and a healthier environment for both Americans and Canadians [1]. However, these events also brought with them a firestorm of criticism directed at the science of acid rain and the scientists who participated in the acid rain research programs.

Some of the severest criticism of the science (and scientists) comes from within the scientific community itself. Orié Loucks, professor of botany and zoology at Miami University in Ohio, suggests that the policies developed to deal with the acid rain problem were only modestly influenced by the scientific findings and that scientific facts were manipulated to support a policy based on near-term economic and constituency interests [2]. Even more discouraging is Loucks' estimate of the effect the development of an acid rain policy had on the science-policy linkage:

The most important result is not that the [acid rain] amendments passed, but that the scientific community as a whole, and the U.S. government in particular, lost a substantial measure of credibility. Scientific credibility, eroded during the acid rain debate, cannot quickly be restored in current debates over green-house emissions and global warming [2].

Ralph Perhac, the former director of the Environmental Science Department for the Electric Power Research Institute, shares Loucks' concerns. He alludes to the fact that most of the people he interviewed for his research felt that science played a very small role in establishing the final policies regarding acid rain pollution and pointedly asks "Why did science, which is such an important part of the acid rain issue, seem to have such a small influence in the legislative process?" [3]. Then, in answering this question, Perhac faults the utility industry for putting "too much faith in science as a means of solving a complex scientific/political issue" and suggests that the failure of science to have an impact was caused by the fact that policy makers wanted a consensus of scientific opinion but never got it because of the polarity that had developed among scientists [3]. Moreover, Perhac provides reasons for the polarity.

Some scientists were acting out of self-interest; politics got in the way of their scientific reporting. Some were using hype and selective data to support a position. And some were out-right advocating policy but not clearly distinguishing between policy and science [3].

In the end, Perhac charged that the scientific disagreements with respect to acid rain degenerated into the highly selective use of data to support predetermined policy positions and asserted that the only way to restore scientific credibility is for scientists to "make a concerted effort to separate fact from policy judgment" [3].

Canadian scientist David Schindler of the Department of Zoology and Botany at the University of Alberta is also highly critical of the science of acid rain,

charging that the research effort made by the United States (under the auspices of NAPAP) included:

political interference with the course of science, obfuscation of scientific conclusions, and delays in the release of first-class science that did not support political agendas [4].

Schindler also believes, just as Loucks and Perhac do, that despite the production of some very good science, the legacy of the scientific debate about acid rain is one of considerable mistrust of scientists and science in general [4].

The criticisms voiced by Loucks, Perhac, and Schindler (among others) about the role that science is playing or should play in the development of policy in today's world are not new. For some time, researchers have been investigating the science-policy linkage. Albert Wohlstetter questioned the freedom and objectivity of science and scientists when they are pulled into politics [5]. Sheila Jasanoff asked about the specific role scientists can expect to play in decision making if science in the policy setting is always colored by values [6]. Bruce Smith asked whether scientists best served the nation as an "apolitical elite" or with recognition that they were immersed "in the battle rather than above it" [7]. Karen Litfin observed that "the cultural role of science as a key source of legitimation means that political debates are formed in scientific terms" [8].

Clearly, these questions about the part that science and scientists play in the policy making process remain important and deserve further study. As Aaron Wildavsky points out:

Scientific evidence does matter. I notice that no mention is made of witchcraft as a rationale for regulation, but rather obeisance is made to science whether or not it is what matters. Nor does any responsible person get up and say that his ideology or her world view requires inventing or denying dangers and to hell with the evidence. As long as science is the only publicly acceptable rationale, it matters [9].

There exists a need to know more about how scientists view the science-policy linkage because the role of scientists in introducing, popularizing, and elevating ideas that directly affect the policy debate is critical to understanding why environmental policies (including acid rain policy) either succeed or fail. Scientists' perceptions are especially meaningful in the case of acid rain because from the very beginning of the policy debate, scientists were called upon to communicate objectively the scientific facts and uncertainties and to describe the expected outcomes [10]. Essentially, the scientific community was expected to provide "the best available science to figure out the causes and effects of acid rain and how to control it" [11]. Because there remain serious questions about the role that scientists played in the development of our present-day acid rain policy and because scientists continue to play a central role in the implementation of

such policy in the United States and Canada, it is worth our while to explore how scientists view the making of this policy.

