

# INTERNATIONAL JOINT COMMISSION GREAT LAKES WATER QUALITY AGREEMENT PUBLIC FORUM

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## GREAT LAKES SCIENCE ADVISORY BOARD

*Tony Wagner, Canadian Cochair, Science Advisory Board*

Commissioners, ladies and gentlemen, thank you very much for this opportunity to present, not necessarily a report of the Science Advisory Board are working on. Prior to starting however, I would like to introduce some members of the board that are present, particularly Michel Fournier, sitting at the front here, Brian Gibson is in the audience, George Werezak, Diane Henshel. I would also like to acknowledge our secretary, Peter Boyer and Michael Gilbertson who is secretary to the Ecosystem Health Workgroup. While I am in the process of acknowledging individuals, I don't know whether Doug McTavish has been acknowledged. I was out for awhile, but Doug has concluded his tenure as Director of the Regional Office in Windsor, and if we have not yet acknowledged him with an applause for the work that he's done on the Water Quality Board and the Science Advisory Board, Doug has been an immense value to supporting the work of the Commission. I would like to do that now, please. Doug, stand up.

My Cochair, Michael Donahue, expressed his regrets for not being able to be with us this morning, But he does extend his best wishes.

The Science Advisory Board operates on a structure of three working groups. All of the members of the board are assigned to one of the working groups and those workgroups are subsequently augmented with experts in various fields. The three work groups are ecosystem health, parties implementation, and emerging issues.

I'm going to take a few moments to refer to the categories of recommendations in the Priorities Report. I commend the report to you. We will not take time to review what's in here, but it is worth reading.

- The first two categories of recommendations are outputs from the Ecosystem Health Workgroup and one of the roles of the Science Advisory Board is to bring together, debate and discussion among scientists on scientific issues.
- The next are with respect to the PCBs, the New Equilibrium within the Great Lakes basin.
- The RAP process as well as the State of the Lakes Ecosystem Conference recommendations are from the Implementation Workgroup and we have comments relative to the IJC's future role with regard to evaluation of the RAP process, and also how the State of the Lakes Ecosystem Conferences could be more useful
- The last three are outputs of the Emerging Issues Workgroup. I would like to make reference to Ambassador Fraser's comments from last night about traditional economics determining that the Exxon Valdez disaster was beneficial to the gross national product of a country, there's really something wrong with this in terms of how we value the environment. So we do make a recommendation in terms of changing the way we go about evaluating our system.

Without taking up more time, we are going to have two speakers speak on areas of their expertise. The first will be Dr. Theo Colborn. Theo is a member of the Workgroup on Ecosystem Health. She will be talking on results of transgenerational exposure to persistent toxic substances. Theo works with the World Wildlife Fund in Washington and she's also the author of a recently released report "Our Stolen Future." I would commend that report to you as well. Following Theo will be Dr. Michel Fournier, and Michel is with the University of Quebec, the National Institute of Scientific Research. He will be speaking on immunotoxicity of persistent toxic substances. Theo

***Theo Colborn, member, Workgroup on Ecosystem Health and World Wildlife Fund, Washington, DC***

I was told to do the history, tell you everything about PCBs and everything else I know in ten minutes. I am going to speak fast and do the best that I can so we can keep to our time allotment.

In the 1960s, wildlife biologists began to notice that wildlife populations were disappearing around the Great Lakes, and many were obviously destabilized. Over the years, on closer examination, they began to notice that the animals were dying before birth or hatching, if they were fish, birds or reptiles. If they survived to birth, many times they did not thrive through to adulthood or were incapable of reproducing.

This is a slide of a bald eagle that was born in 1993 on the shorelines of the Great Lakes. One of the obvious problems that they are seeing still in the birds around the Great Lakes are crossbills. The research also discovered that there were behavioural changes going on in the wildlife populations, that male fish and birds were not making it through to sexual maturity and actually had gonads from both sexes.

There are thyroid hormone problems even today. This is a slice through the side of the head of a coho salmon. You can see that bright red area is the slice through the gills. The thyroid is that big mass right there down at the bottom of the gills. You shouldn't see that thyroid gland. That's an extremely large gland. Under ordinary conditions, you have to take a piece of jaw into the laboratory and do a slice and look for the vestigial thyroid cell tissues. This is going on in Lake Erie today, even after the eutrophication has been resolved. In the last five years, they are finding these thyroid glands exploding. Something is still going on. The interesting thing about the work is that in every case, except for this thyroid problem, in most of the populations, the more highly contaminated were the most affected.

