

Awareness of the West Nile Virus on the University of Waterloo Campus



ERS 250

Study Team Members

Amanda Hooykaas 20068590

Jennifer Lay 20077864

Kyle Ramsay 00090417

UNIVERSITY OF WATERLOO

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Executive Summary

The aim of this project was to assess awareness of the West Nile Virus on the University of Waterloo (UW) Campus and to create a knowledge base on Campus accordingly. Research findings were also utilized to make recommendations for Campus education and future research concerning this issue. The research project was exploratory in nature due to the fact that the West Nile Virus is an emerging issue. Therefore, research was conducted under the assumption that the level of awareness on Campus would be low and education would therefore be necessary.

Surveys of UW students and staff/faculty were conducted on Campus to assess awareness, and confirmed predictions that awareness of the West Nile Virus would be low. Interviews were conducted with a number of experts on the West Nile Virus who provided useful information about the current status of the West Nile Virus, as well as educational material to be distributed around the UW Campus. One of the final products of this study is an information package. The package, called “The West Nile Virus Comprehensive Report”, contains information on the history, action taken by various levels of government in Ontario and how other universities are addressing the issue of the West Nile Virus.

The original aim of this study was to assess the feasibility of mosquito fogging as a solution to the West Nile Virus, but due to lack of a knowledge base on Campus, this was not possible. Instead, the research focused on assessing awareness and creating a knowledge base.

1.0 Introduction

The spread of the West Nile Virus is an emerging and therefore pressing issue in North America. It will not disappear over time, nor will it retreat with temperature fluctuations. With each breeding season of the *Culex* and *Aedes stimulans* mosquitos (Ontario Ministry of Health and Long-Term Care, 2002), there is growing potential for a pandemic.

As recently as November 19th, 2002, the West Nile Virus made the news in the Golden Horseshoe. It was reported that the number of people who have contracted the Virus in the Toronto Region was initially reported as being lower than actual. As of November 12, there were a total of 21 confirmed cases of the illness in the City of Toronto itself, as well as 34 probable cases and 60 suspect cases. There was also an eight-fold increase in cases of viral encephalitis this year, reaching a total of 109 cases.(Toronto Star, 2002) West Nile Encephalitis traverses the blood-brain barrier and infects the brain, clinically manifesting as viral encephalitis (i.e. inflammation of the brain) (eMedecine, Inc, 2002). The cases, presently classified as “undetermined”, could be related to the Virus, bringing the total number of potential and confirmed West Nile Virus cases to 224 this year. Of those 224 cases, seven people died: one confirmed to be West Nile Virus, three listed as “probable”, two as “suspect” (Ontario Ministry of Health and Long-Term Care, 2002).

Citizens are beginning to panic but it is questionable as to whether the actions being examined by various governments and institutions are effective, necessary, and safe for both the environment and people. There is need for education before significant actions are taken to protect the human population from this threat.

Very few universities, including the University of Waterloo, have contingency plans currently in place that would provide for control, prevention, or even monitoring of the West Nile Virus (WATgreen, 2002). The University of Waterloo has a concentrated population and many potential breeding grounds for mosquito carriers of the West Nile Virus. This poses a risk to the Campus population. Thus, there is a need to begin exploring and addressing the issue of the West Nile Virus on the University of Waterloo Campus.

1.1 Goals and Objectives

It was initially recommended by the ERS 250: “Greening the Campus and Community” course instructors that this research project focus on the feasibility of larviciding and adulticiding on the University of Waterloo Campus. With further investigation however, it was discovered that a knowledge base of the subject did not exist on the UW Campus (WATgreen, 2002). Therefore, the new research questions became the following: “What is the current level of awareness amongst University of Waterloo students, staff/faculty, as well as ‘experts’, concerning the West Nile Virus? What educative methods can help raise the current level of awareness?” Therefore, the goals were to assess and increase the University of Waterloo (UW) Campus population’s awareness of the West Nile Virus by providing education accordingly, as well as create a ‘West Nile Virus knowledge base’ in document form. Objectives have been identified to help achieve the research goals:

1. improve communication links between Campus and Regional Municipality of Waterloo education coordinators, who would be relaying information concerning the West Nile Virus;
2. improve information flow to UW student, staff and faculty regarding the West Nile Virus.

By focusing the direction of the research on these objectives, the goals of increasing awareness and creating a ‘West Nile Virus knowledge base’ on the UW Campus were met.

Research was **exploratory**¹ in nature due to the fact that the West Nile Virus is an emerging issue. Therefore, research was conducted under the assumption that the level of awareness on the University of Waterloo Campus would be low and education would therefore be necessary. The research also assumes that a high level of awareness contributes towards enhancing sustainability of the UW Campus and community. The reasoning for this assumption is explained in the following section.

1.1.1 Awareness and Sustainability

The purpose of the “Greening the Campus and Community” projects is to promote *sustainability* on the University of Waterloo Campus and in the larger community (WATgreen, 2002). However, there is no single accepted definition of *sustainability*. Therefore, for the

¹ See “Glossary” for definitions of all bolded terms.

purposes of this research project, *sustainability* has been defined as *development that meets the needs of the present without compromising the ability of future generations to meet their own needs* (Canada's Commissioner for the Environment and Sustainable Development, 2002.). *Sustainability* can be further described as follows:

"...not a fixed state of harmony, but rather a process of change in which the exploitation of resources, the direction of investments, the orientation of technological development, and institutional change are made consistent with future as well as present needs".

(Canada's Commissioner for the Environment and Sustainable Development, 2002.)

This research project aims to enhance sustainability in terms of the aforementioned definitions. However, because the West Nile Virus is an emerging issue and no prior research has been done on the UW Campus to study this phenomenon, the current research project is exploratory in nature. This means that the research must focus on taking the first steps towards the process of enhancing sustainability. These first steps involve assessing awareness of an issue and augmenting existing (or non-existing) awareness through appropriate education, and making recommendations for follow-up initiatives to reinforce what has been learned. The reasoning for this assertion is as follows:

- awareness of the issue must be high for people to want to participate in behaviour change activities;
- raising awareness about an issue will not go very far toward long term changes without activities, such as skill building, that support behaviour changes;
- there is little point in continuing activities designed to change behaviour without efforts to maintain those behaviours (The Health Communication Unit, 2001).

