ADOPT-A- RIVER PROGRAMME PHASE II: DEVELOPMENT OF AN IMPLEMENTATION PLAN MONITORING MODELS

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DOCUMENT INDEX

Reports as part of this project:

Report number	Report Title
N000000RET0109	Adopt-a-River Programme Phase II: Development of an Implementation Plan. Inception Report
Authors	Y. Burger, P. de Souza, A. Neumann, J.N. Rossouw and L. Rossouw
N000000RET0209	Adopt-a-River Programme Phase II: Development of an Implementation Plan. Database of stakeholders
Authors	A. Neumann
N000000RET0309	Adopt-a-River Programme Phase II: Development of an Implementation Plan. Monitoring Models
Authors	L. Rossouw
N000000RET0409	Adopt-a-River Programme Phase II: Development of an Implementation Plan. Institutional aspects/Governance Structures
Authors	Y. Burger
N000000RET0509	Adopt-a-River Programme Phase II: Development of an Implementation Plan. Water Resource Quality Situation Assessment
Authors	H. Hendriks and J.N. Rossouw
N000000RET0609	Adopt-a-River Programme Phase II: Development of an Implementation Plan. Manual for Volunteer Monitoring
Authors	K. Versfeld and J.N. Rossouw
N000000RET0709	Adopt-a-River Programme Phase II: Development of an Implementation Plan. Programme coordination manual for National and Regional coordinators
Authors	T. Manxodidi and J.N. Rossouw
N000000RET0809	Adopt-a-River Programme Phase II: Development of an Implementation Plan. Communication Structures
Authors	P. de Souza, K. Versfeld and J.N. Rossouw
N000000RET0909	Adopt-a-River Programme Phase II: Development of an Implementation Plan. Training Material and Training Needs
Authors	K. Versfeld and J.N. Rossouw
N000000RET1009	Adopt-a-River Programme Phase II: Development of an Implementation Plan. Implementation Manual
Authors	Y. Burger, P. de Souza, J.N. Rossouw and L. Rossouw
N000000RE T1109	Adopt-a-River Programme Phase II: Development of an Implementation Plan. Recommendations for the Implementation of the Adopt-a-River Programme
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EXECUTIVE SUMMARY

An initiative to create awareness amongst all South Africans of the need to care for our scarce water resources was raised in Parliament in 2006. This was done to foster public participation in the protection and management of our rivers and also as a sign of their own commitment.

To give effect to this initiative the Minister requested the former DWAF officials to formalise and implement such a programme as soon as was practicably possible. The Adopt-a-River Programme was initiated. The aim of this programme (at least at the onset) is to create awareness amongst all South Africans of the need to care for our scarce water resources and to facilitate their participation in the protection and management these resources.

A phased approach is being followed to develop the programme. Phase 1 was the initiation and development of a Strategic Framework. Phase 2, which is the topic of this assignment, is the development of an Implementation Plan and the preparation for Phase 3 where pilot implementation on selected rivers will take place.

The objectives of this report will be to define the field of volunteer monitoring and stakeholder involvement, to consolidate our understanding of the monitoring programmes in South Africa, focussing on volunteer monitoring and to gather information on volunteer monitoring programmes elsewhere in the world and to capture good practices. This information will be used for proposing an appropriate volunteer monitoring model for South African conditions indicating how to involve volunteer and other stakeholders in monitoring and managing our water resources.

In defining volunteer monitoring a distinction should be made between volunteer monitoring to support formally designed water resource quality monitoring programmes (such as the national monitoring programmes operated by DWA) and volunteer programmes aimed at creating awareness and to encourage citizens to become involved in the protection of our water resources (monitoring in the sense of sample collection and analysis will in this case be more of a tool to involve the community rather than to collect data to support formal monitoring programmes).

Volunteers make visual observations of habitat, land uses, and the impacts of storms; measure the physical and chemical characteristics of waters; and assess the abundance and diversity of living creatures – aquatic insects, plants, fish, birds, and other wildlife.

Volunteers also clean up garbage-strewn waters, count and catalogue beach debris, and become involved in restoring degraded habitats.

Some detail will be presented in the Executive Summary to enable the reader to get a good idea of the models available without having to read the complete report. Some of this information will again be duplicated in the implementation manual.

Where do volunteers fit in? Volunteers build stewardship of local waters

By educating volunteers and the community about the value of local waters, the kinds of pollution threatening them, and how individual and collective actions can help solve specific problems, volunteer monitoring programmes can:

- Make the connection between catchment health and our individual and collective behaviours;
- Build bridges among various government departments, agencies, businesses, and organizations;
- Create a constituency for local waters that promotes personal and community stewardship and co-operation.

How can volunteer water monitoring contribute and how is it funded?

Volunteers make visual observations of habitat, land uses, and the impacts of storms; measure the physical and chemical characteristics of waters; and assess the abundance and diversity of living creatures – aquatic insects, plants, fish, birds, and other wildlife.

Volunteers also clean up garbage-strewn waters, count and catalogue beach debris, and become involved in restoring degraded habitats.

Volunteer monitoring programmes are organized and supported in many different ways. Projects may be entirely independent or may be associated with government, provincial, local, or other agencies; with environmental organizations; or with schools and universities. Financial support may come from government, partnerships with businesses, endowments, independent fundraising efforts, corporate donations, membership dues, or a combination of these resources.

How to get started as a volunteer monitor

Determine your personal goals: Participating in a volunteer programme that provides data to be used by government agencies will usually require that you take part in formal training sessions and commit to regular schedule sampling (usually weekly, monthly or seasonally). If you are more interested in learning about your local waterway and educating others, your time commitment may be less and any training will probably be less formal

Learn about any existing monitoring programmes in your area and around the country. Other potential sponsors or sources of information include local community based groups such as civic or catchment associations, garden clubs, universities, and activist organizations. National environmental organizations with chapters in their areas and regional offices of government agencies are also sources of information.

Once a monitoring group, possibly a volunteer group, is located, the volunteer will probably find that they offer a variety of opportunities. Chances are that the volunteer will find opportunities that suit their skills and interest.

If you cannot locate a local group, consider starting one yourself.

Some basic research is required to determine how to proceed. To help with the research a list of questions can be developed and discussed with other volunteer/formal programme coordinators. Some typical questions would be:

- What relationship does the programme have with government and local agencies, local businesses, schools and colleges, other groups?
- What kind of monitoring does the programme conduct?
- What are the costs for the monitoring?
- How is the programme funded?
- How are volunteers/stakeholders recruited, trained, and retained?
- How is the quality of the data ensured? Does the programme have an approved quality assurance plan? Is a quality assurance plan required?
- What reference materials, training aids, and methods manuals are available and do they recommend?

Monitoring review

Rossouw and Februarie provided a broad overview of volunteer monitoring and how different countries have approached this.

Volunteer monitoring programmes can include a variety of activities depending on their purpose and funding. If the primary purpose of a monitoring programme is public education, volunteers may focus on documenting point sources of pollution in a catchment (watershed) – an activity which does not require much equipment. Another group's purpose might be to collect scientific water quality data. This may necessitate a different level of funding and commitment.

There are many different organisations around the world involved in water quality monitoring. The following institutions make use of volunteers at different levels.

Global Water Watch

Global Water Watch (GWW) is a voluntary network of community based water monitoring groups. They provide an information and assistance network for community groups using monitoring techniques approved by the US Environmental Protection Agency. The overall goal of GWW is to foster the development of citizen volunteers to monitor surface waters for the improvement of both water quality and public health and policy. GWW helps communities establish teams of citizens who measure physical, chemical and biological indicators of watershed fitness. Monitors use their data to restore streams and lakes, improve drinking water quality and public health, and implement environmental education programmes for the public.

United States Environmental Protection Agency (USEPA)

Across the USA, trained citizen volunteers are monitoring the condition of their local streams, lakes, estuaries, and wetlands. The USEPA encourages all citizens to learn about their water resources and supports volunteer monitoring because of its many benefits. Volunteer monitors build awareness of pollution problems, become trained in pollution prevention, help clean up problem sites, provide data for waters that may otherwise be un-assessed, and increase the amount of water quality information available to decision makers at all levels of government.

USEPA supports volunteer monitoring by sponsoring national conferences, publishing manuals on volunteer monitoring methods and on planning and implementing volunteer programmes, managing a listserver for volunteer monitoring programme coordinators, producing a nationwide directory of volunteer programmes, and funding a national newsletter, The Volunteer Monitor.

Canada's Stewardship Agenda

The vision of Canada's Stewardship Agenda is a nation where Canadians are actively working together to sustain their natural life-support systems. The scope of the Agenda reflects this vision, promotes collaborative action, and builds a social cohesion and shared responsibility among citizens. It engages those who are involved in the conservation of biodiversity, the sustainable use of Canada's biological resources and the wise management of all natural resources. Under the Agenda, stewardship activities can be directed at the recovery of species at risk and contribute to the sustainability of terrestrial and aquatic ecosystems.

The Plan includes establishing a national network of stewards, improving co-ordination among stewardship programmes and efforts, and supporting the capacity of individual stewards to carry out conservation activities. The Agenda draws on collective experience, complements existing investments in stewardship programmes, and fosters actions to conserve and promote wise use of their natural resources. It is intended to establish a broad, long-term course of action, foster collaborative actions and identify priorities for future investment in stewardship.

Stewardship is implemented primarily at the local level, recognizing the diverse social and economic conditions across Canada and the different situations faced by stewards in different areas.

Canadians can expect direct benefits from investments in stewardship, including better support for landowners and land users that are good stewards, improved integration among government agencies, more efficient funding processes and easier access to stewardship knowledge and information.

Voluntary Sector Initiative

The Voluntary Sector Initiative (VSI) was a unique undertaking between the Government of Canada and the voluntary sector to enhance their relationship and strengthen the sector's capacity. The overall goal of the initiative was to improve the quality of life in Canada.

The VSI was based on the recognition that the voluntary sector is one of the three pillars of Canadian Society, equal in importance to the public and private sectors. It aims to improve the ability of organizations to benefit from the contribution of volunteers, to encourage citizens to participate in voluntary organisations, and to enhance the experience of volunteering.

The Canada Volunteerism Initiative (CVI) aims to improve the ability of organizations to benefit from the contribution of volunteers, to encourage citizens to participate in voluntary organisations, and to enhance the experience of volunteering. The CVI represents the first ongoing programme to be implemented under the broader VSI. The CVI established three national centres and thirteen local networks, one in each province and territory. The national centres deliver a range of programmes and services related to volunteerism.

Volunteer Canada

Volunteer Canada is the national voice for volunteerism in Canada. They have been active since 1977 and have been committed to supporting volunteerism and civic participation through ongoing programmes and special projects.

Waterwatch

The Australian Government has an initiative “Caring for our Country” in which there are a number of ways that volunteers can get involved in natural resource management (NRM) activities at a local, regional, state or national level. The Australian Government and other organizations that facilitate activities can help people find an appropriate group to join, or support the formation of a new group concerned about the quality of the land and water in their area.

“Caring for our Country” includes groups such as Conservation Volunteers, Earthwatch Institute, Greening Australia, Landcare Australia, Reef Check Australia, Threatened Bird Wetwork, WWF-Australia and Waterwatch.

Waterwatch is a national community water monitoring network that encourages all Australians to become involved as volunteers and be active in the protection and management of their waterways and catchments. The vision for Waterwatch Australia is healthy waterways. Waterwatch is supported and funded by the Commonwealth Government’s Natural Heritage Trust in partnership with all levels of government, industry and the community.

Waterwatch groups collect data using nationally adopted protocols for nine parameters. They are: macro-invertebrates, dissolved oxygen, temperature, pH, conductivity, turbidity, reactive phosphorus, nitrogen and, riparian habitat assessments. The data are recorded using nationally agreed units and national site code systems and then entered into a standard national Waterwatch database. The data can then be pooled, analysed and interpreted for specific catchments or larger regions. This system enables reports to be produced for water management authorities to assist in natural resource management.

World Water Watch

World Water Watch (WWW) is a non-profit organization supporting other Non-Governmental Organizations (NGOs), foundations, and government and private agencies involved in the planning, protection and restoration of water resources. WWW assists in the development and management of water quality monitoring networks and the design and implementation of remedial measures to restore surface and groundwater quality on a catchment scale. WWW represents a group of international experts in the field of water resources and environmental engineering. This group utilizes its expertise in the development of assessment, evaluation and design tools, and assists in specific project activities. WWW works closely with local communities to develop and support water resources protection and management activities.

WWW supports volunteer monitoring programmes by assisting with catchment monitoring system design, implementation and operation. They also provide guidance with respect to quality assurance and control practices. WWW also assists volunteer monitors in locating and utilizing resources and expert guidance.

Most of their activities involve partners and collaborating organizations. WWW, along with partner organizations, offer volunteer opportunities both in the USA and overseas. Volunteers can commit to as little as one week, or as long as one year.

South African National Monitoring Programmes

The National Water Act specifically mandates the Minister of Water Affairs and Forestry to establish national monitoring systems that monitor, record, assess and disseminate information on water resources. To comply with this requirement of the Act and with Chapter 3 of the National Water Resources Strategy, the former DWAF has developed and implemented a series of national water quality monitoring programmes.

The following are National Monitoring Programmes: National Microbial Monitoring Programme (NMMP), the National Eutrophication Monitoring Programme (NEMP), the National Chemical Monitoring Programme, the National Toxicity Monitoring Programme and the Aquatic Ecosystem Health Monitoring Programme, including the River Health Programme and the Adopt-a-River Programme. Other activities include the application of eco-toxicology (ecological risk assessment), the National Radioactivity Monitoring Programme and support for the Resource Directed Measures (RDM) Office in the ecological reserve determination and monitoring.

These programmes are government driven and do not use volunteers for any of the water quality sampling. There are many reasons for this but mostly the data must be of high quality and the programmes are subjected to strict quality control measures and little or no flexibility in what is being monitored.

Rand Water and Umgeni Water, bulk suppliers of water, have extensive water quality monitoring programmes, but do not make use of volunteers in their water quality monitoring activities. A number of concerns were raised concerning the use of volunteers.

The City of Cape Town has trained and used volunteer water quality monitors in the past but it was more an awareness creation campaign and a lack of funding, structure and specific skills within the community resulted in nobody taking responsibility for such a programme.

Catchment fora such as the Olifants River Forum in Mpumalanga and the Olifants-Doorn River Forums and Reference Group in the Western Cape are active in catchment management and the identification of problem areas (pollution, soil erosion etc) in the interim until Catchment Management Authorities are established. Although routine or baseline water quality monitoring is not part of their mandate, problem areas are identified and referred to the local authorities to investigate and solve the problem. Volunteers from the different communities in a particular Water Management Area manage the fora.

There are a number of very successful non-water related examples of volunteer input such as the Volunteer Child Network and the St John Ambulance Foundation.

The St John Ambulance Foundation is assisted by a network of professionals and trained instructors who give training in first aid and health promotion. Training of volunteers is their core business and incentives are used to attract the volunteers.

Wildlife and Environment Society of South Africa - WESSA

WESSA is South-Africa's oldest and largest non-government, membership-based environmental organisation. Their mission is to promote public participation in caring for the Earth.

The Society maintains a watchful eye on the environment through its extensive network of Regional offices, Branches (volunteer groups acting for their community), Friends Groups (groups of people who have banded together to conserve natural areas) and Environmental Youth Clubs.

Professional conservation and educational staff are employed to work directly with the public, with local, provincial and national government and with other conservation bodies to press for effective environmental planning and legislation to offer better protection of the environment.

Environmental education is vital in indicating the impact of man on the environment. WESSA offers their services at schools, teachers' groups and other environmental educators, either directly or by mobile units. WESSA increasingly engage in community development work and run environmental education centres across the country. Two successes are the initiation of a national youth environmental club scheme and the establishment of a resource development network, Share-Net.

WESSA has adopted a holistic approach to environmental issues and is involved in a wide range of projects and initiatives.

One national project, the Adopt-a-Beach Programme is an example of how volunteers can be included in volunteer monitoring within the South African context. The idea behind the Adopt-a-Beach Programme is to encourage groups of people (volunteers) to adopt or help look after a piece of coast in their region and link with others as part of a national project. This programme was launched by the Department of Environmental Affairs and Tourism's Marine and Coastal Management Branch, and is being implemented by WESSA. Participating groups include schools, coastal communities, participants of Coastcare projects like Working for the Coast, Blue Flag beaches, as well as local environmental interest groups.

The activities are guided by giving each participating group an easy-to-use handbook and log sheets, as well as a resource box containing a wide range of items and resource materials, useful for monitoring and learning about coastal issues and having fun on the beach.

Different groups are involved in different activities. They do not necessary follow the action topics of the guide, i.e. one group takes special care of coastal caves, another helps with seabird counts. Some have alerted the police to poaching activities while others have collected tons of plastic and many other issues are addressed.

There is great public interest in the programme and by contacting your nearest WESSA Regional Office for details of Adopt-a-Beach groups in your area, you can become involved.

Other national projects include the Eco-schools programme, designed to encourage curriculum-based action for a healthy environment; Share-Net: It is a South-African based informal networking project that supports environmental education and development in the SADC region and Enviro Clubs that focuses on young people.

Friend of …. Groups are community-based groups that are affiliated to WESSA, and consist of community members who have banded together around a particular natural environment to ensure its conservation and environmental integrity. The main aim of the Friends movement is to support local government by providing volunteer time and assistance to make the public more aware of the value of our natural heritage. All activities and projects are planned in liaison with the owner/administrator of the area. Friend groups educate themselves and the public, by collecting and distributing information on the conservation-worthiness of their area, they promote the natural assets of their areas and they help the management of the area to eradicate aliens and combat soil erosion. There are already some Friend groups that have selected water bodies/rivers to manage, i.e. Friend of Nylsvlei, Friends of the Liesbeek and Friends of Little Princess Vlei.

