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## **Monitoring the Moraine Project: Ecosystems Workshop Proceedings**

Friday December 8, 2006  
10:30am – 3:00pm  
Tennis Canada Rexall Centre, York University

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## TABLE OF CONTENTS

**EXECUTIVE SUMMARY** .....3

**INTRODUCTION**.....4

**COMMON SUGGESTIONS** .....7

    Monitoring Questions.....7

    Protocols .....7

    Study Design.....8

    Data .....9

    Volunteers .....10

**AQUATICS**.....12

    Indicator: Benthic Macroinvertebrates (BMI).....12

    Protocol: Ontario Benthos Biomonitoring Network (OBBN) .....12

    Study Design: Site Selection.....12

    Other Indicators.....13

    Volunteer Training.....13

**WETLANDS** .....14

    Indicator: Frogs and Birds.....14

    Protocol: Marsh Monitoring Protocol (MMP).....14

    Other Protocols .....15

    Study Design.....15

    Other Indicators.....16

    Volunteer Training.....16

**TERRESTRIAL** .....17

    Protocol: EMAN 20x20 Plots .....17

    Other Protocols .....17

    Study Design.....17

    Other Indicators.....18

**ADDITIONAL COMMENTS** .....19

**NEXT STEPS** .....21

**ACKNOWLEDGEMENTS**.....21

**Appendix I: List of Workshop Participants** .....22





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## EXECUTIVE SUMMARY

On Friday December 8, 2006, the MTM project partners held an Ecosystems Workshop at the Tennis Canada Rexall Centre. This workshop brought together 25 participants representing various groups, including volunteer organizations, conservation authorities, non-governmental environmental groups, academics and provincial and federal government agencies.

The purpose of the workshop was to gather feedback on monitoring ideas suggested by the MTM project partners for community-based monitoring on the Oak Ridges Moraine. The suggestions were based on the following monitoring themes: aquatics, wetlands and terrestrial. A backgrounder of the project was presented and speakers shared information on current monitoring programs. Marlene Doyle from the Ecological Monitoring and Assessment Network Coordinating Office (EMAN CO) introduced their ecosystem monitoring protocols and the guest speaker, Josh van Wieren from Parks Canada. He spoke about their Ecological Integrity Monitoring Program and emphasized the need for concrete monitoring questions and sound study design prior to data collection. The aforementioned presentations are available on the MTM project website ([www.MonitoringtheMoraine.ca](http://www.MonitoringtheMoraine.ca)). The latter half of the workshop was a series of facilitated discussions in breakout groups about the recommended monitoring ideas for each monitoring theme.

Workshop participants provided valuable feedback and specific recommendations for the project's monitoring program. This feedback will directly contribute to the development of the MTM project's Community-Level Strategic Monitoring Plans. These plans will be guiding documents for communities who want to contribute to the protection of the Oak Ridges Moraine by participating coordinated moraine-wide monitoring.





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## INTRODUCTION

There has been an identified need for a unified monitoring program for the Oak Ridges Moraine. While there is currently monitoring on parts of the moraine, the activities are not implemented in a coordinated fashion and it does not take into account the moraine as a landscape. As the Oak Ridges Moraine Conservation Plan will be under review in 2014, it is important be equipped with sound ecological information to make informed recommendations at the Review.

The Monitoring the Moraine (MTM) project partners are in the process filling in this gap by developing monitoring themes based on the vision of the Oak Ridges Moraine Conservation Plan and a suite of community-based monitoring protocols for each theme. The ecological monitoring themes are terrestrial, wetlands and aquatics. Wetlands have been singled out as its own category for the sake of clarity (sometimes wetlands are classified under land or water) and to acknowledge its significance as an important ecological feature of the moraine.

The primary goal of the workshop was to gather feedback as to which protocols are appropriate for community-based monitoring on the Oak Ridges Moraine that will provide meaningful outcomes. Secondly, the workshop was a forum for sharing information (e.g. lessons learned from workshop participants and how to communicate results) and identifying partnerships.

As a collaborative project, it is important to the MTM project partners to consult with moraine stakeholders and obtain feedback and suggestions to improve the project. It was especially important to bring together a diverse group of participants for the workshop to provide input towards finalizing the protocols. Over 100 people were invited. In total, 25 participants attended the workshop representing various groups, including volunteer organizations, conservation authorities, non-governmental environmental groups, academics and provincial and federal government agencies (Appendix I).