Thus, change cannot be made towards enhancing sustainability (i.e. implementing workable programs and partnerships on Campus and in the community) without first assessing and taking steps to assess and increase awareness of the West Nile Virus through education.

2.0 Background Information

No previous projects have been completed on the University of Waterloo Campus that aim to address the emerging threat of the West Nile Virus (WATgreen, 2002). This is why it is essential to assess current awareness and implement a knowledge base on Campus through the creation of a comprehensive report on the West Nile Virus, and the distribution of appropriate educational materials.

Research of this emerging phenomenon has led to the examination of many secondary literature sources that have provided essential information for assessing the UW Campus population's current awareness of the West Nile Virus.

By searching the Internet to determine how many North American Universities currently possess West Nile Virus contingency/action plans, it was discovered that Harvard University in the United States (Harvard University, 2002) is the only university to have implemented such a plan on campus. This discovery serves as a warning of how unprepared North American universities are to address this emerging issue.

The Ontario Provincial plan, "Surveillance and Prevention in Ontario"(Ontario Ministry of Health and Long-Term Care, 2002), provided the bulk of information about West Nile Virus and also contained techniques for public education that have helped in developing ideas for increasing awareness on the UW Campus, as well as making recommendations for further research.

Information provided by the Region of Waterloo Health Unit has also been a source of up-to-date knowledge on the status of the West Nile Virus in North America and of how public education has already been carried out within the Regional Municipality of Waterloo.

3.0 Actors

The following is a comprehensive list of the actors whose involvement is essential to assessing current awareness of the West Nile Virus on Campus and to implementing educational tools.

3.1 Core Actors

Core actors in the system are defined as a person or group having an interest, or stake, in an undertaking, with respect to a particular issue (De Wolf, G.D. et al, 1998). These actors were identified through the secondary literature review and through consultations with course

instructors and teaching assistants of “ERS 250: Greening the Campus and Community” (see Acknowledgements).

- **UW Health and Safety Officer:** Serves as an environmental health and safety resource to the university community and assists students, faculty and staff in meeting their obligations in provision and maintenance of a healthy and safe campus. Deals with how to address current health issues as well as emerging issues such as the threat of West Nile Virus. (University of Waterloo, 2002b)
- **Waste Management Co-ordinator:** Involved in waste and recycling program and an important general information source for staff, faculty and students.
- **Public Health Inspectors at the Region of Waterloo:** Involved with research on the West Nile Virus, implementing programs to educate the public on current and emerging health issues. They are currently educating the public about the West Nile Virus as well as conducting many forms of monitoring in the Region to keep track of the Virus. (Regional Municipality of Waterloo, 2002)
- **Ontario Ministry of Health and Long-Term Care:** Aims to provide provincial leadership to develop health policy, enforce health regulations, promote disease prevention and enhance healthy living for all residents of Ontario. The Ministry has already released the report “West Nile Virus: Surveillance and Prevention in Ontario, 2001”, informing the public about the Virus as well as outlining the Ministry current and future action plan to monitor this emerging disease in Canada. (Ontario Ministry of Health and Long-Term Care, 2002)
- **National, Regional, and Local Media:** Newspapers, television news, radio and other information media report past, current, and emerging issues. The West Nile Virus has been a popular topic and media has relayed general information to the public as well as updates as to the status of the virus in Canada, Ontario, and locally. However, media tend to sensationalize events and information provided must be considered carefully.
- **UW Faculty and Staff:** As they are constantly connected to large amounts of information, it is useful to assess their knowledge of this emerging threat. Also, they are connected to large amounts of the Campus population, and could play a role in educating students and one another about the West Nile Virus.

- **UW Students:** The UW Campus is home to thousands of students whose health may be at risk due to the West Nile Virus. In order to safeguard students' health, it is important to assess their current knowledge of the West Nile Virus and implement educational tools accordingly.

3.2 Other Actors

Other actors in the system, who may influence the system being examined but are not included in this system, were also identified through the secondary literature review.

- **Locally Elected Officials:** They are key players in the formulation and implementation of regulations indirectly affecting health on Campus. They could play a larger role in developing programs and partnerships with campuses to improve awareness of the West Nile Virus.
- **Local Citizen Groups and Non-profit Social and Health Organizations:** They could play a role in promoting awareness of the West Nile Virus on campus using innovative methods of communication.

4.0 West Nile Virus Awareness/Information System on the UW Campus

The system being studied is the West Nile Virus awareness/ information system on the University of Waterloo Campus (see Figure 1). The research project focused on assessing general awareness of the Virus amongst UW students and staff/faculty by asking what media has kept them informed on the issue, how informed they feel, and their general knowledge and concern about the West Nile Virus. The system is characterized by flows of ideas and information. Studying the system and understanding its dynamics led to ideas for creating a knowledge base. The resulting educational materials and the creation of a comprehensive report on the West Nile Virus, available to the University of Waterloo students, staff/faculty will enhance sustainability on Campus (see section 1.1.1). By testing student and staff/faculty knowledge as well as consulting with experts on the issue of the West Nile Virus, this study provides a means for finding out what information is being given and determining what educational tools/ information need to be provided. Furthermore, this study provides recommendations for future research on the West Nile Virus. Thus, as a result of this study, some of the new inputs to the system will

include incoming information provided for the Campus population by the University of Waterloo.

This study was limited to students and staff/faculty of the University of Waterloo as well as officials at the Region of Waterloo Health Unit. Before primary research was initiated, however, secondary literature sources were investigated extensively to gain a background knowledge base for the research and creation of research tools (i.e. surveys and interview questionnaires). The evaluation of the knowledge of the West Nile Virus on Campus will assist in enabling the current system to become more effective and efficient by improving lines of communication between various parties involved through minimizing interference from the environment (see Figure 1).

In order to analyse the level of awareness amongst the Campus population, it was necessary to understand how and what students, staff/faculty know about the West Nile Virus (what media has been their information source, where it comes from, how it is transmitted to people, what can be done about it, etc.). To accomplish this goal, appropriate research tools were selected and data collection, aggregation, and analysis were carried out in a systematic way.

5.0 Methodology

This section describes methods used in data collection, aggregation and analysis. For a more detailed illustration of the research process followed from initiation to completion of this project as well as the time frame for project completion (see Figure 2).

5.1 Secondary Literature Review

A secondary literature review was conducted at the commencement of the research process to gain preliminary knowledge of the West Nile Virus in order to generate surveys and an interview questionnaire to be used in primary data collection. Sources investigated included the Internet and general publications.

The Internet provided a large body of general information about the West Nile Virus as well as information about government and community initiatives and programs that aim to address the issue of the West Nile Virus. Canadian newspapers accessed through the Internet, included the Globe & Mail, National Post, Toronto Star, and the Kitchener- Waterloo Record. These sources provided past and current information on the West Nile Virus in terms of its status in areas all over Canada and general information about detection, prevention, symptoms, etc. Government of Ontario information and reports about the West Nile Virus were also accessed online, and provided detailed 2001/2002 statistics about the status of the Virus throughout Ontario as well as programs currently in place to address the issue (i.e. monitoring, education). Internet sources provided the most current and pertinent information on this emerging issue.

General books about West Nile Virus were used to obtain more detailed information about symptoms, detection, origin, etc. of the Virus.

Together, these literature sources provided a solid knowledge base about the West Nile Virus, its past and present status in North America, and issues related to this emerging disease.

5.2 Created Surveys and Interview Questionnaires

A survey was created to assess UW student, staff and faculty awareness/knowledge of the West Nile Virus. The data collected from secondary literature review contributed wholly to the design of the survey and corresponded with the goals of the project definition.

The survey (see Appendix 3) was composed of six short answer questions (i.e. multiple choice and “check all that apply”) which assessed:

- Participants’ knowledge of general facts about West Nile Virus, such as its origin,

transmission, and possible methods of control;

- Participants' rating of their personal level of awareness of the Virus and level of concern it will come into their community;
- From which medium/ media the participants obtained information about the Virus.

The interview questionnaire (see Appendix 3) was designed differently from the survey in that it involved ten questions that required long, more in-depth answers. These questions were focused on assessing general and specific knowledge of 'experts' or 'key informants' who are expected to have some degree of knowledge about the West Nile Virus due to their employment position or status in society. The questions also asked for each participant's opinion on a number of factors concerning the West Nile Virus.

The questions posed to each participant can be summarized as follows:

- Questions one to four inquired about general information, including the West Nile Virus' description, origin, spread and transmission, detection, and symptoms once contracted.

These questions established whether or not the interviewee had general knowledge of the West Nile Virus and determined how useful answers to the next six questions would be deemed to the research.

- Questions five to ten inquired about the expert's opinion. Question five asked whether the public is "well-informed" about West Nile Virus and question six inquired as to what level of risk the Virus currently poses to residents of Ontario. Questions seven and eight asked what steps should be taken by governments and individuals as safeguards against the Virus. Questions nine and ten inquired whether spraying of pesticides would be a method of controlling the virus' spread and what risks this action may pose to human and environmental health.

5.3 Surveyed Students, Staff and Faculty

The survey was given to a small sample size (85 students and 16 staff/faculty) relative to the student (17,907) and staff/faculty (3,500) (University of Waterloo, 2002a) population on the University of Waterloo Campus. The sample size was determined using proportionate stratified random sampling (Palys, 1997, p. 129) (i.e. 3,500 staff/faculty is roughly 16 % of 21,407 UW population, thus 16 out of 101 people were staff/faculty, and 17,907 students is roughly 84% of 21,407 UW population, thus 85 out of 101 people were students). This sampling method entails a procedure in which the studied population is first divided into groupings of interest and then

sampled randomly within each group (Palys, 1997, p129) and was used to ensure that there was equal representation of both targeted groups.. In the primary data collection, the Campus population was divided into the two groups mentioned above: 1. Students, 2. Staff/ Faculty.

Surveys were distributed at chosen locations (i.e. Modern Languages building, Student Life Centre, Physical Activity Complex, Environmental Studies 1 and 2, Arts Lecture Hall, Dana Porter Library, and random locations around Campus) in order to obtain a sample of which students and staff/faculty came from mixed disciplines and occupations (i.e. a heterogeneous sample). This **heterogeneous sample** was obtained in order to ensure that it represented the diverse awareness of the larger University of Waterloo Campus population (Palys, 1997, p. 120).

Student and staff/faculty were approached and asked to fill out a short survey. If they agreed to do so, they were asked to read an information letter about the study and sign a consent form. They were advised that their participation in the study would remain confidential because the surveys would be anonymous, as per University of Waterloo Research Ethics requirements (University of Waterloo, 2002c). A researcher was present at all times during the filling out of the survey by the participant to ensure that any ambiguities or questions could be clarified, and to be certain that the survey was filled out fully and properly.

Completed surveys were securely stored by the researchers and will be discarded in a proper fashion at the completion of the study (i.e. the end of the 2002 Fall term at UW).

5.4 Interviewed Experts

'Expert sources' of information were defined as people who should have a thorough knowledge of the West Nile Virus and issues surrounding it due to their employment position or status in the community. These experts were chosen through consultations with ERS 250 Teaching Assistants, who suggested interviewing a UW Health Officer, UW professors working in the environmental health field, and the Waste Management Coordinator. The UW Health Officer was chosen because he is directly involved with the health and safety of the University of Waterloo population and would be informed of any information concerning the West Nile Virus. A UW professor working in the environmental health field (Dr. Leonard Tsuji) was chosen because he has researched the West Nile Virus in depth and is very knowledgeable on the subject. The UW Waste Management Coordinator suggested that Regional Health Officials be interviewed as well because of their affiliation with municipal and provincial government concerning West Nile Virus. It was suggested by one of the research team members that the Plant

Operations Foreman be interviewed due to his elevated employment position at the University of Waterloo. Specific names of individuals (see Results section of this report) and their contact information were obtained through Internet research on Regional Municipality of Waterloo and University of Waterloo websites (Regional Municipality of Waterloo, 2002), and by looking in the local telephone directory. Interviewees were contacted by phone or e-mail and date, location and time of interviews were confirmed.

