

## Summary Document from the



**Sponsored by**

**International Air Quality Advisory Board  
International Joint Commission**





## **Purpose for the Workshop**

Beautiful vistas and rugged wilderness are iconic scenes in the eye of most citizens of the United States and Canada. The world's longest undefended border from Seattle and Vancouver in the west to St. John and Bar Harbor on the Atlantic transverses several of these most attractive and protected areas.

As sister nations, Canada and the United States share many goals, including the preservation and enhancement of these precious areas. The federal governments of both countries have recognized that, in many areas, this common resource has become degraded by the same pollutants – ozone and particulate matter, including acid aerosols - that negatively affect human health. Over the past decade, each country has established its own means of maintaining and enhancing these areas, with distinct mandates, goals and objectives within the context of its existing environmental programs.

The International Air Quality Advisory Board (IAQAB) of the International Joint Commission, as part of its continuing review of transboundary air quality issues, is preparing advice for the Commission on the nature and status of such initiatives and the workshop is one means of developing this advice.

Experts from federal, state and provincial governments as well as regional organizations joined in a review of the recent history, current challenges and possible joint opportunities in various clean air quality area programs. The workshop was facilitated by Dr. Karen McDonald, Director, Environmental Health Department, Concordia University College of Alberta. Dr. McDonald and the staff of the International Joint Commission also prepared this summary report for the International Air Quality Advisory Board, with input and comment from several of the participants, including Board Members.

## **Workshop Mandate**

The workshop stems from a recommendation of the International Air Quality Advisory Board in its report: *Summary of Critical Air Quality Issues in the Transboundary Region*, prepared for the International Joint Commission (ISBN 1-894280-43-1; January 2004). The Board recommended:

***The Commission should champion keeping clean areas clean and prevention of significant deterioration in the border region. As a first step, the Commission should convene an expert workshop in one of the transboundary areas currently within a U.S. Regional Planning Organization (RPO) to review prevention of significant deterioration and related visibility programs in both the U.S. and Canada in detail and obtain advice on effective ways and means to preserve and enhance such programs under both national approaches.***

The Commission accepted this recommendation and requested the IAQAB to continue its work on this issue, which led to the convening of this workshop.



## Executive Summary

This workshop addressed the issue of Keeping Clean Areas Clean (the Canadian descriptor) and Prevention of Significant Deterioration (PSD- the U.S. descriptor) in the border regions. Broad representation from federal, provincial, state and regional entities and the academic communities in both the United States and Canada demonstrated the importance of this issue in the priorities of both countries.

Federal government representatives from each country reviewed the Prevention of Significant Deterioration and related visibility programs and Clean Areas initiatives in detail. While there are some distinct differences between the approaches, marked particularly by a generic focus on clean air in the Canadian case as compared to consideration of air quality in particular designated areas in the U.S. case, a common long term element is the maintenance and improvement of quality in relatively clean (protected parks and wilderness) areas. During the workshop, relevant components of ambient air quality standards and guidelines, emission limits, new project assessment, and long-term environmental goals were presented and compared.

The basis under which clean areas are addressed in the U.S. is the Prevention of Significant Deterioration (PSD) Program under the Clean Air Act. Areas to be protected are designated, and programs and goals established to achieve air quality improvement. In Canada, the program focuses on Keeping Clean Areas Clean as an outcome of a continuous overall improvement in ambient air quality through implementation of national programs including the National Smog Program, Canada Wide Standards, Clean Vehicles and Fuels, emission limits and environmental assessment programs.

Regions across the continent have made substantive progress towards the goal of addressing Keeping Clean Areas Clean/PSD through the cooperative efforts of organizations, jurisdictions and stakeholders. Representatives from four successful regional initiatives were invited to present and discuss their organizational approach, objectives and accomplishments. All four approaches emphasized the importance of a structured coordination and decision-making processes among the stakeholders in the organization.

Scientists from the United States and Canada presented technical approaches available to determine the status of areas of interest and related key data and results. U.S. National maps and data comparisons demonstrate that an east-west dichotomy exists in both countries; that is, the more heavily industrialized and populated east experiences substantially worse visibility than the western part of the continent. The need for coordinated regional approaches, in some cases, extending across the international boundary, to address the maintenance and enhancement of clean areas was evident.

There was a common recognition by the participants that “clean air” and “clean areas” were distinctly different conceptual approaches. The practical definition of these terms varied in different regions of the continent, as well as between the two countries, and among different stakeholders. The effect of this difference requires further consideration particularly in the boundary region.

Both countries and specific regions within them have programs in place to maintain clean air or improve air quality. It was clearly stated that our two countries have some of the most well developed international agreements on environmental issues and many opportunities exist within these to work collaboratively. A key issue was one of raising awareness of the full scope of these opportunities and encouraging the use of them. One suggested approach was a communication forum for the demonstration of success stories, with regional transboundary examples, citing the components critical to success and recognizing the impediments which were overcome or remain. Particular emphasis was placed on the need to continue to promote and enhance scientific cooperation across the border.

Three distinct themes emerged from consideration of a possible future approach to Keeping Clean Areas Clean/PSD in the border region:

1. building on existing programs and partnerships;
2. reviewing and enhancement of regulatory processes; and
3. creating a border region approach.

The key challenges and opportunities identified by the assembled experts focused on three main areas - the defining of 'clean', the role of science, and possible policy approaches. Within these broad areas a number of items were raised as concerns and encouragements to progress on cross-border collaboration and implementation of bi-national projects.

The workshop identified some critical areas most in need of attention, where cross-border efforts could be the most effective. These included:

- (1) A formal review of the current status of integrated monitoring, inventory monitoring stations in the boundary region, including what parameters are currently being measured, gaps or omissions in the measurement programs and, possible changes to make them more compatible and useful;
- (2) Selection of a pilot project region in the border area for assembly of monitoring information and air quality data, identification of risks to airshed, development of recommendations for co-locating monitors, working toward a common plan;
- (3) In anticipation of queries, identification of the economic benefits for Keeping Clean Areas Clean/PSD;
- (4) Continued improvement of cross-border communications, including provision of a forum for dialogue on the issues raised at this workshop;
- (5) Consideration of ways and means to encourage Canadian participation in U.S. Regional Planning Organizations;
- (6) Application of common metrics and measurement protocols and outcomes, including those used in the determination of visibility, across the border regions;

- (7) Development of relationships among those with responsibility for parks and designated areas and those managing the keeping clean areas clean implementation in Canada; and
- (8) Improvement in the processes and procedures for cross border interventions and cooperation in addressing environmental concerns related to new emission sources with transboundary impacts.