Now, what the wildlife biologists did was to collaborate with others. They went back into the laboratory and using the same manmade chemicals that they found in the tissues in the animals in the wild, they were able to replay many of the problems they were seeing in the field. The most important thing that came out of this research was the fact that they discovered that the mothers were serving as a pathway for these manmade chemicals to their offspring -- either in the womb or in the egg. This knowledge combined with the worrisome reports were coming from a team of psychologists, Sandra and Joe Jacobson about impaired neurological development of children whose mothers had consumed Lake Michigan fish prior to their pregnancies, led to a concerted effort by the Agency for Toxic Substances and Disease Registry [ATSDR], which is a subdivision of our Health and Human Services in the United States. They began to investigate the human health problems around the Great Lakes basin. They have just right now -- within the last couple of weeks -- released their first results and these results are available. In essence what they have said is that using the weight-of-evidence approach and looking at the work of wildlife biologists, toxicologists and epidemiologies, there is clear indication that populations continue to be exposed to PCBs. In this case, they are talking about

human populations, and that significant health consequences are associated with these exposures. Now, this is an outstanding statement coming from a federal agency.

What I would like to do now is take you back through some of the research findings that led to these conclusions. I think we should start with the seminal work of Sandy and Joe Jacobson. Infants born between 1980 and 1981 of mothers who ate two to three meals per month, that's not many meals per month for someone like me who is a fish eater, of Lake Michigan fish at least six years prior to their pregnancies, were behind at birth in neuromuscular maturity when compared with controls. This deficit was associated with levels of PCBs in the unborn baby's blood which the mother shared with her baby. At age 4, again based on the levels of PCBs in the unborn baby's blood, these children had difficulty with short-term memory. At age 11, the most highly exposed children during gestation, had an average 6.2 IQ deficit and some were more than a year behind their peers in word and reading comprehension. Those in the highest group were more than two year behind their peers.

When assaying the blood of these children at age 11, the children's PCB concentrations were not associated with their achievement measures or their IQ scores. In other words, if the Jacobsons had only tested the children's blood at age 11 for PCBs, they would have ruled out PCBs as a causal agent. This is extremely important to keep in mind, especially for researchers and health professionals, when seeking causal links with synthetic chemicals. Millions of dollars have been spent and are still pouring into cancer research studies in the U.S. to look at the concentration of contaminants in diseased tissue, such as cancerous breast tissue, seeking a causal link with specific chemicals. Unfortunately if the study finds no association, the press immediately jumps to the conclusion that chemicals are not involved at all and writes the issue off!

What if the breast cancers were associated with the synthetic chemicals that the women who developed breast cancer were exposed to before birth? Chemicals that were in their mothers. Chemicals that sensitized them to cancer before they were born. I can't go into it today, but there's a whole body of new research that lists chemicals that when they are in the womb, during early prenatal development, can actually lay down enough hormonally responsive tissue in the secondary sex organs, so those individuals as they mature are definitely going to be more sensitive to the natural hormones they produce and any synthetic chemical they might encounter later on in life. This is a very serious consideration to take into mind when we are thinking about how we look at exposure and make links.

Also important in this Jacobson study was the mother's fat approached 1.25 ppm in PCB content, the intellectual detriments among the children became significant. Now, as the authors of this study pointed out, one does not have to eat fish to accumulate this amount of PCBs because PCBs are found in meat, dairy products, fast foods, ocean fish, ice cream and even vegetarian diets. This is not a problem that is linked only to the Great Lakes. For example, average PCB fat levels around the industrialized world run at about 1 ppm in human fat, suggesting that a sizable proportion of the general population is being affected. In some regions this could be more than 11% of the children being born, and up to as much as 20% of the children being born today.

In a recent study done by the Center for Disease Control just found that there is a four-fold increase in probability of developing non-Hodgkins lymphoma when body fat burdens exceed 1.07 ppm of PCBs. I know you're all sitting there wondering what your body burden is of PCBs.