The purpose of this study is to investigate the criticisms (and questions) posed by Loucks, Perhac, and Schindler in light of the fact that several years have passed since the establishment of an official acid rain policy (when their criticisms were made public). As described above, science and scientists remain at the heart of environmental policy making. If we are to make progress in understanding the complexities of the science-policy linkage, it is important that we understand how scientists perceive their role, especially as it pertains to such concepts as objectivity, advocacy, and the separation of science from politics.

THE FRAMEWORK OF STUDY

Because the acid rain debate in North America centered on the border between the United States and Canada, this study focuses on both United States and Canadian natural scientists who participated, commented on, or studied different aspects of the acid rain issue. Natural scientists are defined as those whose primary training is in the physical or natural sciences such as physics, chemistry, biology, and geology. Sixty-six scientists were interviewed (33 each from the United States and Canada). The majority of scientists interviewed worked for universities (U.S. = 55%; Canada = 52%) or the government (U.S. = 42%; Canada = 48%). One of the United States scientists interviewed was working for private industry. All of the scientists interviewed had earned their Ph.D. except for one United States scientist who had two Master's Degrees in forest ecology.

Scientists were selected to be interviewed from a list generated by the author (over a 10-year period of time) of those scientists who testified at congressional or parliamentary hearings on acid rain, participated in review of the National Acid Precipitation Assessment Program, served on the task force implementing the Canada-United States Air Quality Accord, or published peer-reviewed scientific research on acid deposition or in an area related to acid deposition. The goal of the author was to interview at least thirty scientists from each country. Originally, fifty scientists from each country were contacted (via letters, telephone, or electronic mail). However, to reach the final count of thirty-three scientists from each country, the total number of scientists contacted was fifty-seven from the United States and fifty-four from Canada. It is understood that this list of scientists is not comprehensive. However, the scientists who participated in these interviews (because of the selection criteria) were knowledgeable about the science of acid rain. The final list of interviewed scientists represents a wide range of disciplines, including chemistry (15), atmospheric science (13), biology (16), ecology (8), forestry (3), engineering (6), and geology (5).

The interviews consisted of asking large, philosophical questions (see below) about the linkage of science to policy designed around the theoretical concepts

discussed in the introduction of this article.¹ While questions were asked in a “yes/no” format, they were designed to be open-ended and the scientists were asked for their perceptions based on their personal experience. Scientists were not prompted to answer in a specific way, but were asked to answer as they saw fit. All interviews and all subsequent coding of results were completed solely by the author.

RESULTS OF INTERVIEWS

As described in the introduction, the science-policy linkage is fraught with questions about the ability of science to provide reliable and ideologically neutral data and whether it is possible for scientific research to be separated from policy judgments. Along these lines, scientists were asked to respond to four specific questions about these aspects of the science-policy linkage.

The results of the first interview question, “Do policy makers listen to scientists?” are presented in Table 1. It is important to note that there was a difference between United States and Canadian scientists, as a much higher percentage of Canadian scientists (30.3%) than United States scientists (6.1%) felt that scientists provided a strong influence.

However, it is more important to note that the vast majority of both United States and Canadian scientists believed that policy makers do listen to scientists, although most believed that their influence was not a strong one. Comments from interviewed scientists such as “policy makers listen but don’t always take into account the scientific information as much as scientists would wish” and “policy makers have many things to consider besides science” [12] suggest that scientists understand that science is only one part of the decision making process. This view was expressed by one scientist as follows:

Table 1. Scientists' Perceptions of Policy Makers

The interview question was: “Do policy makers listen to scientists?”		
	United States (<i>n</i> = 33)	Canada (<i>n</i> = 33)
Yes, strong influence	6.1%	30.3%
Yes, with qualifications	75.8%	66.7%
No, do not listen	12.1%	3.0%
Do not know	6.1%	0%

¹ The four questions selected for analysis in this article were actually part of a series of nine questions asked regarding environmental policy making.

A lot of scientists like to think science is the only foundation of decisions. I think of policy decisions as a pie and scientists get their slice and it is real important that you provide the best science you can for your slice. It is unreasonable to base policy solely on science. There are many other impacts like distribution and equity and it is totally unreasonable for scientists to address these issues [12].

