

# SCIENCE HORIZONS YOUTH INTERNSHIP PROGRAM

## YOUTH REPORT

### YOUTH INFORMATION

NAME: **Stephanie Mehlman**

### EDUCATION:

- Master of Science in Analytical Chemistry, Dalhousie University  
Graduation: May 1998
- Bachelor of Science with Honours, Mount Allison University  
Graduation: May 1995

### EMPLOYER

NAME: **Clean Annapolis River Project (CARP)**

ADDRESS: P.O. Box 395  
Annapolis Royal, NS  
B0S 1A0

CONTACT: **Stephen Hawboldt, Executive Director**

PHONE: (902) 532-7533

SUPERVISOR: Stephen Hawboldt, Executive Director

### PRODUCTS, ACTIVITIES AND/OR SERVICES PROVIDED BY EMPLOYER:

- Office space, supplies and administrative support.
- Proofreading and input on various aspects in the design of public awareness materials.
- Site for ground-level ozone monitor provided by former board member

PROJECT TITLE:       **PROJECT CFA'S (COME FROM AWAY'S)**  
Location:               Annapolis Royal, NS  
Start Date:             May 8, 2000  
End Date:               December 31, 2000

**PROJECT OBJECTIVE:**

The goal of Project CFA was to undertake, within the Annapolis Watershed, a research program to investigate elevated levels of ground-level ozone and to implement a series of public awareness initiatives related to air quality issues within the region. To reach this goal, the following objectives were set:

1. To investigate the differences in ground-level ozone readings between Aylesford Mountain and the floor of the Annapolis Valley
2. In cooperation with Meteorological Services Canada (MSC) and the Nova Scotia Department of the Environment (NSDOE), establish a predictive air quality program for the Annapolis Watershed
3. Design and implement a public awareness program for air quality issues in the Annapolis watershed, including an air quality module for Environment Canada's Sky Watchers program.

**YOUTH ROLE IN PROJECT:**

As project leader, I was responsible for the day-to-day management of the project and ensuring deliverables and the goals were met. This included consultation with several contacts at Environment Canada to establish the research program and to complete the Sky Watchers chapter. As the primary author of the Sky Watchers chapter, I was responsible for gathering the necessary information and compiling it for the teacher's guide, as well as finding useful activities to enhance the student's knowledge.

**RESULTS:**

## OBJECTIVE 1

The first of the three goals for this project was the implementation of a research program to investigate elevated levels of ground-level ozone in the Annapolis Valley. In the summer of 1998, in partnership with the MSC (Atlantic Region), CARP established a ground-level ozone monitoring station at Cornwallis Park, mid-way between Annapolis Royal and Digby, in the western end of the Annapolis Watershed. The data show a statistically significant variance with the information collected by the NSDOE on the Aylesford Mountain. The maximum, minimum and average values for Cornwallis Park were all statistically significantly higher. Since ground-level ozone concentrations were expected to be higher on the top of the Aylesford Mountain than at Cornwallis Park, on the Valley floor, some questions regarding the nature of the unexpected results were raised.

These questions were:

- Was the difference a one-summer event?
- Was it due to the west to east difference in the monitor locations?
- Was it a vertical or elevation difference?
- Was there a local influence or something else that affected one of the monitors?

In an attempt to answer some of these questions, a monitor was set up in Aylesford Village, at the home of Twila Robar-Decoste (former member of CARP Board of Directors). The location of this monitor was closer to the provincial monitor, reducing the west-east difference that existed between the monitors in 1998. This allowed an evaluation of the questions of elevation difference and the possibility of a one-summer occurrence in 1998.