Legal, health and safety issues

The issue of the legal, health and safety aspects of using volunteers, especially for water quality monitoring, needs to be investigated in more detail.

The value of volunteer involvement in the monitoring of water quality programmes

It has been acknowledge that the future of our water resources and sustainability thereof are dependant on the attitude of the users thereof, and in this instance, the role of community members cannot be ignored or under-estimated. It is important that communities be made aware of the significant role they can play to preserve and protect our water resources. Volunteers have been successfully utilized in different activities and at various levels within communities and sectors.

Even the new Water Act of 1998 emphasis the need for community involvement at all levels within the water sector. It is acknowledge that water resource quality management problems are extremely complex and occurs on a broad spatial and temporal scale. To assist water resource quality managers and users to deal with these complex issues, the Department of Water Affairs, in partnership with other institutions and private sector, should build on previous initiatives by making further investments through long-term strategic capacity building programmes. By investing in such programmes and promoting the involvement of communities and volunteers, the integrated management and protection of our water resources on a sustainable basis will become more of a reality.

Lessons learnt

The following are lessons learnt from both the international and local case studies. They are not in a particular sequence and are all considered equally important. It is also assumed that volunteers will be used in possible monitoring and awareness creation projects.

Institutional/governmental support and guidance

Provide mechanisms for different catchment organizations to co-ordinate activities, exchange ideas, and share experiences so that programmes are delivered as efficiently and effectively as possible.

Legislate catchment planning and ensure the integration of catchment management programmes into existing policy regulations and activities.

Develop public awareness campaigns aimed at increased understanding of the importance of integrated catchment management.

Commit to building collaborative partnerships with communities, universities, industry (including forestry, agriculture, mining and energy), all levels of government, and community groups.

Training

Well-trained volunteers can play a vital role in assisting institutions to perform their monitoring functions effectively. By involving volunteers in the management of water resources and

exposing them to training, not only the institutions benefit, but communities become more aware of the urgency and importance of protecting precious water resources.

A well-structured training programme is required. There are many training programmes currently available internationally and locally. A skills audit will identify the specific training requirements of a volunteer group and this must fit in with the objectives of their monitoring goals. Once this is done it is proposed that they tap into the various exiting training programmes and select the most appropriate programme that will affectively address their needs. If nothing were available one would have to source funding to develop a specific programme to suit their needs.

Volunteer groups whose primary purpose is education and constituency-building generally adopt simple, easy-to-use assessment methods and may not need to develop a stringent quality assurance project plan.

Acceptability of data

The acceptability of data will depend on the quality control mechanisms in place and the purpose of the monitoring data. Volunteer monitors collect independent data that can be used to either uphold or challenge public agency and industry data or that can be used for awareness creation only.

Volunteer groups whose primary purpose is education and constituency-building generally adopt simple, easy-to-use assessment methods and may not need to develop a stringent quality assurance project plan.

Keep your goals-and those of your volunteers-realistic

Chances are slim that your data will ever be used in court to stop a polluter. Data collected for such regulatory purposes requires a very high degree of quality assurance. Most volunteer data is used to educate the community and to screen for potential problems.

Secure funding

It is critical to secure funding for any proposed activities prior to the initiation and implementation of a volunteer project. It is just as critical to have a secure source of funding. It is even better to have multiple secure sources of funding.

Volunteer monitoring programmes can be organised and supported in many different ways. Financial support may come from government grants, partnerships with business, endowments, independent fundraising efforts, corporate donations, membership dues, or a combination of these sources.

Responsibilities towards volunteers

Institutions must be aware of legal responsibilities towards volunteers, if any exist. If there are no legal protective measures in place, the volunteers should be informed accordingly, before they commit themselves.

Lengthy process

Create an action plan: The aim of an action plan is to allow your group to move from an awareness of water quality/quantity problems, to eventually coordinating and implementing actions that will have a beneficial impact on the water resource. An action plan will help focus your activities, and consequently you will manage water resource challenges more efficiently.

Before volunteers can be used to perform monitoring functions, appropriate and clear guidelines should be developed to assist stakeholders in the initiation and implementation of the process of volunteer water resource monitoring.

It takes time to establish a monitoring programme of any nature. Proper planning is essential. If the use of volunteers are considered, all the structures and funding to initiate the programme should be in place before volunteers are recruited. If everything is not in place, and the time of the volunteers are wasted by not knowing what to do (action plans should be in place), the volunteers will loose interest and be lost to the programme.

Start small

It is generally recommended that one should start small, i.e. with a pilot study, before full implementation of a monitoring/awareness creation project. A pilot project that serves to test out methods, training sessions, and organizational skills can keep you from being overwhelmed and allows you to evaluate and refine your project before moving on to more ambitious efforts.

Commitment of volunteers

Volunteers must be inspired, motivated, keen and caring, to name but a few of their characteristics that will enhance their commitment to a specific volunteer monitoring programme.

The attitude of people plays an important role in their availability to participate in a volunteer programme.

Education and training

Education and awareness of environmental issues should start in schools. This way a future generation that has an environmentally sensitive attitude will be created.

Public education and awareness programmes are an important component of catchment plans to build support for, and also encourage stakeholder participation in, catchment management.

A good training programme enhances the project's scientific credibility with potential data users and it boosts the volunteers' confidence in the project and themselves.

Good training equips group members with skills to produce reliable, credible data and an understanding of why it is being collected and what it means. Benefits of training increases the

confidence of the participants, acts as personal motivation from increased opportunities, it is an important social networking event and improves personal safety in the field and minimizes possible accidents and mistakes.

The key areas where training is required will depend on the existing skills and experiences of group members. It will also depend on their roles, responsibilities and functions within the group. A “skills audit” should give information about existing skill levels and required skills. The skills needed will depend in part on what is being monitored and what the data will be used for. Some training will be mandatory for all members, i.e. health and safety training. Training can range from informal on-the-job training through to formally accredited courses. It is important to be flexible in how, where and when training is delivered.

Stewardship

Catchment stewardship promotes joint target setting, monitoring, and evaluation, leading to strong accountability in achieving shared goals and objectives.

Catchment stewardship, as promoted in Canada, focuses on promoting, monitoring, and conserving the ecological health and biodiversity in a catchment. Since catchments often span many jurisdictional boundaries (e.g., of governments, of agencies, and of organizations), effective catchment stewardship requires strong collaboration among communities and all levels of government. Building understanding and partnerships among different communities, improving collaborative and inclusive decision-making, and respecting community rights are all key components of successful catchment stewardship.

Make connections

Create awareness amongst all stakeholders about the proposed activities. Ensure that relevant government water and land managers, local government officials, and conservation groups are involved. Also include groups or individuals that may be contributing to the decline of water quality.

The more people you talk to in your community and within local and government agencies/departments/industries, the more friends and supporters your programme will have. Include potential data users in all phases of your project's development.

Incentives

It does not matter how committed a volunteer is, there must be incentives such as training (enhancing future work opportunities), feedback on work well done, valuable use of the collected data and acknowledgement of their contribution to their communities. The importance of a well-structured and co-ordinated approach in a volunteer programme cannot be stressed enough.

Maintain volunteer interest and morale by ensuring that the programme as a whole and the data are credible. A credible programme is one that incorporates regular review and analysis of

people procedures such as monitoring training, satisfaction and morale as well as technical matters like monitoring techniques, equipment performance, and data recording and reporting. Do not under-estimate local expertise. Arrange occasions when monitoring groups and water quality experts can meet, ask questions and enjoy being part of a catchment team. Also use newsletters, phone calls and easily understood and useable reports to keep your group informed of results, programme progress and events. Be sure to publicise any action or improvement in water quality that results from your monitoring.

The training and involvement with a volunteer monitoring initiative also leads to a higher level of understanding of their environment and empowerment to be able to contribute towards the solving of an environmental problem. This also serves as an incentive to keep them active in the monitoring programme.

Report findings to volunteers and to the community. Help volunteers present monitoring results at conferences and community meetings. Create a newsletter or data report and let the world see what the volunteers have accomplished.

Pamper your volunteers

Volunteers give up their free time to come to meetings, attend training sessions, and travel to monitoring sites. Provide social opportunities and reward volunteers for a job well done.

Short-term versus long-term monitoring

Short-term water quality monitoring, that is project based and community initiated and driven, has a better chance of success than long-term ongoing routine monitoring, as the long-term monitoring does not produce the same kind of immediate, visible results as the smaller projects.

Partnerships

Partnerships are the core of a volunteer water quality monitoring programme. It can be between public and private sectors, between public and government departments/agencies or between public and learning sectors or any combination of these. These partnerships can be based on a number of approaches. Projects can be categorised along a continuum of increasing community involvement and control.

The bottom-up approach is more effective at building a sense of community and an appreciation for the power of organized groups. It gives the volunteers a sense of ownership of the project, and encourages them to become environmental stewards and advocates committed to seeking community unity for action. It also leads to a higher level of understanding and empowerment. The other partner provides the specific protocol, training, supplies, and equipment. The volunteers provide the manpower.

The bottom-up, community-based model has the potential to involve participants in every step, from defining the problem through communicating the results and taking action. The bottom-up approach does not dispense with scientists/trainers etc.; their involvement is critical to produce

valid, credible data or actions. However, their role is to advise rather than to set the agenda for the volunteer group.

The local nature of water quality problems means that volunteer water quality monitoring is tailor-made for the bottom-up approach.

There are also benefits to a top-down approach. Some volunteers prefer to work on a "ready made" project rather than investing the time and energy required for community-designed programmes. Furthermore, the greater degree of institutional control over study design, methods, and data analysis has made possible more robust data that are more acceptable to the scientific community and possible data users.

The strength of top-down programmes is their ability to co-ordinate large numbers of volunteers/stakeholders, span a wide geographic area, and collect and manage a large amount of data. Such programmes can answer important scientific questions that would be difficult to answer any other way. The downside is that the role of volunteers is usually limited to data collection.

Co-ordination

The co-ordination of a volunteer water quality monitoring programme is crucial to its success. The coordinator is responsible for keeping the volunteers, the funding agency as well as all other partners involved in a specific monitoring programme informed about all aspects of the project.

Don't under-estimate volunteers

Never under-estimate the capabilities of volunteer monitors. They relish the challenge, but more importantly, they want to collect high quality, usable data because they want their effort to count for something. They should be seen as equal partners in a monitoring programme.

Cultivate data users

One of the fundamental lessons is the importance of engaging data users right from the start. The data needs guide the selection of the monitoring/action protocols. Taking the necessary steps to ensure that volunteer-collected data/activities will be used is closely tied to the "don't under-estimate volunteers" principle. People who put in time and effort for training and monitoring do not want their commitment treated lightly and they do not want their data treated lightly.

TABLE OF CONTENTS

Page No.

1. INTRODUCTION

Involving voluntary groups in the protection and management of our resources is not a new concept and in February 2002, our President, Mr Thabo Mbeki, called on the people of South Africa to volunteer their services with the following words: "We have it within us as a nation to join them and many others to forge a massive movement of volunteers – dedicated workers in all fields of life – to bring to life those enduring attributes of all our people, of perseverance and persistence in the struggle for our own good and the good of humanity".

A report entitled *Guidelines for implementing volunteer water quality monitoring in South Africa* by Rossouw and Februarie[1], funded by the Water Research Commission, was published in 2006.

At the same time, an initiative to create awareness amongst all South Africans of the need to care for our scarce water resources and to facilitate their participation in the protection and management of these resources was raised in Parliament in 2006. Parliament wanted to know from officials of the then Department of Water Affairs and Forestry (DWAF) whether South Africa's rivers are healthy and fit for use. Some Members of Parliament volunteered to adopt a river and to act as a patron for that river. This was done to foster public participation in the protection and management of our rivers and also as a sign of their own commitment.

To give effect to this initiative the Minister requested DWAF officials to formalise and implement such a programme as soon as was practicably possible. The Adopt-a-River Programme was initiated. The aim of this programme (at least at the onset) is to create awareness amongst all South Africans of the need to care for our scarce water resources and to facilitate their participation in the protection and management these resources.

A phased approach is being followed to develop the programme. Phase 1 was the initiation and development of a Strategic Framework document[2]. Phase 2 of the project (which is the topic of this assignment) is the development of an Implementation Plan and the preparation for Phase 3 where pilot implementation on selected rivers will take place.

The Adopt-a-River programme can play a vital role in encouraging citizens to learn about water resources and become involved in the protection and management of these resources in their particular area.

Once awareness of the water resource and its problems/benefits is created, stakeholders, including volunteers, can gain knowledge and insight into the causes of the problems affecting the quality and quantity of the water resources in their area. They will then be able to act as watchdogs, but also be part of the prevention and problem solving fraternity for the specific water resources in their area[2].

[1] Rossouw and Februarie, 2006
[2] DWAF, 2007

An additional benefit of their awareness and involvement is that the stakeholders will be empowered to realistically evaluate service delivery and hold the relevant authority responsible where there is a lack of implementation of important elements of existing environmental and water resource management policies and strategies.

The objectives of this report will be to define the field of volunteer monitoring and stakeholder involvement, to consolidate our understanding of the monitoring programmes in South Africa, focussing on volunteer monitoring and to gather information on volunteer monitoring programmes elsewhere in the world, to capture good practices. This will be documented and used as guidelines for proposing a monitoring model that will work for South African conditions to involve stakeholders in monitoring and managing our water resources.

The Literature Review on Monitoring Models Report will also form part of the “Record of Decisions” that will be kept up to date as new information, especially on local experience, becomes available, to ensure that all relevant discussions and decisions taken throughout the project are properly documented.

2. APPROACH

This report is part of Task 2 as described in the Inception Report.

There is a comprehensive body of published reports and information available on volunteer monitoring, especially in the USA, Australia and Canada. There are also a number of examples for volunteer monitoring initiatives at national and local level that can provide insights that may be of value in determining an appropriate stakeholder, including volunteers, water quality monitoring model for South African conditions. Currently for example, there is an Adopt-a-River programme in the Western Cape involving the Eerste River. It is assumed that there will be many more examples of this but some may only identified as the pilot studies begin and more public awareness is created.

The focus of the Adopt-a-River programme is not so much volunteer monitoring to support national water resource quality programmes but to create awareness and to provide an opportunity for the public to gain an understanding of IWRM and to participate in monitoring the quality of SA's water resources in general terms. The objective of this search has been different that that of the previous study cited below.

Rossouw and Februarie (2006) provided a broad overview of volunteer monitoring and how different countries have approached this. The focus of this literature review will be to identify a short list of appropriate models for the Adopt-a-River programme, including the pros and cons of the different models. A starting point will be the reference list as sited in the above report as well as an Additional Google search for new references. These models will then be discussed with the client and our team members to select the most appropriate model or models.

Although a new Google search was conducted some of the information in the Rossouw and Februarie (2006) report will be repeated because the information will be relevant to this project.

3. INTERNATIONAL VOLUNTEER MONITORING MODELS

Volunteer monitoring programmes can include a variety of activities depending on their purpose and funding. If the primary purpose of a monitoring programme is public education, volunteers may focus on documenting point sources of pollution in a catchment (watershed) – an activity which does not require much equipment. Another group's purpose might be to collect scientific water quality data. This may necessitate a different level of funding and commitment[3].

What can volunteer monitoring programmes provide?

- Baseline data – consistent monitoring of the same site over time.
- Investigative sampling – locate sources of pollution by sampling areas found to be suspect and continuing sampling to pinpoint contamination.
- Shoreline survey work or watershed surveys – document potential and actual, direct and indirect, sources of pollution.
- Resource inventory – survey of flora and fauna of the area and surveys of benthic organisms.
- Scientific investigations – test a hypothesis.
- Public education – stimulates awareness that complex ecological systems require long-term observation and study for understanding.
- Establish new management priorities – provides information that may help guide management efforts.
- Understanding of the relationship between ecological conditions and human land use.

What is generally not provided by a volunteer water quality programme?

- Direction that environmental quality is taking – a sequence of only 2 to 3 years of data can be very misleading.
- Immediate detection of change – environments have a response time which varies greatly – for example, perhaps a decade for lakes, a century for soils.
- Cannot tell us whose activities should be controlled – science can give us data to assist in judgements, but it cannot make those judgements for us.

Many different variables can be measured in a water quality monitoring programme. A variable is any defined environmental factor or condition that changes over time and space.

There are complicated relationships between physical, chemical, and biological parameters. By monitoring all three types of variables rather than only one, one hopes to paint a more complete picture of the interactions. Understanding these relationships will facilitate management of the water resources.

[3] http://inlet.geol.sc.edu/wqmhp.html

Monitoring water quality is important for community education, environmental protection, managing waterways and controlling pollution. Monitoring consists of making measurements that are analysed and reported for the purpose of providing information and knowledge about a waterway. Identifying a clear purpose for monitoring is the first step for an effective monitoring programme and should be based on an analysis of issues affecting the catchment and/or waterbody. The quality and reliability of data must be reported to data users so that information can be used with confidence for comparison across catchments and through time[4].

3.1 UNITED STATES OF AMERICA

3.1.1 Global Water Watch

Global Water Watch[5] (GWW) is a voluntary network of community based water monitoring groups. They provide an information and assistance network for community groups using monitoring techniques approved by the US Environmental Protection Agency. The overall goal of GWW is to foster the development of citizen volunteers to monitor surface waters for the improvement of both water quality and public health and policy. GWW helps communities establish teams of citizens who measure physical, chemical and biological indicators of watershed fitness. Monitors use their data to restore streams and lakes, improve drinking water quality and public health, and implement environmental education programmes for the public.

GWW, in partnerships, with local government, NGOs and community groups, have the following objectives:

- To protect and restore the aquatic environment: Practical ways are implemented for improving watershed management by communities;
- Advocacy and policy: Communities and citizens are empowered to influence decision-makers at all levels of society;
- Environmental education: Community awareness of aquatic environment and resource issues will be raised in formal and in-formal ways for broad-based participation in watershed protection.