The idea that scientists and policy makers function in two different worlds and speak two different languages came up time and again during the interviews. One scientist described the science-policy linkage this way:

Scientists and policy makers operate in two entirely different value systems. One is a system of science and one is politics and both believe they have insight and the process to find the absolute truth. There are egos of monumental proportions. Both systems are egocentric and tend to be dismissive of the other party. They do not understand each other [12].

Many of the interviewed scientists spoke of the poor communication linkages between scientists and policy makers. One scientist submitted that:

It's just a matter of communication. Science is just not getting through. Policy makers and scientists have different approaches to the problem in terms of what scientists can produce and what policy makers need. Either it is not the right information or not in the right form [12].

Many scientists blamed policy makers for the poor linkage.

Policy makers view scientists as naive fools, having their proverbial heads in the sand, not having any idea what the real world is about, sequestered in their own special place [12].

Policy makers look in your eyes and have their ears open and write things down but there is a real question about their comprehension. They say all the good things to you but when all is said and done I suspect that the vast majority of policy makers miss the vast majority of what scientists have to say [12].

However, a good many scientists also blamed themselves for the poor communication linkage.

Scientists talk about uncertainty and use "weasel words" that are often seized by one side of the issue as indicating grave doubts [12].

Scientists are their own worst enemy. In general the entire profession has long basked in the notion that we are separate, above the common folk and even if I take the time to talk and explain to you in laymen's terms, you're too stupid or you will twist what I'm saying to fit your perspective because I'm credible [12].

Scientists interviewed for this study also emphasized that the key to making the connection between science and policy lay in how scientists approached the policy makers. There was a general belief that policy makers were not going to make the effort in bringing these two worlds together and that if the connection was going to be made, it would have to come at the urging of scientists. It was submitted that because policy makers do not understand “this mysterious scientific language,” scientists must make sure their presentations are completed “in such a way that policy makers can understand” [12].

In addition, several scientists felt that getting policy makers to listen was dependent on how skillful scientists were in articulating the policy relevant science. One scientist maintained that:

If you approach policy makers correctly and can speak to them on their terms and put things in context—in their context—then they will listen [12].

Another scientist put the burden of communication squarely on scientists.

Sometimes, when scientists articulate the policy relevant science in a meaningful way, policy makers listen. It is a matter of how skillful the scientists are in presenting their material. It is a matter of scientists packaging the science in a way that makes sense to policy makers. I hate to have to say that, but it is a matter of putting it in these terms [12].

Another view that was pervasive among the interviewed scientists was that policy makers listened to scientists only when it fit their personal agendas or when the scientific evidence was “politically palatable.” One scientist summarized this feeling this way:

Policy makers only listen to scientists when it is in their interest to do so and under two circumstances—one, if the scientist promotes ideas that support the policy maker’s preconceived notions and two, if the policy maker is being pressed by public opinion. That is what drives policy makers. They might consult for help in coming up with remedies consistent with their position and public opinion, but it is very rare that policy makers pay a great deal of attention to what scientists say [12].

Another scientist put it this way:

Yes, policy makers listen but they have agendas of their own and their level of listening reflects their personal biases. If they find scientists who agree with their preconceived notions then they become their champion and seek to minimize, and are critical of, anyone who disagrees [12].

The results of the second interview question, “Should scientists advocate policy positions?” are presented in Table 2. There appears to be no substantial difference between the United States and Canadian scientists in answering this

Table 2. Scientists' Perceptions of Advocacy

The interview question was: "Should scientists advocate policy positions?"		
	United States (n = 33)	Canada (n = 33)
Yes	63.6%	69.7%
No	36.4%	30.3%

question. However, it is clear that the majority of scientists interviewed in both countries felt that scientists should advocate policy positions.

Scientists spoke of times "when the issue and evidence is so clear" that scientists would be "irresponsible" and "guilty" if they did not speak out [12]. The words of the scientists themselves show how strongly they view their role as advocates.

No person is just a scientist. We have a social and moral responsibility [to speak out] . . . more than just describing; but do it openly and modestly, recognizing the possibility of error [12].