Interviews were held with experts to determine their level of awareness concerning the West Nile Virus. After an information sheet describing the study was read, and a letter of consent signed by each participant, as per University of Waterloo research ethics requirements (University of Waterloo, 2002c), questions were posed to the interviewee(s).

The research team member(s) conducting each interview would record participant's answers during the interview in order to ensure that any participant questions answers could receive clarification, if necessary. Immediately after the interview, researcher(s) completed a summary sheet of the interview including overall themes and impressions concerning information obtained on the West Nile Virus. This information was used in the final report to assess awareness on the University of Waterloo Campus.

5.5 Aggregation and Analysis of Survey Answers

Survey answers from students and staff/faculty were compiled in two separate tables and converted to pie graph format in order to create clearer visual displays of the data. Analysis of the data was done through combining survey answers in a Microsoft Excel database. The researchers then produced pie graphs showing what percentage of survey participants (both students and staff/faculty) selected each option for survey questions 2 through 4 and 6. Question 1 and 5 asked survey participants to rank what level of knowledge (#1) and level of concern (#5) they had. Ranking the answer as being 1 indicated that the respondent knew very little of the subject or was not concerned at all about WNV. Ranking 5 indicated that the respondent was either completely informed on WNV or was extremely concerned about the Virus coming into his/her community (depending on the question).

The survey identified students, staff/ faculty level of awareness about the West Nile Virus. If awareness was low, as predicted, recommendations would be made for education on the UW Campus. From the results of the survey conducted by the researchers, it is evident that the level of information amongst University of Waterloo students, staff and faculty is low and yet concern for the subject is high.

5.6 Aggregation and Comparison Interview Summaries

Interview summaries were aggregated and compared qualitatively to measure awareness and compile suggestions for education on Campus concerning the West Nile Virus.

5.7 Creation of the “West Nile Virus Comprehensive Report”

After having compiled secondary literature information and expert knowledge from interviews, the research team created the “West Nile Virus Comprehensive Report” (see Appendix 1). The creation of this report helped to fulfill two of the research goals (i.e. creating a West Nile Virus knowledge base on Campus and providing educational materials to the Campus population). The report constitutes a knowledge base in document form containing the history of the West Nile Virus, its current status in Ontario, Canada, and North America, general information about spread, transmission, symptoms, etc of the Virus, and other useful information that will be made available for the Campus population and the general public to consult.

5.8 Challenges and Limitations

There were some challenges and limitations to fulfilling the research methods in a way that ensured that the results yielded a high degree of validity:

- Time was a major limitation. It was difficult to accurately and fully assess awareness of the West Nile Virus amongst the UW Campus population in such a short period of time.
- After survey questions were completed it was brought to the researchers’ attention by a participant that many of the questions may have been misleading to other participants in the survey. Again, time constraints did not allow the researchers to address this potential issue by perhaps redesigning the questions, resubmitting surveys to the UW Office of Research and Ethics, and conducting new surveys

6.0 Results

6.1 Survey Results

The questions that were posed to students and staff/faculty on the University of Waterloo Campus are considered to be of minimal difficulty and are all short answer. Seventy-five (85) students, and sixteen (16) staff/faculty, completed the survey (see Appendix 2 for visual representation of survey results).

Survey participants were asked if they felt they were well informed concerning the West Nile Virus. They were able to choose any number between 1 (being poorly informed) and 5 (being completely informed). On average, survey participants rated their overall knowledge of the subject as being, on average, 2.94, which means they were slightly less than middling for knowledge.

The second question asked participants what their main source of information regarding the West Nile Virus was. The result found was that the majority of people obtain their information from either TV news (38.2%) or the radio (29.25%). Following that, 17.95% obtain their information from the newspaper, 8.25% obtain their information from the Internet, while yet others (6%) obtain their information via word of mouth.

In the third survey question, participants were asked where WNV comes from. Approximately 75% answered that the Virus came from mosquitos (73.65%) and birds (2.35%). Although a person cannot contract the West Nile Virus directly from birds, this answer is indirectly correct because the Virus originates in birds. Fourthly, those surveyed were asked how WNV could be transmitted to people. Considering that blood from birds transmitted through mosquitos is the correct answer, the majority of participants (87.25%) were right in saying that mosquitos can transmit the Virus to humans. Of the survey participants, 11.75% answered that the West Nile Virus could be passed to humans through blood.

It is interesting to see that survey participants, on average, felt somewhat concerned (on average participants ranked 2.125 out of 5, 1 being not at all concerned and 5 being extremely concerned) about the West Nile Virus coming into their community.

The final question posed to participants was: What action, if any, should be taken if WNV was found in their community? The answers were quite extreme. Mosquito fogging was ranked as being number one (29% of participants chose this), followed closely (25%) by “other”, where participants were given the opportunity to suggest other methods of action. The two extremes

may be due to the fact that people are not generally informed on WNV and therefore, have nothing to base such a decision on. Those suggestions offered by survey participants included quarantining humans affected with the Virus, evacuating affected areas, and educating the public. Other suggestions include finding a vaccine, developing non-toxic sprays, and finding a way to biologically destroy mosquito breeding ability (similar to spaying or neutering cats and dogs). Though creative, many of these suggestions are not realistic or useful (see Appendix 1)

6.2 Interview Results

Below are the summaries of general themes and impressions resulting from individual interviews. These summaries were compiled by the researchers directly after interviews had taken place.

6.2.1 Patti Cook

An informal meeting was conducted with Patti Cook, who is the Waste Management Coordinator, on October 30, 2002. It was discovered that Ms. Cook was very interested in the subject and wished to know more. She was receptive to the preliminary suggestions the researchers had devised to tackle the WNV issue. Ms. Cook informed the researcher that she would take on the task of distributing any educative information about the West Nile Virus produced through the research to appropriate locations on the UW Campus.

6.2.2 Marla Rocca and Sandra Morrison

An interview was conducted with Marla Rocca and Sandra Morrison, who are Public Health Inspectors at the Regional Municipality of Waterloo Community Health Department (Environmental Health and Lifestyle Resources Division), on November 7, 2002. It was discovered that municipal and provincial governments are taking actions to study and understand the West Nile Virus as well as prepare for any possible future outbreaks of the virus. There has been much research and continuous surveillance of the virus itself (ie: in dead birds, mosquitoes, and humans). Little has been looked at terms of the feasibility of spraying with pesticides. They provided us with prepared Ministry of Ontario West Nile Virus Fact sheets and advised us to distribute this information (to ensure consistency of information) accordingly on the UW Campus.

6.2.3 Ian Fraser

An interview was conducted with Ian Fraser, who is a University of Waterloo Health and Safety Officer, on October 28, 2002. It was discovered that the Health and Safety Officer does not see the West Nile Virus as being a great concern or posing a significant risk to the Campus

population, residents of Kitchener/Waterloo or Ontario in general. He stressed that the virus generally causes nothing more than flu-like symptoms and therefore is not a high priority issue to health and safety on Campus and there is currently no education program or contingency plan for the University of Waterloo.

6.2.4 Dr. Leonard Tsuji

An interview was conducted with Leonard Tsuji, who is a University of Waterloo Assistant Professor in the Environment and Resource Studies Program specialized in the field of health, on October 28, 2002. It was discovered that the professor is very knowledgeable regarding the Virus and is neither excited nor worried about its presence in the Region of Waterloo. He explains that the recent introduction of the virus is due to global warming and the movement towards a more global community. He does not believe that the public is well informed about the West Nile Virus.

6.2.5 Peter Fulcher

An interview was conducted with Peter Fulcher, who is Plant Operations Foreman at the University of Waterloo, on November 3, 2002. It was discovered that the Foreman is not well informed about the West Nile Virus and was unable to confidently answer many of the questions posed. He did state, however, the belief that the threat of the West Nile Virus is over-emphasized by the media and that the Virus does not pose a great risk to city-dwellers including the UW Campus population.

7.0 Discussion of Results

Through this research project it was found that assessing awareness of the West Nile Virus on Campus is a complex issue. This research dealt with **qualitative** information (i.e. survey and interview results). The researchers were surprised that awareness of the West Nile Virus amongst survey and some interview participants was low due to a lack of communication between different actors (i.e. Regional Municipality of Waterloo and the University of Waterloo population). The results of the research include the following:

- Awareness of the West Nile Virus amongst students and staff/faculty on the University of Waterloo Campus is generally low, as indicated by the survey results
- Awareness of the West Nile Virus among many, but not all, identified experts is also fairly low, as indicated by the interview summaries

8.0 Recommendations

- **Further education:** Getting guest speakers such as UW Health and Safety officials and/or Regional Municipality of Waterloo Health officials to host interactive information sessions at the University of Waterloo involving students, staff, faculty, and any other interested parties.
- **Publicity:** Writing articles for UW newspapers such as *The Imprint* and *The Gazette, Alternatives*, etc. and for community newspapers such as *The Kitchener-Waterloo Record* and others. Other means of publicity could include distributing more information pamphlets and flyers around the UW Campus.
- **Further “ERS 250: Greening the Campus and Community” research projects:** Future projects could examine the issue of larviciding and adulticiding as a means of controlling the West Nile Virus, investigate the alternatives to mosquito fogging and recommend the best alternative. Other research could examine examples of contingency plans for addressing the West Nile Virus and such plans could be applied to the University of Waterloo.
- **University Authorities should make themselves informed of all options before making decisions about how to address the West Nile Virus:** Making informed decisions means researching all options and forming a contingency plan of how to deal with the West Nile Virus should it be detected on Campus.
- It is hoped this research project, with its focus on the Campus population, will initiate the relaying of knowledge of the impending threat of the West Nile Virus to the larger community.

9.0 Conclusion

The goals of this research project were to increase awareness of the West Nile Virus and to create a knowledge base on the UW Campus. These goals have been achieved by following the objectives of improving information flow between Regional Municipality of Waterloo and UW Campus coordinators (i.e. Region of Waterloo Health Officials and Patti Cook), and having coordinators (i.e. Patti Cook) distribute educative materials to appropriate locations accessible to students, and staff/faculty. Awareness of West Nile Virus itself has been raised by the simple fact that surveys were conducted amongst the UW population and important coordinators as well as the creation of a knowledge base in document form in the “West Nile Virus Comprehensive Report” (see Appendix 1) which will always be accessible to the Campus population (i.e at the WATgreen office – see www.adm.uwaterloo.ca/infowast/watgreen).

It is highly recommended that the University of Waterloo affirm and promote a healthy quality of environment to its students, and staff/faculty. The University should be committed to environmental excellence now and in the future. As a leading teaching and researching institution, the University must play the role of an exemplary model committed to sustainability so that all members of the university community are knowledgeable of emerging environmental/health issues. The University of Waterloo must contribute to the education of an environmentally literate population. It is believed that respect for sustainability will be achieved through education, communication, co-operation and research.

Glossary*

Environment: Components that affect the studied system but are not part of it

Exploratory Research: collecting data in order to understand a phenomenon but is lacking any knowledge of the subject's dynamics

Heterogeneous: the degree of diversity found in a population of interest

Qualitative Information: Details with an inductive slant, where research is based on peoples' views and opinions rather than statistics and science

*Reference: Palys, 1997.

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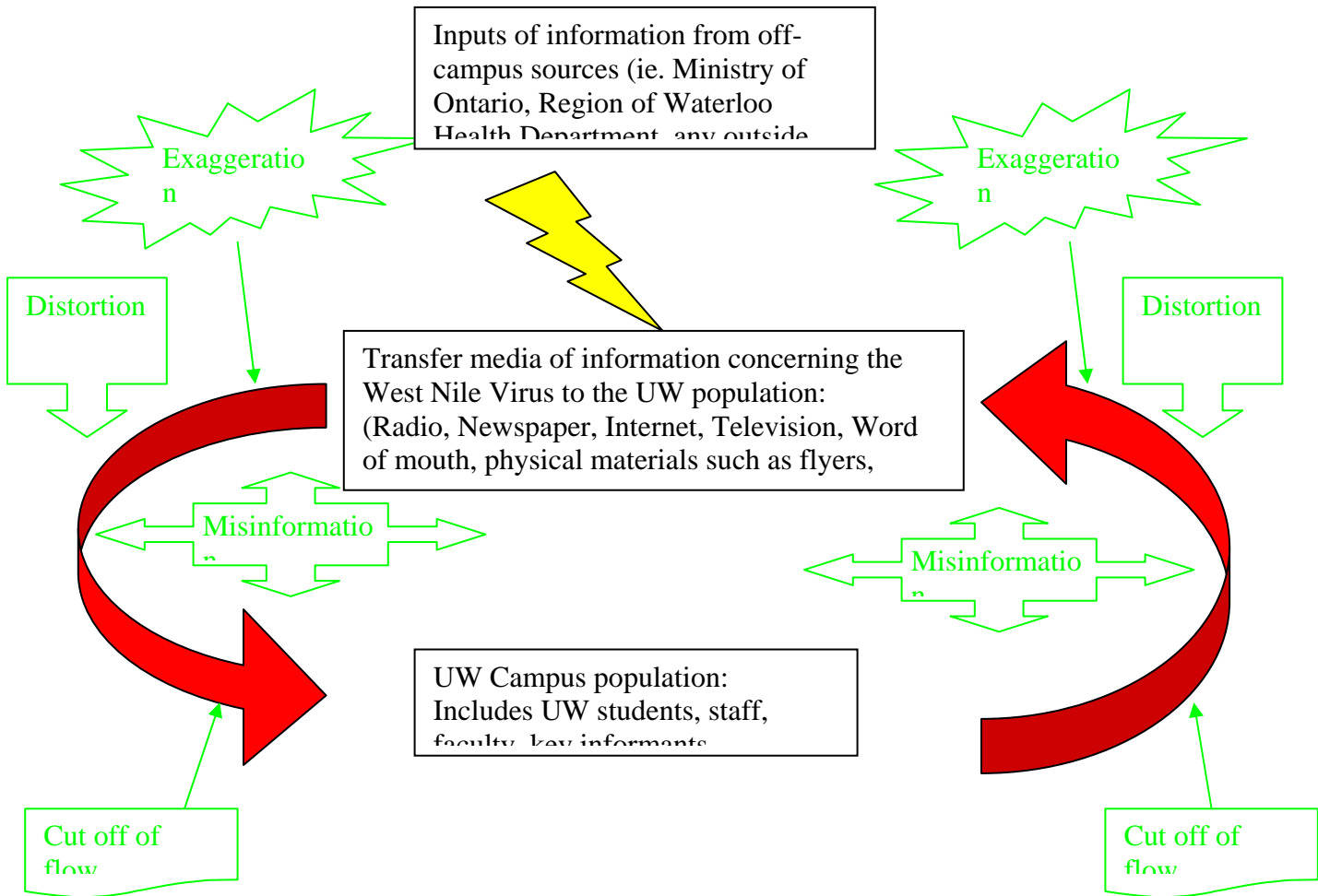
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Figure 1 - West Nile Virus Awareness/ Information System on the UW Campus



This systems diagram shows the flow of information concerning the West Nile Virus to the University of Waterloo population. This diagram could be vastly more complex but was constructed in this simple way to illustrate a few important points, which are as follows:

1. Information may flow continuously through the system from many different media sources to the UW Campus population and back
2. Inputs into the system may come from outside sources
3. Components in the 'environment' influence the system by changing the quality or accuracy of information or cutting off the flow off information altogether

Overall, this system shows the flow of information that creates 'awareness' of the West Nile Virus. It is important that the flow of information be uninterrupted in order to have high awareness of an issue. It is also

Legend





-  - Components in the 'Environment'
-  - Components within the boundaries of the system
-  - Indicates direction of flow of
-  - Indicates direction of flow of