In another mother/infant study that commenced 12 years later than the Lake Michigan study between 1992 and 1995, infants of mothers who, again, ate approximately 2-3 fish meals a month of Lake Ontario fish over their lifetime prior to their pregnancies, when compared with controls, also

displayed the same neuro detriments at birth as the Lake Michigan infants. When tested with an additional set of tasks, were found to be hyper-reactive similar to the effects reported in rats that had been fed Lake Ontario fish.

Using new test protocols we are just finding new reports coming out from this study. The babies in this study were also found to smile and laugh less. They expressed more fear. They were more difficult to sooth and calm down than control babies in this study. These changes in temperament were associated with the mother's lifetime consumption of fish, not just what she ate during pregnancy or recently near her pregnancy. These findings suggest that PCB concentration in Lake Ontario are still not low enough to protect human health.

One more study: in the Netherlands, another large healthy-mother infant study was undertaken across the general population from an urban to an industrialized area, not necessarily looking at fisheaters. Those infants of the mothers with the highest PCB/dioxin levels -- they got more sophisticated with their chemistry by the way -- they exhibited psycho-motor deficits at three months. Now a different battery of neurological development tests were used in this study, making comparisons difficult, and just having listened to Don McKay, I think that it's obvious that somehow/someway we've got to figure out how to harmonize the presentation of the results or studies when we are doing some of these very long-term, expensive human epidemiological studies.

Other biochemical measurements were also added to the testing protocol in this study. They looked at thyroid hormone levels in the infants and found that they decreased as the PCB/dioxin levels increased. The thyroid hormone plays a critical role in brain development. Today there are increasing reports about the impacts of PCBs, dioxins and pesticides on the thyroid system -- the brain and behavioural development. By the way, we have a new addition of a journal coming out within a month with a whole compendium of papers discussing this topic. In addition, in this study, they also looked at the infant's immune systems and found that they were quite different. They varied in the dose-response manner -- again with PCBs and dioxins. Michel is going to speak about the immune system in a minute. But what this means in the long term is yet to be determined. Again, in this Dutch study, a sizable proportion of the population was affected.

In all three of these studies, and another one from North Carolina, it was the exposure prenatally -- 266 days back from the day of conception. We usually don't think about that time. It was not the result of breast feeding that led to the children's impairment. It was something in the womb that changed their course of development. It is important to note that in each of the human studies that I just mentioned, even though the detriment among the children were statistically significant at the population level, their loss would not have been recognized by the infant's parents or doctors. It took skilled psychologists and technicians to quantify the changes in the children. These children are not obviously sick as Andy [Gilman] said 'we don't look for these parameters in our health registries.' Physicians and public health officials would have missed these effects. These children are not retarded or obviously different, nevertheless they are not developing to their fullest potential and certainly the quality of their lives and their parents' lives, and I'm a grandparent, the grandparent's lives, will be reduced as well.

The economic and social costs of this loss at the population level have not been calculated to date. Economists are now considering the lifetime earning loss for each IQ point reduction per year class of children born. From the experience with lead, this could mean billions of dollars in lifetime earnings per year class of children born in the U.S.A.

As a group of experts who met to look at the impact of endocrine disruptors on the developing brain and behaviour reported recently that they were certain the widespread loss of this nature can change the character of human societies and destabilize wildlife populations.

In order to close, I have something I want to advertise for Andy Gilman here. This was the report that was just released on Friday by Health Canada that supports quite a bit of what I have just told you. I think you should all take the time to look at this. We have two government reports that are telling us that something is happening from the day of conception -- 266 days -- until birth that's changing the destiny of our children. We have GOT to wake up and pay attention to this. Thank you.

***Michel Fournier, Cochair, Workgroup on Ecosystem Health, and National Institute for Scientific Research, Montreal***

I will try to give my presentation in English, but you may need the translation device anyway. I am very pleased and honoured to speak on this occasion, especially after the presentation of the other boards.