I have always argued that scientists not only be allowed to advocate but have the responsibility to articulate their work, to describe what kinds of policy responses should result from their work—scientists should have that right. Most do not . . . Scientists must be thinking about the "so what" of their work and use whatever routes available to do it, to get the word out [12].

It is pretty risky to try to do both science and advocacy. On the other hand, there are issues where if scientists were not advocating, no one else would be. Global climate change is one. It was scientists who initially sounded the alarm . . . it was effects documented by scientists investigating and able to identify and demonstrate. And if they weren't doing it, nobody else would [12].

Many scientists felt that it was very important that scientists separate their role as scientists from their role as citizens. The words of the scientists themselves express this belief.

Scientists must be able to separate personal and professional behavior, one as citizen and one as scientist. If making a speech to the Sierra Club, I say right up front and want the press to understand that I'm acting as a citizen and not as a member of [my university]. But when it comes to my data, I can be as much as a damn advocate as I please and that's my right and responsibility [12].

Yes, scientists should advocate, with qualifications. I do this frequently . . . where I say this is what I have to say about the science and then take my hat off as a scientist and put my hat on as a citizen. And I would even go further and say that it would be shirking one's duty not to do that, to not say what ought to be done [12].

The role of an individual environmental scientist is to be objective and do objective analysis of the environment, to do basic science only, to determine how nature works. If you start being an advocate then you must take the scientist's hat off and be clear you are doing it only as a citizen [12].

Another scientist explained advocacy in terms of frustration and need.

Occasionally you get so frustrated by the lack of action and you do go public to advocate . . . you become very frustrated with the inability of the sheer weight of the evidence to produce any action . . . Sometimes there comes a time in your best judgment that if the ends justify the means . . . but it also pushes the science beyond credibility. We're all guilty from time to time [12].

Yet, many scientists remain adamant that scientists should not advocate under any circumstances—that the loss of credibility is just too great a risk.

If we are going to become party to causes, then that's what we become, party to causes. We lose our scientific credentials when we become party to causes. If we want respect as scientific specialists . . . [we cannot confuse] what scientists know about the facts and what they think society should do about the facts. It took me a long time to learn this lesson, but from my Congressional experience, when a Congressman asked "What should we do?" I should have had the good sense to say "You are the decision maker and I am the scientist and let's not confuse the two" [12].

Scientists are not advocates and they shouldn't be. If they go too far, their reputations will be messed up. I am an ecologist, a scientist. But people sometimes think because of that that I'm an environmentalist—that they are the same thing. Now I may have environmental leanings, but in my profession as an ecologist I follow the scientific method. As a professional I do the science dispassionately. Environmentalists follow emotional paths as advocates and there is a big difference [12].

The job of scientists is to find out what nature is trying to tell us and that's different from the notion of what we want to happen—that taints the analysis and breaks objectivity. Objective science is practiced less and less. There are many more advocates and advocates have no credibility in my view. I don't believe a thing they say.

The results of the third interview question, "Is it possible to separate science from policy making?" are presented in Table 3. There appears to be no substantial difference between the United States and Canadian scientists in answering this

Table 3. Scientists' Perceptions of Separation of Science and Policy

The interview question was: "Is it possible to separate science from policy making?"		
	United States (n = 33)	Canada (n = 33)
Yes	66.7%	69.7%
No	33.3%	30.3%

question. In both Canada and the United States, over two-thirds of the interviewed scientists felt that it was possible to separate science from policy. The case for separating science from policy was made along the following lines.

It is possible for scientists to avoid considering policy and study pollution as a fundamental science. That is what I do and I would be insulted if someone called me an applied scientist . . . Now, policy makers cannot make policy without scientists, but it is possible for scientists to do science without policy and policy makers [12].

Science and policy can be separated. A lot of my work is pure science for knowledge sake. I do think about social responsibility and how work benefits society, but I can keep it separate [12].

Others argued that there cannot be a separation of science from policy.

You must always think in terms of policy outcomes rather than pure science. It is useless to know the solution and not be able to use it [12].

Some scientists are stuck back in 1755 with their attitudes. They are technicians who believe you can have science and policy separate and objective. They do not realize the entire system is political [12].

Today much of what science does is driven by society's view of what is important rather than trying to reach a thorough understanding of how the world works. Science and policy are not independent. Science is steered by the availability of resources [12].