Figure 2 - Research Study Diagram

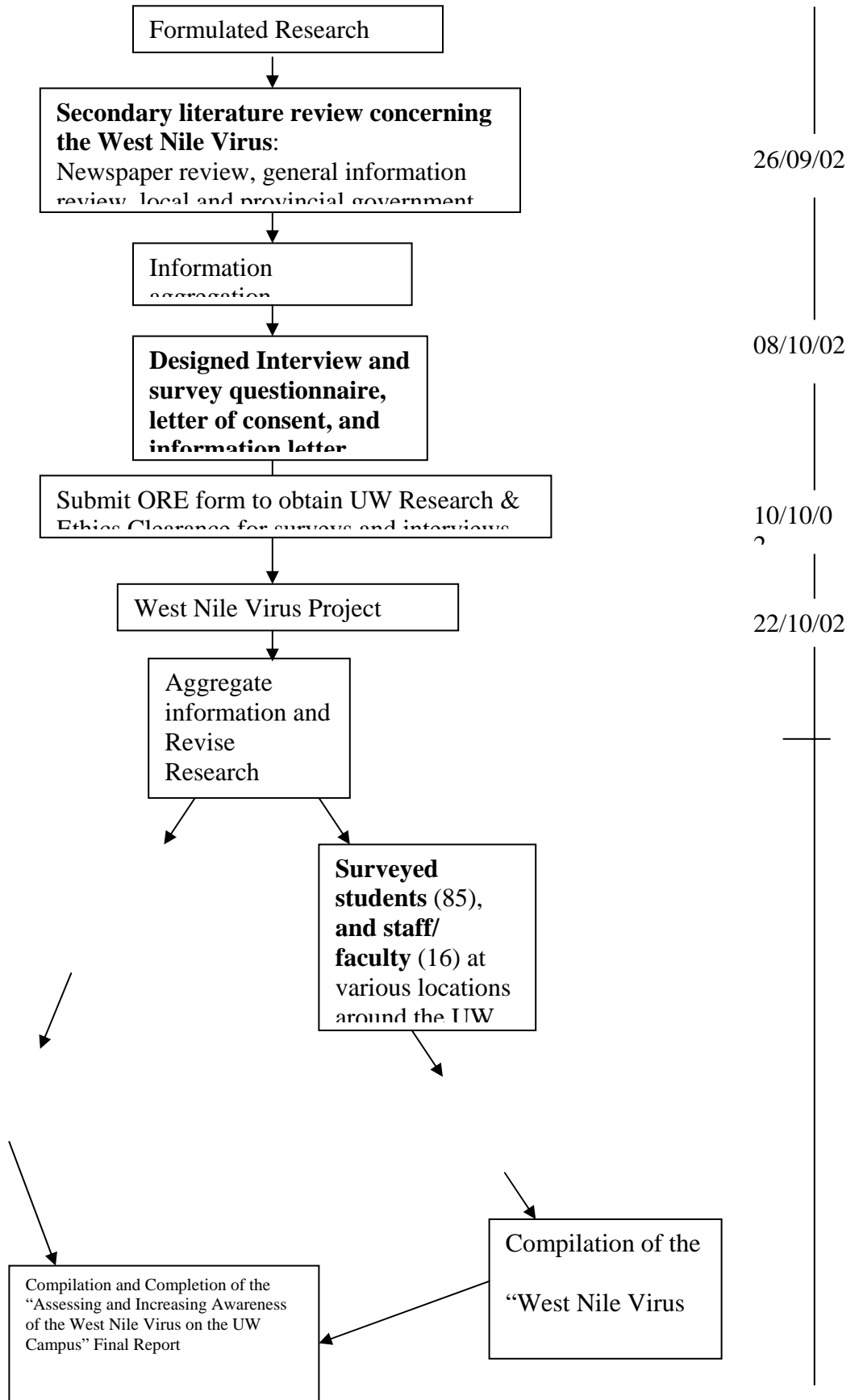
Time Frame

This diagram shows the steps taken in carrying out this research project from initiation to completion.

The time frame shown here illustrates the challenges and limitations outlined in section 5.8.

Clearly, the research process is iterative as information is gathered, aggregated and analyzed at each step of the process.

Note: bolded components in this diagram are described in detail in section 5.0



Appendix I

West Nile Virus:

A Comprehensive Report

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Introduction:


The West Nile (WN) virus has recently emerged as a significant public health issue in North America. West Nile is of a Flavivirus Japanese Encephalitis Antigenic Genus, closely related to St. Louis encephalitis. (www.cdc.gov) Figure 1 and 2: VIRUS WN causes symptoms much like the common flu including body aches, fever, headache, swollen lymph glands, and skin rash. (www.cdc.gov) Serious infections have more serious symptoms such as a higher fever, disorientation, coma, tremors, neck stiffness, and paralysis. (www.uncashd.org/WNV.htm) As a result, WN symptoms are often mistaken for the common flu, leading to prolonged exposure to the virus before medical attention is sought.

History:

The West Nile virus was first isolated from an adult female in Uganda in 1937. (www.cdc.gov) The ecology of the virus was then characterized in the 1950's in Egypt when it was found in the blood of three seemingly healthy children. (www.cdc.gov) The virus then proceeded to travel through Africa, Europe, the Middle East, and west and central Asia, before arriving in North America sometime around 1999. (www.cdc.gov) Modern outbreaks have occurred but three major epidemics stand out. "Between 1996 and 1999 there were outbreaks "in southern Romania, the Volga delta in southern Russia, and the northeastern United States. However, epidemics involving hundreds of cases of severe neurological disease and fatal infections were totally unpredicted." (Hayes 25) WN has been found in forty-three states in the US and in Canada from Saskatchewan to Nova Scotia. (www.cfe.cornell.edu/erap/WNV)

The Risk:

West Nile is classified as a virus, meaning, among other things, that there is no known cure; just as there is no actual cure for the common cold or the flu. Presently, the only treatment the medical community can offer those infected with WN is to stimulate the immune system through various antibiotics. (www.cdc.gov) Therefore, it is essentially the strength of individual immune systems which dictate who becomes seriously ill and those who recover. Those most at risk from WN are the elderly and the very young, as their immune systems are not as robust.

Nevertheless, the human immune system is effective at keeping the body healthy, consequently, humans are often “dead end hosts” for viruses as they are defeated within the body and are therefore unable to be retransmitted. (Regush 1)  Fig. 3: TRANSMISSION CYCLE

Recent WN scares have enabled scientists to warn and prepare the public of the impending threat of other mosquito-borne viruses such as Ebola. Global changes in the form of climate, increased development into tropical regions and growing travel and trade have enabled foreign pests to travel to, and survive, in the North American climate. With these pests come tropical diseases, some of which are extremely deadly. Many of the world’s most deadly viruses are transmitted through mosquito bites. In the future, mosquitoes may lead to outbreaks of far deadlier viruses than West Nile.

Presently, epidemiologists agree that the WN virus is here to stay. (www.sierraclub.org) Climate resistant species of mosquitoes and longer temperate seasons ensure the North American WN strains have a secure “foot hold” to continue infecting humans and animals. Therefore, individual actions and awareness are key to staying healthy.

The Historical Solution: Spraying

The historical solution to insect-borne viruses has overwhelmingly been the use of

pesticides. In World War II DDT was used to combat the growing malaria problem in the Pacific Islands, and in Vietnam Agent Orange was used as a mosquito killer and a defoliant. Each chemical was used before the complete list of effects on humans was realized, thus, people exposed to these chemicals suffered severe health problems.

Therefore, it is not surprising that many politicians are advocating the use of pesticides to combat the West Nile Virus. However, WN is in major cities such as New York. Mass spraying of pesticides will expose the population to harmful chemicals, the long-term effects of which are unknown. In New York, Malathion was sprayed in large amounts, causing health problems such as rashes and breathing problems. (www.abcnews.go.com) Then, the pesticide Anvil was utilized, leading to two hundred reported cases of pesticide sickness ranging from blurry visions, nausea, itching, coughing, choking, and a swollen tongue. WN has effected a very small minority of the population of North America, whereas spraying pesticides exposes millions to toxic chemicals; The New York spraying campaign has exposed 15 million people to pesticide chemicals. (www.fair.org) The simple attitude of “you have to drink this stuff to get sick” has no place in this very serious issue. (Daily News 08/21/00) Before pesticides are used governments must know the exact effects they will have on human life and the environment. If not, greater damage to public health and the ecosystem is being unnecessarily risked. As the cumulative effects of spraying are unclear the public danger must be overwhelming before their use is authorized.

Alternatives:

There are many alternatives to pesticide use such as source prevention through landscaping, personal protective measures, DNA manipulation, larvicide, and public awareness.