## Program and Speakers<sup>1</sup>

### Opening Remarks – Commissioner Jack Blaney, International Joint Commission

- Introduction of Workshop Participants
- Review of Workshop Objectives

### Review of Federal Programs: Recent History and Current Initiatives

- United States – Racqueline Shelton – New Source Review Group, U.S. EPA
- Canada – Ken Smith – Environment Canada, National Smog Program, Transboundary Air Issues Branch

### Regional Perspectives

- Midwest Regional Planning Organization  
Mike Koerber – Lake Michigan Air Directors Consortium
- Western Regional Air Partnership  
Rich Halvey – Western Governors Association
- Georgia Basin/ Puget Sound Pilot Project  
Morris Mennell - Environment Canada, Air Quality Management Pacific Region
- The Alberta Approach  
George Murphy – Government of Alberta, Pollution Prevention and Conservation Section

### Scientific Issues in Prevention of Significant Deterioration/ Keeping Clean Areas Clean

- U.S. Overview – Marc Pitchford – National Oceanic & Atmospheric Administration, Air Resources Lab and Rich Poirot – State of Vermont
- Canadian Overview – Jeff Brook – Environment Canada, Atmospheric & Climate Science Division

### The Fundamental Questions: Panel Discussion

- Elizabeth Waddell – U.S. National Park Service, Pacific West Region
- David Welch – Parks Canada
- Mike Koerber – Lake Michigan Air Directors Consortium

### Panel Questions

1. How do the two countries define "clean air" areas?
2. What approaches and programs are in place to protect clean air or correct degraded conditions in these "protected areas"?
3. What are some examples of cross-border collaboration to protect "clean air" areas? How can U.S. and Canadian programs coordinate or communicate in order to protect these "clean air" areas?
4. What approaches should be considered for the future in Keeping Clean Areas Clean in the border region?

### Open Discussion Opportunities

- Challenges and Opportunities
- Blazing the Path Forward

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<sup>1</sup> Presentations in paper copy or electronic format are available from the IJC



## Summary of Presentations

### A. Review of Federal Programs: Recent History and Current Initiatives

In preparation for the general discussions, federal government representatives from both Canada and the United States opened the workshop by reviewing Keeping Clean Areas Clean (a Canadian descriptor) and the Prevention of Significant Deterioration and its related visibility programs (a U.S. descriptor) in detail. Some common elements and distinct differences were identified. Components of the ambient air quality standards and guidelines, emission limits, the assessment process for new projects, and long-term goals were summarized.

Both countries have national standards for ambient air quality concentrations for particulate matter and ozone: the National Ambient Air Quality Standards (NAAQS) in the United States and Canada-Wide Standards (CWS). These levels are reviewed periodically in national processes. These standards are principally for the protection of human health; secondary standards for other objectives also exist. As an example, the U.S. is currently considering a secondary fine particulate matter standard.

At the present time, under the Canada-Wide Standards process, Canada is engaged in the development of a guidance document to be used by jurisdictions when implementing their strategies to achieve the Canada-Wide Standards. The Canadian program does not directly address visibility. It is recognized by both countries that achievement of the health-based ambient air quality standards may not be adequate for protection of visibility.

Within the United States, the need to prevent significant deterioration in parks and wilderness areas was recognized in the 1977 Clean Air Act, which called for source emission limits, beyond that required for the achievement of the NAAQS, in designated areas. Currently there are 156 such designated areas in the United States. Application of the Best Available Control Technology to particular sources can be required as part of a case-by-case determination considering energy, economic and environmental impacts.

Emission limits are recommended in Canada through guideline documents usually aimed at specific sectors and applied through provincial regulatory and environmental assessment processes. Some examples include the New Source Emission Guidelines for Thermal Electricity Generation and the Cleaner Vehicles, Engines, and Fuels Agenda. Provincial limits or standards may also apply. In a great majority of instances, the province develops and enforces the final permitting documentation.

Concerns over visibility are not confined to parks, wilderness areas and nature preserves. They are also an issue in the urban environment, as illustrated in Figure 1, demonstrating the effect of an increase in fine particulate ( $PM_{2.5}$ ) on visibility in Chicago. It is likely that an increase in relative humidity accompanied this change.

# FIGURE 1. Chicago, Illinois

PM<sub>2.5</sub> = 8 µg/m<sup>3</sup>

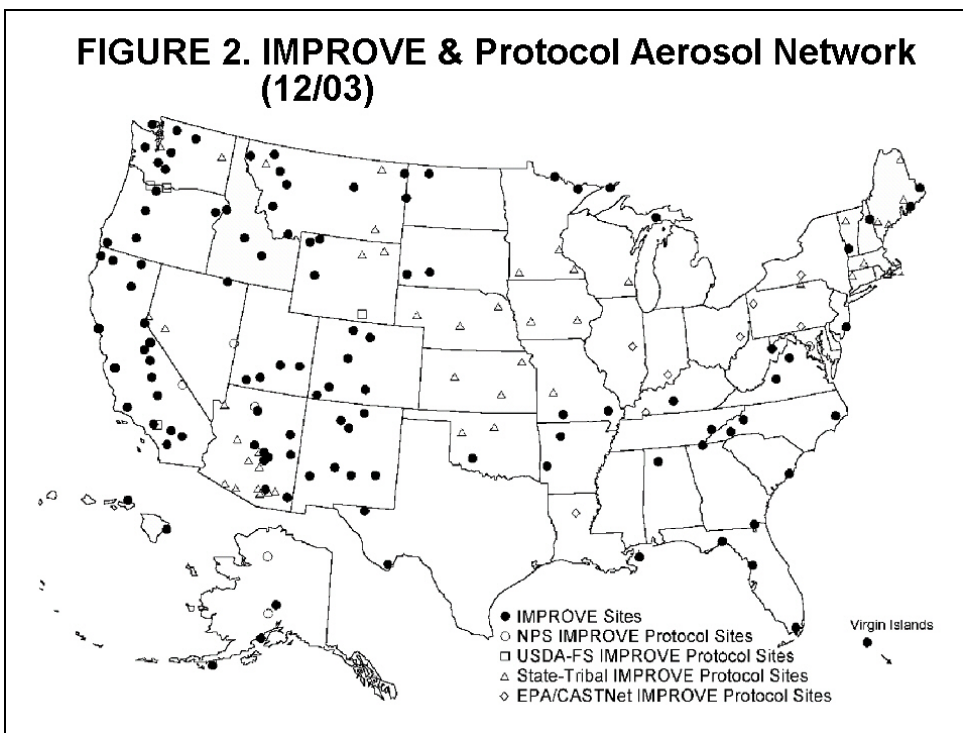
PM<sub>2.5</sub> = 30 µg/m<sup>3</sup>



New and modified emission sources are assessed for environmental impacts in both countries. In the United States, the provisions of the New Source Review and Prevention of Significant Deterioration portions of the Clean Air Act apply; in Canada, the impact of such sources can be considered under the Canadian Environmental Assessment Act and similar provincial acts. In general, both processes encourage best technological and management practices to ensure new developments do not interfere with achieving or maintaining national standards. Public participation in the review process is possible in both countries. The question of participation or intervention in such processes by interests on the other side of the boundary was raised when the possibility of cross border pollution exists; no-one at the workshop identified a formal process for citizen participation in such an instance.

Following initial regulations issued in 1980 to address the deterioration of visibility, and a renewed call for action in the 1990 Clean Air Act, in 1999 the United States promulgated the Regional Haze Rule, specifically aimed at addressing the long-term visibility issue in 156 designated areas, including the National Parks. The goal is to reach natural visibility conditions, taken to be a visibility of between 60 and 80 miles in the Eastern United States and 110-115 miles in the West, by the year 2064 and, in the interim, to continually demonstrate reasonable progress towards this goal. The IMPROVE (Interagency Monitoring of PROtected Visual Environments) network (see Figure 2) monitors scene, optical and aerosol parameters at 108 sites, many of them in or

adjacent to the designated areas, providing some indication of visibility in all the designated areas.