The monitor was set up in Aylesford Village from June 1<sup>st</sup> until September 25<sup>th</sup>, in partnership with MSC (Atlantic Region). The map on page 5 illustrates the geographic relationship between the monitor sites. Several pictures of the monitor location are included on page 4. An initial examination of the data collected at the Aylesford Village monitor, the Aylesford Mountain monitor and

## Aylesford Village Continuous Ground-Level Ozone Monitor

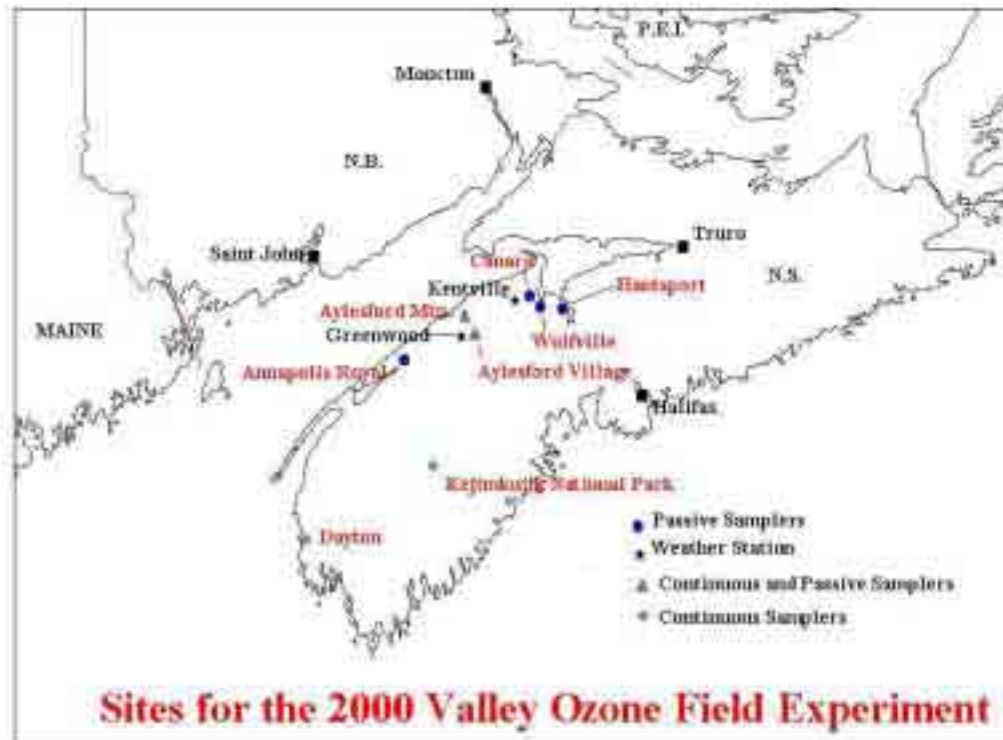
Outside - Air Intake and Rain Shelter



Inside - Monitor and Data Logger



the Environment Canada monitor in Kejimikujik National Park is included here. At the present time, the monitor from the Aylesford Village site is set-up at the provincial site on the mountain to obtain an intercomparison between the two monitors. This final piece of data will be valuable in determining a calibration factor between the two sites that will take any instrument differences into account.



A summation of the rough comparison of ozone data from the three sites is shown on the following page. The Aylesford Village mean is lower than the other two sites, for both the hourly average (Table 1) and the daily average (Table 2) ozone concentrations. The hourly averages were recorded by a data-logger at the monitor site while the daily averages referred to here are averages of the hourly averages for each daily 24-hour period. The Village monitor was located on a private property, surrounded by trees and other vegetation. Because the Village monitor was on the Valley floor, it was expected that the

### DATA COMPARISON

AYLESFORD VILLAGE, AYLESFORD MOUNTAIN AND KEJIMKUJIK NATIONAL PARK

PERIOD: JUNE 1<sup>ST</sup> TO SEPTEMBER 25<sup>TH</sup>

**TABLE 1** - HOURLY AVERAGES (PPB)

	Aylesford Village	Aylesford Mountain	Kejimkujik Park
Mean	18.57	31.32	29.58
Range	58.54	80.05	79.00
Minimum	0.00	6.00	1.00
Maximum	58.54	86.05	80.00

**TABLE 2** - DAILY AVERAGES (PPB)

	Aylesford Village	Aylesford Mountain	Kejimkujik Park
Mean	18.45	31.19	29.43
Range	32.11	39.87	39.71
Minimum	5.69	10.14	10.75
Maximum	37.81	50.02	50.46