GWW offers ten types of certification to become involved in water quality monitoring: Water chemistry monitoring, bacteriological monitoring, stream monitoring, total suspended solids and stream discharge monitoring, water chemistry recertification, bacteriological monitoring recertification, stream monitoring recertification, water chemistry monitoring trainer, bacteriological monitoring trainer and stream bio-monitoring trainer.

Training workshops are offered at a water body where the monitors live. The GWW programme works with citizen groups to develop a monitoring plan. Sampling sites are selected that are convenient, safe, legal, accessible and strategic in water quality information gained. Monitors

[4] Cassidy, 2003
[5] http://www.globalwaterwatch.org/gwwOurgoals.aspx

are encouraged to sample their sites at least monthly to record water conditions and capture seasonal and yearly trends.

Information is recorded on standard forms and sent to the GWW office by mail or processed online for entry into the GWW database. GWW also provides technical support for monitoring groups, such as data interpretation sessions and a database for storing, analyzing and disseminating data to water monitors, educators, decision-makers and the general public.

Some of their activities include the following and are funded by different organizations:

- GWW project in the Jequitinhonha Valley sponsored by the Christian Children Fund teaches community groups how to analyze water quality in wells and rivers;
- The Annual Workshop on Community based Water Monitoring for Watershed Stewardship held in May 2006 at Auburn University; and in Mexico held in March 2006 in Coatepec, Veracruz, etc.

There are many GWW groups in the USA. Some examples are the following:

- Alabama Water Watch (AWW), co-ordinated through Auburn University's Department of Fisheries and Allied Aquacultures, and the International Center for Aquaculture and Aquatic Environments. The Program Office oversees the day-to-day operations of AWW.

  AWW's goals include the education of citizens about water issues in Alabama and the world; conducting water quality workshops; providing technical backstopping and data management to monitors; and partnering with monitors for making positive impacts on water quality and policy.

  AWW Programme personnel provide a wide range of services to monitors, including conducting training sessions, compiling and maintaining a massive collection of data on citizen volunteers, monitoring sites and water quality data, interpreting technical data gathered by monitors, and providing online summary graphs and maps.

  Most AWW participants are from existing groups such as lake associations, environmental clubs, and schools, and are middle-class people with the time and interest to collect data for protection or restoring their water body. Monitors' concerns often focus on learning about water; saving stream ecosystems; swimming, fishing or other aspects of water recreation; and overall quality of life.

- GWW in Brazil aims to improve the quality of life for children and their families through improvement of water quality and prevention of waterborne disease.
- GWW in Ecuador aims to understand aquatic ecosystems and use of alterations of water resources as components of sustainable management. The activity will train and equip

residents of Andean watersheds to be monitors and provide scientifically valid water resource data.

- GWW in the Philippines is providing citizens monitors with new materials and database management opportunities. New training programmes are being tested in the Philippines.
- Mexico's Water Data forum is designed to maintain a physico-chemical and biological database of surface water quality available to users of the internet.
- Community Based Water Monitoring project in Thailand conducted the first water quality workshop in 2002. This project is co-ordinated through the Heifer Project International/Thailand programme, with close collaboration and guidance from the Philippines programme.
- GWW continues to encourage interest at starting a Community Based Water Monitoring project in China as the Country Director has attended meetings and training workshops in Thailand and the Philippines.
- Oklahoma Water Watch[6] (OWW) is co-ordinated by the Oklahoma Water Resources Board (OWRB) and serves as a valuable educational tool, providing participants with first-hand involvement in the protection of community water quality. In addition to students, volunteers include individuals who want to maintain the quality of their local water resources, such as members of lake associations and other civic groups.

  The five primary goals of the OWW are to collect environmental data to determine baseline water quality conditions, to identify current or potential water quality problems, to determine water quality trends, to promote citizen participation in protecting, managing, and restoring their water resources, and to educate the public on basic ecological concepts associated with water resources.

  Becoming a volunteer

  The OWW requires that volunteers make a commitment for a minimum of two years, because of limited resources, quality assurance, and data management make it essential for monitors to serve as long as possible.

  Prior to becoming a Certified Water Quality Monitor, OWW volunteers complete a three-phase training session. The first level of training introduces the concepts of water and air temperature, water colour, water transparency, pH, dissolved oxygen, and nutrients, as well as procedures forhandling equipment, measuring parameters, and data recording. The next level involves water quality testing. The final phase occurs in a sampling area, where participants take field measurements and record scientific observations.

  Once OWW volunteers have chosen an OWRB-approved monitoring site, they are asked to collect data a minimum of six times each year, preferably monthly from April through September. All the necessary chemicals and testing equipment are provided by

[6] http://www.owrb.ok.gov/quality/monitoring/watch/wwatch.php

the OWRB in a convenient testing kit. At the end of each sampling season, the OWRB staff analyses the collected data and distribute a summary report to the volunteers. A Quality Assurance Project Plan approved by the Environmental Protection Agency (EPA) is followed, which outlines data collection techniques, frequency, and the quality assurance/quality control measures volunteer monitor's use. All OWW information is included in periodic reports to the EPA.

Volunteers are also required to attend at least one Quality Control Assessment session per year to retain their certification as OWW monitors.

- Texas Stream Team[7] (TST), formerly Texas Watch, changed its name in order to facilitate a growing need for the programme to work with private landowners, members of the agricultural community, and watershed stakeholders in general. Texas Stream Team is a network of trained volunteers and supportive partners working together to gather information about the natural resources of Texas and to ensure the information is available to all Texans. TST is administered through cooperative partnerships between Texas State University, the Texas Commission on Environmental Quality, and the USEPA.

- IOWATER[8] is the state-wide volunteer water quality monitoring programme in Iowa. IOWATER's main focus is training workshops (at different levels of competency) that are scattered across the state. These workshops are conducted both in classrooms and streams, using biological, chemical, physical and stream-habitat assessments. Volunteers decide on their monitoring regime based on the questions they are trying to answer.

  The IOWATER programme is an expanding partnership overseen by an advisory council that includes volunteer monitors and several organizations across the state. It is administered and funded by the Iowa Department of Natural Resources through state and federal monies.

- The Missouri volunteer water quality monitoring programme[9] is a partnership between the Department of Conservation, Department of Natural Resources, the Conservation Federation of Missouri and the citizens of Missouri. The goals of the programme include the informing and educating of citizens about the conditions of their streams, establishing a monitoring network, generating water quality data, enabling citizens and halting degradation of Missouri streams.

  The volunteer programme is flexible, offering different levels of involvement and commitment that build on each other. Volunteers are expected to share the knowledge

[7] http://txstreamteam.rivers.txstate.edu/
[8] http://www.iowater.net/
[9] http://www.dnr.mo.gov/env/wpp/VWQM.htm

they gain with their community, periodically monitor a stream and submit collected data in a timely manner. Volunteers begin by mapping their watershed, submitting a visual survey of their selected sites and submitting macro-invertebrate data. With further training volunteers can learn to collect for chemical and microbiological parameters. Water quality volunteers often work in conjunction with Missouri Stream Teams.

The Department of Natural Resources Volunteer Water Quality Monitoring Programme and the Missouri Stream Teams are in the process of implementing a new programme called Cooperative Stream Investigations. The goal of this programme is to foster co-operation between the department, watershed management committees and volunteers to perform sampling for special projects such as *E coli* sampling.

- Fairfax County, Virginia, has water quality volunteers that monitor local streams[10]. The Northern Virginia Soil and Water Conservation District provides all the training and equipment required. No prior experience is necessary. Volunteers are trained to assess ecological conditions in streams based on the presence and abundance of benthic macro-invertebrates. Volunteers also learn how to take chemical measurements about nitrate/nitrite and turbidity. Training includes indoor and field workshops and mentoring by experienced monitors.

  Volunteers can monitor at different levels of commitment. They can choose to assist other monitors when it is convenient for their schedules, or they can adopt their chosen stream and commit to monitoring it four times a year. They have a flexible programme.

- New Jersey Community Water Watch (NJCWA)[11], a project of the New Jersey Public Interest Research Group, Law & Policy Center and AmeriCorps, is a state-wide community service-based environmental programme. The goal of the programme is to give communities the resources to have a clear measurable impact on improving water quality in environmentally and economically distressed areas in New Jersey. They have chapters based on college campuses across the state that empower students and community members to work together and effect positive environmental and social change. Princeton University Water Watch[12] is a chapter of the NJCWW and works with students and community members to combat their local water quality problems through environmental education and community outreach, stream monitoring, and river cleanups.

  River cleanups are to remove trash and debris from the banks and water and to raise awareness about local water quality issues. Cleanups deliver immediate results to our waterways. They also provide a hands-on opportunity to engage volunteers in making a difference in their own community.

[10] http://www.fairfaxcounty.gov/nvswcd/monitoring.htm
[11] http://www.princeton.edu/~njh2o/about.html
[12] http://www.princeton.edu/~njh2o/

Environmental education at Princeton Water Watch teaches fun, interactive environmental science lessons to elementary school students. They need volunteers to visit classes with them and training is provided to the volunteers.

Volunteers collect data about the ecological health of the streams that flow through the Princeton campus. They use easy-to-use chemical testing kits with funding from the Student Volunteer Council. They also conduct biological assessments, which involve collecting and identifying aquatic macro-invertebrates. The data are used to evaluate the health of the streams and to measure the impact of the University on the waterways over time. This data will be used to determine the need for restoration efforts and make recommendations for effective methods.

3.1.2 United States Environmental Protection Agency

United States Environmental Protection Agency (USEPA)[13]

Across the USA, trained citizen volunteers are monitoring the condition of their local streams, lakes, estuaries, and wetlands. The EPA encourages all citizens to learn about their water resources and supports volunteer monitoring because of its many benefits. Volunteer monitors build awareness of pollution problems, become trained in pollution prevention, help clean up problem sites, provide data for waters that may otherwise be un-assessed, and increase the amount of water quality information available to decision makers at all levels of government.

They have a number of different information sections on their website. They have fact sheets on starting out as a volunteer and a description of the EPA volunteer monitoring programme. Additional information includes methods that should be used for different types of monitoring such as estuaries, rivers and lakes. A newsletter, “The Volunteer Monitor”, published twice yearly and, the Volmonitor listserver connecting volunteer water monitoring programme co-ordinators nationwide by serving as an internet forum for questions, announcements, and discussion on topics of interest to the volunteer monitoring community are ways of communicating with the volunteers. A directory on volunteer monitoring programmes (this directory lists volunteer organisations around the country engaged in monitoring rivers, lakes, estuaries, beaches, wetlands, and groundwater, as well as surrounding lands. It is intended to be updated regularly), lists on conferences and events, and a list of related links are also available on their website.

Starting out in volunteer water monitoring

How can volunteer water monitoring contribute and how is it funded?

Volunteers make visual observations of habitat, land uses, and the impacts of storms; measure the physical and chemical characteristics of waters; and assess the abundance and diversity of living creatures – aquatic insects, plants, fish, birds, and other wildlife.

[13] http://www.epa.gov/volunteer/

Volunteers also clean up garbage-strewn waters, count and catalog beach debris, and become involved in restoring degraded habitats.

Volunteer monitoring programmes are organized and supported in many different ways. Projects may be entirely independent or may be associated with state, interstate, local, or federal agencies; with environmental organizations; or with schools and universities. Financial support may come from government, partnerships with businesses, endowments, independent fundraising efforts, corporate donations, membership dues, or a combination of these resources.

Volunteers provide quality data

Many volunteer groups collect data that supplements the information collected by state and local resource management or planning agencies. These agencies might use the data to:

- Screen water for potential problems, for further study or for restoration efforts;
- Establish baseline conditions or trends that would otherwise go unmonitored;
- Evaluate the success of best management practices designed to mitigate problems.

In general, the volunteer monitoring programme should work cooperatively with state and local agencies in developing and coordinating technical components. To ensure that the data are used, the monitoring programme should also develop a strong quality assurance project plan that governs how volunteers are trained, how samples are collected and analyzed, and how information is stored and disseminated.

Volunteers most commonly monitor: water temperature, dissolved oxygen, pH, macro-invertebrates, phosphorus, nitrogen, flow/water level, turbidity, habitat, secchi transparency, bacteria and land use.

Volunteers build stewardship of local waters

By educating volunteers and the community about the value of local waters, the kinds of pollution threatening them, and how individual and collective actions can help solve specific problems, volunteer monitoring programmes can:

- Make the connection between watershed health and our individual and collective behaviours;
- Build bridges among various agencies, businesses, and organizations;
- Create a constituency for local waters that promotes personal and community stewardship and co-operation.

Volunteer groups whose primary purpose is education and constituency-building generally adopt simple, easy-to-use assessment methods and may not need to develop a stringent quality assurance project plan.

How to get started as a volunteer monitor

- Determine your personal goals: Participating in a volunteer programme that provides data to be used by government agencies will usually require that you take part in formal training sessions and commit to regular schedule sampling (usually weekly, monthly or seasonally). If you are more interested in learning about your local waterway and educating others, your time commitment may be less and any training will probably be less formal
- Learn about any existing volunteer monitoring programmes in your area and around the country. "The National Directory of Volunteer Environmental Monitoring Programmes" and "Adopt Your Watershed" are sources of information in the USA and are located on the USEPA website. Other potential sponsors or sources of information include local community based groups such as civic or watershed associations, garden clubs, universities, and activist organizations. National environmental organizations with chapters in their areas and regional offices of federal agencies are also sources of information.

Once a volunteer monitoring group is located, the volunteer will probably find that they offer a variety of opportunities. The volunteer might become involved in collecting samples, analyzing the results in a laboratory, developing ways to present data, writing reports, speaking to local groups about water resource issues and the volunteer project, producing a newsletter, fundraising, or recruiting and training new volunteers. The volunteer might also become involved in organizing stream cleanups, planting trees, and other habitat restoration activities. Chances are that the volunteer will find opportunities that suit their skills and interest.

If you cannot locate a local group, consider starting one yourself.

Some basic research is required to determine how to proceed. To help with the research a list of questions can be developed and discussed with other volunteer programme coordinators. Some typical questions would be:

- What relationship does the programme have with state and local agencies, local businesses, schools and colleges, other groups?
- What kind of monitoring does the programme conduct?
- What are the costs for the monitoring?
- How is the programme funded?
- How are volunteers recruited, trained, and retained?
- How is the quality of the data ensured? Does the programme have an approved quality assurance plan?
- What reference materials, training aids, and methods manuals do they recommend?

Starting a volunteer monitoring programme is not a simple task. The following will be needed:

- Money for equipment and possibly for staff;

- Appropriate meeting, training, and laboratory facilities;
- A network of knowledgeable people such as educators, extension agents etc.;
- Who are interested in your project and willing to advise and help out;
- Connecting to, or sponsorship by, potential data users who can help plan the project so that it meets their needs as well as your own;
- Organisational skills to manage and maintain the project;
- Time to make contacts in the community, design the monitoring plan, develop training sessions, recruit volunteers, revise the programme as it matures, raise funds, analise the data, and report back to the volunteers and the community.

Some lessons learned by other volunteer programmes:

- Start small: A pilot project that serves to test the methods, training sessions, and organizational skills can keep you from being overwhelmed and allows you to evaluate and refine your project before moving an to more ambitious monitoring.
- Keep the goals realistic: Most volunteer data are used to educate the community and to screen for potential problem and not for use in a court.
- Planning all your activities pays off.
- Make connections: The more people you talk to in your community and within local and state agencies, the more friends and supporters your programme will have. Include potential data users in all phases of the project development.
- Develop volunteer leadership: Volunteer leaders within a project provide the vision for setting goals and the commitment to achieve them. They also enable a project to develop and grow.
- Pamper your volunteers: Volunteers give up their free time to come to meetings, attend training sessions, and do the monitoring. Provide social opportunities and reward volunteers for a job well done.
- Use the data: Report findings to volunteers and to the community. Help volunteers present monitoring results. Send the findings to your contacts in state and local government. Create a newsletter or data report and let everybody see what has been accomplished.

Volunteer monitoring resources

USEPA supports volunteer monitoring by sponsoring national conferences, publishing manuals on volunteer monitoring methods and on planning and implementing volunteer programmes, managing a listserver for volunteer monitoring programme coordinators, producing a nationwide directory of volunteer programmes, and funding a national newsletter, The Volunteer Monitor.

Volunteer coordinators in the ten EPA Regional offices provide some technical assistance for local programmes and help co-ordinate region wide conferences. The regions are also responsible for grants to the states that can be used, in part, to support volunteer monitoring programmes that assess non-point sources of pollution or that serve to educate the public about non-point issues. They also serve as contacts for volunteer programmes in the region and

provide information exchange services for volunteers. Some offices hold regional workshops to bring volunteers together and build partnerships.

3.1.3 Who are volunteer water quality monitors?

- Partnerships are what makes volunteer water quality monitoring programmes work. Making it work for both partners begins with talking to potential partners about outcomes, products and "what's in it for them". There are many models for partnerships. Snyder (2004)[14] presents three models:

  Agency/Department driven

  Agency/Departmental projects tend to be rigid, requiring volunteers to follow specific procedures and protocols. The downside of this kind of prescriptive process is that there is no place for volunteer creativity and input into project design. On the other hand, some volunteers like to have a "recipe" to follow; and in addition, volunteers realise that if an agency is asking for help, the data are more likely to be used.

  Combination agency/volunteer

  Residents are concerned with the water quality of their river. At the same time an agency is interested in obtaining water quality and other information on the same river. This joint interest can lead to the formation of volunteer monitoring based on a partnership between the agency and the volunteers. The agency/department provides volunteers with a specific protocol, training, supplies, and equipment on loan, and gives volunteers copies of their monitoring results. The volunteers provide manpower.

  Such a project can be a win-win situation for the volunteers and the Department/Agency. Such a study not only provides the volunteers with information but also provides data that the Department/Agency can use. The broadening scope of such a project can help volunteers gain an understanding of their river.