Long-term air quality improvements are expected in Canada with implementation of the concepts of Continuous Improvement and Keeping Clean Areas Clean found in the Canada-Wide Standards and Post 2000 Acid Rain Strategy. Specific action frameworks are currently being developed by provincial jurisdictions.

## **B. Regional Perspectives**

Regions across the continent have made substantive progress towards the goal of addressing the maintenance and enhancement of clean areas through the efforts of cooperative organizations of jurisdictions and stakeholders. Representatives of four specific programs were invited to present their organizational approach at the workshop:

- The U.S. Midwest Regional Planning Organization
- The U.S. Western Regional Air Partnership
- The Bilateral Georgia Basin/ Puget Sound Pilot Project
- The Province of Alberta

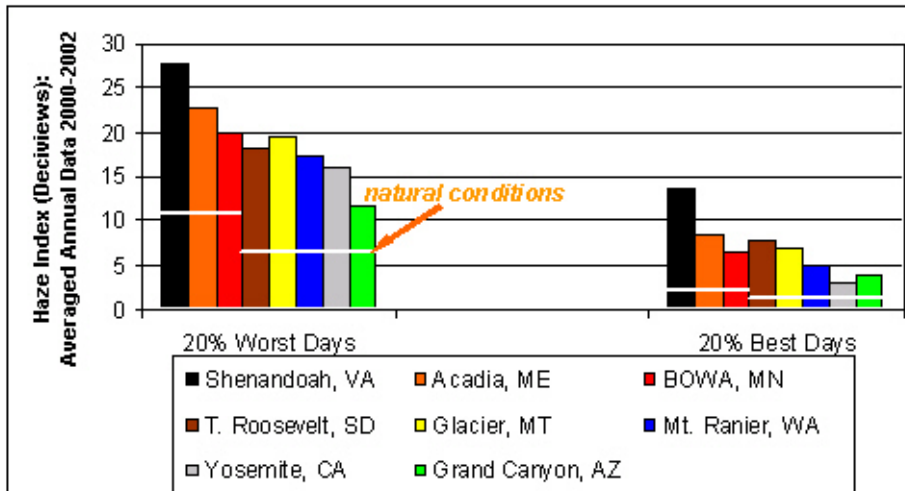
All four approaches include some provision for a coordinated decision-making processes among stakeholders in the organization. Specifically, the Midwest group employed a Memorandum of Agreement among the participating states; the Western Regional Air Partnership process is based on cooperation and consensus; the Georgia Basin/Puget Sound strategy is an international planning partnership formed around scientific

characterization of the common airshed; and the Alberta approach uses a multi-stakeholder process with consensus decision-making in the development of advice for the provincial government.

A common element is the recognition of the importance of the clean or protected areas of each region. In the case of the U.S. regions, these are the Class I areas defined in the Clean Air Act that lie within the particular region. The Georgia Basin/Puget Sound is a bounded regional area, while the entire province of Alberta is the area of interest, without further distinction. The oversight bodies also incorporate a process to address air quality in parks and wilderness areas, as well as in adjacent populated portions. In general, these processes are multi-pollutant, based on sound technical analyses, include monitoring efforts and are designed to be sustainable over the longer term.

These regional approaches have similar long-term goals but take different paths to their achievement. In the U.S. Midwest and several other locations, emphasis is placed on defining the 20% worst and 20% best visibility days in the region and then working toward a reduction in the number of the most impaired days while maintaining the levels of the least impaired days. Figure 3 compares visibility information for the years 2000 to 2002, as expressed by annual average Haze Index, in selected U.S. Parks against the goals established in the Regional Haze Rule, which are to be achieved in 2064. Conditions in the Boundary Waters Canoe Area (BOWA), in the Superior National Forest adjacent to the Minnesota/Ontario portion of the international boundary, while not the worst of the National Parks, are some distance away from achieving these goals.

**FIGURE 3. How far is the US from its Haze Goals?  
Data from Selected National Parks**



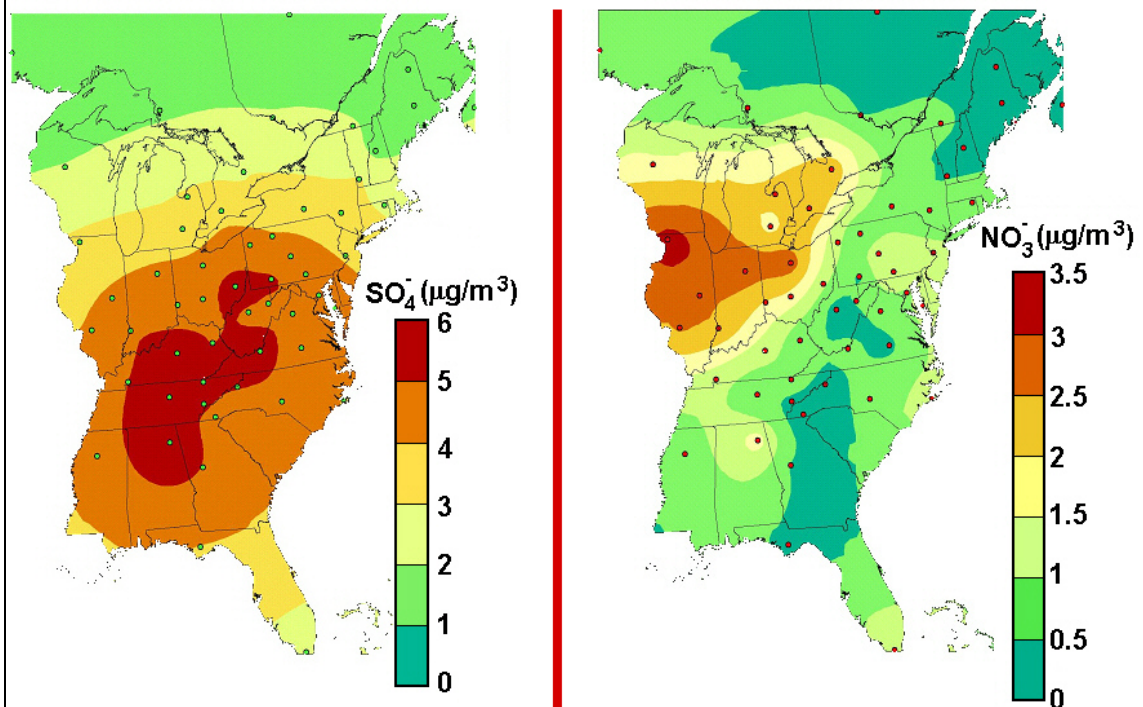
A comparison of the quality of visibility in the Boundary Waters Park, along the Canada/United States boundary, to that achieved in other U.S. National Parks is shown in Figure 3. In the West, the approach includes recognition that the improvement of visibility in parks and protected areas would require multi-jurisdictional planning and more stringent emission controls than would be needed to achieve the National Ambient Air Quality Standards (NAAQS). In the Pacific Northwest, airshed characterization is used to identify emission reduction options in the management area. In Alberta, the Particulate Matter and Ozone Management Framework takes a multi-tiered approach with varying levels of stringency depending on the proximity of the current conditions to national standards, particularly for particulate matter and ozone.