I have been given the task of providing you with the evidence on the toxicity of persistent toxic substances. About 20 years ago, a group of researchers began to be interested in looking at the immune system as a target for the toxic action of environmental contaminants. They started a series of experiments in which they exposed different laboratory animals, such as mice or rats, to different chemicals present in the environment. In that case, it was dieldrin. After several exposures, they looked at the effects on the immunological endpoints and they found with several chemicals, like dieldrin, there were several components of the immune system that were affected. The effects on the immune system was strong enough to compromise the role of the immune system which is to protect the organisms against bacterial disease or viral disease or cancers. So after 20 years of research in that field, it was clear that exposure to several persistent toxic chemicals that the immune system may be suppressed and dysfunctional. This could lead to increased susceptibility to infection, increased susceptibility to cancers, and development of several autoimmune diseases.

But all this work was performed in lab animals so the next question was do we have the same type of effects when we are dealing with wildlife species? So a series of experiments using the immune cells coming from various species was undertaken in an attempt to see if the wildlife species are sensitive to chemicals. With the use of these cells and in vitro exposure to several chemicals, we were able to point out that we have suppression of functions and that all species studied to date were affected. There was no specie that was exempt of effects. With comparative studies, we were able to point out that the aquatic species were the most susceptible. As an example, you have here, dose-response studies of exposure to several metals on clams. Another example is the effect of DDT on beluga whales in competent cells. You can see that at some concentrations we have toxic effects of DDT on the competence of immune cell in vitro. Using this kind of approach, we can compare the sensitivities of all the species studied to date. You can see from the results that aquatic species, especially fish, bivalves, are the most susceptible to persistent toxic chemicals whereas mammals and humans are more resistant but they all present toxic susceptibility.

The second question is what is the real exposure from chemical mixtures and do we have effects with wildlife species. A series of experiments have been started using wildlife species and lab controls with environmentally relevant cocktails. This was done using earthworms bivalves several types of fishes and even an experiment performed using seals. The type of results we have in that case, you have lesser scaup that were fed zebra mussels coming from the Great Lakes, you can see the development of the immune suppression following time of exposures. Also, here are the results of America place

that were exposed to marine sediment coming from the St. Lawrence estuary. You can see in columns 2 and 3, the suppression of immune function with sediments coming from the St. Lawrence Estuary as compared to a clean sediment in column 1.

Using those approaches, it was possible to demonstrate that wildlife species are sensitive to chemicals as they are present in the environment. So the next step was to get into the field and identify effects directly in the species in the fields and try to correlate these effects with body burdens or exposure to specific contaminants. This has been done to date in several species: bivalves, trout, terns, herring gulls, alligators and polar bears. There is a nice study that has been completed in the Canadian Wildlife Service with terns and herring gulls, in which they were able to put in correlate exposure to PCBs and impairments to immune function. The type of correlation as presented by Theo Colborn from the Dutch study. As an example, you have results of fish exposed to pulp mill effluents directly in the Maumishee River where you have suppression of immune markers or even, in the case of alligators, the comparison of the immune competence in alligators living in two different lakes, a clean and a highly polluted one in Florida.

In humans, as presented by Theo, we begin to have epidemiological evidence that we have immune impairment related to exposure to chemicals. We have other evidence but those are coming from normal accidental exposure or from occupational exposure that immune system in human is sensitive and the types of detrimental effects that we have noted with wildlife species can be present in humans in relation to exposure to chemicals.

In summary, the immune system may be the target for the toxic action of environmental contaminants, auto-immunity allergy, increased susceptibility to infection and cancer are among the consequences to exposure. There is to date no species protected. There are some species presenting more sensitivity than others but again, there is no species exempt. Actual environmental levels of contaminants are immuno-toxic in several species as shown by the field assessment of immune function in wildlife. Thank you for your attention.

***Tony Wagner, Cochair, Science Advisory Board***

Thank you Theo and Michel. The Ecosystem Health Workgroup is presently preparing a final report to the Commission, based on a health conference that took place in Montreal in May, sponsored by Health Canada, Health Quebec and the Agency for Toxic Substances and Disease Registry in the U.S. That was followed by a policy workshop that took place at the beginning of September in Wingspread in Racine, Wisconsin. Based on that, policy advice is being prepared for the Commission to be used by them as part of their next Biennial Report which we expect to be out some time early next year.

Just because what we are experiencing in the Great Lakes basin is not unique to the Great Lakes basin, but essentially global, there's no reason for us in the Great Lakes who have the leading edge technology, leading edge scientific wisdom and knowledge to not be world leaders in trying to confront the issues that you have just heard. Mr. Chairman, that is our presentation.