We really erode our political and public policy dialogue if we think of social policy in separate compartments. Science clearly has to focus on the majority policy questions. Yet, most scientists do not know how to phrase the questions or organize their research to answer the questions [12].

But many scientists made the point that it is the interface of science and policy that holds the key to establishment of good environmental policy; that is,

To have a fundamental system you need feed back loops that accurately and on a timely basis give information back to the other side, both on the science and policy sides. Scientists provide the data and policy makers the questions. The question is in the degree of overlap. There still needs to be a way to insulate the sides, but there is more of an effort from the policy side to influence the science than the other way. Scientific integrity must be protected from the policy imperative of the day [12].

There must be a linkage between science and policy. The problem is when we get scientists trying to be policy makers and policy makers trying to be scientists, both amateurs in the other's field [12].

In other words, there is a "need to have brokers in the middle who will interpret the science and scientific findings and to consolidate the science and express it in a policy relevant manner" [12]. Or, as another scientist declared:

It is possible to separate science from policy as long as there is a liaison person who can translate between the two, an individual who understands science and can translate scientific information that is useful to the policy maker. Most scientists cannot do that or don't do that well. They are caught up in their research and don't think about the policy aspects [12].

The results of the fourth interview question, "Is it possible for scientists to be objective in completing their research?" are presented in Table 4. The word "objective" was not defined for the scientists being interviewed. It was left up to each individual scientist to answer the question based on his/her interpretation of what "objective" meant. A large majority of scientists from both countries appear to believe that scientists can be objective in completing their research, with a slightly higher percentage of Canadian scientists (72.7%) than United States scientists (60.6%) taking this view.

Scientists tended to defend objectivity as one of the essential qualities of being a scientist. One scientist stated that he would have a "hard time being a scientist if

Table 4. Scientists' Perceptions of Objectivity

The interview question was: "Is it possible for scientists to be objective in completing their research?"		
	United States (n = 33)	Canada (n = 33)
Yes	60.6%	72.7%
No	18.2%	12.1%
Individual, No; Within Process, Yes	21.2%	15.2%

he didn't believe he could be objective" and another stated that scientists would "not be true to their scientific credentials" and would be "abusing science" if they did not practice objectivity [12]. This point of view is summed up as follows.

Yes, scientists can be objective. In fact, that is exactly what makes for the integrity of science and scientists and separates them from others. It is extremely important to be just and true and science has to be seen as being that, having integrity of scientific thought and judgment [12].

One scientist decried what he viewed as a recent trend to abandon objectivity as a goal of scientists.

What worries me is that we have even abandoned objectivity as a goal. Scientists ought to struggle for objectivity—show a disdain for advocacy. But neither the public nor the administration shares this belief of mine. You get research dollars if you choose the side that they want to hear [12].

Another scientist described how his objectivity is slowly being compromised by forces on the policy side of the equation:

We like to think we are being truly objective but in fact we are not . . . Now, the numbers are never fudged, but slowly but surely the scope, the audience, and the questions we are asking are being shaped by what we think EPA finds interesting. I will stand completely behind the science but the process is not efficient. We keep rewriting the budgets and grants to fit what EPA wants. So it is easy to see that the science is biased in substance, like in the questions being addressed. We are very objective as far as work is concerned but would have done things differently if resources and money were just given to scientists to do the work. But EPA is responding to a different master—the policy makers—and we scientists have been jerked around for many years [12].

Of special note are the number of scientists who felt that it did not matter whether individual scientists could be objective because the scientific process was designed to deal with this contingency; that is,

There is the notion of intersubjectivity where it is not so much that individual scientists are objective but that as a group they will come to some finding that is possible [12].

I do not adhere to the view that scientists . . . are objective. However, we do follow the scientific process and that is where objectivity comes in. You can say which scientists are more credible and it is done by following a rigorous process [12].

We have the scientific process that is self-correcting and driven by empirical data as objective as humanly possible. This equals the scientific method and it is the ideal we should all strive for. But everyone is human and we never fully live up to those ideals. But that is why we have a self-correcting process and

where replication takes over. Science is an intensely human endeavor full of mistakes, but by nature it is the best process as opposed to all the other processes. It gets you on the right track and sooner or later it will come to the right answer. My fear is that we do not let the process run its course [12].