### **C. Scientific Issues in Prevention of Significant Deterioration/ Keeping Clean Areas Clean**

Scientists from the United States and Canada presented key data, technical approaches and findings available to address the non-deterioration issue. In acknowledging that visibility is the most sensitive indicator, emphasis was placed on fine particulate matter concentrations, including acid aerosols and the influence of atmospheric chemistry. Other air quality issues were discussed including ground-level ozone and toxic contaminants. U.S. national maps and data sets demonstrate that an east-west dichotomy exists, with visibility in the Eastern part of the country generally more impaired, principally by sulphate aerosols from several sources, including fossil fuel fired generating facilities. Visibility in the West, while less compromised and subjected to much the same variety of sources, is more relatively affected by nitrates from mobile sources. Variations in relative humidity affect aerosol formation and contribute to this dichotomy between east and west.

As illustrated in Figure 4, much of the haze generated in the more heavily industrialized and populated eastern segment of both Canada and the United States arises from the formation of fine particulate sulphate aerosols associated with sulphur dioxide emissions. Figure 4 also illustrates that nitrogen oxide emissions and subsequent nitrate aerosol formation is significant in the East; this aerosol form is a substantial contributor to haze formation in the West as well, particularly in the winter months. Organic carbon and black carbon concentrations affect the baseline across the continent, with a greater influence in the west.

**FIGURE 4. Northeast North America  
PM Composition**



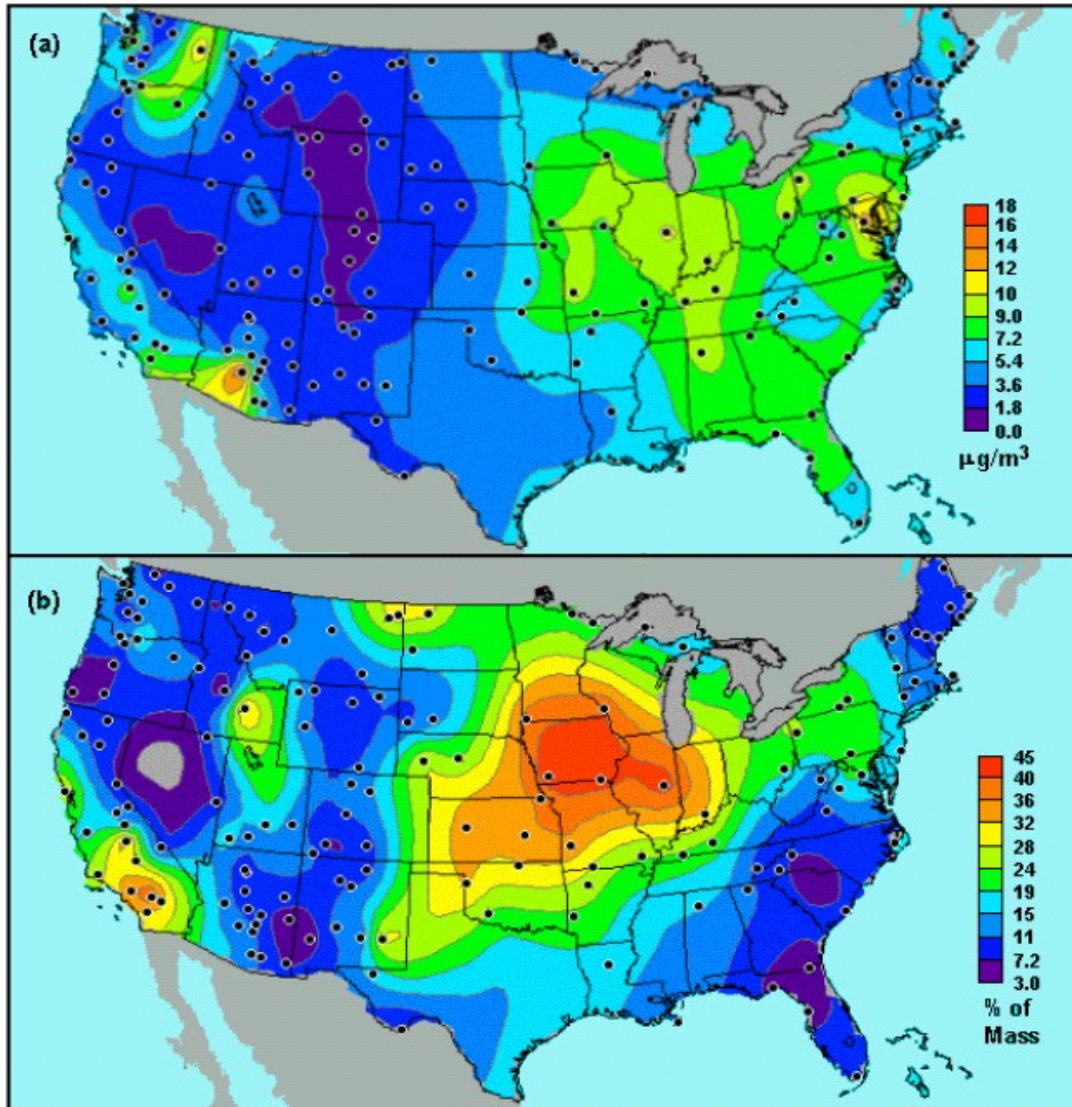
The U.S. Regional Haze Rule goal is based on two concepts: reduction of visibility impairment on the 20% worst of days and progress towards the estimated natural conditions in the long term (year 2064). Achievement of these goals includes execution of demanding scientific tasks including the definition of a natural aerosol condition, characterization of transboundary transport events in North America, transcontinentally and globally, and source identification through air quality modelling efforts. In addition, the issues of visibility, acid rain,  $\text{PM}_{2.5}$ , and climate change are all inter-related such that improvement in one area has the potential for multiple benefits.

Several issues requiring scientific attention in the transboundary region were identified. While much is known about sulphate and nitrate, the current and future roles of ammonia and carbonaceous aerosols were highlighted, as there remains great uncertainty as to the contribution of these other important species.

The importance of ammonia species is indicated by the two illustrations that make up Figure 5 – one of total fine particulate and the second of the percentage of that total particulate which occurs in the form of ammonium nitrate. Both estimates are for the continental United States during the final quarter of 2002. Illustration (a) is the fine particulate ( $\text{PM}_{2.5}$ ) mass concentration in the final quarter and (b) is the percentage of that mass which is in the form of ammonium nitrate. This percentage was above 40% in some parts of the U.S. during the period studied.



**FIGURE 5. Total Fine Particulate (PM<sub>2.5</sub>) Concentration (a) and percentage of PM<sub>2.5</sub> as Ammonium Nitrate (b) Last Quarter, 2002**



Reference:  
<http://vista.cira.colostate.edu/views/Web/AnnualSummary/ContourMaps.aspx>

The importance of further quantification of transboundary influence on protected areas, including that associated with natural and proscribed forest fires, discernment of natural, manmade and co-causal sources, and the nature and trends in transcontinental transport, was noted repeatedly.