***L.H. Legault, Chairman, Canadian Section, IJC***

Are there any questions? We would like to keep them brief as possible.

**Q:** Good morning. My name is ***Terry Yonker***. I am from the ***Lake Erie Alliance***. Approximately five years ago, I chaired a project advisory committee for a project funded by the Great Lakes Protection Fund for over a third of a million dollars and it was to respond to Annex 12 of the GLWQA under

early warning systems. That is to study the feasibility of establishing a Great Lakes regional biological specimen bank. The project advisory committee was made up of a binational group of government scientists, university scientists and others who concluded that such a bank was feasible and ought to be developed in the Great Lakes. One of the major concerns we had was that all of the biological specimens that go into the research that we were talking about here this morning, we are occasionally losing. In the future we may not be able to do those retrospect analyses that are all important to the future research within the Great Lakes. Would the Science Advisory Board entertain a review of those recommendations and the possibility of establishing such a bank in the Great Lakes?

**R: *Tony Wagner:*** Terry, I appreciate your comments. And thank goodness for the specimen bank at the Canadian Wildlife Service. In their wisdom, was established in the 1960s and 1970s that we are able to retrospectively give us a good handle on the rates of decrease of many of the substances that are in the environment and the cause for the extirpation of many of the native species in the Great Lakes basin. Reflecting back to some 10 years ago, a specimen bank was very much on the agenda of the preparation of the Great Lakes National Surveillance Program [GLISP] as was discussed very briefly yesterday morning in the recommendation to the Parties and I believe that the resurrection of GLISP is on the agenda. I would certainly encourage those in the audience who have an impact on the development of GLISP to consider specimen banking as a component of the Surveillance and Monitoring program. Thanks, Terry.

**Q: *Daniel Green.*** I would like to ask Dr. Fournier. Bonjour Dr. Fournier, merci ... from Niagara Falls. Dr. Fournier, we have heard recently in the Chesapeake Bay environment certain bacterias, almost like fish/flesh-eating disease, *Pfeisteria*, if I am not mistaken, have cropped up. These disease has been transferred from fish to fishermen with some effects. You have mentioned to us, reduction in immuno-competency of certain cells in certain animals. Of course, the question, what does this all mean in the immune response of these organisms? Have you gone a step ahead saying well this is what we've measured and this is the results of the effects of this immuno-reduction in the species?

**R: *Michel Fournier:*** I can answer that by giving an example of an experiment that has been done in the Netherlands in which they fed the seals with fish coming from the Baltic, as compared to fish coming from the Atlantic. Fish coming from the Baltic are having higher contents of PCBs and other organochlorines. The seals present immune defects and also viral disease occurs in these seals. Looking then at the immune response along with the disease and the viral exposures, it's was also decreased so that's probably the first demonstration outside lab animals with a real situation, that exposure to chemicals may lead to decreased resistance to infections and reduction of populations.

**Q: *Daniel Green:*** I would have one more question for Theo, if you don't mind. Dr. Colborn, we have heard this week of a newly-published study in the New England Journal of Medicine from Harvard explaining to us that there seems to be a negative correlation between instances of breast cancer and concentrations of PCBs and DDT in breast cancer. Could you comment on that study?

**R: *Theo Colborn:*** Yes, I addressed that in my talk. I said that we were spending millions of dollars looking for chemicals in the tissue of the women who have breast cancer. We are designing type 2 studies, which in other words, you get false negatives. These studies, in effect, are designed to create false negatives. They are not looking in the right place. I said they must go back and find out if these women were exposed in the womb and whether their mothers were exposed.

**Q: (*Green*)** So in your opinion, this study was not well designed?

**R: (Colborn)** These studies are not well thought out at all, based on our current knowledge of the mechanism of actions of these chemicals.

**Q: (Green)** Thank you.

**R: (Colborn)** I'm glad you brought that up, Daniel.

**Q:** My name is *Ian Brindle*. I wanted to commend Dr. Colborn on the studies identifying problematic concentrations at this point in time. It reminds me of the studies that resulted in lower standards for lead in the environment as a result of behavioural criteria. I hope that we can look forward to such type of criteria being used to develop new standards for chemicals in the environment. The second point I wanted to make is that I continue to be troubled by the lack of comment in documentation from many sources relating to the International Joint Commission and by various other organizations, on the compounds that are being released by the dumps along the Niagara River. I refer specifically to this group of fluorinated compounds that have been identified by Ronald Hites, that have been found as far away as eastern Lake Ontario where there's significant potential for these to have an impact, but they seem to get scant attention, except from Dr. Hites and his group. I hope that the Science Advisory Board will at some point take this out and do something with it.

**R: (Wagner)** Thank you very much for the comment. I appreciate your comments and the work that Dr. Hites has done. He's traced a lot of substances, markers from the lake back into, say Hyde Park, for instance. I would suggest that a lot of the work that's being done under the Declaration of Intent by the four parties on the Niagara River, hopefully, is identifying part of those connections and certainly the release of the stage 1 report of the Lake Ontario LaMP might provide us a source for comment as to whether or not they are appropriately addressing the issues of releases from the sites alongside of the river.

**Q: (Brindle)** As far as I know, nobody is looking at these as potential endocrine disruptors. I think it's that that particularly concerns me.

**R: (Colborn)** May I interject something here. Remember the ATSDR report and the Jacobson report all said "PCBs and their co-contaminants." Unfortunately, the number of chemicals that are in the environment got way ahead of our detection techniques and the money to go out and detect them. But we have looked at a handful of chemicals and used them as our 'chemical indicators.' There could very well be associated with a lot of other chemicals that are out there. Now the EDSTAC process, which is the Endocrine Disruption Screening and Testing Advisory Committee is working on this particular issue that you just raised. How are we going to look at the 70,000 chemicals out there and prioritize them? This consideration is being taken into their plans for how we are going to prioritize and start looking at chemicals.

But I would like to go back to one thing. I get very nervous when I hear people talking about standards. We have to find a new approach to deal with chemicals. Some of these chemicals have no threshold. I want to explain something to you. You're alive, you are standing there, you are producing hormones all the time, you're gasoline is on, your system is running. We are dealing with a system that's running, your system runs at a little different level of testosterone and estrogen than someone else over here. There is no threshold for the kind of chemicals and the mechanisms that we are talking about. You've got to start thinking about that. When you think about reducing the levels, we have got to think about maybe reducing the mix, the numbers of chemicals that are out there, because we're setting ourselves up for all kinds of unexpected, interactive reactions. When you're dealing with that precious 266 days, we know it only takes one hit to make a change. These are the things you are going



to have to weigh in your decisions when you start seeking changes. Be careful of the terminology you use and don't get locked into the old paradigm.

**Chairman Legault:** I would just like to note that we will not be able to accept any more speakers, except those that are now at the microphones. Please only one question and very brief.

**Q: Bill Borden from Lake Michigan Federation.** Two months ago, U.S. EPA sponsored an endocrine disruptor workshop in Chicago. A representative from the Chemical Manufacturers Association denied any direct quantifiable links between organochlorines and human health effects. So my question, if you wouldn't mind taking off your very respected scientist hat and putting on a policy hat, is; In the year 2002, when there is finally established a direct and quantifiable link between one of those chemicals and human cancers, and a coalition of environmental groups gets together and sues the chemical manufacturers successfully for \$500-billion, is that what it's going to take to move the removal process along and push the virtual elimination strategy forward. Is that's what it's going to take?

**R: (Colborn)** No, I don't think it will, because there are too many chemicals out there. You're never going to be able to do the human experiment you want and expose a single, pristine individual to one chemical and prove it. When you get with a bunch of lawyers in the courts, you're not going to win. Believe me, don't go for suing. Let us educate the manufacturers that the product they're using is not safe. Believe me, already, out of that EDSTAC process, I know this is happening, scientists are coming and sharing their ideas on how we may be able to screen and test the chemical for one of these effects. We don't have a validated screen to test a chemical today for endocrine disruption. But I know that the industries are listening, they're going back to their laboratories already, they're scrambling, they're trying these things, and they're testing their chemicals.

The bottom line, of course, is the dollar, and the company that can come out and say: we've tested our product with every one of the possible screens and assays that's available now, and we'll tell you it's safe up to this point is going to be the company that survives through 2050. I think what we have to do is work hard to bring along the scientific knowledge, catch up with the technology that got us in the mess we're in. I don't believe in turning to technology to solve our problems by the way; that's a big mistake, but basically, this is the way we're going to do it. It's going to happen. We are going to get changes in products long before we get the legislation, even on the books, and then figure out how to enforce it. Truly, I am thoroughly convinced of that, but YOU can't let up.

The public and IJC, and other international organizations have to form together and unite and address this on an international level. Believe me, when the truth comes out about some of the plastic products we're using, the manufacturers of these chemicals took off just like the organochlorine chemistry industry did. We plodded along and we've been mapping the route of the organochlorine chemicals. We're just beginning to realize that we should have been following the polymers, the monomers that went into the polymers, and the additive that we've been putting into our plastics. It's a lot more complex than what we have been addressing here today.

**R:** Hello, my name is *Jeanna Paluzzi*. I work day to day in the *Clinton River AOC* but I am also affiliated with the *Lake Erie and Lake Michigan Forums* in the development of LaMPs. One comment I would like to make the next time we meet in two years is that we should have your presentation and other related to health effects on October 31, Halloween and then talk about the actions that have been taken on All Souls Day, on November 1<sup>st</sup>. Secondly, I am also quite thankful that ecosystem economics have been taken up as an emerging issue. I would wholeheartedly offer my participation in anything that we could do to move that along. I am especially interested in trying to

find any documentation of the economic benefits of environmental protection. We are finding in the State of Michigan, that through some heavy lobbying by the Homebuilders Association and Developers that we've had two iterations of amendments to our subdivision control act which provides for unbuildable lots. Given the burden on local governments, and making landuse decisions, it makes it increasingly difficult to have rational development within our watershed in the context of an active wise-use movement when we've got legislation that creates unbuildable lots. Anything that this task force or group could do that might be developed around ecosystem economics and getting towards documenting the benefits of developing stormwater management plans up front, rather than reacting to development as it occurs would be helpful. The Clinton River Watershed Council, 20 years ago, came out with a document called "Stormwater Management Planning for Michigan Communities" which documented a ten-fold decrease in capital infrastructure and improvement costs by having the planning process in place. We're now launching a two-year effort to take a look at the functional values of wetlands in our watershed. Anything that we can get our hands on to work with the development community, with consulting engineering firms, with site planners, landscape architects, and encourage them that there is an economic benefit, not only private sector benefits, but also community benefit, for protecting these community assets would make my job tremendously easier.

**R: (Wagner)** Thank you for your comments. I want to remind the audience that the Commission is searching for advice on priorities for 1997 to 1999 and I believe a book is out on the table to assist the public in providing that support. Our recommendations are to the Commission and we certainly take guidance from them as to how the next two years will evolve, but I appreciate your comments.

**Q:** My name is *Tim Eder*. I am with the *National Wildlife Federation*. I'm glad I get to make the last comment today for the benefit of the SAB and the Commission, I want to know how much we appreciate the work of the SAB and that you, Theo and your colleagues are doing for all of us. The work that you've done to identify health effects, particularly from endocrine disrupting chemicals, has been absolutely crucial to our understanding of the nature of the problem of toxic chemical contamination in the Great Lakes. It demonstrates and provides the justification for the wisdom of those policies of virtual elimination and zero discharge in the Water Quality Agreement. It gives us the inspiration and motivation to keep working against what sometimes seems to be such impossible odds. What we have learned, of course, is that the most important problems are not what we thought they were ten years ago, they are not caused by cancer, they are caused by those chemicals that transmit their effects from one generation to the next by disrupting the development system, and the endocrine system, and our immune system.

I also want you to know that, notwithstanding your comment Theo, about the problem with trying to control these substances using standards, that this work has resulted in some direct action by governments. This work and this body of knowledge that you brought to our attention is now the basis of fish consumption advisories. It's that research that forms the basis of providing advice to anglers and consumers of sport-caught fish. It is also the basis of water quality criteria that we now have in place for the first time in the Great Lakes to protect wildlife. For the first time, we have chemical standards to protect the health of wildlife. They may not be perfect but that is progress and I think that is due almost directly to the work of you and your colleagues. So, to the Commission, I hope you continue this work and I want to say thank you.