COMMENTS AND CONCLUSION

The need for understanding the linkage between science and environmental policy making has never been more evident than it is today. The social role of contemporary science is now "at a time when the relation between knowledge and power is more contentious than ever" [13] and there exists an increasing reliance of societies on complex technologies which has accelerated the "need for the contribution of scientific expertise to public policy" [14]. In this type of environment, it is important that we consider how the scientists involved in conducting environmental research view their role in formulating public policy.

To this end, the purpose of this study was to investigate the science-policy linkage as viewed today from the perspective of scientists who participated in the environmental policy making leading to our current acid rain policy. As delineated in the introduction, some of the most preeminent acid rain scientists in the United States and Canada (e.g., Loucks, Perhac, and Schindler) were highly critical of the policy making process, suggesting that politics corrupted the science-policy linkages and eventually led to a deterioration of scientific credibility. They essentially castigated scientists for lacking objectivity, for failing to distinguish between science and policy, and for out-right advocating policy positions. In light of these criticisms, this author asked scientists to express their views about the current science-policy linkage and their responses proved quite interesting.

First, it is important to note that, except for a few instances, there were no substantial differences between the responses of United States and Canadian scientists with respect to the four questions asked. Slightly higher percentages of Canadian scientists were more apt to believe that scientists could be objective in completing their research and were more apt to believe that science had a strong influence on policy makers. This lack of a major difference between the views of scientists from two different countries provides a certain amount of consistency to the overall responses and allows us to focus on the substance of the questions that were asked.

The interviews revealed that few scientists believe that science has a strong influence on policy makers. In fact, scientists perceive that we have moved into a world where the relationship between themselves and policy makers is skewed toward the policy (and political) side, with policy makers having the ability to manipulate, ignore, and frame science as they see fit. In this light, a good many scientists view their work as becoming less relevant to environmental policy decisions because they are not consistently communicating the science to policy

makers in a meaningful manner. That is, scientists sense that the science is not getting through and that they must do a better job of “packaging” their findings in a way that is more understandable and appealing to policy makers.

Along these lines, the interviewed scientists overwhelmingly believe that scientists should advocate policy positions. While this may seem odd (given the fact that a majority of the scientists also attached great importance to scientific objectivity and the need for separating science and policy), this finding should be viewed in the context of what Walter Rosenbaum describes as the treacherous zone between science and politics that compels public officials to make scientific judgments and scientists to resolve policy issues when neither is trained to make such judgments [15]. Basically, scientists are attempting to function in two different worlds under two different sets of rules. On the one hand, scientists feel strongly about the need to retain their scientific objectivity. Indeed, scientists believe it is following this tenet of the scientific method that separates them from all other interested parties. On the other hand, scientists also feel they have a moral and civic responsibility to insure that the “good” science is getting into the policy debate.

The key for many scientists is that they feel that they can balance both worlds—that they can separate personal and professional behavior under the guise of acting as citizens at one point in time and acting as scientists at other points in time. This view is bolstered by the belief among scientists that if they continue to work within the confines of the scientific process (with its systematic use of peer-review and replication), all values will be filtered out. But this is the very thing that brought on the wrath (and criticism) of scientists like Loucks, Perhac, and Schindler.

By venturing into the policy arena, scientists risk losing their standing in the scientific community. Yet, according to the interviews for this research project, more and more scientists are willing to take that chance. They believe that if policy makers are choosing which science to use based on their ideological bent rather than an evaluation of the science itself, then scientists have a civic duty to communicate their views (i.e., advocate) in the context of what they, as both scientists and citizens, believe is important. Essentially, many scientists have decided that policy makers alone should not be left to frame scientific knowledge and that scientists have a responsibility and obligation to insure that policy decisions are indeed based on good science (meaning science explained and communicated by the scientists themselves).

Understanding why scientists have moved toward an advocacy role is helpful in evaluating the part that science plays in the environmental policy making process. Whether this movement toward advocacy harms scientific credibility in the long term remains to be seen. However, it certainly appears that more and more scientists are willing to risk the status of their scientific credentials in hopes of remaining (or becoming) relevant to the policy making process.

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