Science must play a role in defining indicators of cleanliness and in differentiating between two types of clean areas: those within which air quality needs to be maintained and those where air quality needs to be improved. With regard to U.S.-Canada

coordination, suggestions from the scientific presenters included the need to jointly develop appropriate indicators of an area's cleanliness, to quantify factors characterizing the area's air quality, to promote a long-term, internationally consistent approach to assessing trends through co-ordinated application of comparable methods and the use of common platforms and protocols for data exchange, presentation, co-analysis, and interpretation.

#### **D. The Fundamental Questions: Panel Discussion<sup>2</sup>**

- How do the two countries define "clean air" areas?
- What approaches and programs are in place to protect clean air or correct degraded conditions in these "protected areas"?
- What are some examples of cross-border collaboration to protect "clean air" areas? How can U.S. and Canadian programs coordinate or communicate in order to protect these "clean air" areas?
- What approaches should be considered for the future in Keeping Clean Areas Clean/PSD in the border region?<sup>3</sup>

Definitions of clean air areas ranged from those locations meeting national air quality standards or guidelines to those areas, such as parks, specially designated for enhanced protection. In the United States, achievement of the NAAQS is attempted in areas of mixed urban, rural, and special areas such as found in the Midwest Regional Planning Organization's jurisdiction. In the specially-designated Class I areas of the United States where the Regional Haze Rule is applicable, the tools used include assessment of new developments under the Prevention of Significant Deterioration (PSD) program, including possible application of the Best Available Retrofit Technology (BART) to existing sources, as well as the development of State Implementation Plans (SIPs) designed to meet both the NAAQS and address the Regional Haze Rule.

In Canada, for the national parks, national historic sites and national marine conservation areas under their jurisdiction, Parks Canada has formally approved an Environmental Management System focusing on compliance with federal "house in order" programs and the reduction of pollution from its own operations. For the ecosystems under Parks Canada stewardship, this System focuses on the broader aspect of reducing threats to ecosystem integrity including those associated with air pollution.

Examples of bi-national collaboration in the parks services include the Northeast Regional Air Quality Committee (NERAQC), the Crown of the Continent Waterton-Glacier Park agreement, the Adirondack-to-Algonquin project, and the Lake Superior management plan. The U.S. Midwest Regional Planning Organization (RPO) is already an example of cross-jurisdictional cooperation and inclusion of Canadian interests that would be welcomed. Some suggested approaches for further enhanced collaboration, in addition to improved consultation across the border areas, included the identification of other transboundary locales for enhanced protection, the coordination of air quality

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<sup>2</sup> Panelists were asked to present responses to four key questions.

<sup>3</sup> A more detailed account of the responses regarding these discussion topics is provided in the following section, "Open Discussion Sessions."

research and monitoring particular to clean areas.

From the question periods following each presentation, the following issues and questions were raised and held for further consideration during the open discussion segment of the Workshop.

- Do we have a common definition of “baseline” and “clean” and “protected areas” recognizing that, at the moment, all ‘clean areas’ in the United States are impaired? Is there a clear definition of “natural contributions”?
- Is there a mechanism for cumulative assessment of impacts? Are interactions between or among pollutants adequately considered?
- Are there visibility issues related to human health and enjoyment of parks?
- How is the role of the public different in the two countries?
- How does the U.S. BACT (Best Available Control Technology) compare with BAEFT (Best Available Economically Feasible Technology)?
- Is there a Canadian parallel to the U.S. Regional Haze Rule goal?
- Is annual or episodic management the focus?
- What are the jurisdictionally controllable sources? Are they different in the two countries? What is the impact of population density on air quality?
- A comparison of standards across the border is needed.
- A comparison of regionality along the border would also be useful.
- What role could representatives of Canadian jurisdictions play in U.S. Regional Planning Organizations?
- Is the inclusion of regional annexes focused on the Clean Areas issue in the *Agreement Between the Government of the United States of America and the Government of Canada on Air Quality* feasible/practical?



## Open Discussion Sessions

### Monday, February 23<sup>rd</sup>

Discussion on the first day centered about the four key questions posed earlier to the panel members. A summary of the discussion is presented below.

#### **How do the two countries define ‘clean air’ areas?**

There was a common recognition by the participants that the concepts behind the terms “clean air”, “clean areas”, and “protected areas” were not identical among jurisdictions. The discussion that ensued included a consideration of the use of these terms (a) in different regions of the continent; (b) between the two countries; and (c) by different stakeholders.

One of the most obvious differences evident in the scientific presentations and the descriptors of approaches applied in various regions is the east-to-west dichotomy across the continent. Current conditions that might be experienced as being relatively clean in the east would be less acceptable in the west. In addition, the chemical species that contribute to the reduction in visibility vary with the source profiles in each region particularly with regard to sulfate and nitrate species. This implies that the approach to achieving progress towards clean air will of necessity be different in various regions across the continent.

In the more industrialized east, one definition of a ‘clean area’ is one where the national ambient air standards are achieved, that is air is considered relatively clean with respect to the human health goals, although negative human health effects may persist at concentrations of some common air pollutants that are lower than the standards. In the longer term, while visibility is also of concern, the immediate goal in this region would be to decrease the peak events contributing to any disruption in acceptable air quality. In much of the west, air quality at the level of the national standard would actually represent deterioration in the quality of the air. In this situation, immediate application of other indicators (including visibility or other valued ecosystem components) is more appropriate as a measure of achievement than consideration of concentrations associated with ambient air quality standards. Suggested approaches in Western regions included employing a continuous improvement concept in an attempt to lower the overall baseline and reach natural background levels.

A second dichotomy in the definition of ‘clean’ was apparent between the two countries. Concern was raised that the approach in the United States is to protect and improve the air in parcels represented by the boundaries of approximately 150 designated areas while the Canadian health based approach, given its absence of designated areas, is more universal. However, it was noted that the U.S. also has a health based approach that is broadly applied in a similar fashion. The discussion suggested that the U.S. method specific to prevention of deterioration is more measurable and mandated, while the

Canadian method is flexible though apparently less overtly rigorous in the pursuit of protection and enhancement of clean areas.

It was also apparent that different stakeholders maintain different views of clean air and of clean areas. The parks services in both countries have a philosophy of maintaining the ecosystem integrity over the long term by careful consideration of the influence and interaction among air, water and land quality indicators. They are aware that there are indicators of environmental stress due to air pollution in the parks beyond visibility and human health effects, including decreased plant productivity, and disrupted nutrient cycles, succession, and biodiversity in valued ecosystem components such as protected plant species. Local community leaders focus on the potential impacts of new sources introduced into their immediate airshed while regional air quality managers in states and provinces give priority to achieving their mandated requirements. All are moving in the same direction with similar philosophical goals but with different milestones, objectives and timetables.

In considering specific differences among the governments further, it was pointed out that there are presently four distinct means of defining a clean area, and until agreement is reached on what is an appropriate objective, there may never be a common bilateral vision or set of standards. By extension these four active definitions likely require four quite different and supportive sets of air quality standards. The four contexts are:

- (1) Human Health – areas should have air quality that is clean enough to not jeopardize human health i.e. medical conditions lessening activity and capacity, with the possibility of hospitalization, and ultimately, death;
- (2) Human Welfare – air should be clean enough to satisfy human welfare demands, e.g. satisfactory visibility, also clean enough to not jeopardize extreme aerobic sports performance;
- (3) Plant and Animal Health – clean enough to not jeopardize the health of individual wild organisms, considering both acute outcomes - which in the case of air quality, are often associated with common air pollutants such as ozone - and chronic life shortening contamination by the transport and deposition of emissions of persistent toxic substances such as DDT, Hg or UV-B; and
- (4) Ecosystem Health – clean enough to not jeopardize ecosystem health, i.e. even in the presence of detectable quantities of harmful chemicals, the population of any species can still maintain itself and individuals mature, breed, give birth and raise young in sufficient numbers that the species does not become threatened in a given area.

The U.S. NAAQS and the Canadian Canada Wide Standards (CWS) respond to the first context and segments of the third, and the U.S. Haze Rule is one response to the second. Hazardous and toxic emission control programs at the state, province, federal and international level span contexts 3 and 4.

Industrial plumes are among the sources that can contribute to conditions described in the first, second, third, and from a long range perspective, the fourth context. Acid deposition in the east has a definite impact on the fourth context; i.e. the acidity may not kill any individual fish present directly, but it has interfered with spawning of more desirable species. Parks Canada's fundamental legislated mandate for the protection of the ecological integrity of the ecosystems under its stewardship is solidly within the fourth context. The Service also deals with cases of Type 3, i.e. Methylmercury reducing fledging rates in Kejimikujik loons; however, their maturation rate appears adequate to maintain the population.

Excess photons (light pollution at night, often associated with urban sky glow) is a Type 2 issue - the U.S. National Park Service (NPS) is monitoring it in some southwestern parks (e.g. Pinnacles) - as well as a Type 3 concern (many birds suffer disorientation during nocturnal migration through cities and die following crashes with buildings), and Type 4 (e.g. evidence of amphibians suffering from disturbed mating patterns (certain frogs) or disoriented migration (e.g. turtle hatchlings)).

From a Parks Canada perspective, a clean air area would be one in which the air quality is such that it does not threaten the sustainability of the population of any native species or association of species. This leads to seeing CO<sub>2</sub>, CH<sub>4</sub>, SO<sub>x</sub>, and NO<sub>x</sub>, both as an acidifier and a fertilizer; as well as POPs, diurnal UV-B and nocturnal photons as harmful; whereas mercury and aerosols *per se* would not be considered of significant concern. Visibility *per se* is not part of these considerations.

### **What approaches and programs are in place to protect clean air or correct degraded conditions in these 'protected areas'?**

Both countries and specific regions within such areas have programs in place to protect clean air or improve air quality. Some key differences in approach to past issues were highlighted. Specifically, the approach taken to address the acid rain issue in eastern North America was discussed. While the United States employed the Clean Air Act Title IV mandated approach to sulfur reduction at the sources themselves, Canada developed a critical loads based approach which ultimately resulted in further source control, while retaining some further flexibility in the mechanism for achieving the needed reductions for ecosystem recovery.

A similar distinction could currently be observed between the Class I Prevention of Significant Deterioration implementation in the U.S. and the evolution of the continuous improvement approach now under development in a guidance document under the Canada Wide Standards. Similarly, the variability in the national standards or guidelines for ambient concentrations and in the metrics chosen, particularly the use of a visibility parameter in the United States, and the differences in legislative approaches in the implementation of the U.S. National Ambient Air Quality Standards and Canada Wide Standards are a further demonstration of the dichotomy across the boundary.

Notwithstanding these distinctions, it was noted that the two countries have some of the most well-developed international agreements and many opportunities exist within these to work collaboratively. The issue is not one of lack of tools and capacity but appears to

be one of lack of awareness of opportunities and of a willingness to pursue them. A broad awareness of legislative options and a commitment to participate in international opportunities are critical. Both jurisdictions recognize that air quality issues are transboundary and that the ability to achieve established national goals in either country is dependent, at least in part, upon actions taken in the other country. It is also important, however, to note the limitations facing any extension of control options such as implementation of an air quality cap and trade or pollution credit concept, across the border.

Much discussion centered on the question of the existence of a Canadian equivalent to the U.S. Regional Haze Rule goals. Specifically, the concern was expressed that there may be an imbalance in the long-term air quality goals on each side of the boundary. The U.S. goal of achieving 'natural' conditions in selected areas by the year 2064 is derived from an extrapolation from the year 2010 particulate matter (PM) requirements in the U.S. Clean Air Act. Achievement of this ultimate goal would require an improvement of approximately one deciview per decade in visibility. Perspectives on the definition and management of clean areas are likely to change over time, and this long-term U.S. goal might not be able to account for such an evolution in perspectives. The Canadian continuous improvement approach is intended to provide an equivalent outcome to the haze goals in the U.S. However, Canada is still in the process of developing a guidance document that will serve to provide advice to the provinces and municipal jurisdictions on how to proceed to achieve such a goal.

**What are some current examples of cross-border collaboration to protect 'clean air' areas? How can U.S. and Canadian programs coordinate or communicate in order to protect these 'clean air' areas?**

This session focused on the identification of success stories from the past. Examples of successful emission reduction, program development, and policy implementation were cited. For each of these cases, the components that were considered critical to the success and some of the impediments were recognized.

Reduction of SO<sub>2</sub> emissions through the eastern North America acid rain programs

The acid rain programs substantially reduced sulfur dioxide emissions in the eastern portions of the United States and Canada. This outcome demonstrates that emission controls can be the appropriate approach in some situations. There is evidence that these emission reductions also resulted in associated improvements in particulate matter levels and visibility. It is evident that further control of acid deposition will be necessary.

Progressive development of the Grand Canyon process into WRAP

The Grand Canyon Visibility Transport Commission had used collaborative actions and consensus decision-making to produce a very successful result. This Commission was mandated by the Clean Air Act of 1990 to bring resolution of the Grand Canyon visibility issue. This solid working relationship developed by the Commission was then used as a basis for the formation of the Western Regional Air Partnership (WRAP) – a sustainable program to address the longer -term Regional Haze Rule goals. All parties involved in



the WRAP acknowledge the value of these goals and are confident that their process can be effective in their management now and in the future.

### The Georgia Basin / Puget Sound (GB/PS) Initiative

**This initiative was highlighted as an example of locally based effort to focus on issues at the regional level across the boundary. Shared motivation for such transboundary projects encouraged individuals and local jurisdictions to move forward despite the fact that this initiative, while commanding resources in Canada, currently remains an unfunded mandate within the U.S.-EPA. Hence, it was predominantly discretionary dollars within participating U.S. agencies that were used in the process. This project was one of three pilot projects of the U.S.-Canada Border Strategy.**

### **What approaches should be considered for the future in Keeping Clean Areas Clean/PSD in the border region?**

Three distinct themes formed around the concept of a future approach to Keeping Clean Areas Clean/PSD in the border region: (a) building on existing programs and partnerships; (b) review and enhancement of regulatory processes; and (c) creation of a specific border region approach.

#### Theme One: Build on existing programs and partnerships

It was generally accepted that any international approach in the border region would have to be built upon existing programs due simply to the logistical difficulties involved in initiating new projects within the financial structures of both countries. Therefore, the suggestion was to use budgets already in place more effectively towards international efforts.

Some obvious approaches were suggested, many of which were enhancements to those already in place. Specifically, the scientific partnerships across the border could be better coordinated such that the many data sharing mechanisms and work plans underway in the border regions could be extended into the adjacent countries in products such as contour maps, data archives, or modeling outputs. It was recognized that, while there is some framework for exchange within the scientific community, there is little collaboration at the management and policy level. Management and policy partnerships could be enhanced by initiatives as simple as reducing the restrictions on travel and travel funds between the two countries.

Further collaboration would assist in addressing the issues of United States-Canada reciprocity in a manner such that the benefits of reductions undertaken in both countries would be recognized as having value across the border. Negotiation would be needed to find balanced benefits to both parties

Two specific approaches were suggested: (1) proceed to determine ways whereby Canadian representation can be incorporated into the U.S. Regional Planning Organizations (RPOs); and (2) consider further annexes to the *Agreement Between the*

*Government of the United States of America and the Government of Canada on Air Quality* specific for border regions. The RPOs are successful because of the formality of the process, and the specificity of their goals. They have a designated purpose, sanction, budget and continuity of project. Questions were raised without response on the ability to extend the tools to include Canadian participation, how RPOs may have to change to include Canadian interests, and whether indeed this is a desirable approach for Canada. With regard to the latter suggestion, the concept of an annex to existing agreements such as the *Agreement Between the Government of the United States of America and the Government of Canada on Air Quality*, was seen as valuable but not necessarily the most appropriate approach at this time. Some further consideration of these suggestions should be undertaken shortly.

### Theme Two: Review and enhance regulatory processes

There was some consideration of the issue of mechanisms for dealing with industrial developments in the adjacent country that could have a transboundary impact. The proposed SUMAS II power plant located in Washington State adjacent to the United States/Canada boundary was cited repeatedly during this discussion. Though programs and policies in both countries exist to respond to this situation, there was concern that the commitment to cross-border participation was limited. Apparently, time frames for negotiation and consultation do not align entirely with the processes of project development and approval. Some suggested approaches to address this concern included the need to build on specific examples and clarify issues as part of improved communication. Developing a comparative view of triggers and impacts both cross-boundary and cross-continent so that measures could be considered simultaneously and in a comparable manner was identified as a significant need. Improved policy collaboration activity was also acknowledged as a mechanism to enhance discussion around regulatory needs.

### Theme Three: Create a border region approach

There was general agreement that planning groups are empowered by sharing common goals such as found in the GB/PS Initiative and in the United States/Mexico relationship and around the Grand Canyon processes. The concept is that smaller, geographically connected regions with common vision and values would be best able to design a process to achieve regional goals using a consensus model. Some logistical considerations were identified, particularly the need for a sustainable budget. While there was positive acknowledgement of the use of internal discretionary budgets for staff time and resources, it was suggested that this is difficult to sustain and raises questions of mandate. It was stated that when a process is not formally mandated or sanctioned, it can often go unnoticed in terms of policy and implementation. Any border region projects would require such acknowledgement to empower the organizations engaged in the activities.

Ensuring cooperative scientific exchanges, including the use and sharing of agreed upon tools are also required to extend processes across a border area. While sovereignty issues must be acknowledged, the coordination issues are critical. How can groups be brought together and what particular groups should be involved? What can be done across the length of the border to identify areas of cooperation?

## **Tuesday, February 24<sup>th</sup>**

The first component of this day's open session was the discussion of key challenges and opportunities that the delegates thought could provide value to the transboundary air pollution issue. This was followed by the identification of specific recommendations to the International Air Quality Advisory Board as they discuss a path forward.

### **Challenges and Opportunities:**

The key challenges and opportunities identified by the assembled experts focused on three main areas: (1) the definition of clean; (2) the role of science; and (3) the policy approaches. Within these broad issues a number of specific items were raised as possible barriers to progress forward on cross-border collaboration and implementation of bi-national projects.

Discussion of the definition of clean again focused on the difference between clean air, clean areas, and protected areas. As noted, these are distinctly different concepts and it was suggested that perhaps a consideration of the reduction of man-made influence would be a better approach than the goal of achieving 'natural' conditions. Another suggested key issue was the recognition that, while baselines are vital to the evaluation of progress towards a goal, definitions currently in use appear to be relative, rather than absolute, ones. In particular, this was evident in the imbalance created by the lack of a Canadian metric, such as visibility, for continuous improvement.

Discussion focused on the desired rate of improvement and the regional specificity of improvement. It was emphasized that the Canadian approach is still under consideration between the federal government and the provinces and a guidance document should be forthcoming shortly. Other metrics, such as the acid rain critical loads parameter, do exist.

While the PSD baseline has an established timeline, the process does allow some incremental deterioration of air quality and thus the Regional Haze Rule is a required addition to provide assurance of improvement. In the U.S. there are certain areas designated for attention, but at the moment in Canada the mandate is for every area to be clean. Is continuous improvement in this context meant to preclude or prevent any degradation? The specific issue of the possible contribution of a secondary U.S. fine PM standard to improved air quality in Canada was also raised.

The role of science was considered in a number of differing contexts. First, the necessary tasks of scientists were discussed. Specifically identified were questions of where and when to monitor, when and on what basis to alter monitoring programs, and the best means to describe ambient air, emissions, and deposition conditions with respect to policy metrics in both countries. It was recognized that individuals and programs do what they can within existing resources but if science is to do more, more funding must be put into existing projects, and new funding made available for new projects. For

example, the United States is reevaluating its national monitoring approach, and it would be timely to begin consideration of means of connecting such programs across the border.

Second, the ability of scientific collaborations to influence and lead to international progress on transboundary issues was discussed. For those national issues that are too distinct to harmonize, it may be possible that bilateral scientific co-operation can create a collaborative trust necessary to move towards a similar or comparable approach. For example, science can demonstrate that the risk of proliferation of new industrial developments in clean rural areas adjacent to the boundary would significantly reduce the number of cleanest days in areas extending across the boundary. In addition, the critical nature of aerial emissions, particularly from mobile sources, can be demonstrated to encourage a focus on urban planning and zoning. However, all of these approaches are dependent upon adequate monitoring. Even at this time, the existing data and tools are not being well shared – scientists need to have further opportunities to put together tools and information in a way that policy makers need and can utilize.

The United States faces the challenge of implementing the Regional Haze Rule in jurisdictions where the NAAQS are already being met, while, under PSD, preventing the proliferation of industrial development into rural areas; Canada faces the challenge of implementing the Continuous Improvement concept through a guidance document that will be open to interpretation by jurisdictions, particularly provinces, across the country. The issue of the equivalence of these two approaches underlies the discussion of an imbalance in the *Agreement Between the Government of the United States of America and the Government of Canada on Air Quality*.

One suggested mechanism for addressing the uncertainty in border regions is to focus on airsheds of specific interest and define and describe the current situation as fully as possible using the metrics and techniques available in both countries to provide policy-makers with a conceptual model of the state of the air quality. Such an activity should demonstrate if the metrics and techniques are adequately comparable and effective in determining the maintenance of these relatively clean areas.

Another mechanism for encouraging jurisdictions to pursue cross-border collaborations could be the communication of success stories. Areas considering such a venture would benefit from an awareness of other similar activities underway elsewhere, the ways in which a cooperative approach was effective, and a compilation of the issues and impediments faced. It was suggested that the Commission could assist in such communication efforts by hosting an annual transboundary region workshop, as one example.