The workshop started with an overview of the MTM project. The presentation outlined the purpose of the project, its framework and timelines, as well as its progress to date with





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community engagement and pilot projects. Speakers were invited to address the need and current progress of standardized and coordinated monitoring methods. Marlene Doyle from the Ecological Monitoring and Assessment Network Coordinating Office (EMAN CO) provided an overview of their ecosystems monitoring programs, e.g. NatureWatch, and the online tools and resources available for monitoring. She introduced the guest speaker, Josh van Wieren from Parks Canada. Josh gave a stimulating presentation on the Ecological Integrity Monitoring Program of Parks Canada, lessons learned and recommendations for the MTM project. He stressed the importance of identifying the appropriate monitoring questions and study design prior to any monitoring. This became one of the main discussion themes of the workshop.

In the afternoon, MTM project partners presented some proposed monitoring ideas for each theme. The criteria used in selecting these protocols were shown as well as some of the pros and cons for each. The following indicators and protocols were recommended by the MTM project partners:

Monitoring Theme	Indicator	Protocol
Aquatic	Benthic Macroinvertebrates	Citizens' Environment Watch
		Toronto and Region Conservation Authority
		Ontario Benthos Biomonitoring Network
	Small Stream Flow	Check Your Watershed Day (modules within the Ontario Stream Assessment Protocol)
Terrestrial	Terrestrial Vegetation	Ecological Monitoring and Assessment Network's Terrestrial Vegetation Biodiversity Monitoring Protocol using 20x20m plots



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As the MTM project partners had the least amount of experience in monitoring wetlands, they were seeking specific recommendations from the workshop participants as to which indicators and protocols should be used.

Participants were divided into six groups for a facilitated discussion on the presented materials. The comments have been compiled into the common suggestions from each monitoring theme, comments specific to each monitoring theme, and additional comments related outside the monitoring themes. Additional comments included other indicators and protocols for consideration, how to develop and launch the MTM project monitoring program, and a list of agencies to approach for potential partnerships.





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## COMMON SUGGESTIONS

Workshop participants were pleased with the movement towards standardizing protocols, the consultation process and involving community members. They thought the MTM project partners are taking on an important and challenging task. The comments below were all common to each monitoring theme.

### Monitoring Questions

There needs to be a clearer idea of specific monitoring questions. Monitoring needs to have a purpose. Is the MTM project monitoring the Oak Ridges Moraine Conservation Plan or ecological integrity? This information is necessary before launching monitoring programs. It was also demonstrated in Josh's presentation, with lessons learned from Parks Canada. Although they have a plethora of information, there was not a comprehensive and cohesive study design. Consequently, the data was not able to be used meaningfully. The MTM project needs to have a strategy behind the monitoring, or else it will not be effective. The project must identify today's issues and make sure there is long-term relevance, e.g. the identified policies are still appropriate to be basing efforts on in 10 years.

### Protocols

Protocols need to be useful and comparable across organizations. They need to feed into larger initiatives, e.g. provincial concerns and programs, and larger datasets. The MTM project should link into existing protocols and adapt it to suit the project's needs if necessary.

All selected protocols must balance accessibility and scientific rigor. There should be protocols to accommodate different capacity levels of the volunteers. However, there should not be any gaps between professional monitoring and community-based monitoring. Layering or nesting protocols will help with information integration. Monitoring at a lesser intensity with a more consistent timeline can be beneficial to showing the linkage. In addition to skill level, protocols need to also be layered in terms of scale. There should be protocols for site, complex and landscape level monitoring that complement each other.



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Finally, a common theme was climate change. Protocols should be linked to monitoring climate change, e.g. ice, birds, and frogs. There were suggestions that the MTM project adopt a climate change protocol. For example, air quality, temperature and precipitation data can be combined into a climate change protocol.

### Study Design

There were many study design questions to consider. For example, when should monitoring occur, where will the sites be located, how many replicates should there be, and how will the analysis be done? It was recommended that key stressors and key concerns should be identified. However, when identifying stressors, one needs to be cognizant of inevitable and natural cycles. There needs to be a separation between natural and unnatural occurrences. There also is general need to incorporate the presence/absence invasive species, diseases and pests in identified hot spot areas.

The MTM project partners should plan to a certain extent, but partners also need to get out on the ground to assess the appropriateness of the proposed monitoring activities. This is why pilot projects are so useful. What happened to Parks Canada with respects to their monitoring and data only represents a part of the picture.

### Sites

Sites should be representative of the Oak Ridges Moraine and its land use designations. Criteria should be developed for site selection. For example, what type of area should be included: high threat areas and fragile sites, hotspots, and sites off the moraine? Another consideration is urbanization. Sites should be located in areas that are urban or urbanizing. This is a major component in developing monitoring programs for the MTM project as many volunteers are interested in monitoring to track the local effects development. Proper site selection will help to minimize volunteer burnout, e.g. a few strategically located sites.

Site accessibility is another major concern. While accessible locations can be monitored by volunteers, inaccessible areas may be monitored by CEW or some other organization. While monitoring is going to be on public lands, private lands should be considered in the future. Perhaps a recruitment strategy should be developed. Finally, the MTM project





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should ensure that each monitoring site is going to be under the same management in the long term so it is continually accessible.

## Data

### *Baseline data*

It is important to start base-lining data so that data can be compared over time. This is especially important as there is no baseline data for some indicators. It was suggested that experts establish baseline data while volunteers monitor for trends in subsequent years. Baseline data would be a great resource for students in monitoring and analysis, and can facilitate their contribution and involvement in the project. In all three monitoring themes, the need for inventories was mentioned. This included wetlands, biodiversity, and biophysical inventories.

### *Community-based monitoring (CBM) data*

There was a general concern that CBM data will not be taken seriously by decision-makers or feed into larger databases. There were some helpful suggestions to address this issue that are related to study design. It was recommended that there should be a formally trained individual who can act as a resource while volunteers complete their field sampling. There can be comparison studies between CBM and scientist data. Quality assurance and quality control measures should be integrated into all protocols. For example, a “pre-database” can be created for volunteers. Volunteers can enter their data into a depository database specifically for volunteer data. The data can be reviewed before it is entered into an official database. It will offer a level of quality control, ensuring that data is checked before a qualified individual enters data into a database.

### *Data accessibility*

A database system should contain all monitoring data and ensure organizations have links to it. There should be two types of data available. The first should be “nervous data” or current data for immediate sharing as soon as it exists. It was suggested because it can take many years to receive the data as it may require verification by several people. This type of data will enable volunteers to receive data and feedback in real time. In conjunction with the availability “nervous data”, volunteers should also understand the use and limitations of the unverified data. The second type should be the verified data that will be used for the analysis and interpretation.



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### *Data outcomes*

To ensure that the data is useful, decision-makers should provide input on what kinds of information will be helpful to them. There were some questions regarding the data outcomes. For example, if ongoing monitoring reveals a relationship between declining environmental quality, what will this mean for the Oak Ridges Moraine Conservation Plan? Will the plan be criticized for not working and will serious remediation efforts be implemented?

## **Volunteers**

### *Education & training*

A major challenge will be to educate people on the importance of the MTM project and the value of their presence on the landscape. There also needs to be proper volunteer education on how to monitor while minimizing disturbance to the habitat and indicators. The number of volunteers monitoring in a given area should be checked as not to compromise the habitat.

Generally, the monitoring process is time consuming and labour intensive. In many cases, the limiting factor is the identification skills for the given indicator. These factors can limit the number of participants. To address this, there should be different protocols to match different skill levels for a given indicator, and these protocols should feed into each other. However, volunteers are motivated by the learning experience, so proper training is very important. When this learning is combined with refresher courses and multiple training opportunities, the monitoring program should be easily marketable to volunteers.

### *Support*

Some challenges are long-term volunteer interest, engagement and support. Monitoring should be an enjoyable experience for volunteers. For example, the MTM project should offer consistent and high quality training sessions, including a proper venue, access to proper and functioning equipment and refreshments. Monitoring stations should be established, for both monitoring and training/education. These stations can monitor multiple indicators rather than having multiple plots specific for each indicator or dataset.



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In addition, a coordinator is necessary for training, support and consistency within a group or a whole season can be lost, i.e. if someone moves away. There should be a coordinator for each set of monitoring data. A core group of volunteer should be established to avoid constant re-training. Coordinators can also engage high school groups for help. Training and reporting packages should be developed to ensure that volunteers are on the right track and using appropriate protocols. Liability and insurance should be considered for volunteers.

There also needs to be a balancing between the needs of the MTM project and the needs of the community. Volunteers should be able to monitor based on their interests. Community-based monitoring should also be useful, easy to implement and consistent on the Oak Ridges Moraine. There should be a mutual relationship between those participating in monitoring programs and those running them. The last thing volunteers want is to create more work for others. Generally, volunteers need to determine which protocol is best for them. The MTM project must be aware that this may not always fit the needs of the project.

### *Landowner engagement*

The MTM project should consider developing a strategy to engage landowners as a good portion of the moraine land is privately owned. There is a “Landowners Survey Directory” for landowners. The MTM project can advertise postings there to gauge landowner interest.



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## AQUATICS

### **Indicator: Benthic Macroinvertebrates (BMI)**

Overall, benthic macroinvertebrates (BMI) were agreed to be a good indicator of water quality for community-based monitoring in wadeable streams. BMI are good indicators because they are living things that are both a chemical and biological measure. They are also more satisfying to collect than chemical or physical indicators for water quality, and are a good tool for fostering community relationships. Finally, it avoids overlap with the stewardship initiatives of the Oak Ridges Moraine Stewardship Partnership Alliance (ORMSPA) in smaller lakes.

### **Protocol: Ontario Benthos Biomonitoring Network (OBBN)**

The Ontario Benthos Biomonitoring Network (OBBN) protocol and the Toronto and Region Conservation Authority's (TRCA) benthic monitoring protocol were discussed. While they both have similar requirements for identification skills and training, it was generally agreed that the OBBN protocol was the most appropriate to measure water quality with BMI on the moraine. It is a provincial protocol that feeds into a national program, Canadian Aquatic Biomonitoring Network (CABIN). There is some level of quality control as all participants require certification to collect the data for the network and trainers requires certification to input the data onto the online database. While the network is relatively new and without historical data, the protocol is gaining popularity and momentum across Canada. Many conservation authorities and national parks are using the OBBN. The OBBN has a database which everyone can use and is useful to decision-makers. The only mentioned con for the OBBN protocol is that it is not appropriate for urban sites in which there are not many BMI.

### **Study Design: Site Selection**

There were some helpful comments related to the study design for BMI monitoring. Many of them were about sites, e.g. site location and condition. The streams should be monitored in a watershed context, taking into account upstream and downstream factors, as well as both distant and local water sources, e.g. groundwater and aquifers. The moraine headwaters should be a priority for monitoring. Furthermore, sites should be reflective of the land use designations of the Oak Ridges Moraine Conservation Plan. This



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includes urban sites as there are many on the moraine. For example, more than half of the TRCA jurisdiction is urbanized. Information on changes in water quality in areas of development is useful.

### Other Indicators

Chemical and physical indicators were suggested because they require minimal training and yield a high data return since the sampling process is simpler and faster. Combining both BMI monitoring with chemical indicators can provide a more powerful assessment. Suggested chemical and physical indicators include phosphorus, turbidity, stream flow, daily loadings, temperature and rain. Aesthetics monitoring was also recommended. There was also a recommendation to monitor fish and lakes. There was a particular emphasis on kettle lakes and the importance of establishing baseline information. Water table monitoring was also recommended as being both easy, cheap, and something other groups are doing, e.g. a group in Lemonville. H<sub>2</sub>O Chelsea has a qualitative groundwater monitoring program for homeowners.

### Volunteer Training

It is imperative that there is proper and consistent training for volunteers with regular refresher courses. A trainer who is working with community groups or schools needs proper training and experience.

The monitoring process can be time consuming with respect to setting up the site, collecting the data and identifying samples. Distinguishing monitoring roles can facilitate the monitoring process. For example, a volunteer with limited knowledge on BMI identification can focus on the data collection while an experienced volunteer can concentrate on the BMI identification.

To ease new volunteers into biomonitoring, chemical and physical indicators can be used first. Once this type of monitoring has been established and successful, volunteers can move on to more intensive sampling. The Check Your Watershed Day event led by the MTM project partners is an example of engaging volunteers in monitoring physical indicators using simple and low-tech methods. The protocol was commended for its suitability for community engagement and usefulness in filling information gaps.





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## WETLANDS

The need to monitor wetlands was apparent from the breakout sessions. A participant mentioned that Ontario's Wetland Evaluation System is declaring that significant wetlands are falling apart. A caveat in wetland monitoring is the many different wetland types. For each type there are different protocols. Wetland classification and distinguishing may be important if the MTM project will be examining hydrology as a driving parameter.

### Indicator: Frogs and Birds

Both frogs and birds were recommended as indicators for wetland health. However, amongst the groups, there was no agreement in whether birds or frogs should be monitored. There are seasoned volunteers who can help to educate new volunteers. There is also a network of groups involved in monitoring these indicators and historical data is present.

### Protocol: Marsh Monitoring Protocol (MMP)

It was recommended that the MTM project use an existing wetland protocols for its monitoring suite. Specifically, the Marsh Monitoring Protocol (MPP) was suggested. The MMP is already well-established and well-known. Workshop participants recommended adapting this protocol to suit the needs of the MTM project. Other groups have been tailoring the MPP protocol successfully in their monitoring efforts. Parks Canada has developed a "most wanted" list of birds. As they continually hire new field staff, this was done for ease in identification and to increase monitoring speed. The MTM project was recommended to create a "most wanted" list for monitoring in certain areas. This list should include rare species, whose presence will be verified by an experienced birder before database entry.

Some cons to the MPP protocol is that it requires volunteers to be very knowledgeable in identifying birds and frog species, tapping into a specialized group of eager and experienced volunteers. Monitoring occurs either very early in the morning (for birds) or late a night (for frogs). There were also concerns about the applicability of the MMP as it was developed for costal wetlands, not inland wetlands.



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## Other Protocols

The Ontario Benthos Biomonitoring Network (OBBN) protocol was mentioned for wetland monitoring as it is applicable to streams and wetlands. Using the OBBN protocol for both wadeable streams and marshes will minimize the number of protocols. However, benthic samples are more difficult to collect in wetlands and harder to identify than birds and frogs.

The MTM project should look into other wetland monitoring initiatives. Ducks Unlimited has monitoring focused on examining changes in open water. As well, the Toronto Zoo has an Adopt-a-Pond program and EMAN is in the process of adding a marsh monitoring protocol to their list as well.

## Study Design

### *Sites*

In general, the wetlands on the moraine should be identified as well as their designations. To start, a wetland base map should be located. A community survey can be organized to determine the moraine wetlands in public areas. In some areas, there is enough land to warrant wetland monitoring, e.g. in the TRCA jurisdiction. In other areas however, landowner recruitment may be necessary. As well, the recruitment process will be easier if people can monitor in their own backyards. Once sites have been established, there also needs to be some consideration around site proximity to urban areas. Ducks Unlimited can be consulted in this case.

### *Scale & Time*

Another consideration is the monitoring level. Volunteers will monitor at a site level, but landscape level information may be needed to answer the monitoring questions. There should be a strategy towards layering, in which there are landscape, complex and individual level monitoring that are compatible. There needs to be consideration over capturing landscape level changes. A landscape level approach will enable generalizations to be made, rather than local results.

### *Sampling*

Point and plot-based sampling were recommended for wetland monitoring. Polygon descriptions should be included for modeling and model validation. This type of sampling





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will help to avoid duplication. To monitor birds, it was recommended that a presence/absence count is used rather than abundance, as to prevent duplicate counts of the same bird.

### Other Indicators

Chemical indicators were also suggested: pH, phosphorus, nitrogen, ammonia (especially since ammonia is not naturally there), temperature, and other water quality measures. Including chemical indicators may draw in the more scientifically-minded people, but would require more of an initial investment.

Other biological indicators were suggested. These included invasive species and dominant plant communities. Certain plants can be selected to represent stressed wetlands and narrow down the monitoring plant species list. Dragonflies were equivocally suggested as both appealing and boring for volunteers. A biotic inventory was recommended for the wetland sites.

### Volunteer Training

As with the OBBN, the MMP requires volunteers to be trained to accurately identify the indicator species. To increase involvement, there should be multiple start points for volunteers based on their skill level. FrogWatch may be a good protocol to start off with because it is easy to use and relates to habitat quality. Also, a simple indicator of wetland quality can be used initially, e.g. the number of non-invasive plants. Experienced volunteers can act as resources for new volunteers. There was a general consensus that community-based monitoring should happen without compromising the ecological integrity of the wetland site. There is a high education component involved with wetland monitoring.



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## TERRESTRIAL

Terrestrial monitoring was considered a good way to get volunteers involved, more so than the other monitoring themes. This type of monitoring is truly filling in a gap in fine scale vegetation in Ontario. Currently rapid forest assessment plots are being developed by the Ontario Ministry of Natural Resources and Parks Canada.

### Protocol: EMAN 20x20 Plots

The 20x20m EMAN plots was agreed to be a good monitoring protocol for terrestrial health. This was preferred over then one hectare plots as the smaller plots are more practical for volunteers. As well, more small plots will provide more beneficial information than a few large plots. However, setting up the initial plot takes about a full day commitment. Regeneration in subplots should be taken into account.

### Other Protocols

It was recommend that the MTM project feed into other bird monitoring programs such as the forest bird monitoring program and the breeding bird atlas. The TRCA has a terrestrial monitoring program where species are ranked and scored for sensitivity. These species represents the different gradients and thus helps to identify what stressors are in affect and the level of stress. It also provides variance data in urbanized areas. This is also done because it is impossible to do a complete inventory.

### Study Design

Criteria needs to be developed for what the MTM project wants: patch of size, type of land (private versus public), and site location and selection method for example. Will forest plot monitoring take into account plots undergoing succession? Will interior plots be sufficient to assess the larger ecosystem health? How does scale factor in to the decisions? A final consideration is determining a measure for terrestrial monitoring effectiveness or success. It was recommended that forest experts be consulted.

### Sites

An inventory of sites is needed to determine site placement and enable sites to be ecologically categorized. Sites should be representative of biodiversity and randomly stratified by the types of sites that should be covered. However, a randomized plot



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selection is not appropriate for vegetation because of climate gradient effects. There should be more than 10 plots on the Oak Ridges Moraine.

It will be important to have both disturbed and undisturbed sites for comparison. Parks Canada has a map of stressed and non-stressed zones that will help to identify sites. Sites can also be strategically located in areas that may be developed in the near future: while they cannot be monitored on the long term, it will help to show the negative effects of development. Pressures from adjacent land uses should be taken into account when selecting sites.

### *Sampling*

Rather than a complete inventory, key species should be selected that are easy to identify and represent a gradient. This is preferable to presence/absence monitoring. Transect and plot monitoring are necessary for terrestrial indicators. Transects should be used for birds and vegetation while plots should be used for tree densities. A minimum of three seasons of monitored is required and should definitely include the spring and fall. There needs to be enough monitoring and data so the study is defensible. MNR could coordinate a database to collect enough points for modeling and mapping of forest and wetlands that is based on stressors.

### **Other Indicators**

Suggestions for other indicators spanned both flora and fauna, and other moraine features:

- Lichens were suggested as an indicator for moisture, decomposition and air quality. While a high initial investment may be necessary to train volunteers, the tradeoffs may be worth it.
- Amphibians and butterflies were suggested as an indicator because there is a high interest.
- Invasive species, pests and diseases should be monitored simply by identifying hotspots and the presence/absences of a few major species.
- Soil and vernal pools should be monitored.
- Alvars, meadows and grasslands were also suggested. There are also different types of meadows to consider, e.g. old farm fields and forest openings.
- Indicators of climate change were also suggested including ice, birds and frogs.



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## ADDITIONAL COMMENTS

### Other Indicators & Protocols

Workshop participants suggested monitoring noise and light pollution on the moraine. Lichens were also recommended, relating atmospheric chemical inputs to aquatic and health disruptors. Other protocols were recommended such as a trampling protocol to determine the affects human use on a landscape, e.g. bike use. This combines both quantitative and photographic data. There was a question regarding growth on the moraine, and who was monitoring it.

### 2014 Team

Because there are many study design questions, it was recommended that the MTM project assemble a 2014 team to assist with the process. It would be a team of respected monitoring experts. Their role would be to make links between what we need to know and what knowledge is available, develop a context for monitoring issues, identify key stressors, ensure that the issues are relevant today and for the long-term, and help to develop the monitoring study design protocols that will produce useful data.

### Outreach & Communication

The MTM project should expand its outreach. For example, the project should expand beyond the four pilot areas and involve the private sector more. The project should engage youth in monitoring and hold annual school trips. Social networks such as MySpace and YouTube should be used to draw in the younger population, share ideas and spur interest. Importantly, there needs to be a clearer connection between monitoring and action.

There should be timely reports and annual summaries or newsletters that are supplemented with workshops. Annual workshops should be held to share initiatives, findings, and events on the moraine. Perhaps there can be a monitoring or workshop focus each year to get more people engaged in monitoring. There should be open discussions between the various groups about program linkages, consistency and coordination. This way, protocols can be communicated in a consistent manner. As well, volunteer communication on a moraine-basis should be stronger. Although this is already happening on a stewardship level, it is absent on a monitoring level. There should be more



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meetings between MTM project partners and local groups to start building contacts and awareness. Local initiatives should be made available moraine-wide if possible.

### **Potential Partnerships**

There were many groups recommended as potential partners in the MTM project. Generally, these included the Conservation Authorities Moraine Coalition, Stewardship Councils, Land Trusts, local municipalities, universities, the Ministry of Natural Resources and the Ecological Monitoring and Assessment Network. For local municipalities, it was recommended that the MTM project should have links on the websites of moraine municipalities. For aquatic monitoring, recommended groups included Friends of the Rough Watershed, cottage associations and the Vernal Pool Association in Credit Valley. For terrestrial monitoring, naturalist clubs with birders were recommended, the GRCA and TRCA, and adopt-a-park and trail maintenance programs. Participants also mentioned linking into Greenbelt initiatives.



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Save The Oak Ridges Moraine



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## NEXT STEPS

Overall, ten key recommendations have been identified from the workshop participants:

1. Combine biological indicators with physical and chemical indicators
2. Conduct for inventories on the moraine, using selected key species where appropriate
3. Integrate the monitoring of invasive species, pests and diseases
4. Tap into existing protocols and groups who use them
5. Ensure there are no monitoring gaps in monitoring scales between groups (site, complex and landscape level)
6. Link climate change into the monitoring program
7. Develop 2014 Team to focus on the study design and preparing for the Review
8. Verify the validity of community-based monitoring using paired plots with scientists for comparison
9. Ensure there are consistent volunteer education & training that are appropriate for different skill levels
10. Offer various avenues for communication and information sharing, e.g. annual event, newsletters, and workshops

The MTM project's Steering Committee and Monitoring Advisory Committee will review the proceedings and decide the suite of indicators that the project partners can undertake over the next three years. The recommendations will be incorporated into the MTM project work plan. These comments will assist the MTM project partners in developing the Community-based Strategic Monitoring Plans (CBSMP). The CBSMP will become a reference document to guide groups as to how their policy and environmental monitoring efforts can contribute to protecting the Oak Ridges Moraine.

## ACKNOWLEDGEMENTS

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## Appendix I: List of Workshop Participants

Kim Baker	Natural Heritage Biologist, Lower Simcoe Region Conservation Authority
Jeff Borisko	Biomonitoring Scientist, Toronto and Region Conservation Authority
Sharon Bradley	Founding Member, Oak Ridges Friends of the Environment
Martin Bunch	Assistant Professor, Faculty of Environmental Studies, York University
Mark Carroll	Program Coordinator, Community Resource Centre of Scarborough
Alice Casselman	President, Association for Canadian Educational Resources
Patricia Chow-Fraser	Professor, Department of Biology, McMaster University
Marlene Doyle	Science Communication Coordinator, Ecological Monitoring and Assessment Network Coordinating Office
Adrienne Duff	Staff, Credit Valley Conservation
Jennifer Havelock	Source Water Protection Technical Coordinator, Conservation Ontario
Sue Hayes	Project Coordinator, Terrestrial Field Inventories, Toronto and Region Conservation Authority
Pamela Lancaster	Watershed Technician, Ganaraska Region Conservation Authority
Patricia Lowe	Director, Watershed Stewardship, Community Outreach & Education
Dan McCarthy	Associate Professor, Department of Earth Sciences, Brock University
Margo McNab	Member, Protect the Ridges



# MONITORING the MORAINE

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Lionel Normand	Terrestrial Biologist, Toronto and Region Conservation Authority
Danijela Puric-Mladenovic	Senior Analyst, Settled Landscapes, Information Management & Spatial Analysis Unit - Southern Science and Information Section, Ontario Ministry of Natural Resources
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Eric Sager	Faculty, Oliver Ecological Centre
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Silvia Strobl	Coordinator, Information Management & Spatial Analysis Unit - Southern Science and Information Section, Ontario Ministry of Natural Resources
Sue Walmer	Member, Aurora Environmental Advisory Committee
Maria Naccarto	Staff, Association for Canadian Educational Resources
Tom Waechter	Member, Richmond Hill Naturalists
Josh van Wieren	Park Ecologist, St. Lawrence Islands National Park