Preventative landscaping is as simple as making sure personal property does not allow natural standing pools of water. These are insect breeding grounds and will seriously increase pest numbers and human exposure. Therefore, land depressions near residential properties should be filled in and child play centers and public areas should be located away from these areas, thus preventing unnecessary exposure to insects.

Personal protective measures come in the form of long pants and shirts, personal bug spray, and the time of day or night a person goes outside. Awareness of personal vulnerability to mosquitoes is essential. Before going outside ensure personal apparel is effective in preventing exposure to mosquito bites. If clothing is not sufficient, add another layer in combination with a bug spray.

DNA manipulation has been briefly discussed within the media and seems to be a last resort. This would involve locating mosquito breeding areas and capturing unborn larvae, then manipulating the larvae to be unable to produce offspring. There are many other modifications, which are possible, but this seems to be the most popular. Mosquitoes would then have a single generation life span, thus dying out after several generations. The negative effects of this plan come in the form of genetic manipulation morals and unknown environment side effects.

Larvicide is a very dangerous option. This plan involves larvicide being introduced into the public water supply which doubles as a mosquito breeding ground. The larvicide would kill unborn mosquito populations and decimate the insect population. However, other insects and animals would also become exposed to the larvicide with unknown health effects. Furthermore, humans would be drinking this larvicide with every sip. As the toxic effects of such a chemical are unknown this is extremely hazardous. This option seems neither plausible or necessary.

Public awareness is one of the most important aspects of combating West Nile virus. The

public is currently almost entirely ignorant as to the subject of WN yet they are constantly exposed to WN on the news. The problem is the media; no clear, useful information is given to the public. Awareness campaigns are necessary to bring public knowledge of the issue to satisfactory levels. As people become more aware of the danger or lack thereof they will begin to take steps to ensure their safety. Furthermore, information helps to prevent unwarranted panic.

An ideal solution would be a combination of public awareness, preventative landscaping, and personal protective measures. If each person takes these steps to protect themselves WN becomes that much less of a worry. Relying on the government to protect the population is one thing, but people must take steps to help protect themselves. Without personal awareness people leave themselves vulnerable to infection.

Conclusion:

This comprehensive report has given a brief overview of a much broader project on the West Nile project. An introduction to the issue, both past and present, the risk and preventative measures have been discussed in an effort to raise public awareness of the issue at hand. Through awareness comes peace of mind. Please take these suggestions seriously, as they will help protect your health and the health of those around you.

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Appendix II

Staff	Students		
1 Average	3.0775	1 Average	2.75
Data Calculations			
2 TV News	0.61	2 TV News	0.154
Radio	0.123	Radio	0.462
newspaper	0.167	newspaper	0.192
Word of	0.05	Word of	0.077
Mouth		Mouth	
Internet	0.05	Internet	0.115
3 Mosquitos	0.78	3 Mosquitos	0.693
Bird	0.22	Bird	0.25
Rats	0	Rats	0.019
Squirrels	0	Squirrels	0.038
4 Saliva	0	4 Saliva	0
Air	0	Air	0.02
Moquitos	0.88	Moquitos	0.865
Blood	0.12	Blood	0.115
5 Average	2.37	5 Average	1.88
6 Mosquito	0.194	6 Mosquito	0.326
Fogging		Fogging	
Nothing	0.18	Nothing	0.212
Individual	0.158	Individual	0.212
Use of		Use of	
Sprays		Sprays	
Exterminat	0.194	Exterminat	0.115
ion of all		ion of all	
Crows		Crows	
Other	0.436	Other	0.154
Combined			
1 Average	2.914		
2 TV News	0.382		
Radio	0.2925		
Newspaper	0.1795		
Word of	0.0635		
Mouth			
Internet	0.0825		
3 Mosquitos	0.7365		
Bird	0.235		
Rats	0.0095		
Squirrels	0.019		
4 Saliva	0		
Air	0.01		
Moquitos	0.8725		
Blood	0.1175		

5 Average	2.125
6 Mosquito	0.357
Fogging	
Nothing	0.196
Individual	0.185
Use of	
Sprays	
Exterminat	0.1545
ion of all	
Crows	
Other	0.295

Appendix 3 – Survey and Interview Questionnaire

West Nile Virus Survey for ERS 250 (Greening the Campus and Community)

Circle the category in which you are currently:

Student

Staff/ Faculty

1. Do you feel that you are well informed on the West Nile Virus? (circle one)

(1 being poorly informed, 5 being completely informed)

1 2 3 4 5

2. What has been your main source of information regarding the West Nile Virus? (check one)

newspaper ___ television news ___ word of mouth ___ internet ___ radio ___ other (please specify) _____

3. Where does the West Nile Virus come from? (check all that apply)

mosquitos ___ birds ___ squirrels ___ rats ___

4. How can the West Nile Virus be transmitted to people? (check all that apply)

saliva ___ air ___ mosquito bites ___ blood ___

5. How concerned are you that the West Nile Virus will come into your community? (circle one)

(1 being not at all concerned, 5 being completely disturbed)

1 2 3 4 5

6. If it was found in your community (either in human or animal form), what action, if any, should be taken? (check one)

mosquito fogging (pesticides) ___ nothing ___ individual use of sprays ___ extermination of all
crows ___ other (please specify)

ERS 250 “Greening the Campus and Community” – Instructor: Susan Wismer
“Awareness of West Nile Virus on the UW Campus”

Interview Questionnaire

1. What is West Nile Virus and where does it come from?
2. How does West Nile Virus spread (through the environment and to humans)?
3. How can West Nile Virus be detected?
4. How does West Nile Virus affect human health once contracted?
5. Is the general public ‘well-informed’ about West Nile Virus?
6. Does West Nile Virus currently pose a risk to inhabitants of Ontario and specifically to inhabitants of the Kitchener/Waterloo region?
7. What steps, if any, should governments (federal, provincial, and municipal) take to safeguard the public from West Nile Virus?
8. What steps can individuals take to safeguard themselves against West Nile Virus?
9. Would the spraying of pesticides be a useful method to control the spread of West Nile Virus?
10. Does spraying of pesticides pose any significant risks to human or environmental health?