**TABLE 3** – NUMBER OF EXCEEDANCES OF NATIONAL OBJECTIVES  
FOR GROUND-LEVEL OZONE

Level	Aylesford Village	Aylesford Mountain	Kejimkujik Park
<b>1-hour averaging period</b>			
Desirable (51 ppb)	13	143	109
Acceptable (82 ppb)	0	1	0
<b>24-hour averaging period</b>			
Desirable (15 ppb)	77	114	98
Acceptable (25 ppb)	20	88	72

concentrations of ground-level ozone would be lower than the concentrations measured on the Mountain. The Village site was lower than the Mountain site by approximately 40%, when comparing the averages and the maximums. This large difference may be attributed to the vegetation near the Village monitor, which could have acted as an ozone sink. The instrumental comparison, which is being conducted at the present time, may eliminate instrumental discrepancies as a cause of this difference. The Kejimkujik Park data used here has not been quality controlled, so an accurate comparison is not possible at this time. The difference between the Aylesford Village monitor and the Kejimkujik Park monitor is approximately 37%, possibly reflecting the same disparity in the amount of vegetation close to the monitor at the two sites and/or elevation differences.

The National Objectives for ground-level ozone concentrations establish three thresholds as indicators of the level of ozone concentrations over different averaging periods. The number of times that these levels were exceeded, referred to as exceedances, can be counted at each site. A comparison of these counts, summarized in Table 3, demonstrates the lower ozone concentrations that were recorded at the Village site. Both the Mountain site and Kejimkujik Park exceeded the hourly desirable concentration of 51 ppb over 100 times. The Village site, however, only recorded 13 hours over 51 ppb. There were no exceedances of the tolerable level (153 ppb over one hour).

The daily average levels shows a similar trend. The Village site had 77 days over the desirable level of 15 ppb, and 20 days over the acceptable level of 25 ppb. The daily average for the Village site lies between these two levels, at 18.45 ppb. The Aylesford Mountain and Kejimkujik sites had higher daily averages, both above the acceptable level, and both have more days above the acceptable level, as you would expect.

In addition to the continuous ground-level ozone monitors, David Waugh of MSC (Atlantic Region) obtained additional funding for six passive samplers. The samplers were part of the Passive Air Sampling System from Maxxam Analytics Inc. A rain shelter was installed and the sampler disks were placed face downwards to allow air movement to cross the surface of the diffusion

barrier. The samplers were taken down after a specific length of time and sent to the Maxxam laboratory for analysis, along with local meteorological data. The sampling rates for the passive samplers are calculated based on the associated meteorological factors. Photos of the set-up of several of the monitors are on page 9.

The passive samplers were set up between August 9<sup>th</sup> and September 6<sup>th</sup> at six locations in the Annapolis Valley. Two of the samplers were located near the continuous monitors in Aylesford Village and the Aylesford Mountain. The locations are indicated on the map on page 5 and the results for the six locations are in Table 4. The results for the two samplers adjacent to the continuous monitors can be compared with the average of the same time period from the continuous monitor. The Aylesford Mountain continuous monitor average was 28.02 ppb, compared to the 28 ppb measured with the sampler. The Aylesford Village continuous monitor had an average of 14.75 ppb, compared with the sampler average of 15.7 ppb.

**TABLE 4** – PASSIVE SAMPLER RESULTS

<b>Station</b>	<b>O<sub>3</sub> ppb</b>	<b>O<sub>3</sub> Average</b>
Aylesford Mountain	28	
Aylesford Village	14.8 16.5	15.7
Canard	20.2 21.6	20.9
Annapolis Royal	1.2 (blank) 23.9	
Hantsport	0.6 (blank) 25.2	
Wolfville	19.5 17.8	18.7

### Passive Samplers

Setting up the passive sampler in Wolfville August 9th. Those participating included Rob Tordon (MSC-Atlantic), Krista Leudamann, Kristie Abraham, Sasha Siddal, Kathleen Young (student employees), David Waugh (MSC-Atlantic) and Stephanie Mehlman.



View of underside of passive sampler.