### **Recommendations and Path Forward:**

In this final session of the workshop, delegates were challenged to identify some critical areas where cross-border efforts would be the most effective or the most attention was needed. Some possible initiatives and issues were quickly recognized:

- (1) A formal review of the current status of integrated monitoring, inventory monitoring stations in the boundary region, including what parameters are currently being measured, gaps or omissions in the measurement programs and, possible changes to make them more compatible and useful;
- (2) Selection of a pilot project region in the border area for assembly of monitoring information and air quality data, identification of risks to airshed, development of recommendations for co-locating monitors, working toward a common plan;
- (3) In anticipation of queries, identification of the economic benefits for Keeping Clean Areas Clean/PSD;
- (4) Continued improvement of cross-border communications, including provision of a forum for dialogue on the issues raised at this workshop;
- (5) Consideration of ways and means to encourage Canadian participation in U.S. Regional Planning Organizations;
- (6) Application of common metrics and measurement protocols and outcomes, including those used in the determination of visibility, across the border regions;
- (7) Development of relationships among those with responsibility for parks and designated areas and those managing the keeping clean areas clean implementation in Canada; and
- (8) Improvement in the processes and procedures for cross border interventions and cooperation in addressing environmental concerns related to new emission sources with transboundary impacts.

Integrated monitoring was identified as a key issue that should be pursued immediately. As the United States is in the process of consolidating monitoring networks across the country, it would be advantageous to include a more North American approach. Three critical steps were suggested.

First, an inventory of available information and comparison of data is required and should be undertaken, recognizing those instances where integrated efforts are already taking place such as in the Integrated Atmospheric Deposition Network (IADN).

Second, the border regions would benefit greatly from the display of information on common platforms. For example, contour mapping tools and database development should be extended seamlessly across the boundary.

Finally, once these other features are in place, an assessment of the airshed risks could be performed to identify long-term needs or the program could be shifted towards a special study including ecosystem components, co-sampling and methods comparisons, as an example. In summary, application of such a three step process to a key clean border area would serve to integrate information, identify risks to the airshed, establish a common baseline and ultimately broaden the net of information for policy applications.

The delegates recognized the importance of the consideration of economic value of visibility, and the health of both humans and other ecosystem components. However, it was suggested that this is an issue requiring further research at this point. First, the monitoring programs need to demonstrate program effectiveness. Monitoring information can then be used as a common platform for economic evaluation across the border regions to respond to any future need.

The communications concern was segregated into both external and internal issues. External communication was seen as necessary for the promotion of success stories and demonstration of the value of protecting and enhancing relatively clean areas to the public and stakeholders that may be affected by programs. Internal communications are needed on a more regular basis initially through use of structures that are already in place. A regular forum for discussion of common issues – beginning with a definition of what is “clean” – is needed.

The immediate invitation for Canadian participation in the U.S. Regional Planning Organization was one mechanism suggested to create equivalency across the border. Both the WRAP and Midwest RPO representatives suggested that there were obvious opportunities for exchange of a technical nature to allow extension of the tools across the border such that an impact analysis for Canada could be readily done. Including Canadian jurisdictions in the decision-making processes at the RPO Board level would require a more formalized approach, but this was not seen as an impossible task. The most difficult issue would be creating the impetus for this participation, as the value to both parties must be made clear to allow for a successful collaboration.

The last issue raised was the one of metrics development and application. Ending where the workshop began, the lack of a common definition of ‘clean’ was identified as a key impediment to effective engagement and decision-making. To address this need, a mechanism to identify cross-border similarities and differences was suggested in an attempt to clarify and encourage the acceptability of criteria in the two countries.

## Workshop Participants

### Chair

#### **Ann McMillan**

IAQAB, Canadian Co-Chair  
Director  
Policy and International Affairs  
Environment Canada

#### **Edward A. Bailey**

Engineering Advisor  
International Joint Commission  
Canadian Section

#### **Jack P. Blaney**

Commissioner  
International Joint Commission

#### **Jeff Brook**

Research Scientist  
Processes Research  
Environment Canada

#### **Joel Fisher**

Environmental Advisor  
International Joint Commission  
U.S. Section

#### **Rich Halvey**

Project Manager  
Air Quality, Mexico Air Quality Projects  
Western Governors Assoc.

#### **Mike Koerber**

Executive Director  
Lake Michigan Air Directors Consortium

#### **John McDonald**

Senior Engineer/ Secretary  
International Air Quality Advisory Board  
IJC Great Lakes Regional Office

#### **George Murphy**

Manager  
Environment  
Government of Alberta

### Facilitator

#### **Karen McDonald**

Director  
Environmental Health Department  
Concordia University College of Alberta

#### **Richard Bennett**

Air Quality Science Officer  
Ministry of Water, Land & Air Protection  
Government of British Columbia

#### **Michael Brauer** (IAQAB Member)

Director & Professor  
School of Occupational and Environmental  
Hygiene  
University of British Columbia

#### **Peggy Farnsworth** (IAQAB Member)

Director - Transboundary Air Issues  
Environment Canada

#### **Long Fu**

Air Quality Chemistry Specialist  
Environment  
Government of Alberta

#### **Nancy Helm**

U.S. Environmental Protection Agency  
Region X  
Seattle, Washington

#### **Maris Lusic**

Chief  
Measurements and Analysis Research  
Environment Canada

#### **Morris Mennell**

Head  
Air Quality Management Section  
Environment Canada

#### **Alan Newman**

Senior Air Quality Engineer  
Department of Ecology  
State of Washington

**Glen Okrainetz**

Manager  
Air Protection  
Ministry of Water, Land and Air  
Government of British Columbia

**Marc Pitchford**

Air Resources Laboratory  
National Oceanic and Atmospheric  
Administration

**Patricia Ross**

Chair  
Fraser Valley Regional District  
Air Quality Committee

**Ken Smith**

Manager  
National Smog Program - Transboundary  
Issues  
Environment Canada

**Natalie Suzuki**

Senior Air Quality Science Specialist  
Ministry of Water, Land and Air Protection  
Government of British Columbia

**Bruce Thomson**

Head  
Atmospheric Sciences Section  
Pacific & Yukon Region  
Environment Canada

**Kamila Tomcik**

Program Admin. Officer  
Department of Environment and Labour  
Government of Nova Scotia

**David Welch**

Ecological Integrity Branch  
Parks Canada

**Carmelita Olivotto**

Chief  
Regional Air Quality - Transboundary  
Issues  
Environment Canada

**Rich Poirot**

Air Pollution Control Division  
Vermont Dept. of Environmental  
Conservation

**Racqueline Shelton**

New Source Review Team  
U.S. Environmental Protection Agency

**Ken Stubbs**

Manager  
Air Quality Monitoring and Assessment  
Greater Vancouver Regional District

**Rebecca Temmer**

Research Assistant  
International Joint Commission  
Great Lakes Regional Office

**Kathy Tonnessen (IAQAB member)**

Research Coordinator  
Rocky Mountain CESU  
National Park Service

**Elizabeth Waddell**

Air Resources Specialist  
U.S. National Park Service  
Pacific West Region