  Volunteer initiative

  The issue with volunteer initiatives is the usability of the data. For data to be usable it must have strict data collection procedures and quality protocols, and often volunteer data do not meet these requirements.

- Citizen projects[15], including volunteer monitoring, rely on partnerships between citizens and professional scientists. These partnerships can take many forms, which may be arranged along a continuum of increasing community involvement and control. It can be a single-issue, "top-down" programme to a multi-issue, "bottom-up" programme.

[14] Snyder,C. 2004.
[15] Rossouw and Februarie, 2006

The bottom-up approach is more effective at building a sense of community and an appreciation for the power of organized groups. It gives the volunteers a sense of ownership of the project, and encourages them to become environmental stewards and advocates committed to seeking community unity for action. It also leads to a higher level of understanding and empowerment.

There are also benefits to a top-down approach. Some volunteers prefer to work on a "ready made" project rather than investing the time and energy required for community-designed programmes. Furthermore, the greater degree of institutional control over study design, methods, and data analysis has made possible more robust data that are more acceptable to the scientific community.

Whichever model is used, volunteer monitors collect independent data that can be used to either uphold or challenge public agency and industry data. This opens previously closed doors for meaningful participation by citizens in environmental decision-making. This kind of dialogue leads to the mutual trust that is essential to co-operate efforts to solve environmental problems.

- While Extension volunteer[16] monitoring programmes started for a variety of reasons, one important similarity was found: these programmes are typically community driven. The overall success of Cooperative Extension volunteer programmes is due in large part to their grassroots, bottom-up approach. These programmes often become embedded in their communities, as individuals and businesses take personal responsibility for the health of their community's water bodies.

  The advantages to stakeholders, to the monitoring programme, and to University, Government Department or Extension involvement with volunteer monitoring, are many and varied. First, the community gets answers to their concerns and the ability to respond to problems and protect their resources. In addition, the volunteers gain access to current scientific research and methods, as well as other university, Government Department or Extension resources, which can enable them to expand their monitoring activities and improve the scope and credibility of the data.

  One example of such a project is The Volunteer Water Quality Monitoring National Facilitation Project[17] that is designed to build a comprehensive support system for Extension volunteer water quality monitoring efforts across the country. The goal is to expand and strengthen the capacity of existing Extension volunteer monitoring programmes and support development of new groups. It is a partnership of the USDA CSREES and Land Grant Colleges and Universities (University of Rhode Island and University of Wisconsin).

[16] Rossouw and Februarie, 2006
[17] http://www.usawaterquality.org/volunteer/

A Guide for Growing Programmes is provided on their website as a number of fact sheets in pdf format and includes the following topics:

- Getting started
- Why Volunteer Water Quality Monitoring makes sense
- Designing your monitoring Strategy: Basic questions and resources to help guide you
- Monitoring matrix
- Training Volunteer Water Quality Monitors Effectively
- Monitoring equipment suppliers
- Direct links to monitoring programmes' manuals
- Building credibility: Quality Assurance and Quality Control for Volunteer Monitoring Programmes
- Sharing information through internet exchanges
- Volunteer management and support
- Considerations for planning your programme's data management system
- Outreach tools
- Locating support and funding

Other topics on the first webpage are a description of the Facilitation project, Extension Volunteer Monitoring programmes, related research and educational efforts, training modules, other National Facilitation projects, upcoming events and special topics.

3.1.4 The Great North American Secchi Dip-In

The Great North American Secchi Dip-In[18] is celebrated each year in the first two weeks in July. Volunteer monitors across North America take to their local waters to measure water transparency. It is sponsored by the North American Lake Management Society (NALMS) and the USEPA and directed by Kent State University. The Dip-In accepts data from Secchi discs and other instruments, as well as temperature and pH data. The data collected are used to assess the transparency of volunteer-monitored waterbodies in the USA and Canada. The Dip-In collects valuable data on lake usage and user perceptions of water quality.

One of the goals of the Dip-In is to increase the number of volunteer monitors and to spark public interest in environmental monitoring. Quality assurance is enhanced if the volunteer participates in both the national and local activities. It also provides a national perspective on water quality. Scientists and volunteers observe how transparency varies according to water type, regional geology, and land use.

Kent State University provides public access to the Dip-In monitoring data through a website.

[18] http://www.epa.gov/owow/lakes, http://www.epa.gov/owow/monitoring/volunteer, http://www.nalms.org

The large number of monitoring programmes that sponsor or support volunteer monitoring efforts is a clear indication to how well volunteer monitoring fulfils certain objectives[19] such as:

- Educating the public. Volunteer monitoring programmes disseminate water quality information broadly in the community through citizen-to-citizen interactions and provide an opportunity for hands-on science education for youth.
- Encouraging citizens to "adopt better practices". Through monitoring, citizens learn how their actions on land affect the quality of surface and groundwater. This leads directly to voluntary adoption of recommended best management practices for water quality protection.
- Bringing university science to the community….and community science to the university.

3.2 CANADA

Canadian Stewardship: Naturally connecting Canadians[20]. It is a federal-provincial-territorial initiative.

Canada is diverse in many ways. Within this diversity, stewardship in agriculture, forestry, fisheries and wildlife management and other natural resource sectors is a basic component of the wise use of Canada's natural legacy. Stewardship is also part of the broader voluntary effort in which Canadians share a commitment to improve the quality of life and to foster vibrant, healthy communities.

Stewardship means Canadians – including landowners and other individual citizens, private companies and volunteers – are caring for their land, air and water, and sustaining the natural processes on which life depends. Aboriginal communities share directly in stewardship and have unique experience in managing the land.

Every day, thousands of Canadians take action to improve their natural environment through a variety of stewardship projects – a contribution that is worth millions of dollars. These activities reflect the recognition and importance of a common ethic and means for achieving environmental objectives. Many stewardship initiatives have already been implemented in the forestry, fisheries, oceans, agriculture and wildlife sectors, and others are underway. They (Canadian Government, provinces and territories) have committed to further support and encourage stewardship as a key conservation tool.

Many consultations and workshops have been held. The national Voluntary Sector Initiative provide valuable support for the community wokshops that were held across the country, led by staff of Wildlife Habitat Canada. One of the purposes of these consultations was to capture best

[19] Rossouw and Februarie, 2006
[20] http://www.stewardshipcanada.ca

ideas. A Consultation Report reflecting the results of the consultations is available on their website[21].

3.2.1 Canada's Stewardship Agenda

Canada has a Stewardship Agenda[22] that is a plan for collaboration that proposes a national vision and operating principle for stewardship. The Agenda outlines four key goals, objectives for each goal and identifies a set of priority actions that recognize and empower stewards. This includes establishing a national network of stewards, improving co-ordination among stewardship programmes and efforts, and supporting the capacity of individual stewards to carry out conservation activities. The Agenda draws on collective experience, complements existing investments in stewardship programmes, and fosters actions to conserve and promote wise use of their natural resources. It is intended to establish a broad, long-term course of action, foster collaborative actions and identify priorities for future investment in stewardship.

The vision of Canada's Stewardship Agenda is a nation where Canadians are actively working together to sustain their natural life-support systems. The scope of the Agenda reflects this vision, promotes collaborative action, and builds a social cohesion and shared responsibility among citizens. It engages those who are involved in the conservation of biodiversity, the sustainable use of Canada's biological resources and the wise management of all natural resources. Under the Agenda, stewardship activities can be directed at the recovery of species at risk and contribute to the sustainability of terrestrial and aquatic ecosystems.

The federal, provincial and territorial governments will further develop the Agenda by identifying options to support stewardship that are appropriate for each jurisdiction. Jurisdictions seek broader partnerships for the Agenda, particularly with the forestry, fisheries, agriculture and other natural resource sectors.

Stewardship is implemented primarily at the local level, recognizing the diverse social and economic conditions across Canada and the different situations faced by stewards in different areas. The following eight principles will guide the implementation of the Agenda:

- Stewardship builds on the strong connection between Canadians and their natural heritage;
- Stewardship initiatives respect the interests and rights of all participants;
- Stewardship is knowledge-based;
- Stewardship is based on ecological principles and ecosystem approaches;
- Stewardship depends on collaborative action, local capacity and ownership;
- Stewardship programmes are developed with an understanding of socio-economic conditions;

[21] http://www.stewardshipcanada.ca
[22] http://www.stewardshipcanada.ca

- Stewardship programmes are transparent and inclusive;
- Stewardship programmes are ideally based on long-term commitments.

The following four goals and supporting objectives[23] create a framework for engaging Canadians in stewardship at the local, regional and national levels. The goals and objectives are intended to assist stewards in enhancing their efforts and promoting collaborative stewardship activities across Canada.

Goal 1: Invest in Stewardship by enhancing stewardship programme support and capacity.

Objective 1: Enhance and integrate incentives
Objective 2: Enhance local community support and capacity

Goal 2: Strengthen the application of knowledge by enhancing participation in stewardship through education and awareness, and by better recognizing the contribution of stewards.

Objective 1: Manage use of data and information
Objective 2: Collect and apply scientific, traditional and local knowledge
Objective 3: Empower stewards with knowledge and information
Objective 4: Communicate stewardship achievements
Objective 5: Recruit and recognize stewards

Goal 3: Strengthen policy and legislative support for stewards by providing the essential economic, policy and legal tools and instruments required to support stewardship programmes and activities.

Objective 1: Increase the use of Conservation Agreements, Easements and Management Plans
Objective 2: Develop and provide access to guidelines and codes of conduct
Objective 3: Ensure that public policies support stewardship
Objective 4: Use legislation to support proactive stewardship

Goal 4: Connect stewardship programmes by fostering co-operation among stewardship programmes, and integrating them with terrestrial and aquatic approaches to conservation and sustainable use.

Objective 1: Improve institutional arrangements
Objective 2: Integrate stewardship with planning and ecological management
Objective 3: Improve monitoring and reporting of stewardship progress.

The above goals and objectives provide a framework for strengthening and encouraging stewardship across Canada. However, practical steps are required to implement this framework in close collaboration with Canadians. The following actions focus on strengthening the network

of stewards in Canada, empowering and expanding this network through the internet-based Stewardship Canada Portal, and challenging this network to refine and improve Canada's Stewardship Agenda.

Action1: Promote improved co-operation among stewardship programmes and, where possible, co-ordination with conservation and sustainable use initiatives.
Action2: Establish a stewardship network to facilitate collaboration among stewards and help guide the implementation of Canada's Stewardship Agenda.
Action3: Continue to develop and enhance the Stewardship Canada Portal.
Action4: Explore the development of a Stewardship Charter to engage Canadians.

Canada's stewardship Agenda is a plan for collaboration among Canadians that draws on the collective experience of communities, organisations, Aboriginal peoples, the private sector and individuals, and that complements existing stewardship programmes.

Canadians can expect direct benefits from investments in stewardship, including better support for landowners and land users that are good stewards, improved integration among government agencies, more efficient funding processes and easier access to stewardship knowledge and information.

There is a new national voice for Stewardship, the Canadian Stewardship Communities Network. They are a forum committed to helping guide the implementation of Canada's Stewardship Agenda. It is composed of representatives from various national communities of stewardship interests and the Network is dedicated to promoting improved co-operation amongst stewardship programmes and co-ordination with conservation and sustainable use initiatives.

Linkages between Canada's Stewardship Initiatives illustrate the relationships and potential degree of synergy among the stewardship initiatives of a diversity of leading organisations[24].

A Compendium of Stewardship Programmes and Activities[25] was compiled in 2002 giving a summary of national, regional and local stewardship programmes. This report focussed on different themes and stewardship projects under these themes. The themes were the following:

Theme One: Legal and policy Instruments Supporting Stewardship.

- Develop guidelines and codes of conduct, amendments and new legislation, as well as new management tools may be necessary to advance and better support stewardship activities. There is also a need to ensure that existing policies and programmes do not discourage stewardship activities. Some projects are:

[23] http://www.stewardshipcentre.on.ca/stewardshipCanada/home/
[24] http://www.stewardshipcanada.ca/stewardshipCanada/home/si.asp?s=scn&l=en&dc=4854
[25] http://www.stewardshipcanada.ca Federal-Provincial-Territorial Stewardship Working Group, 2002

- Principles and Guidelines for Minimizing Surface Disturbance in Native Prairie and Parkland Areas – Alberta
- Codes of Practice – Alberta
- Manitoba Model Forest – Manitoba
- Operational Policy Framework – National

- Long-term funding has been identified as one of the most important requirements for successful stewardship programmes. Funding must be consistent and ongoing tosustain stewardship programmes and their long-term benefits. Tangible incentives, including economic incentives and technical or logistic support, have proven to be very effective in advancing stewardship in many areas of Canada. Economic incentives strengthen and facilitate a commitment to stewardship, especially where conservation actions or activities involve costs to landowners and resource developers. Identification and removal of economic disincentives can also advance stewardship. Some projects are:
  - Island Trust Natural Area Protection Tax Exemption Programme – British Columbia
  - Conservation Land Tax Incentive Programme – Ontario
  - Ecological and Fiscal Reform – National
  - Municipal Wetland Stewardship Programme – Newfoundland and Labrador

Theme Two: Stewardship Programme support

- Stewardship programmes need to be knowledge based and adaptive. This requires research, and mechanisms to better integrate such research, with traditional and local ecological knowledge. Integration is particularly important in stewardship programmes that are most often implemented locally. Some projects are:
  - Integrating Traditional Knowledge into Environmental Impact assessment – Nunavut and Northwest Territories
  - Igaliqtuuq Critical Bowhead Habitat Stewardship Project – Nunavut
  - Manitoba Model Forest – Manitoba
  - Traditional Ecological Knowledge Related to Coastal Resources – Newfoundland and Labrador

- Governments have a major role to play in advancing stewardship. One key role is to ensure that institutional arrangements promote programme integration with efficient use of financial resources being allocated to support stewardship. Governments must also lead by example, ensuring that their actions and activities support sustainable development and more integrative management approaches. Some projects are:
  - Pacific Salmon Foundation Contribution Agreement – British Columbia
  - Agriculture and Environmental Resource Conservation Programme – Prince Edward Island
  - Stewardship Association of Municipalities – Newfoundland and Labrador
  - Resource Stewardship Branch – Nova Scotia

- Enhance local community support and capacity. The driving force for stewardship is at the local level involving communities, citizens, landowners and resource developers. They need support to recruit stewards, administer programmes and to increase their capacity to help implement stewardship programmes over the life of the programme. Greater community capacity will enhance community ownership and empower individuals to contribute more to conservation and sustainable use objectives. Some projects are:
    - Delta Farmland and Wildlife Trust – British Columbia
    - Cows and Fish, Riparian Habitat Management Programme – Alberta
    - Environmental Sustainability Initiatives – Quebec and Labrador
    - Enhancing the Capacity of recipient Organizations to Manage Ecological donations – Ontario

- Data and Information management is crucial. It is essential that stewards have access to the best available data and information. Priority data and information needs must be determined and effective approaches for dissemination must be established to ensure intended audiences are reached. Improved data and information management can also promote collaboration among organizations. Some projects are:
    - Langley Environmental Partners Society mapping and inventory Programme – British Columbia
    - Provincial Woodlot Database – Manitoba
    - Biodiversity Data for Stewards – National
    - Effective Communication Key to Stewardship, Wetkit – National

- Monitoring and reporting will provide a means to determine and report on successful approaches to stewardship, and to share this information across a national stewardship network. Monitoring and reporting may require the development of performance indicators and the use of electronic and other means to make reports widely available. Some projects are:
    - Citizen Science Initiative, Pilot Project – Ontario
    - Researching Amphibian Numbers in Alberta – Alberta
    - Monitoring of Whale Watching – Newfoundland and Labrador
    - Stewardship Monitoring in the Oil and Gas Sector - Yukon

Theme Three: Stewardship education, awareness and recognition

- Education and awareness are key elements in recruiting new stewards. People generally respond well to identify community needs. Education and awareness also promote citizen participation in policy and programme development. Some projects are:
    - Shorekeepers Programme – British Columbia
    - Streamkeepers Programme – British Columbia
    - Environmental Education Programme – Alberta

- Ducks Unlimited Canada Education and awareness - Manitoba

- Recognition of stewardship efforts is essential to both acknowledge the efforts of individuals and communities, and to encourage others to participate in stewardship programmes. Recognition can take many forms. Public awards acknowledge the efforts of volunteers. Some projects are:
  - Order of the Bighorn – Alberta
  - Urban Habitat Stewardship Award, Living with Wildlife – Ontario
  - Island Trust Community Stewardship Awards – British Columbia
  - Countryside Canada, Recognizing Stewardship – National

- Networking is important to advancing stewardship efforts, especially to promote local participation in stewardship initiatives. Regional and national networking using conferences, electronic and other means are also important to share successes and failures, and to help design regional and national stewardship programmes. Networking is also important to effective collaboration among sectors and organizations engaged in stewardship. Some projects are:
  - Establishment of Stewardship Canada Web Portal – National
  - Fish and Wildlife Management Board Stewardship Programme – Yukon
  - Prairie Conservation Forum – Alberta
  - Land Stewardship Resources Centre - Alberta

Theme four: Integrated Stewardship Approaches

- Bioregional planning and management enhances stewardship programmes. Stewardship programmes are necessary on a variety of geographic scales. Programmes that foster local activity, but also play a role in addressing provincial, territorial, national, and international issues, and fulfil needs at ecosystem or bio-regional scales are particularly desirable. Integrating stewardship activities into ecosystem approaches and bioregional planning will bring together diverse interests who share common ecosystems, resources and issues. Some projects are:
  - The Nature Trust – British Columbia
  - Freshwater Stewardship Programmes – Ontario, Quebec, Nova Scotia and New Brunswick
  - Wetland and Coastal Habitat Project – Nova Scotia
  - Bedeque Bay Environmental Management Association – Prince Edward Island

3.2.2 National Watershed Stewardship

The National Watershed Stewardship Report[26] published in 2003 presented a number of important policy recommendations. These recommendations were grouped under seven

[26] Langley Environmental Partners Society, 2003

themes: founding mechanisms, funding, governance, information and communication, partnerships, volunteers and monitoring and evaluation. Additionally key actions were identified for community and government acknowledging that there may be overlap.

Theme 1: Founding mechanism

Recommendations

- Use an ecosystem-based approach to define and harmonize jurisdictions, mandates, and activities along watershed boundaries.
- Create opportunities to engage all parties in the founding and ongoing support of normal and informal watershed stewardship groups.
- Use a strategic approach to design and initiate new watershed stewardship programmes.
- Provide the support to meet the specific challenges of emerging watershed stewardship groups and programmes.

Theme 2: Funding

Recommendations:

- Create stability for watershed stewardship groups and programmes by generating long-term, stable funding through diverse sources.
- Offer specific assistance and training to sustain organisations and to optimize funding allocations.
- Develop effective criteria and processes for funding community stewardship groups.
- Develop economic incentive to encourage stewardship amongst land owners, industry, and government.

Theme 3: Governance

Recommendations

- Support the development of a national coalition/network of watershed stewardship organizations.
- Develop and implement policies and guidelines to facilitate watershed planning and to deliver programmes.
- Establish and maintain long-term, multi-party watershed governance bodies.
- Ensure accountability of watershed policies and programmes.

Theme 4: Information and communication

Recommendations:

- Create community-wide, awareness-raising programmes that build a stewardship ethic across generations and sectors.
- Create transparent and accessible mechanisms to make information from many different knowledge bases, available to all interested parties.
- Produce a comprehensive national communication strategy with an implementation plan and adequate funding.

- Provide sufficient tools, resources, and support to understand how human behaviours influence natural resources, and to engage in the work required to effect change.

Theme 5: Partnerships

Recommendations:

- Create opportunities for and sustain collaborative partnerships toward a common vision with shared decision-making, risk taking, investment, and benefit.
- Create opportunities for and support watershed stewardship groups that include all relevant parties (e.g. all levels of government, aboriginal communities, educational institutions, industry and youth).

Theme 6: Volunteers

Recommendations:

- Provide volunteer stewards and stewardship groups with support to maintain momentum and produce successful, long-term initiatives.
- Honour volunteers by publicly recognising, celebrating, and rewarding their efforts and accomplishments.

Theme 7: Monitoring and evaluation

Recommendations:

- Include monitoring and evaluation, as part of the programme/project design and development.
- Build on existing approaches to provide consistent methods of monitoring and evaluation.

The next phase of this initiative involves communicating and implementing the recommendations and activities. Six strategic priorities were identified:

- Implementing recommendations among government agencies.
- Implementing actions with regional organisations.
- Strengthening partnerships.
- Building on other relevant initiatives.
- Create a stewardship task force.
- Investing in stewardship.

The following is an example of a stewardship project in Canada, the Muskoka Water Web.

The Muskoka Water Web[27] describes different stewardship organisations. They define stewardship as taking good care of something. It requires sound planning and informed choices to ensure continuous improvement in environmental, health, and safety and social performance.

Stewardship can also be a personal commitment to care for your land, sustaining or enhancing it for the enjoyment of future generations. Stewardship programmes encourage landowners to manage their lands in ways that maintain, restore or enhance the diversity of native plants and wildlife.

Watershed stewardship involves understanding and respecting the interrelatedness of the watershed. It will provide significant benefits for current and future generations. In the long-term, proper stewardship is cost effective with economic and environmental savings in the preservation of natural watersheds.

Some of the Stewardship organisations in the Muskoka area are: Nature Canada, Environment Canada:Take Action for the Environment, Stewardship Canada, Ontario Stewardship, Parry Sound-Muskok stewardship Network, Centre for Sustainable Watersheds, Watershed InfoXchange, LandOwner Resource Centre, Muskoka Heritage Foundation, Muskoka Watershed Council, Lake of Bays Heritage Foundation, Georgian Bay Association and the Federation of Ontario Cottagers' Associations.

3.2.3 Voluntary Sector Initiative

The Voluntary Sector Initiative[28] (VSI) was a unique undertaking between the Government of Canada and the voluntary sector to enhance their relationship and strengthen the sector's capacity. The overall goal of the initiative was to improve the quality of life in Canada. This was a five-year initiative.

The VSI was based on the recognition that the voluntary sector is one of the three pillars of Canadian Society, equal in importance to the public and private sectors. It aims to improve the ability of organizations to benefit from the contribution of volunteers, to encourage citizens to participate in voluntary organisations, and to enhance the experience of volunteering. The work of the VSI took place in two phases[29]. In the first two years, the VSI brought together equal numbers of representatives from the voluntary sector and the federal government to work at seven joint tables. The tables included issues such as capacity, regulations, awareness, national volunteerism, information management/information technology, co-ordination and a joint accord table.

In the second phase the VSI followed up on and implemented the recommendations, new research, actions and achievements produced during Phase I. Phase II resulted in the provision of new information and tools that are practical, realistic and accessible to all voluntary sector organisations, especially those that are small and medium-sized.

[27] http://muskokawaterweb.ca/3/3.4/stewardship.htm
[28] http://www.vsi-isbc.org/eng/index.cfm
[29] http://www.vsi-isbc.org/eng/about/goals.cfm

The Canada Volunteerism Initiative (CVI)[30] aims to improve the ability of organizations to benefit from the contribution of volunteers, to encourage citizens to participate in voluntary organisations, and to enhance the experience of volunteering. The CVI represents the first ongoing programme to be implemented under the broader VSI. The CVI established three national centres and thirteen local networks, one in each province and territory. The national centres deliver a range of programmes and services related to volunteerism. They are:

- The Knowledge Development Centre that provides support for both local and national research to improve their understanding of volunteerism.
- The Information, Capacity-Building and Awareness Centre that manages a resource centre, an awareness campaign, and a capacity-building programme.
- The Community Support Centre that provides support for organisations to develop and test innovative methods for sustaining volunteerism.

The local networks ensure the CVI responds to the needs of voluntary organisations and volunteers in each province and territory. Each network has developed a volunteerism action plan and community investment strategy for their respective region.

A Strategic Management and Co-ordination Committee oversees all aspects of the CVI. The Committee is co-chaired by Volunteer Canada, on behalf of the Voluntary sector, and the Community Partnerships Programme at the Department of Canadian Heritage, on behalf of the federal government. The CVI is funded by the Community Participation Programme.

3.2.4 Volunteer Canada

Volunteer Canada[31] is the national voice for volunteerism in Canada. They have been active since 1977 and have been committed to supporting volunteerism and civic participation through ongoing programmes and special projects.

Volunteer Canada is led by a Board of Directors comprised of three volunteer centre representatives and six members selected for broader voluntary sector expertise.

Volunteers are seen as people from all walks of life, all ages and stages. What they have in common is the desire to make a difference in their community, and in their own life, by giving their time and expertise.

Volunteers are involved in virtually every aspect of society including health, education, social services, youth, sports and recreation, culture, the arts and the environment and play a vital role in Canadian society. Some volunteers give just one hour each week; others devote many hours. Volunteers are involved in one-time events as well as ongoing commitments. Some choose to volunteer out in the community whereas others are virtual volunteers and do their volunteering

[30] http://www.vsi-isbc.org/eng/hr/cvi.cfm

from the comfort of home. Volunteers can work on their own or with others, do hands-on work or volunteer at an administrative or leadership level.

Some volunteers have the support of their employers and are permitted to modify their work hours in order to take part in volunteer activities.

Youth volunteers become involved to discover their talents, to explore career options, to act on their social awareness, to gain self-confidence, to build a sense of independence or to complete high school curriculum requirements.

Older volunteers know that experience matters and volunteering provides opportunities to use valuable skills, to give back to their communities, to mentor others and to create and maintain relationships.

3.3 AUSTRALIA

3.3.1 Waterwatch

The Australian Government has an initiative "Caring for our Country" in which there are a number of ways that volunteers can get involved in natural resource management (NRM) activities at a local, regional, state or national level. The Australian Government and other organizations that facilitate activities can help people find an appropriate group to join, or support the formation of a new group concerned about the quality of the land and water in their area.

"Caring for our Country" includes groups such as Conservation Volunteers, Earthwatch Institute, Greening Australia, Landcare Australia, Reef Check Australia, Threatened Bird Wetwork, WWF-Australia and Waterwatch[32].

Waterwatch is a community based initiative operating throughout Australia. It facilitates and co-ordinates projects to improve water quality in all states and territories. The projects include education, training and water monitoring activities.

Waterwatch[33] is a national community water monitoring network that encourages all Australians to become involved as volunteers and be active in the protection and management of their waterways and catchments. Waterwatch is supported and funded by the Commonwealth Government's Natural Heritage Trust in partnership with all levels of government, industry and the community.

The vision for Waterwatch Australia is healthy waterways.

[31] http://www.volunteer.ca/en/about
[32] http://www.nrm.gov.au/do/volunteer.html
[33] http://www.waterwatch.org.au/publications/communitydata.html

The essence of Waterwatch is described in the following beliefs and principles[34]:

- Everything that happens in a catchment can have downstream effects;
- Community participation is vital to ensure effective environmental management;
- Education is a fundamental element of environmental management;
- Shared responsibility and collaborative action through partnerships is effective;
- Monitoring by the community facilitates environmental action;
- Local cultural, historical and environmental degradation should be addressed, not the symptoms;
- Changing attitudes and values will lead to behavioural change;
- Support for on-ground action by communities is essential.

The Waterwatch network is made up of individuals, community groups and school groups who undertake a variety of biological and habitat assessments as well as physical and chemical tests to build up a picture of the health of their waterways. Waterwatch helps people to get together with their local councils, water authorities, industry, catchment managers, and other organizations to discuss the water quality issues in their catchments and to develop strategies to deal with these issues.

Waterwatch is an important element in the conservation of waterways. Across Australia data are collected by monitoring groups using nationally adopted protocols for nine parameters. The data are recorded using nationally agreed units and national site code systems. The different protocols are described on their website[35]. The South Australian Waterwatch group include pH, turbidity, flow, salinity, dissolved oxygen, phosphorus, nitrogen, water temperature, riparian habitat survey, macro-invertebrates and fish monitoring[36]. Different local waterwatch networks conduct different types of monitoring and some include algae, frogs and faecal coliforms.

Once collected, the data are entered into a standard national Waterwatch database. The data can then be pooled, analysed and interpreted for specific catchments or larger regions. This system enables reports to be produced for water management authorities to assist in natural resource management.

Waterwatch Australia is an umbrella programme overarching the State programmes, which include the following: Waterwatch Victoria, Waterwatch South Australia, Ribbons of Blue in Western Australia, Waterwatch Northern Territory, Waterwatch Queensland, Waterwatch New South Wales, Waterwatch Australian Capital Territory and Waterwatch Tasmania.

Some examples of monitoring programmes under the Waterwatch umbrella:

[34] http://www.tas.waterwatch.org.au
[35] http://www.waterwatch.org.au/publications/

- King Island's saline groundwater monitoring programme (Tasmania);
- Lake Parramatta – swim towards 2005 (New South Wales);
- The river people – monitors high rainfall events along the Yea River (Victoria);
- Nhulunbuy Primary School Waterwatch Group (Northern Territoty);
- Talbot Brook Land Management Associations (Western Australia);
- Communities monitor waterways in South Australia's arid regions (South Australia);
- Lake Tuggeranong (Australia Capital Territory);
- The Invisible flow of the Boyne River (Queensland).
- There are many other examples[37] of Waterwatch in action in Australia such as learning about water monitoring techniques has become an essential element for scouts who wish to obtain the Victorian Branch World Environment badge (Melbourne Waterwatch) and Waterwatch groups helping to remove willows, etc.

Waterwatch[38] groups conduct biological and habitat assessments plus physical and chemical water tests to build up a picture of the health of their waterways and catchments. Over time, Waterwatch groups can determine if the health of their waterway and catchment are improving, declining or being maintained.

Waterwatch groups collect data using nationally adopted protocols for nine parameters. They are: macro-invertebrates, dissolved oxygen, temperature, pH, conductivity, turbidity, reactive phosphorus, nitrogen and, riparian habitat assessments. The data are recorded using nationally agreed units and national site code systems and then entered into a standard national Waterwatch database. The data can then be pooled, analysed and interpreted for specific catchments or larger regions. This system enables reports to be produced for water management authorities to assist in natural resource management.

How to get involved in Waterwatch Australia

- Create an action plan: The aim of an action plan is to allow your group to move from an awareness of water quality problems, to eventually coordinating and implementing actions that will have a beneficial impact on water quality. An action plan will help focus your activities, and consequently you will manage water quality problems much more efficiently.
- Community co-operation: Create awareness amongst all stakeholders about the proposed activities. Ensure that relevant government water and land managers, local government officials, and conservation groups are involved. Also include groups or individuals that may be contributing to the decline of water quality. The aim of Waterwatch is to foster community based solutions to water quality problems. Good outcomes are based on the principle of co-operation, not confrontation.

[36] http://www/sa.waterwatch.org.au/monitor.htm
[37] http://www.waterwatch.org.au/monitoring.html
[38] http://www.waterwatch.org.au/monitoring.html

- Examine the situation: Make sure that a genuine problem exists and identify the causes of the problem.
- From awareness to action: Once it is determined that there is a water quality problem, and the source is confirmed, an action plan can be developed. The nature of the problem will usually determine what actions are most suitable. A good way to work out potential actions is to review the problem, and then determine appropriate aims (what are you trying to achieve), goals (make sure the goals are achievable, tangible and positive. Also place realistic time frames on the goals and prioritise them) and objectives (they should be definable and measurable) for dealing with the problem. Ensure that there are enough people and resources to get the job done.
- Other activities of importance are quality control and training of the volunteer monitors. A good training programme enhances the project's scientific credibility with potential data users and it boosts the volunteers' confidence in the project and themselves.
- Other issues that should be considered when starting a monitoring programme are insurance cover, permission to monitor on private land, safety precautions[39], look after the environment (e.g. no littering) and make sure your results are credible (evaluate and review results).
- Evaluate your progress: Once the plan is in action, progress should be evaluated by reviewing your aims, goals and objectives.
- Review the plan: Even if you have achieved all that was originally planned, one should still review the whole process.
- Maintain volunteer interest and morale by ensuring that the programme as a whole and the data are credible. A credible programme is one that incorporates regular review and analysis of people procedures such as monitoring training, satisfaction and morale as well as technical matters like monitoring techniques, equipment performance, and data recording and reporting. Do not under-estimate local expertise. Arrange occasions when monitoring groups and water quality experts can meet, ask questions and enjoy being part of a catchment team. Also use newsletters, phone calls and easily understood and useable reports to keep your group informed of results, programme progress and events. Be sure to publicise any action or improvement in water quality that results from your monitoring.
- When there is a known problem – negotiate. A non-confrontational approach need to be adopted. The aim is to achieve a "win-win" outcome for the waterbody and the person responsible for the pollution. If people have willingly worked together to arrive at a solution, they are more likely to make the solution work.

The South East Waterwatch[40] programme is part of the National community monitoring programme that promotes individual, school and community action group involvement in water quality monitoring. Participants are involved in collecting data on nutrient levels, salinity, pH, turbidity, water temperature, groundwater depth and macro-invertebrate diversity in wetlands,

[39] http://www.waterwatch.org.au/publications/safety.html
[40] http://www.senrm.sa.gov.au/EnvironmentalEducation/WaterWatch.aspx

drains, streams and boreholes within the region. Throughout the year there are four snapshot weeks where the groups monitor their local waterways.

After each water monitoring event feedback posters are created so groups can compare their results with other sites across the region.

Groups also have the opportunity to be involved in fun and interactive education sessions provided by the Regional Co-ordinator, which follow up on water monitoring activities. Sessions on stormwater pollution, ground water, macro-invertebrates, frogs, and water birds are offered to groups in the South East.

The South East Waterwatch programme has produced curriculum resource to assist the region's teachers in conducting water related study units.

This curriculum resource contains ten projects which teachers can use to conduct a unit study on topics related to water. It allows for a whole school approach conducting water related activities.

The curriculum is as follows:

Year level R-2: Introduction to water
Year level 3-5: Introduction to water
Year level 3-5: Water use/social issues
Year level 3-5: Water pollution
Year level 6-9: Introduction to water and water use
Year level 6-9: Water pollution
Year level 6-9: Water quality, monitoring and interpretation
Year level 10-12: Water quality, monitoring and interpretation
Year level 10-12: Water quality, monitoring and interpretation
Year level 10-12: Integrated catchment management.[41]

One of the Waterwatch activities is the Waterways Health Check that classes/schools can undertake. The question: "How healthy is your local waterway?" can be answered with this tool that they use. Teams are formed and activities to assess their river or stream are chosen.

Activities included are land use, litter, pipes and drains, extra structures or modifications, smell, water clarity, vegetation, invertebrate animals and vertebrate animal life. Teams go out to their specific areas and rate the activities from 0 (bad) to 10 (great). At the end scores are combined to come up with the overall health of your local stream, river, lake or wetland. It is easy and does not take too much time or require complex equipment, and will allow you to tune into a vital component of the environment.

Should the scores be low, the local Waterwatch person should be contacted to work out the best way to clean up the stream or river. The Waterwatch coordinator can help with the health check and any further activities that a class or school would like to undertake[42].

Waterwatch Tasmania is a part of Waterwatch Australia. As a result of growing participation the programme has developed into a network of more than 2 000 groups regularly monitoring more than 5 000 sites around Australia.

Waterwatch Queensland[43] is also an active Waterwatch group that uses the monitoring to:

- Identify major water quality issues or hotspots;
- Help to prioritise what actions should be taken to solve catchment health problems and set water quality targets;
- Evaluate the effectiveness and management actions, such as fencing of riverbanks;
- Provide learning opportunities for the local community (including schools) and encourage responsible catchment management and use;
- Provide the opportunity for people of all ages to be involved in catchment monitoring and management processes; and
- Support and assist other monitoring programmes undertaken by state agencies and local government.

How and what to monitor is described on their website. The types of monitoring that they commonly undertake are the following:

- Snapshot assessments;
- Ambient or routine monitoring;
- Load-based or event monitoring;
- Impact assessments;
- Restoration assessments;
- Compliance monitoring; and
- Investigative studies.

Each one is better suited to particular monitoring objectives.

Education and training is provided. A range of activities (i.e. Creek Rescue Game, River Journeys, “What’s happening in our catchment” posters and The Story of a River) and publications are available for use in schools[44], or by school-aged children interested in learning more about their waterways. Training helps ensure that monitoring groups have appropriate skill levels to undertake monitoring and caring for waterways. This will mean that the data collected

[41] http://www.senrm.sa.gov.au/EnvironmentalEducation/WaterWatch/Curriculum Resources.aspx
[42] http://www.environment.gov.au/education/publications/waterwatch.html
[43] http://www.qld.waterwatch.org.au/monitoring/index.html

are of a quality to suit the group's objectives, and those using the data can do so with confidence.

Good training equips group members with skills to produce reliable, credible data and an understanding of why it is being collected and what it means. Benefits of training increases the confidence of the participants, acts as personal motivation from increased opportunities, it is an important social networking event and improves personal safety in the field and minimizes possible accidents and mistakes.

The key areas where training is required will depend on the existing skills and experiences of group members. It will also depend on their roles, responsibilities and functions within the group. A "skills audit" should give information about existing skill levels and required skills. The skills needed will depend in part on what is being monitored and what the data will be used for. Some training will be mandatory for all members, i.e. health and safety training. Training can range from informal on-the-job training through to formally accredited courses. It is important to be flexible in how, where and when training is delivered.

They also have a number of regular events such as the River Festival in September, World Wetland day in February, Clean-up Australia in March, National Water Week in October and World Water Monitoring Day in September.

Newsletters such as "The Water Watcher"[45], the newsletter for the Hunter-Central Rivers Waterwatch Network, are used to give feedback on programmes and special upcoming events as well as information on grant and funding opportunities.

3.4 OTHER WATER QUALITY MONITORING GROUPS

3.4.1 World Water Watch

World Water Watch[46] (WWW) is a non-profit organization supporting other Non-Governmental Organizations (NGOs), foundations, and government and private agencies involved in the planning, protection and restoration of water resources. WWW assists in the development and management of water quality monitoring networks and the design and implementation of remedial measures to restore surface and groundwater quality on a catchment scale. WWW represents a group of international experts in the field of water resources and environmental engineering. This group utilizes its expertise in the development of assessment, evaluation and design tools, and assists in specific project activities. WWW works closely with local communities to develop and support water resources protection and management activities.

[44] http://www.nrw.qld.gov.au/education
[45] http://www.waterwatch.nsw.gov.au
[46] http://www.worldwaterwatch.org/mission.htm

WWW, together with partner organizations, is committed to "internationalizing" the curriculum at American universities, so that graduates will be better prepared to participate in and contribute to needed environmental protection and solutions. They develop courses, curriculum, workshops, and field activities abroad to provide American students with the knowledge and understanding to contribute their skills in a global workplace. Programmes are designed to include engineering, science and liberal art students interested in working in the field of water resources. Courses and programmes are held in the USA and abroad, often in co-operation with universities, NGOs and international organizations.

Monitoring and protecting global water resources, "One Watershed at a time" involves the following activities:

- Monitoring systems: Water quality monitoring networks provide a scientific basis for targeting and controlling surface and groundwater contamination events;
- Integrated watershed management: When monitoring, modeling and control systems are integrated, communities have powerful tools to protect and manage water resources;
- Education and outreach: Workshops, training, conferences and publications improve and sustain watershed projects;
- Conservation and biodiversity: Design methods and maintenance of practices that protect and remediate water quality problems, lead to a healthy watershed;
- Water supply and sanitation: Developing and protecting drinking water systems is in everyone's best interest.

WWW also involves volunteer monitoring programmes. Volunteer monitoring efforts not only expand the scientific base of catchment protection and remediation programmes, but are also the catalyst for education and conservation action initiatives.

The number of volunteer monitoring programmes in the USA has expanded dramatically since the mid-90s. Their contributions vary from basic sampling utilized primarily for educational purposes, to intensive watershed-scale programmes, generating helpful data used by watershed managers.

WWW supports volunteer monitoring programmes by assisting with watershed monitoring system design, implementation and operation. They also provide guidance with respect to quality assurance and control practices. The quality assurance and control in volunteer monitoring is perhaps the greatest obstacle to incorporating or comparing volunteer monitoring data with other sample data. WWW also assists volunteer monitors in locating and utilizing resources and expert guidance.

Most of their activities involve partners and collaborating organizations. WWW, along with partner organizations, offer volunteer opportunities both in the USA and overseas. Volunteers can commit to as little as one week, or as long as one year. Specific travel and housing arrangements vary greatly. Language training can be an element of these programmes. They

also offer and co-operate with partner organizations to arrange tours to environmental and community-based centres, research stations and eco-tourism lodges.

4. LOCAL EXPERIENCES

The review of national monitoring programmes was based on information obtained from the DWAF website[47]. Other successful water related and non-water related volunteer monitoring models were also included as examples of successful volunteer participation in South Africa. Section 4.1 (4.1.1 to 4.1.5) was taken from Rossouw and Februarie, 2006.

4.1 NATIONAL MONITORING PROGRAMMES

The National Water Act specifically mandates the Minister of Water Affairs and Forestry to establish national monitoring systems that monitor, record, assess and disseminate information on water resources. To comply with this requirement of the Act and with Chapter 3 of the National Water Resources Strategy, DWA is developing and implementing a series of national water quality monitoring programmes. The information generated by these programmes is used for water resources planning and management purposes and thus needs to be of high quality. For this reason the national programmes have all been designed according to scientific monitoring design principles and are subject to strict quality control measures.

A number of stakeholders (such as other government departments, local authorities and water boards) give support to DWA in data collection activities. The information generated by the programmes is then provided to participating stakeholders to use for their own purposes.

All the data collected from these different monitoring programmes are stored in The Water Management System (WMS). The Water Management System is a computer programme developed specifically for the Department of Water Affairs to support decision-making and to provide the necessary information needed to manage water resources and monitoring in South Africa. The vision of the WMS is to have a working integrated computer system where different directorates and regions, with different mandates and functions, can support each other, sharing information and the workload, and in this way helping the Department of Water Affairs to be consistent in all its decisions and actions in the management of water resources.

Resource quality monitoring includes a number of reporting activities, including the development of guidelines and procedures for the monitoring and assessment of water resources quality. It also involves management of national monitoring programmes, namely the National Microbial Monitoring Programme (NMMP), the National Eutrophication Monitoring Programme (NEMP), the National Chemical Monitoring Programme, the National Toxicity Monitoring Programme and the Aquatic Ecosystem Health Monitoring Programme, including the River Health Programme and the Adopt-a-River Programme. Other activities include the application of eco-toxicology (ecological risk assessment), the National Radioactivity Monitoring Programme and support for the Resource Directed Measures (RDM) Office in the ecological reserve determination and monitoring. These monitoring activities are only for surface water quality.

Currently there are a number of National Monitoring Programmes that has been developed by the Department of Water Affairs. These programmes are government driven and do not use volunteers for any of the water quality sampling.

What all these national programmes have in common is that lots of money was needed to develop (from R600 000 upwards), establish and maintain these programmes (estimated at Approximately R25 million per annum currently for all six programmes (2004 figures)). This figure would be higher had there not been sampling input from other institutions.

The following are the current national water quality monitoring programmes.

4.1.1 National Microbial Water Quality Monitoring Programme

South Africa does not currently have a central source of information for assessing the potential health risks associated with natural waters contaminated with faecal pollution. With numerous dense settlements (both formal and informal), increasing urbanization and other factors, South Africa's water resources are coming under increasing threat from faecal contamination.

The National Microbial Water Quality Monitoring Programme[48] has the following objectives:

- To provide information on the status and trends of the extent of faecal pollution, in terms of the microbial quality of surface water resources in priority areas;
- To provide information to help assess the potential health risk to humans associated with the possible use of faecally polluted water resources.

These objectives are primarily national, not regional. It is not the intention that the individual causes and impacts of faecal pollution are identified in this programme.

An Implementation manual was written that includes the implementation process and the different monitoring roles from the sampler (in many cases a "volunteer") to the policy maker.

"Volunteers" being people sampling the NMMP monitoring sites in addition to their routine sampling. This is not done on a voluntary basis but is part of their job descriptions.

The design and pilot studies for the NMMP was funded by the Water Research Commission and the Institute for Water Quality Studies at a cost of approximately R1 million. Currently, the programme is co-ordinated by one full-time National Coordinator and a full-time assistant at about R320 000 per annum. They are also assisted by at least three part-time Regional Coordinators. The sampling analysis costs was about R400 000 per annum in 2005 and is expected to increase to about R1 million at full implementation of the NMMP[49].

[47] http://www.dwaf.gov.za/IWQS
[48] http://www.dwaf.gov.za/IWQS/microbio/nmmp.htm
[49] Van Niekerk, 2005

4.1.2 National Eutrophication Monitoring Programme

Many South African impoundments exhibit high nutrient enrichment and eutrophication related problems. Some 80 impoundments have been monitored in South Africa. However, many impoundments do not have regular eutrophication monitoring. A co-ordinated effort did not exist that allows reporting on the nationwide status and trends of eutrophication.

The aim of the NEMP[50] is to address this need. The NEMP provides annual assessments of the eutrophication in South Africa.

The design of the NEMP was funded by the Water Research Commission over a two-year period at a cost of approximately R600 000. However, the costs will increase annually as the programme expands starting at approximately R350 000 in the 2003/2004 financial year to approximately R900 000 in 2008/2009. This cost includes only the DWA budget and does not include the monitoring costs. However, an additional value of about R500 000 per annum is estimated to be required to fully implement and maintain the NEMP[51]. "Volunteers" are used for the monitoring. The "volunteers" are samplers from DWA regional offices and also from local authorities. The staff from DWA regional offices and the local authorities are not true volunteers as they are paid by their organisations and are actually stakeholders that benefit from the collection of samples.

A National Eutrophication Monitoring Programme: Implementation Manual[52] was developed and not only provides a national implementation process but one for regional and local implementation as well. Furthermore, it provides monitoring frameworks for addressing local objectives for impoundments and rivers (except for establishing trophic status).

These monitoring frameworks should be seen as recommended designs for local stakeholders. Because they address more demanding objectives, they necessarily require more intensive monitoring than that required for meeting the national objectives. However, they are intended to provide guidance to local stakeholders on the appropriate design of local monitoring programmes.

These are designs that address their local objectives, and are totally compatible with (indeed, go beyond) the minimum requirements for the NEMP.

This approach is intended to simplify the process of local monitoring programme design and create better buy-in to the NEMP because local objectives are also shown to be important.

[50] http://www.dwaf.gov.za/IWQS/eutrophication/NEMP/default.htm
[51] Van Ginkel, 2005
[52] DWAF, 2002a

However, DWA will not automatically assume responsibility for such local programmes. This is particularly so if a local design is chosen that goes beyond the minimum requirements for the national programme. Exactly who has what responsibility will be subject to negotiation between DWA and the local stakeholders. The final decision should be recorded in a formal contract between the parties. This will also detail who will perform the various monitoring tasks (sampling, analysis, etc.).

A typical idealistic scenario for initializing of a local monitoring programme:

DWA approaches a local stakeholder expressing interest in establishing a local eutrophication monitoring programme in an impoundment in which no such monitoring currently exists. DWA indicates a willingness to be responsible (i.e. provide resources) to the extent of the minimum national requirements. The local stakeholder examines the recommended local design that meets the chosen local objectives. The local stakeholder agrees to provide the necessary resources for any monitoring that might be over and above the minimum national requirements. Details are negotiated, a contract is drawn up and monitoring starts.

Similarly, any regional monitoring programme that is implemented that addresses regional objectives will also need to be negotiated with the regional stakeholders.

4.1.3 National Chemical Monitoring Programme

The National Chemical Monitoring Programme[53] aims to provide regular reporting on the chemical quality of South Africa's surface waters.

A National Water Resource Quality Status Report: Inorganic Chemical Water Quality of Surface Water Resources in SA – The Big Picture, was published in June 2002[54]. The aim of this report is to provide information on the major inorganic chemical water quality constituents of surface waters across South Africa to water resource managers, scientists, decision-makers, and the public. It is intended to provide an overview of the status of surface chemical water quality according to the water quality requirements of two water user sectors, namely, domestic water use and irrigated agricultural water use.

The following recommendations were proposed in the report:

- Revision of the existing monitoring network is necessary to terminate sampling at unnecessary sites and expand the network to cover the sensitive problem areas more adequately or those areas with insufficient sampling sites.
- Role players must be informed of the impact of land uses that result in deterioration in the water quality. This is especially important for mining and agriculture.
- Investigate ways to improve the water quality at those negatively impacted sites.

[53] http://www.dwaf.gov.za/IWQS/water_quality/NCMP/NWRQSR.htm
[54] DWAF, 2000b

- Water users at sites where the water that could be detrimental to their health should be informed. Safe water should be provided to those domestic users who have no access to a safe and healthy water supply.
- Water resources should be protected, in particular the more pristine water sources, in order that their quality does not deteriorate as a result of a change in land use or management practice.
- The trophic status monitoring and assessment programme (NEMP) should be expanded to include more of the impoundments throughout the country and appropriate land use management practises should be encouraged to prevent or minimise large loads of nutrients entering the aquatic environment.

This programme has been ongoing for many years and following the information user-centric approach is was recognised that water resource management approaches and practices have changed with time.

The NMMP and NEMP are also planning to publish status reports in future. This can be used as status reports and also to confirm that the national objectives of the monitoring programmes are being met.

4.1.4 National Toxicity Monitoring Programme

The objective of the National Toxicity Monitoring Programme[55] is to measure, assess and regularly report on the status and trends of the nature and extent of potentially toxic substances in South African water resources.

A report was produced on: Needs assessment and development framework for a test implementation plan for the initialization and execution of a National Toxicants Monitoring Programme (NTMP)[56].

A few general conclusions were drawn from this work:

- The design of a national toxicants monitoring programme will be complex. The most challenging aspect of the design will be the choice of the most appropriate monitoring variables. There are many potential variables, including individual toxicants, indicators of toxicants classes and toxic effects on a variety of potential organisms. Focused planning will be required to ensure that the stated monitoring objectives are met.
- The nature of the measurement of many of the monitoring variables (toxicity tests and analyses for chemicals like pesticides) is such that it is likely that resource constraints will be a primary factor in limiting the variables chosen for the programme. It has been

[55] http://www.dwaf.gov.za/IWQS/water_quality/ntmp/index.htm
[56] Murray, Slabbert and Moloi, 2003

estimated that this programme can cost up to R10 million per year at full implementation[57].

- The particular nature of toxicants, their toxic effects and their likely varying behavior in different water resources (including their sediment), suggests that specialist expertise in these areas will be essential for sound monitoring design. It also suggests that different designs are likely to be necessary for the different water resource types.

4.1.5 South African River Health Programme

The South African River Health Programme[58] (RHP) primarily makes use of biological monitoring (e.g. fish communities, riparian vegetation, aquatic invertebrate fauna), to assess the condition or health of river systems. The rationale for using biological monitoring is that the integrity of biota inhabiting river ecosystems provides a direct, holistic and integrated measure of the health of the river as a whole.

The goal of the RHP is to serve as a source of information regarding the ecological state of river ecosystems in South Africa, in order to support the rational management of these natural resources.

The objectives of the RHP are to:

- Measure, assess and report on the ecological state of aquatic ecosystems;
- Detect and report on spatial and temporal trends in the ecological state of aquatic ecosystems;
- Identify and report on emerging problems regarding aquatic ecosystems;
- Ensure that all reports provide scientifically and managerially relevant information for national aquatic ecosystem management.

The custodians for the RHP are the Department of Water Affairs, the Department of Environment Affairs and Tourism and the Water Research Commission.

A National Coordinating Team (NCT) executes the functions associated with the national co-ordination required to run the RHP. Their responsibilities include the following:

- Marketing and fund raising;
- Day-to-day operations of the RHP at national level as well as DWA contract management;
- Co-ordination and dissemination of RHP information and products;
- Providing a contact point and follow-up mechanism for national and international queries and requests.

[57] Kempster, 2005
[58] http://www.csir.co.za/rhp/goal.html

This project is driven and funded at many different levels, but an indication of expenditure including salaries of staff at DWA Head Office in Pretoria, including the consultants they work with, is in the region of R1.5 million per annum and this grows annually at roughly 5-10%, depending on how many consultants are on board[59].

The RHP is one of six programmes and in total they cost around R25 million per annum, including salaries and overheads. The most expensive of the projects are the National Toxicity Monitoring Programme and the National Radio-activity Monitoring Programme that is being developed. When fully implemented the Toxicity Programme will cost around R10 million per annum and the Radio-activity Programme around R2-3 million per annum[60].

4.1.6 New Monitoring Programmes

The following paragraphs were written by Barbara Schreiner, Senior Executive Manager: Policy & Regulation in the Foreword in "A 5-Year Water Resource Quality Monitoring Plan"[61]: "Historically, the objectives of South Africa's water resources quality monitoring networks and programmes were not so strongly focused on ongoing decision-making. With increasing water scarcity, the focus will be on a holistic assessment of water resources to support various, often competing, human needs and to ensure the sustainability of the environment. With this in mind, the need to co-ordinate and integrate water resources monitoring is embedded in the national water legislation, i.e. Chapter 14 of the National Water Act (Act 36 of 1998) which mandates the Minister to "ensure the continued and co-ordinated monitoring of water resources in its broadest sense… "

The Policy and Regulation Branch of the Department of Water Affairs has recognized the need to integrate water resource quality monitoring services through coordinating monitoring and analysis methods used by different monitoring programmes[62] and institutions. A "Strategic Framework for National Water Resource Quality Monitoring" document [63] was developed in order to provide a basis for reviewing the current monitoring programmes and designing new programmes. A Water Resource Quality Monitoring Task Team from the Chief Directorate: Information Management, was established to work towards an effective and efficient monitoring service and this 5-Year Water Resource Quality Monitoring Plan[64], developed in consultation with Regional Offices, provides the necessary direction.

Through a series of special interventions, the Department intends to re-appraise the current monitoring programmes, to develop new monitoring programmes, and to integrate data acquisition, data management and information products for management purposes at the local,

[59] Madikizela, 2005
[60] Kempster, 2005
[61] DWAF, 2004a
[62] http://www.dwaf.gov.za/IWQ/wrmais/default/htm
[63] DWAF, 2004a
[64] DWAF, 2004b

national and regional levels. The establishment of appropriate governance structures is seen as one of the key interventions through which DWA National Office, Clusters, (RO) proto-CMAs, and new Water Management Institutions will become aligned to create the information base for Integrated Water Resource Management."

The following are some of the main issues addressed in the DWAF, 2004b report :

The existing national programmes have largely focussed on resource status and trends monitoring, whereas the expected most growth in monitoring will be:

- towards assessing water and land-based impacts on the resource and
- towards managing impacts (compliance monitoring).

This will be achieved through authorisations, policy changes, rehabilitation, etc. This monitoring will mainly support resource management that will be delegated to lower levels, and will, to a large extent, also have to be done by the users themselves.

The table below is an indication of expected growth during the next couple of years for particular programmes [65].

Potential or emerging programme	Comments	Expected growth
Existing national programmes	These are all expected to expand again as water resource management at WMA level takes off, requiring a more detailed status and trends monitoring.	*
Aquatic Health	The River Health Programme must still grow to cover the whole country and must expand to include other aquatic ecosystems, in particular wetlands, estuaries and groundwater. This programme will serve status and trends monitoring at national level and performance/compliance monitoring at lower levels.	***
Ecological Reserve	This will be done for compliance monitoring and also to help establish information for determining high confidence Reserves. It will be a continuation of driver monitoring, (e.g. hydrology, geomorphology, water quality) and biological response monitoring. Eco-status can only be assessed through an integration of various monitoring outputs, usually by means of numerical modeling. This has significant capacity implications for Regions and future CMAs.	**
Ecological changes (local and regional scale).	Land use impacts on ecological systems are usually only understood by the integration of several ecological disciplines. Other countries address this in the International Long Term Ecological Research (ILTER) network in specific research sites like a catchment or a coastal environment. In South Africa this is co-ordinated under the South African Environmental Observation Network (SAEON).	*
Environmental impacts of water use and water resources infrastructure	More focused monitoring is required before, during and after impact as part of Environmental Impact Assessments and Strategic Environmental Assessments.	**
Land-use/ land management	Many land use and land management practices are expected to change in order to protect and conserve water in the national interest;	**

[65] DWAF, 2004b

Potential or emerging programme	Comments	Expected growth
changes	Besides in-stream measurement, the land cover itself can be monitored, in particular by remote sensing; Resource quality objectives provide for this type of observation.	
SEDIMENT	Sediment is only measured as an average load through the reservoir survey programme. As catchment management evolves, greater focus on erosion and run-off control is expected, with emphasis on more detailed sediment concentration monitoring. Interpretation and management of many water quality constituents also require knowledge of the concurrent sediment concentrations.	*
Rural Water Quality	This is a particular need, in areas where communities still rely on unprotected water supplies. This would have to include surface water and groundwater programmes like microbial, toxicity and radioactivity monitoring.	**
Water abstraction Use	There is general consensus that water use information represents the biggest uncertainty in water balance calculations. Information is needed for control purposes, and for catchment hydrological assessments and projections. A monitoring programme would link together data from various acquisition activities, e.g. registration, compliance monitoring, auditing, space observations and special studies. The challenge will not be in new data collection, but in enforcement of collection and provision by users and the effective storage and processing of this information.	
Diffuse water abstraction use (controlled activities)	More knowledge and policy needs to be built up on the impact of this use; must be done together with use sector.	**
Diffuse pollution	Measure the impact of remediation policies nationally and locally.	**
Atmospheric conditions	Essential because of climate changes. Co-operation between Weather Services and others required for better understanding for modeling, planning and operation. Flood, drought and disaster management.	**
GEMS (Global Environmental Monitoring System)	Designed to use information from current monitoring programmes, and not to spend additional funds on new monitoring points. Reporting done nationally	*
Transboundary programmes	Management of trans-boundary water resources often requires a greater density of monitoring and special attention to all components of the monitoring functions. Commitments are usually made in bi-lateral agreements, eg. The Incomaputo agreement.	**

The status of monitoring in terms of the main monitoring components, data acquisition, management, storage, information dissemination and information systems, were evaluated against the main critical interventions needed as identified during a workshop in April 2004[66].

From this an overall 5-year goal for monitoring was compiled. The overall goal that should be achieved within 5 years was: "an effective and efficient national information service."

This entails, amongst others:

[66] DWAF, 2004b

- User-focus and value for money.
- Ease of access for users (one point of entry).
- One version of the truth (no duplication).
- Sharing of data acquisition and management.
- Integrated information systems.
- Appropriate capacity (expanded and multi-skilled capacity).

To achieve this goal, thirteen critical strategic interventions were required[67]. The interventions identified were the following:

1. Umbrella Programme: An umbrella programme for monitoring, such as the US Water Information Co-ordination Programme", with the overall purpose to improve water information for decision-making about natural resources management and environmental protection, is seen as an option.

2. Monitoring Governance Model: A programme with national objectives and many different role players needs clear and agreed governance structures and processes. It is proposed that such a programme be based on the US Advisory Committee on Water.

3. Integrated monitoring plans for each WMA: Such plans could provide the essential user/stakeholder focus and would allow for the systematic rollout of the monitoring plans on a priority basis.

4. Business plans for individual programmes: Given the high and increasing costs of monitoring and the growing number of stakeholders as participants, funders and clients, a business approach to monitoring has become essential.

5. Feasibility study for water use monitoring: Information is needed for control purposes, and for catchment hydrological assessments and projections. A monitoring programme would link together data from various acquisition activities, e.g. registration, compliance monitoring, auditing and special studies. The challenge here will not be in new data collection, but in enforcement of collection and provision by users and the effective storage and processing of this information. Because this represents a new way of monitoring, relying largely on other stakeholders' information, a feasibility study is required to assess among others the "why, what, how and who".

6. Business plan for Aquatic Ecosystem Health Monitoring: The River Health Programme must still grow to cover the whole country and must expand to include other aquatic ecosystems. The business plan should address Aquatic Ecosystem Health monitoring at

[67] DWAF, 2004b

different levels and how this would also serve the purpose of Ecological reserve monitoring.

7. Guidelines and Standards: Water resource quality monitoring guidelines and standards are crucial in any monitoring programmes. They have to address all the components of monitoring, from data acquisition to information generation and dissemination. In terms of the Minister's Chapter 14 mandate and the growing delegation of water resources management and accompanying monitoring responsibilities, the development of guidelines and standards needs to be formalised and co-ordinated. These will become the basis for any sharing of monitoring actions and outsourcing in this regard.

8. Development of auditing responsibility: Water resources monitoring will be a major DWA and water sector business process that will require its own auditing. However, according to expert opinion the internationally well-established quality control systems, in particular ISO 9001:2000, can be used. A feasibility study in this regard is a priority, also to serve as a forerunner to the guidelines and standards development.

9. Scoping of technology for monitoring: Given the increasing importance of monitoring and the growing number of stakeholders, a scoping of the technology trends in support of all components of monitoring could be useful. This would serve as a basis for future research and development investment in this field.

10. Cost-benefit-analysis for monitoring: Monitoring represents an essential long-term investment in support of sustainable water resource development. While the strategic interventions discussed here are to make monitoring more effective and efficient, there has often been uncertainty about the overall investment that needs to be made into monitoring. Research that would lead to some kind of benchmarking for monitoring is required.

11. IT systems: Monitoring, in its full meaning, includes data management, information generation and dissemination. These components need to be supported by information systems. The existing national programmes are largely supported by the following systems:

    - Surface water: HYDSTRA
    - Groundwater: NGA/REGIS
    - Water Quality: WMS
    - Spatial: GIS

    Water use information programmes should increasingly be supported by WARMS. Convergence of all these systems is required in order to move towards the goal of an effective and efficient information service. The umbrella programme for DWA/Water

Sector information and monitoring system co-ordination should also become the highest level driver for information system development.

12. Capacity-building for integrated monitoring: Capacity to work towards the stated goal is seen as the most significant bottleneck, particularly the capacity in Regions. Working in a co-ordinated and programmatic way in the implementation of the 5 year plan for resource quality monitoring offers many opportunities for systematic capacity-building, and, where necessary, expansion. Given the importance of this function, a new capacity building network for resource quality monitoring should be urgently considered under the FET-WATER programme. A special task team for capacity building should be established without delay under a new umbrella programme for monitoring.

13. Pilot implementation: In order to make rapid practical progress and allow a realistic assessment of the way forward with integrated monitoring, the full rollout of the 5-year plan in one pilot area is strongly proposed. This could be a water management area or a whole cluster.

4.2 OTHER AWARENESS, MONITORING AND VOLUNTEER GROUPS

4.2.1 Volunteer monitoring and participation

The following summary of monitoring programmes in South Africa and case studies from South Africa where the services of volunteers were used was taken from Rossouw and Februarie[68].

- The third tier of governance is the local authorities such as the City of Cape Town and others that are responsible for bulk water supply (Rand Water and Umgeni Water) and the storage of adequate treated water and reticulation of this water to end users.

  It seems unlikely that effective local government structures would be established to carry out the responsibilities at the third tier level for some time, especially for the smaller local authorities. Because of this, the Department of Water Affairs has expanded the mandate of the Water Boards, such as Rand Water and Umgeni Water, to enable them to provide water and sanitation services to the final consumer.

- Rand Water and Umgeni Water, bulk suppliers of water, have extensive water quality monitoring programmes, but do not make use of volunteers in their water quality monitoring activities. A number of concerns were raised concerning the use of volunteers:

  - Logistically very difficult to co-ordinate and get or collect samples especially in remote areas.
  - Volunteers must be reliable.

  - Equipment needs to be supplied increasing their costs.
  - Samples to be delivered to the laboratories on time.
  - Transport of samples to the laboratories and to the sampling sites especially in the remote areas.
  - Volunteers may need to be remunerated for their transport costs.
  - Health and safety of the volunteer especially in remote areas.

- The City of Cape Town has trained and used volunteer water quality monitors in the past but it was on an ad hoc basis and various problems were identified:
  - Success rate is high when it is need driven e.g. where a community utilise a resource for recreational purposes (river).
  - It was an awareness campaign involving school learners.
  - The data and information gathered were not used for a specific purpose other than creating awareness.
  - In most instances, no laboratory analysis took place.
  - A lack of funding, structure and specific skills within the community resulted in nobody taking responsibility for such a programme.

- Catchment fora such as the Olifants River Forum in Mpumalanga and the Olifants-Doorn River Forums and Reference Group in the Western Cape are active in catchment management and the identification of problem areas (pollution, soil erosion etc) in the interim until Catchment Management Authorities are established. Although routine or baseline water quality monitoring is not part of their mandate, problem areas are identified and referred to the local authorities to investigate and solve the problem. Volunteers from the different communities in a particular Water Management Area manage the fora.

- There are a number other volunteer groups such as the Friends of …… groups. A small core of volunteers who are dedicated and motivated by local issues drives these kinds of groups. More discussion under Section 4.2.2.

- A current initiative ”Adopt-a-Beach” aimed at volunteers from schools, coastal communities, participants in Coastcare projects as well as local environmental interest groups. One of the programme’s main aims is to increase knowledge and interest of a particular part of the coast amongst coastal users that will lead to more effective and participative coastal management. However, the data that are collected are not being used. More discussion under Section 4.2.2.

  A bi-monthly newsletter, “Tidal Tales” keeps the groups informed of the different activities and progress over the last two months. There is also e-mail contact with

[68] Rossouw and Februarie, 2005

interested parties on the progress of the project. This newsletter and the e-mails are used to keep the groups motivated.

- An interesting concept is where a volunteer has to pay to be part of a project such as the Threatened Species Project in the Greater St Lucia Wetland Park. British gap year students pay to come to South Africa and to work on research projects during their holidays. They stay anything from two weeks up to two months and sometimes even longer.

- There are a number of very successful non-water related examples of volunteer input such as the Volunteer Child Network and the St John Ambulance Foundation.

- The main reasons for the success of the Volunteer Child Network are the following:
  - ordinary citizens to help prevent, combat and minimise the impact of child abuse;
  - appropriate and useful activities for volunteers have been identified;
  - the recruitment, training and management of the volunteers in a sustainable and productive way have been developed; and
  - guidelines on becoming a volunteer and making use of volunteers were also developed.

  The objectives of the Volunteer Child Network database are the following:
  - To assist volunteers in identifying appropriate roles and directing their support to appropriate organizations involved in various activities related to the prevention of child abuse and minimizing the negative impact of child abuse on victims.
  - Volunteers will be assisted in offering their services to organizations with requirements closely matching their individual skills and preferences.
  - Organisations will be assisted in defining their needs and becoming more accessible to the potential pool of volunteers available in our communities.

- The St John Ambulance Foundation is assisted by a network of professionals and trained instructors who give training in first aid and health promotion. Training of volunteers is their core business.

  Because of the well-structured training programme the organisation attracts a diverse group of volunteers, e.g. community members, school learners, matriculants, professionals from different disciplines (accountants, health professionals, business etc.) to enable them to assist people in need.

  Matriculants or unemployed people perceive the training as an opportunity to secure a job in the formal sector.

  The Foundation uses the following incentives:
  - Volunteers only receive travelling cost when they have to provide a service.

- Certified training courses.
- Uniforms are provided when on duty (first aid volunteers). This gives the volunteer a sense of equal status to the professional paramedics.

4.2.2 Wildlife and Environment Society of South Africa - WESSA

WESSA[69] is South-Africa's oldest and largest non-government, membership-based environmental organisation. Their mission is to promote public participation in caring for the Earth.

The Society maintains a watchful eye on the environment through its extensive network of Regional offices, Branches (volunteer groups acting for their community), Friends Groups (groups of people who have banded together to conserve natural areas) and Environmental Youth Clubs.

Professional conservation and educational staff are employed to work directly with the public, with local, provincial and national government and with other conservation bodies to press for effective environmental planning and legislation to offer better protection of the environment.

WESSA is represented on many national and regional conservation bodies and investigation commissions, and is a founder member of the World Conservation Union.

The Society is a Section 21 company registered as an Incorporated Association not for gain. The Regions elect a National Council, who in turn appoints the Board of Directors.

The Society remains relevant and influential both as watchdog and educator.

Their professional conservation ecologists have the role as watchdog. They are constantly seeking to prevent degradation of the environment. Innumerable environmentally irresponsible practices and activities have been prevented and their impacts mitigated, by this team of experts.

The society's Conservation Division plays a significant role in influencing "Policy and Planning" in the environment and development field in South Africa. This Division has also initiated popular public participation projects such as the Friends of Nature Areas Scheme, biosphere reserves, conservancies and recycling projects.

Environmental education is vital in indicating the impact of man on the environment. WESSA offers their services at schools, teachers' groups and other environmental educators, either directly or by mobile units. WESSA increasingly engage in community development work and run environmental education centres across the country. Two successes are the initiation of a

[69] http://www.wessa.org.za

national youth environmental club scheme and the establishment of a resource development network, Share-Net.

Share-Net is an open, collaborative structure that was set up through a partnership of WESSA, KZN Wildlife and the World Wild Fund for Nature (WWF-SA) with the endorsement of the Environmental Education Association of Southern Africa (EEASA).

They publish a national magazine, African Wildlife, as well as EnviroKids (previously Toktokkie) for the junior members of the Society. They also publish a number of general and specific interest books from the Ecology of the Drakensberg to how to establish an indigenous garden. WESSA Regional Offices each have their own newsletter, i.e. WESSA Cape Environment is the newsletter for the Western Cape Region. In the latest newsletter Vol3/08 there was an article about volunteers being awarded for their contribution to the environment.

WESSA has adopted a holistic approach to environmental issues and is involved in a wide range of projects and initiatives.

Their national projects[70] include the following:

- Adopt-a-Beach: This section will be dealt in more detail than the other projects because of the similarities to the Adopt-a-River Programme. The idea behind the Adopt-a-Beach Programme is to encourage groups of people (volunteers) to adopt or help look after a piece of coast in their region and link with others as part of a national project. This programme was launched by the Department of Environmental Affairs and Tourism's Marine and Coastal Management Branch, and is being implemented by WESSA. Participating groups include schools, coastal communities, participants of Coastcare projects like Working for the Coast, Blue Flag beaches, as well as local environmental interest groups.

  Adopt-a-Beach is part of the overall Coastcare programme and contributes towards the implementation of the "awareness, education and training" goals of the White Paper for Sustainable Coastal Development in South Africa. Participants are provided with an opportunity to develop a better understanding of the coastal environment and relevant management principles. This will help ensure that there are more responsible coastal users and better overall coastal management.

  The activities are guided by giving each participating group an easy-to-use handbook and log sheets, as well as a resource box containing a wide range of items and resource materials, useful for monitoring and learning about coastal issues and having fun on the beach.

[70] http://www.wessa.org.za/natprojects.asp

Groups can decide how they can help solve some of the many problems in the coastal environmental like litter, badly planned development and uncontrolled fishing. There is regular support and advice from WESSA and co-operation with municipalities and other authorities. There now is a national, organised opportunity for people to tackle some of these issues.

Different groups are involved in different activities. They do not necessary follow the action topics of the guide, i.e. one group takes special care of coastal caves, another helps with seabird counts. Some have alerted the police to poaching activities while others have collected tons of plastic and many other issues are addressed.

There is great public interest in the programme and by contacting your nearest WESSA Regional Office for details of Adopt-a-Beach groups in your area, you can become involved.

- Eco-schools: This is a programme designed to encourage curriculum-based action for a healthy environment. It is an internationally recognised award scheme that accredits schools that make a commitment to continuously improve their school's environmental performance.

- National Mondi-WESSA Interschool Enviro Quiz: This is held annually to encourage young people to "think and act" environmentally.

- Share-Net: It is a South-African based informal networking project that supports environmental education and development in the SADC region. It is co-ordinated from the WESSA in the Umgeni Valley Nature Reserve, KwaZulu-Natal. The project strives to be responsive and participatory and performs the following functions"
    - Develop and review learning support materials for environmental education;
    - Support school teachers and curriculum developers;
    - Support professional development courses in SADC countries;
    - Provide low-cost printing and publishing facilities to members of the community;
    - Provide a low-cost mail-order support service;
    - Maintain a network of people, places and publications in environmental education;
    - Support environmental education centres.

  Share-Net materials are copyright-free for educational purposes and redevelopment for local use is encouraged.

- Enviro Clubs: Enviro clubs focuses on young people. Skill, such as working together as a committee, planning and organising special events and projects and handling money, are developed by starting an environmental club. They work as a team to address environmental issues in their area, network with other clubs and support conservation in South Africa. A Club Action Kit is available as a tool to assist one in starting and running

a club. The Kit contains a membership certificate, membership cards, resource guide, year planner and a comprehensive guide, “Getting Started”, on how to start and run an environmental club. WESSA staff also provides support.

Other national WESSA projects are the following:

- Biodiversity Conservation Unit
- Mondi Wetlands
- Blue Flag Beaches
- Eskom Projects
- SADC EE Regional Programme

WESSA Friend Groups are community-based groups that are affiliated to WESSA, and consist of community members who have banded together around a particular natural environment to ensure its conservation and environmental integrity. The main aim of the Friends movement is to support local government by providing volunteer time and assistance to make the public more aware of the value of our natural heritage. All activities and projects are planned in liaison with the owner/administrator of the area. Friend groups educate themselves and the public, by collecting and distributing information on the conservation-worthiness of their area, they promote the natural assets of their areas and they help the management of the area to eradicate aliens and combat soil erosion. There are already some Friend groups that have selected water bodies/rivers to manage, i.e. Friend of Nylsvlei, Friends of the Liesbeek and Friends of Little Princess Vlei.

5. LEGAL, HEALTH AND SAFETY ASPECTS

Hadley Cabin[71] from DWA Legal services provided the following information on the legality of water quality samples taken by volunteers.

Information was obtained from the National Department of Labour to determine the status of volunteers in terms of the Labour Law.

Health and safety

The Labour Law does not provide any protection and benefits for volunteers. Labour laws should probably be reviewed to include working conditions and protection of volunteers, especially their health and safety before volunteers can be used.

Volunteers in the Department of Water Affairs

Volunteers can be used for sampling if the Department of Water Affairs appoint them. However, there is an issue of authorised access to property. It is possible to "appoint" a volunteer in terms of Article 124 of the Water Act (National Water Act, Act 36 of 1998). The responsibilities of such a volunteer are stipulated in the letter of appointment and the Regional Director must sign an Appointment Certificate.

The powers and duties of such an authorised person are addressed in the National Water Act of 1998 in Chapter 13, Part 1, Article 125.

Data

Any water quality data that were attained legally can be used in court if the person that obtained the data went to the police and made a statement and is prepared to testify in court. However, it is unlikely that DWA will go to court with data that were not obtained according to strict guidelines. These guidelines specify how the samples should be taken, handled after sampling and the analysis thereof as well as the process that should be followed if pollution is being investigated with the purpose of prosecution. Chapter 3 in the National Water Act (Act 36 of 1998) describes these activities.

The issue of the legal, health and safety aspects of using volunteers, especially for water quality monitoring, needs to be investigated in more detail.

[71] Cabin, 2004

6. CONCLUSIONS AND RECOMMENDATIONS

6.1 THE VALUE OF VOLUNTEER INVOLVEMENT IN THE MONITORING OF WATER QUALITY PROGRAMMES

It has been acknowledged that the future of our water resources and sustainability thereof are dependant on the attitude of the users thereof, and in this instance, the role of community members cannot be ignored or under-estimated. It is important that communities be made aware of the significant role they can play to preserve and protect our country`s water resources. As already indicated in this document, volunteers have been successfully utilized in different activities and at various levels within communities and sectors (e.g. health, tourism, water conservation programmes).

Even the new Water Act of 1998 emphased the need for community involvement at all levels within the water sector. It is acknowledged that water resource quality management problems are extremely complex and occurs on a broad spatial and temporal scale. The process involves difficult trade-offs between alternative uses and users at local, regional and national level. Individuals within communities, institutions and government require the skills, knowledge and the will to respond effectively to new water resource quality challenges, and adopt an integrated approach in their quest for long-term management solutions. To assist water resource quality managers and users to deal with these complex issues, the Department of Water Affairs, in partnership with other institutions and private sector, should build on previous initiatives by making further investments through long-term strategic capacity building programmes. The focus should be on addressing all capacity building requirements of water monitoring. By investing in such programmes and promoting the involvement of communities and volunteers, the value and protection of our water resources will become less complex.

6.2 LESSONS LEARNT

The following are lessons learnt from both the international and local case studies. They are not in a particular sequence and are all considered equally important. Should one lesson be ignored in the planning and implementation of a volunteer monitoring programme something can, and probably will, go wrong.

Institutional/governmental support and guidance

Provide mechanisms for different catchment organizations to co-ordinate activities, exchange ideas, and share experiences so that programmes are delivered as efficiently and effectively as possible.

Legislate catchment planning and ensure the integration of catchment management programmes into existing policy regulations and activities.

Develop a public awareness campaigns aimed at increased understanding of the importance of catchment management.

Commit to building collaborative partnerships with communities, universities, industry (including forestry, agriculture, mining and energy), all levels of government, and community groups.

Training

Well-trained volunteers can play a vital role in assisting institutions to effectively perform their monitoring functions. By involving volunteers in the management of water resources and exposing them to training, not only the institutions benefit, but communities become more aware of the urgency and importance of protecting precious water resources.

A well-structured training programme is required. There are many training programmes currently available internationally and locally. A skills audit will identify the specific training requirements of a volunteer group and this must fit in with the objectives of their monitoring goals. Once this is done it is proposed that they tap into the various exiting training programmes and select the most appropriate programme that will affectively address their needs. If nothing were available one would have to source funding to develop a specific programme to suit their needs. Furthermore the current skills and knowledge available in the sector can be incorporated in the training process.

Acceptability of data

The acceptability of data will depend on the quality control mechanisms in place and the purpose of the monitoring data. Volunteer monitors collect independent data that can be used to either uphold or challenge public agency and industry data or that can be used for awareness creation only.

Keep your goals-and those of your volunteers-realistic

Chances are slim that your data will ever be used in court to stop a polluter. Data collected for such regulatory purposes require a very high degree of quality assurance. Most volunteer data are used to educate the community and to screen for potential problems.

Secure funding

It is critical to secure funding for any planned activities prior to the initiation and implementation of a volunteer project. It is just as critical to have a secure source of funding. It is even better to have multiple secure sources of funding.

Responsibilities towards volunteers

Institutions must be aware of legal responsibilities towards volunteers, if any exist. If there are no legal protective measures in place, the volunteers should be informed accordingly, before they commit themselves.

Lengthy process

Before volunteers can be used to perform monitoring functions, appropriate and clear guidelines should be developed to assist stakeholders in the initiation and implementation of the process of volunteer water quality monitoring.

It takes time to establish a monitoring programme of any nature. Proper planning is essential. If the use of volunteers is considered, all the structures and funding to initiate the programme should be in place before volunteers are recruited. If everything is not in place, and the time of the volunteers is wasted by not knowing what to do (action plans should be in place), the volunteers will lose interest and be lost to the programme.

Start small

It is generally recommended that one should start small, i.e. with a pilot study, before full implementation of a monitoring project. A pilot project that serves to test out methods, training sessions, and organizational skills can keep you from being overwhelmed and allows you to evaluate and refine your project before moving on to more ambitious efforts.

Commitment of volunteers

Volunteers must be inspired, motivated, keen and caring, to name but a few of their characteristics that will enhance their commitment to a specific volunteer monitoring programme.

The attitude of people plays an important role in their availability to participate in a volunteer monitoring programme.

Education

Education and awareness of environmental issues should start in schools. This way a future generation that has an environmentally sensitive attitude will be created.

Public education and awareness programmes are an important component of catchment plans to build support for, and also encourage stakeholder participation in, catchment management.

Make connections

The more people you talk to in your community and within local and state agencies/ departments/industries, the more friends and supporters your programme will have. Include potential data users in all phases of your project's development.

Incentives

It does not matter how committed a volunteer is, there must be incentives such as training (enhancing future work opportunities), feedback on work well done, valuable use of the collected data and acknowledgement of their contribution to their communities. The importance

of a well-structured and co-ordinated approach in a volunteer programme cannot be stressed enough.

The training and involvement with a volunteer monitoring initiative also leads to a higher level of understanding of their environment and empowerment to be able to contribute towards the solving of an environmental problem. This also serves as an incentive to keep them active in the monitoring programme.

Another incentive is to create an opportunity for volunteer leadership development. Volunteer leaders within a project provide the vision for setting goals and the commitment to achieve them. They also enable a project to develop and grow without stagnating. Build into your monitoring project plenty of opportunities for volunteers to develop as leaders.

Report findings to volunteers and to the community. Help volunteers present monitoring results at conferences and community meetings. Create a newsletter or data report and let the world see what the volunteers have accomplished.

Pamper your volunteers

Volunteers give up their free time to come to meetings, attend training sessions, and travel to monitoring sites. Provide social opportunities and reward volunteers for a job well done.

Short-term versus long-term monitoring

Short-term water quality monitoring, that is project based and community initiated and driven, has a better chance of success than long-term ongoing routine monitoring, as the long-term monitoring does not produce the same kind of immediate, visible results as the smaller projects.

Partnerships

Partnerships are the core of a volunteer water quality monitoring programme. It can be between public and private sectors, between public and government departments/agencies or between public and learning sectors or any combination of these. These partnerships can be based on a number of approaches. Projects can be categorised along a continuum of increasing community involvement and control[72].

The bottom-up approach is more effective at building a sense of community and an appreciation for the power of organized groups. It gives the volunteers a sense of ownership of the project, and encourages them to become environmental stewards and advocates committed to seeking community unity for action. It also leads to a higher level of understanding and empowerment. The other partner provides the specific protocol, training, supplies, and equipment. The volunteers provide the manpower.

[72] Ely, 2008

The bottom-up, community-based model has the potential to involve participants in every step, from defining the problem through communicating the results and taking action. The bottom-up approach does not dispense with scientists/trainers etc.; their involvement is critical to produce valid, credible data or actions. However, their role is to advise rather than to set the agenda for the volunteer group.

The local nature of water quality problems means that volunteer water quality monitoring is tailor-made for the bottom-up approach[73].

There are also benefits to a top-down approach. Some volunteers prefer to work on a "ready made" project rather than investing the time and energy required for community-designed programmes. Furthermore, the greater degree of institutional control over study design, methods, and data analysis has made possible more robust data that are more acceptable to the scientific community and potential data users.

The strength of top-down programmes is their ability to co-ordinate large numbers of volunteers/stakeholders, span a wide geographic area, and collect and manage a large amount of data. Such programmes can answer important scientific questions that would be difficult to answer any other way. The downside is that the role of volunteers is usually limited to data collection.

Co-ordination

The co-ordination of a volunteer water quality monitoring programme is crucial to its success. The co-ordinator is responsible for keeping the volunteers, the funding agency as well as all other partners involved in a specific monitoring programme informed about all aspects of the project.

Don't under-estimate volunteers

Never under-estimate the capabilities of volunteer monitors. They relish the challenge, but more importantly, they want to collect high quality, usable data because they want their effort to count for something[74]. They should be seen as equal partners in a monitoring programme.

Cultivate data users

One of the fundamental lessons is the importance of engaging data users right from the start. The data need to guide the selection of the monitoring/action protocols. Taking the necessary steps to ensure that volunteer-collected data will be used is closely tied to the "don't under-estimate volunteers" principle. People who put in time and effort for training and monitoring do not want their commitment treated lightly and they do not want their data treated lightly[75].

[73] Ely, 2008
[74] Fuller, 2004
[75] Fuller, 2004

6.3 CHALLENGES FACING SOUTH AFRICA

Institutional support	Creating technical support for regional and local structures in developing and implementing water resource quality monitoring plans.
Funding	Adequate funding is a key component of any resource quality monitoring or awareness creation programme. Monitoring programmes become costly as a result of a need for equipment (both laboratory and field) and other expenses such as travelling. Operation and maintenance of a monitoring programme, chemicals, the process of information dissemination and training of the monitors are all expenses that need to be provided for before a monitoring programme can be initiated.
Legal issues	The Labour Law does not provide any protection and benefits for volunteers. It is suggested that labour laws be reviewed to include working conditions and protection of volunteers, especially their health and safety.
Logistics	Transportation of samples especially from remote rural areas can become an obstacle, especially if water samples have to reach a laboratory before a certain time.
Training and Capacity Building	A variety of skills exist within the Department of Water Affairs, other institutions (i.e. Umgeni and Rand Water, SABS, CSIR and WESSA) and communities. An effort should be make to match the skill with needs of the monitoring programmes. Monitoring programmes must be kept abreast of developments in the Catchment Management Agencies and delegation of monitoring responsibilities over time.

6.4 SUCCESSES AND CHALLENGES BASED ON INTERNATIONAL EXPERIENCE

The following is a summary of success factors and challenges in volunteer water quality monitoring based on the international experiences.

- The input from volunteers water monitors are of particular value in providing quality data and building stewardship/ownership of local waters.

- Volunteers build stewardship of local water. By educating volunteers and the community about the value of local waters, the kinds of pollution threatening them, and how individual and collective actions can help solve specific problems, volunteer monitoring programmes can:
  - make the connection between catchment health and our individual and collective behaviours;
  - build bridges among various agencies, businesses, and organizations;
  - create a constituency for local waters that promotes personal and community stewardship and co-operation.

- Volunteer monitoring programmes can be organised and supported in many different ways. Financial support for any proposed volunteer activities may come from government grants, partnerships with business, endowments, independent fundraising efforts, corporate donations, membership dues, or a combination of these sources.

  The key is that funding must be available. The people volunteer their time to monitor the water environment, but there are expenses that need to be funded such as sampling equipment and the analysis of samples as\well as the co-ordination and management of these programmes.

  Most volunteer monitoring programmes have concerns about the critically important elements of stable funding and stable staffing. Long-term monitoring programmes are generally those that have diversified funding sources and programme elements, ensuring programme flexibility while maintaining the core priorities of the local community.

- Many volunteer groups in the USA and Australia collect data that supplements the information collected by state and local resource management and planning agencies. To ensure that its data are used, the monitoring programme should also develop a strong quality assurance project plan that governs how volunteers are trained, how samples are collected and analysed, and how information is stored and disseminated.

  Volunteer groups whose primary purpose is education and constituency-building generally adopt simple, easy-to-use assessment methods and may not need to develop a stringent quality assurance project plan.

- Catchment stewardship, as promoted in Canada, focuses on promoting, monitoring, and conserving the ecological health and biodiversity in a catchment. Since catchments often span many jurisdictional boundaries (e.g., of governments, of agencies, and of organizations), effective catchment stewardship requires strong collaboration among communities and all levels of government. Building understanding and partnerships among different communities, improving collaborative and inclusive decision-making, and respecting community rights are all key components of successful catchment stewardship.

  An investment into community-based, catchment stewardship can provide the following benefits:

  - Effective monitoring of the processes that influence ecosystem integrity.
  - A community-based model of ecosystem management has been shown to be 5 to 12 times more financially efficient than a direct government delivery approach;
  - A long-term, pro-active approach to environmental protection;

- Catchment stewardship promotes joint target setting, monitoring, and evaluation, leading to strong accountability in achieving shared goals and objectives.

The following non-prioritized list was identified as the most important actions for implementation:

- Provide sufficient, long-term funding for volunteer and community-based organizations to work with landowners to plan and implement stewardship;
- Provide mechanisms for different catchment organizations to co-ordinate activities, exchange ideas, and share experiences so that programmes are delivered as efficiently and effectively as possible;
- Legislate catchment planning and ensure the integration of catchment stewardship programmes into existing policy regulations and activities;
- Develop a public awareness campaigns aimed at increased understanding of the importance of catchment stewardship;
- Commit to building collaborative partnerships with communities, industry (including forestry, agriculture, mining and energy), all levels of government, and community groups;
- Develop and support environmentally sound measures that allow landowners to correct ecological problems on their land (e.g. financial and tax incentives, agri-environmental payments; and
- Provide the necessary tools to monitor and interpret data, and ensure that the results are used to adaptively manage programme delivery and implementation.

Although this list was developed for Canadian catchment stewardship, the same principles will apply in South Africa.

More specific recommendations for the South African Adopt-a-River programme, that have very specific objectives (mostly an awareness programme at this stage but could grow in something more in future) and that are not necessarily the same as the objectives for the Canadian programme will be presented in the Implementation Manual.

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