Hantsport

### Passive Sampler Locations



Aylesford Village



Annapolis Royal



Aylesford Mountain

The other sites did not have a continuous monitor nearby with which to compare the passive sampler results. All of the other sites were on private property owned by staff at Jacques Whitford Environmental. The Wolfville site was surrounded by heavy vegetation, which may again account for the lower ozone concentration obtained at that site. The other sites were relatively open, and their values fall between the high value obtained on the Mountain, and the low values obtained at the heavily vegetated sites in Aylesford Village and Wolfville.

It is difficult to make any conclusions about the results discussed here until the instrumental comparison is completed. David Waugh, of MSC (Atlantic Region) will further examine the data when this comparison is finished. The questions posed at the beginning of this research program have not been conclusively answered at this point. It would appear, after this rough examination of this data, that the higher values obtained at the Cornwallis site in 1998 were a one-time occurrence or were due to some other influence, such as a local pollution source or instrumental discrepancy.

### OBJECTIVE 2

The second goal of this project was to establish a predictive air quality program for the Annapolis Valley. The city of Saint John, New Brunswick was the subject of the New Brunswick Smog Prediction Pilot Project in 1997. The success of this project led to the expansion of the program this year into Prince Edward Island and Nova Scotia. The Nova Scotia Smog Forecast program was launched on August 2, 2000 in Halifax.

### OBJECTIVE 3

The third, and final, goal of this project was to design and implement a public awareness program for air quality issues in the Annapolis watershed. Part of this goal was to develop an air quality module for Environment Canada's Sky Watchers program. The air quality module was developed over the summer and fall with the cooperation of David Waugh and Michael Howe (Environment Canada New Brunswick Weather Centre, Fredericton). It is to be distributed to

all of the participating Atlantic Region schools during the 2001-2002 school year. It will also be available to schools in other regions across the country as a supplement to the Sky Watchers Guide to Weather. A copy of the module is included with this report.

David Waugh and I also gave presentations on weather and air pollution to the grade 5 classes at Annapolis East Elementary School. This was part of their annual Science and Technology Week. I also visited one of the grade 2 classes at this school to talk to them about air pollution. All of the classes enjoyed the presentations and the younger students apparently wanted their parents to stop driving their cars to help the environment. Another portion of this public awareness program was to develop a brochure for the Annapolis Valley to educate residents about air quality issues in the area. This brochure was developed with the cooperation of Environment Canada. At the moment, the brochure has been left with Stephen Hawboldt, Executive Director of CARP, to produce and distribute in the area. A copy of the brochure is included with this report.

#### NETWORKING EXPERIENCE:

This project provided me with several contacts at Environment Canada. They have been very helpful and are assisting me in my job search. Two of these contacts have volunteered to act as references on my employment applications. Funding was available to allow my attendance at the National Air Quality Workshop that was to be held in November. Unfortunately, the workshop was postponed due to the federal election and will now be held in April.

#### FUTURE EMPLOYMENT PLANS:

I intend to look for work in the environmental field, hopefully at Environment Canada. I have also applied to the Management Training Program with the Public Service Commission.

FUTURE EDUCATION:

I do not have any future education plans at the present time. I am not ruling out going back to school to enhance my knowledge in a specific area but I do not plan to return to school to pursue another degree in the near future.

FUTURE ATTACHMENTS:

The Sky Watchers module should be published as a supplement to Sky Watchers Guide to Weather, in both French and English. A copy of the module, as it exists at the present time is attached. According to current plans, it should be available to schools for the 2001/2002 school year. Any further examination of the ground-level ozone data obtained for this project, will be carried out by David Waugh.

CONTRIBUTION TO MY PERSONAL AND CAREER OBJECTIVES:

This placement has provided me with additional background in environmental issues, enhancing my knowledge for a future position. It has also given me the opportunity to try new things, including designing materials for publication and dealing with schoolchildren. The time spent on this project has encouraged me to keep trying to find a position in the scientific field, despite prior frustrations. I also had the opportunity to become involved in human resources issues. I enjoyed this aspect of the project and may decide to pursue further endeavors in the human resources field.

You have my permission to use the above information for external communications purposes (press releases, speeches, announcements and reports)

Name: Stephanie Mehlman

Date: January 11, 2001

Signature: